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SUN RECOMMENDED QUANTITY DISCOUNTS FOR STANDARD VALVES

One line item ■ One order ■ One shipment ■ F.O.B. Sarasota, FL. USA

Prices shown for SUN Cavity form tools are net and not subject to discounts.
Prices for Custom Products and Modifications of Standard Valves are by quotation only.

Quantity:	1-2	3-9	10-29	30-99	100-299	300-999
Discount:	List	7%	15%	25%	35%	On Request

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Selling prices are governed by the price list in effect at the time of acceptance of a purchase order.

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IN THIS CATALOGUE
ARE PREFERRED PRODUCTS
AND ARE READILY AVAILABLE.**

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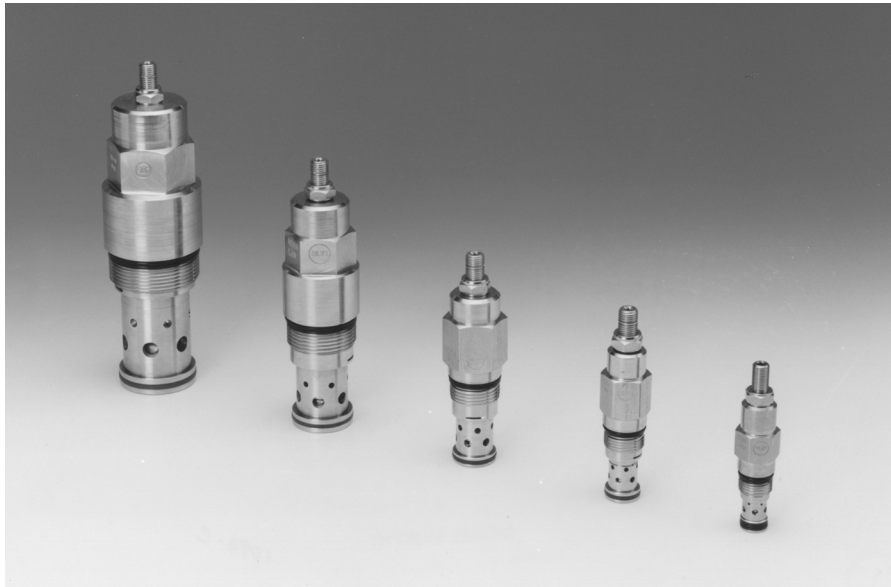
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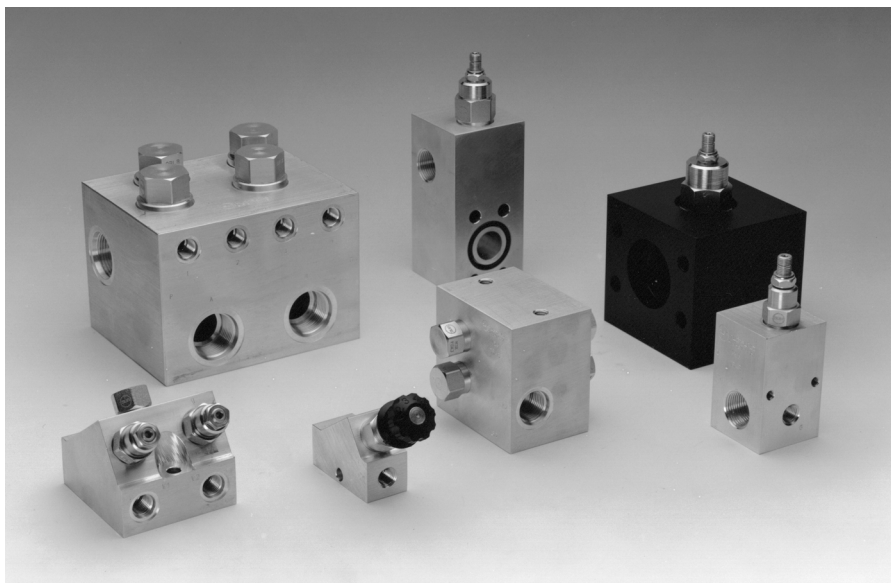
Catalogue #999-901-192

Overview

THE SUN PRODUCT



Sun screw-in cartridges, available in five sizes, are suitable for both mobile and industrial applications.



A wide range of standard bodies are available to simplify the installation of Sun cartridges in new and existing circuits.

Five Cartridge Sizes

*Flows to 200 GPM
(400 GPM for some applications).*

Sun screw-in cartridge type hydraulic valves for industrial and mobile applications are basic building blocks. Each cartridge contains the active elements needed for hydraulic control functions in a convenient and reliable lightweight envelope. Cartridges are available in standard pressure ranges up to 5000 psi (6000 psi in some models). Every cartridge receives a complete functional test prior to shipment.

The use of cartridge valves in hydraulic systems will:

- Improve system reliability
- Simplify circuits
- Reduce leakage points
- Reduce piping costs
- Save space and weight
- Simplify service
- Reduce assembly time
- Reduce spare parts inventory

A significant advantage in the design of Sun cartridges is that the working parts “float” in the body, so they are not susceptible to binding caused by overtightening, during installation in the cavity. (See illustration on inside front cover.)

Sun utilizes relatively few cartridge cavities throughout its entire range of cartridge products. Many valve functions and ranges can be interchanged in the same cavity. The result is greatly increased flexibility, and the capability to modify circuits without disturbing any piping, breaking unions or unplumbing any valves.

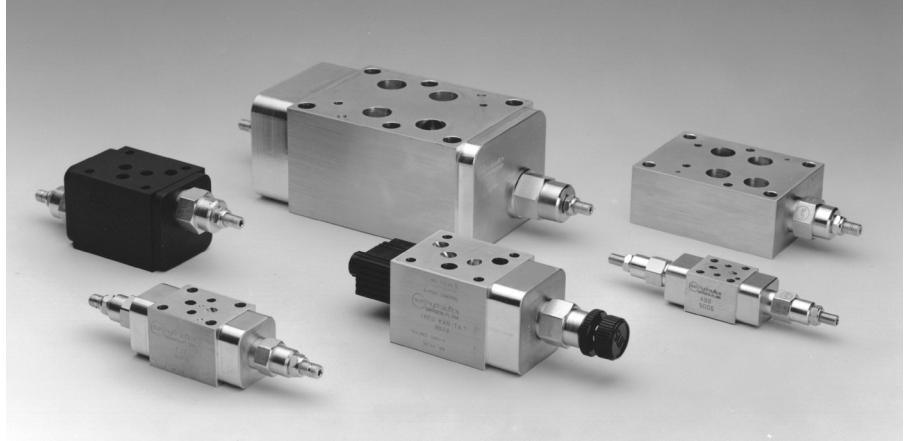
Line Mounted Bodies

Sun manufactures a wide range of standard bodies to simplify the installation of cartridges in new and existing circuits. SAE O-ring straight thread, NPTF, BSPP, SAE Code 61 and 62 split flange, and other ports are available. Two hydraulic functions are frequently combined in a single body to simplify piping. All bodies are available in aluminum or ductile iron.

THE SUN PRODUCT

Sandwich Bodies and Subplates

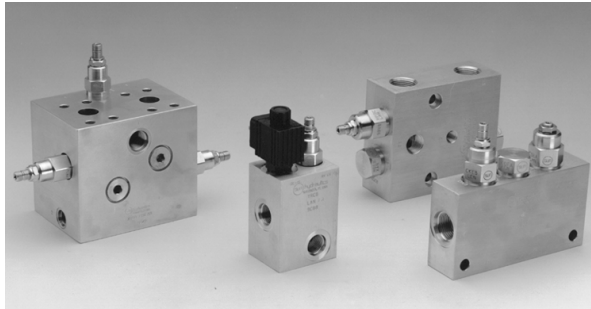
Sun's sandwich valves and subplates are complete circuit elements which mount directly under the solenoid valve. Most hydraulic functions are available in sandwich bodies and subplates. They are available in aluminum or ductile iron and provide a simple method of incorporating circuit controlling components right at the solenoid valve. Sandwich valves and subplates can be easily assembled with studrods and studnuts. The result is a clean, neat assembly with a minimum of external piping that is easily accessible for modification.



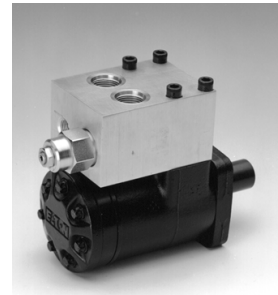
Sandwich bodies and subplates provide a simple method of incorporating controlling components right at the solenoid valve.

Pre-packaged Valve Assemblies

A wide variety of pre-packaged valve assemblies are available to perform many of the more common hydraulic circuit functions. These assemblies incorporate two or more different cartridges in a manifold body with a choice of porting options and are available in aluminum or ductile iron.



Pre-packaged valve assemblies for common hydraulic circuit functions.



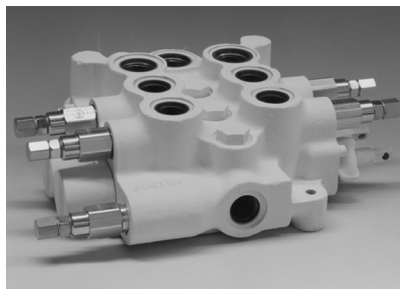
Direct Motor Mount bodies for commercial hydraulic motors.

Direct Motor Mount Bodies

Mounting configurations offered by Sun match the mounting patterns of selected Char-Lynn, Danfoss, Staffa, HPI, Parker Ross, and White motors. These valve assemblies provide relief, counterbalance, and flow control functions for mounting directly to a motor, and are available in aluminum or ductile iron.

Integration into Hydraulic Components

Directly integrating cartridge valves into the housing of other components is a very cost effective and compact method of packaging multiple hydraulic functions. Cavity form tools for machining the cartridge cavity are readily available from Sun.



Direct integration is cost-effective and compact.



Custom valve packages for specific applications.

Custom Valve Packages

It is often desirable and economical to incorporate several cartridges into a special, application specific manifold body to simplify a circuit, reduce piping costs, fit into a confined space, or solve a mounting problem.

Sun Hydraulics and its network of Authorized Distributors (see inside back cover) will work with you to develop customized solutions to your particular application problems.

TECHNICAL PRODUCT INFORMATION

Cartridge Installation

Sun cartridge valves are manufactured from carbon steel with all external parts zinc plated to protect against corrosion. Critical internal working parts (sliding spool valves often have a clearance between fixed and working parts of 5 microns or less) are heat treated and precision ground or lapped, to ensure repeatable, reliable performance.

Sun cartridge valves are available in five different sizes with capacities doubling from one size to the next. These cartridges can only be used in a Sun cavity that matches the external configuration of the cartridge. When installing cartridges in their cavities, they should be torqued to the recommended value.

All cartridges have Buna-N seals as standard, with Viton optional. Buna-N seals have an operating range of -50° F to 200° F. Viton seals have an operating range of 0° F to 250° F.

Filtration

As with any precision hydraulic component, clean oil contributes to long life and reliable performance. The most common cause of failure of a cartridge is dirt in the hydraulic fluid, which can then lodge in the working parts of the cartridge and interfere with operation.

Most Sun pilot operated valves feature a 150 micron stainless steel screen or equivalent, to protect the control orifice from contamination. This filter is produced from electrochemically etched stainless steel sheets to provide a consistent screening material.

It is recommended that hydraulic fluid used in systems with Sun valves have an ISO 4406 contamination level of 18/15 or better at all times. Consult your Authorized Distributor for filtration requirements to meet this cleanliness level.

Pressure and Flow Rating – Performance Data

Unless otherwise specified, Sun cartridges are rated to 5000 psi (6000 psi intermittent). All Sun cartridges are designed with a 4:1 safety factor. This means the minimum burst pressure is at least four times the maximum rated operating pressure.

All performance data in this catalog is derived using Chevron ISO Grade 32 petroleum based hydraulic fluid having a specific gravity of 0.87 at 60° F. All tests are conducted at 110° F.

Leakage is often specified in units of drops per minute in this catalog. For reference, 250 drops equal 1 cubic inch.

All performance data provided is developed in our laboratory.

Materials

All manifolds and bodies are available in aluminum or ductile iron. Aluminum bodies are made of wrought 6061-T6 grade aluminum and have a maximum pressure rating of 3000 psi, a proof rating of 6000 psi, and a burst rating of 12,000 psi.

Ductile iron bodies are made of continuous cast, grade 65-45-12 iron. Ductile iron bodies have a maximum pressure rating of 5000 psi, with a proof rating of 10,000 psi, and burst rating of 20,000 psi.

Porting Options

Sun offers many porting options in its mounting configurations, including, but not limited to: SAE Code 61 and 62 split flanges, NPTF dry seal threads, SAE O-ring threaded ports, and BSPP (Whitworth) threads.

Please note that some bodies with SAE O-ring threaded ports utilize a modified spot face diameter for conservation of materials.

Sandwich Interface Patterns

Most sandwich and subplate bodies are available in the following interface configurations:

ISO 02	NFPA D02	NG 4
ISO 03	NFPA D03	NG 6
ISO 05*	NFPA D05	NG 10
ISO 07	NFPA D07	NG 16
ISO 08	NFPA D08	NG 25

* Available with X and Y ports

Testing

All cartridge valves go through functional testing before shipment. Tests are performed using petroleum based hydraulic fluid (ISO Grade 32) at a temperature of 110° F (SUS = 130). Test stand cleanliness is maintained at ISO 17/14 or better.

Standard and special set pressure controls are set at the following flow rates:

- Load Control Valves - 2 in.³/min.
- Pressure Reducing Valves - 0 flow (blocked control port).
- All Other Valves - 4 GPM.

Sun Service Instructions

Cartridge valves are basic service items and they are easily removed in the field. See **Caution** below and the Sun Service Bulletin for details.

A non-functioning cartridge should be returned to Sun through your local Authorized Distributor for evaluation. A full report of our findings will be issued upon request.

Caution! – Prior to removing any cartridge:

1. **Refer to the equipment manufacturer's documentation for recommendations relating to precautions for securing any moving elements associated with the hydraulic system or equipment. (If documentation does not exist, ensure that all loads are adequately supported.)**
2. **Ensure that the hydraulic system is de-pressurized.**

TECHNICAL PRODUCT INFORMATION

Solenoid Cartridge Valves

Sun Hydraulics offers a variety of pilot solenoid cartridges and direct acting full flow solenoid cartridges to suit most application requirements.

Full Flow Valves Rated for Reliability

- Direct acting full flow solenoid cartridges will operate reliably at their maximum pressure (3600 psi) and flow ratings (10 GPM).
- All pressure and flow ratings are conservative to ensure that the final circuit will function as the designer intended.
- These solenoid cartridge valves will operate at rated conditions with a life expectancy in excess of 20 million cycles.

Multiple Versions

Two port, 2 position / 2-way solenoids are available in either spool or poppet versions, each offered in both normally open and normally closed configurations.

- Spool version exhibit maximum leakage rates of 5 in³/min. at 3600 psi and are recommended for high flow requirements where leakage is not critical.
- Poppet version exhibit maximum leakage rates of 10 drops/min. at 3600 psi.
- Three port, 2 position / 3-way spool type cartridges exhibit all of the features of the two position / 2-way spool cartridges.
- Solenoid cartridges feature a standard push-type manual override.

Designed for Application Flexibility

These direct acting valves require no minimum pressure for their operation.

- An efficient coil and tube design generates maximum force output with only 22 watts of power, so the valves exhibit consistent and reliable operation.
- The high force output of the solenoid ensures that there is enough power to overcome flow forces that may otherwise prevent the valve from shifting.

- Within each cartridge version, the normally open and normally closed configurations have virtually identical performance, allowing them to be used interchangeably.
- Together these features afford the circuit designer greatly increased flexibility.

Connector and Voltage Options

- All solenoids are DC type devices.
- An internal bridge rectifier is used in the coil for AC applications.
- Coils will operate reliably from 80% to 120% of the rated voltage with a maximum ambient temperature of 122°F.
- DC coils are offered in 12 and 24-volt versions with twin lead, DIN or AMP® Junior Timer connectors.
- AC coils are available in both 115 or 230-volt options and feature DIN connectors.
- All coils employ internal transient voltage suppression protection to protect externally connected electrical switching.

High Pressure Solenoid Pilot Controls

- These small spool-type cartridges handle flows up to approximately .25 GPM and will accommodate pressure up to 5000 psi at all ports.
- All pilot solenoid cartridges are rated for a fatigue life of greater than 20 million cycles at their maximum working pressure and flow ratings.

Low Power Consumption

The highly efficient tube design of the pilot solenoids requires only 12 watts to shift the valve.

- Voltage and temperature tolerances of the pilot solenoids are identical to those of the full flow valves.
- All coils employ internal transient voltage suppression protection to protect externally connected electrical switching.
- Both AC and DC coils are offered with AC coils employing an internal bridge rectifier.
- DC coils are offered in various voltage options from 6 to 48-volts.
- Connector options include DIN, SAE twin spade and twin leads.

- AC coils are offered in 115- and 230-volt options and feature DIN connectors.

Integrated Pilot Control

While all of the pilot control solenoid cartridges can be used individually in manifolds to control other devices, the 2-way cartridges offer the added benefit of being able to be directly installed into other Sun cartridges to provide electrically operated high flow and high pressure control.

- The T-8A cavity is offered as a control option on many of Sun's ventable and pilot operated cartridges to offer high performance, 5000 psi electrically controlled products at a competitive price.
- Directly integrating the electrical control in the main stage function results in a product that offers improved control characteristics; separate pilot lines are eliminated and only a single cavity needs to be machined to accommodate both the control and primary function.
- Sun also offers a range of cartridges that incorporate solenoid pilot controls to provide directional control for flow ranges from 15 to 120 GPM.

2-way or 3-way

Pilot control solenoid cartridges are available in either a two port, 2 position / 2-way (DAAA), or a three port, 2 position / 3-way (DBAA), each of which exhibits internal leakage rates of 10 drop/min. maximum at 5000 psi.

- The 2-way versions fit into Sun's existing T-8A cavity.
- The 3-way versions fit the T-9A cavity.
- Both are offered in normally open and normally closed configurations with a variety of voltage and connector options.
- The pilot control solenoid valves include a push-type manual override as a standard feature.

LOCATE LINE MOUNT BODIES WITH ALL NECESSARY SPECIFICATIONS

Sun offers many single and multiple cavity standard line mount manifolds, and many sandwich, motor mount bodies and subplates that are available in a choice of aluminum (3000 psi/210 bar) or ductile iron (5000 psi/350 bar). Ports include NPTF, SAE, BSPP and Code 61 and Code 62 flanges.

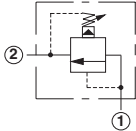
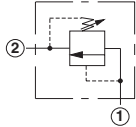
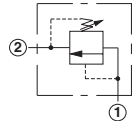
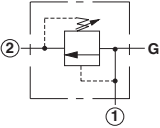
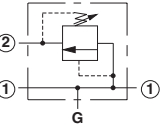
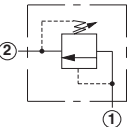
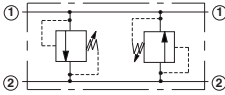
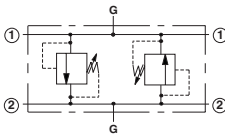
Go to www.sunhydraulics.com. Example: **Click Product: Manifolds: Line Mount: Flow Controls: Inline:** and a pop-up menu shows all the available **SAE Ported Bodies** within your selection (see below). When you click the body in the appropriate Cavity column, the **body page will show all measurements, Technical Data and full orientation views of all body faces.** See [Technical Information](#) section of web site for additional information.

Please hover over the manifolds in order to view porting information.

Port Size	T-162A	T-13A	T-5A	T-16A	T-18A
1/4" NPTF		GCA			
1/4" NPTF	ACA	GCA/S			
1/4" NPTF	ACA/S				
3/8" NPTF		GCB			
3/8" NPTF	ACB	GCB/S			
3/8" NPTF	ACB/S		DCB		
3/8" NPTF			DCB/S		
1/2" NPTF		GCC			
1/2" NPTF		GCC/S	DCC		
1/2" NPTF			DCC/S		
3/4" NPTF				ICD	
3/4" NPTF			VFJ	ICD/S	
3/4" NPTF			VFJ/S		
1" NPTF				ICE	
1" NPTF			VFK	ICE/S	
1" NPTF			VFK/S		
1 1/4" NPTF				ICF	
1 1/4" NPTF			VFL	ICF/S	
1 1/4" NPTF			VFL/S		
SAE 4		GCH			
SAE 4	ACH	GCH/S			
SAE 4	ACH/S				
SAE 6		GCI			
SAE 6	ACI	GCI/S			
SAE 6	ACI/S		DCI		
SAE 6			DCI/S		
SAE 8		GCJ			
SAE 8		GCJ/A			
SAE 8		GCJ/S	DCJ		
SAE 8			DCJ/S		
SAE 10			DCK		
SAE 10			DCK/S		
SAE 12				ICL	

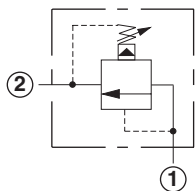
NOTES

Two Port Relief Assemblies

	<i>Cartridge Type</i>	<i>Page</i>
	Pilot Operated	2
	Direct Acting	2
<i>Line Mounted Assemblies (Body Type)</i>		
	90 Degree	4
	90 Degree with Gauge Port 90 Degree 1.50" SAE C62 Flange Port	5 5
	Through Port	6
	2.00" SAE C61/62 Flange Port, 2 Cavities	8
	Cross-Port, 2 Cavities	9-10
	Cross-Port, 2 Cavities with 2 Gauge Ports Cross-Port, 1.50" SAE C61/C62 Flange Port, 2 Cavities	10 10

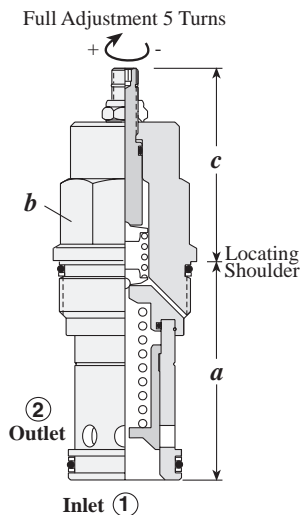
Relief Valves

PILOT OPERATED



Capacity	Typical Cartridge Model Code	Cavity	Cartridge Dimensions					Installation Torque (lb. ft.)
			a	b	c			
					L	C	K	
12 GPM	RPCC - LAN	T - 162A	1.22	3/4"	2.11	2.17	2.31	25/30
25 GPM	RPEC - LAN	T - 10A	1.56	7/8"	2.00	2.06	2.25	30/35
50 GPM	RPGC - LAN	T - 3A	1.88	1 1/8"	2.12	2.18	2.38	45/50
100 GPM	RPIC - LAN	T - 16A	2.44	1 1/4"	2.44	2.47	2.69	150/160
200 GPM	RPKC - LAN	T - 18A	3.13	1 5/8"	2.81	2.94	3.06	350/375

OPTION ORDERING INFORMATION



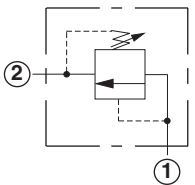
RP * C - * * *

Nominal Capacity	Base Price	Control**	Adjustment Range	Seal
C 12 GPM*		L Standard Screw	A 100 - 3000 psi	N Buna-N
E 25 GPM		C Tamper Resistant	W 150 - 4500 psi	V Viton
G 50 GPM		K Handknob	B 50 - 1500 psi	
I 100 GPM			C 150 - 6000 psi	
K 200 GPM			N 60 - 800 psi	
			Q 60 - 400 psi	

Adjustment Range Options:
 A, B, C, and W are standard set at 1000 psi.
 N Option is standard set at 400 psi.
 Q Option is standard set at 200 psi.
 * Minimum setting 75 psi on all ranges.
Customer may specify pressure setting.

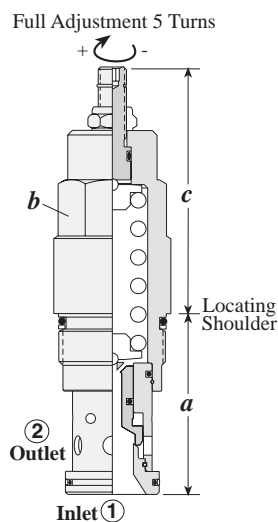
** See page 244 for information on Control Options

DIRECT ACTING



Capacity	Typical Cartridge Model Code	Cavity	Cartridge Dimensions				Installation Torque (lb. ft.)
			a	b	c		
					L	C	
12 GPM	RDBA - LAN	T - 162A	1.22	3/4"	2.11	2.17	25/30
25 GPM	RDDA - LAN	T - 10A	1.56	7/8"	2.38	2.44	30/35
50 GPM	RDFA - LAN	T - 3A	1.88	1 1/8"	2.50	2.56	45/50
100 GPM	RDHA - LAN	T - 16A	2.44	1 1/4"	3.25	3.31	150/160
200 GPM	RDJA - LAN	T - 18A	3.13	1 5/8"	3.94	4.07	350/375

OPTION ORDERING INFORMATION



RD * A - * * *

Nominal Capacity	Base Price	Control**	Adjustment Range	Seal
B 12 GPM		L Standard Screw	A 500 - 3000 psi	N Buna-N
D 25 GPM		C Tamper Resistant	W 1000 - 4500 psi	V Viton
F 50 GPM			B 300 - 1500 psi	
H 100 GPM			C 1000 - 6000 psi	
J 200 GPM			D 25 - 800 psi	
			E 100 - 400 psi	
			S 50 - 200 psi	

Adjustment Range Options:
 A, B, C, and W are standard set at 1000 psi.
 D Option is standard set at 400 psi.
 E Option is standard set at 200 psi.
 S Option is standard set at 100 psi.
Customer may specify pressure setting.

** See page 244 for information on Control Options

U.S. Patent #4,742,846
 European Patent Pending

TECHNICAL TIPS / PERFORMANCE CURVES

Relief Valves, Pilot Operated

Applications

These relief cartridges are normally closed, pressure control elements that are fully adjustable over a wide range of operating pressures up to 5000 psi. They are typically used when accurate pressure regulation is required and spool leakage is not critical.

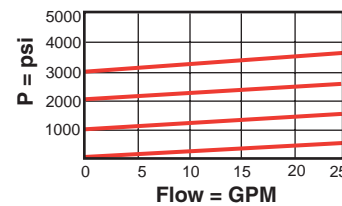
Design Concepts and Features

- Incorporates 150 micron stainless steel screen to protect the main stage control orifice.
- Low leakage, 2 to 5 in.³/min./1000 psi, dependent on frame size.
- Low hysteresis, less than $\pm 1\%$
- Selection of spring adjustment ranges with low adjustment effort.

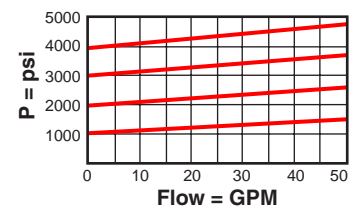
Performance Curves

Typical Pressure Rise

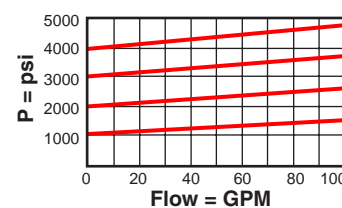
RPCC-L*N



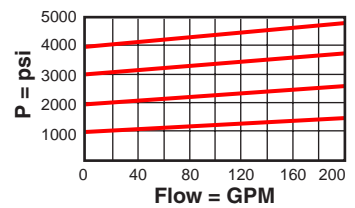
RPEC-L*N



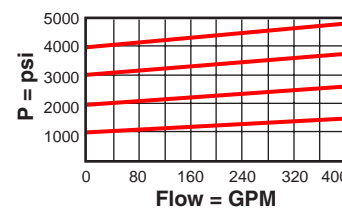
RPGC-L*N



RPIC-L*N



RPKC-L*N



Relief Valves, Direct Acting

Applications

This patented, direct acting, differential area valve with broad operating characteristics is adjustable to 5000 psi. Because of its exceptional performance, this relief cartridge should be considered for applications where fast response, dirt tolerance and leakage are critical. Examples of this type of application would include overshoot protection of fixed and variable volume pumps and shock protection of actuators (cylinders and motors).

Design Concepts and Features

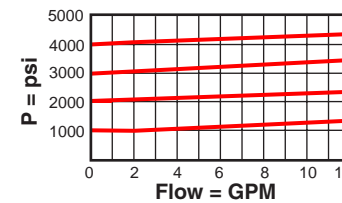
- Maximum leakage is 10 drops/min. at reseal.
- Reseat equals 90% of cracking pressure for all five frame sizes.
- Not recommended for repeated adjustment because of high adjustment effort.

Note: For both types of relief cartridge, any pressure at port 2 is directly additive to the valve settings. In situations where absolute pressure at port 1 is required; use **RS*C-***** sequence cartridge or **RV*D**, four port relief cartridge.

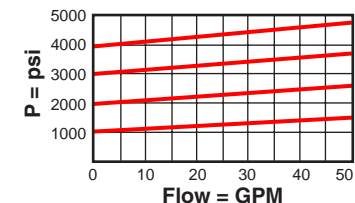
Performance Curves

Typical Pressure Rise

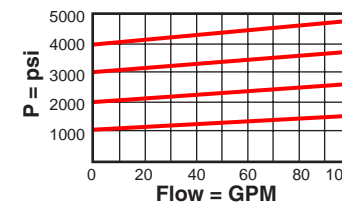
RDBA-L*N



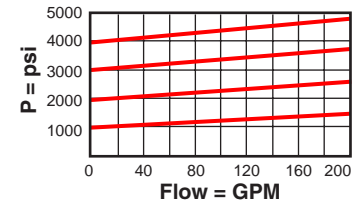
RDDA-L*N



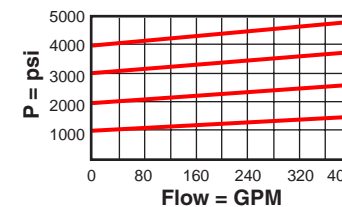
RDFA-L*N



RDHA-L*N



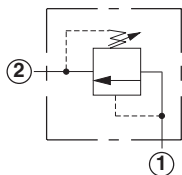
RDJA-L*N



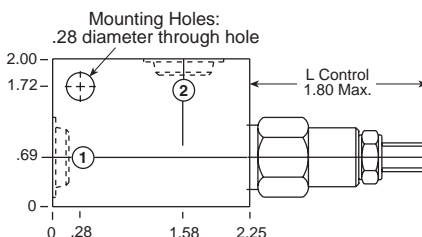
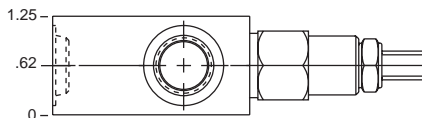
General Application Requirements

- Operating Temperature Range: Buna-N seals -50° F to 200° F, Viton seals 0° F to 250° F.
- Viscosity Range: 60-3000 SUS.
- Fluid Contamination Level: ISO 4406 18/15 or better; Recommend $\beta_{10} \geq 75$ to achieve ISO 18/15 or better in most systems.
- Factory Pressure Setting for cartridge is established at a 4 GPM flow rate.

Line Mounted Assemblies

TWO PORT PRESSURE REGULATING RELIEF APPLICATIONS
(90 DEGREE BODIES)PILOT OPERATED
ASSEMBLIESGo to www.sunhydraulics.com
for more product information and pricing.DIRECT ACTING
ASSEMBLIES

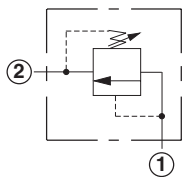
0-12 GPM Cavity T-162A



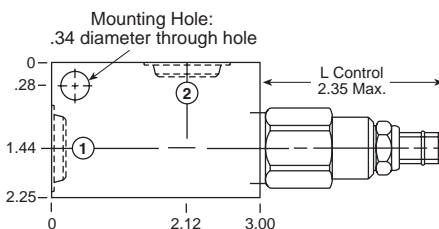
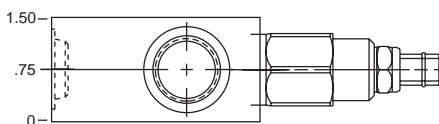
Ports 1 and 2	Assembly Model Code*
1/4" NPTF	RPCC-LAN-AAA
3/8" NPTF	RPCC-LAN-AAB
SAE-4	RPCC-LAN-AAH
SAE-6	RPCC-LAN-AAI

*Add modifier /S to order Ductile Iron for pressure
rating over 3000 psi.

Ports 1 and 2	Assembly Model Code*
1/4" NPTF	RDBA-LAN-AAA
3/8" NPTF	RDBA-LAN-AAB
SAE-4	RDBA-LAN-AAH
SAE-6	RDBA-LAN-AAI

*Add modifier /S to order Ductile Iron for pressure
rating over 3000 psi.

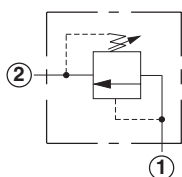
0-25 GPM Cavity T-10A



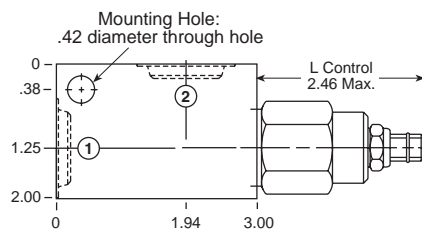
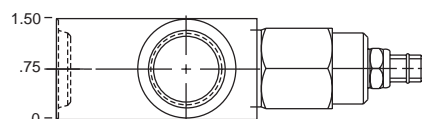
Ports 1 and 2	Assembly Model Code*
1/2" NPTF	RPEC-LAN-FAC
3/4" NPTF	RPEC-LAN-FAD
SAE-10	RPEC-LAN-FAK
SAE-12	RPEC-LAN-FAL

*Add modifier /S to order Ductile Iron for pressure
rating over 3000 psi.

Ports 1 and 2	Assembly Model Code*
1/2" NPTF	RDDA-LAN-FAC
3/4" NPTF	RDDA-LAN-FAD
SAE-10	RDDA-LAN-FAK
SAE-12	RDDA-LAN-FAL

*Add modifier /S to order Ductile Iron for pressure
rating over 3000 psi.

0-50 GPM Cavity T-3A



Ports 1 and 2	Assembly Model Code*
1/2" NPTF	RPGC-LAN-CAC
3/4" NPTF	RPGC-LAN-CAD
SAE-10	RPGC-LAN-CAK
SAE-12	RPGC-LAN-CAL

*Add modifier /S to order Ductile Iron for pressure
rating over 3000 psi.

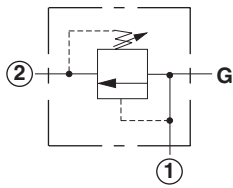
Ports 1 and 2	Assembly Model Code*
1/2" NPTF	RDFA-LAN-CAC
3/4" NPTF	RDFA-LAN-CAD
SAE-10	RDFA-LAN-CAK
SAE-12	RDFA-LAN-CAL

*Add modifier /S to order Ductile Iron for pressure
rating over 3000 psi.

NOTES: Page 2 for cartridge models RP*C-*** and RD*A-*** show performance curves, technical tips, and options.
See page vii for technical information about line mount bodies including SAE flange pattern specifications.
Consult your local Sun Distributor or the Sun Web Site for other port sizes available in the bodies shown above.
Model Codes printed in red are Preferred Products and are readily available.

**TWO PORT PRESSURE REGULATING RELIEF APPLICATIONS
(90 DEGREE/90 DEGREE 1.50" SAE C62 FLANGE PORT BODIES)**

PILOT OPERATED ASSEMBLIES

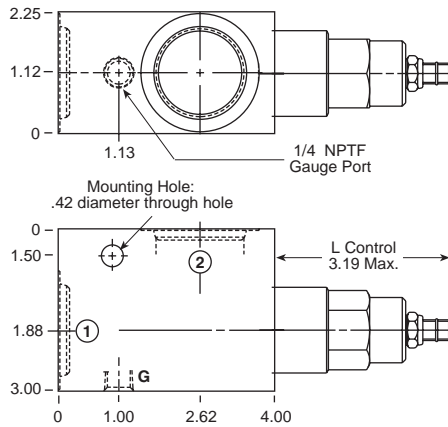


Ports 1 and 2	Assembly Model Code*
3/4" NPTF	RPIC-LAN-IAD
1" NPTF	RPIC-LAN-IAE
1 1/4" NPTF	RPIC-LAN-IAF
SAE-12	RPIC-LAN-IAL
SAE-16	RPIC-LAN-IAM

*Add modifier /S to order Ductile Iron for pressure rating over 3000 psi.

Go to www.sunhydraulics.com for more product information and pricing.

0-100 GPM Cavity T-16A

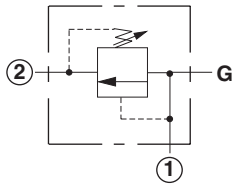


DIRECT ACTING ASSEMBLIES

Ports 1 and 2	Assembly Model Code*
3/4" NPTF	RDHA-LAN-IAD
1" NPTF	RDHA-LAN-IAE
1 1/4" NPTF	RDHA-LAN-IAF
SAE-12	RDHA-LAN-IAL
SAE-16	RDHA-LAN-IAM

*Add modifier /S to order Ductile Iron for pressure rating over 3000 psi.

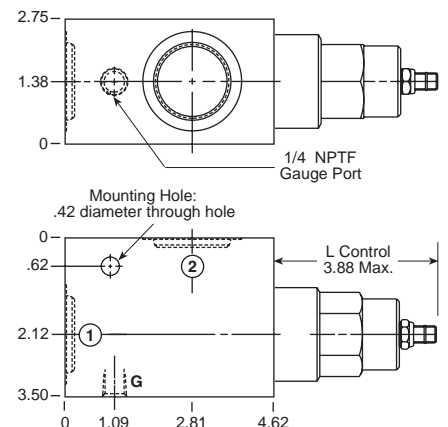
0-200 GPM Cavity T-18A



Ports 1 and 2	Assembly Model Code*
3/4" NPTF	RPKC-LAN-LAD
1" NPTF	RPKC-LAN-LAE
1 1/4" NPTF	RPKC-LAN-LAF
SAE-12	RPKC-LAN-LAL
SAE-16	RPKC-LAN-LAM

*Add modifier /S to order Ductile Iron for pressure rating over 3000 psi.

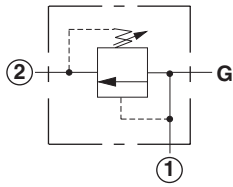
0-200 GPM Cavity T-18A



Ports 1 and 2	Assembly Model Code*
3/4" NPTF	RDJA-LAN-LAD
1" NPTF	RDJA-LAN-LAE
1 1/4" NPTF	RDJA-LAN-LAF
SAE-12	RDJA-LAN-LAL
SAE-16	RDJA-LAN-LAM

*Add modifier /S to order Ductile Iron for pressure rating over 3000 psi.

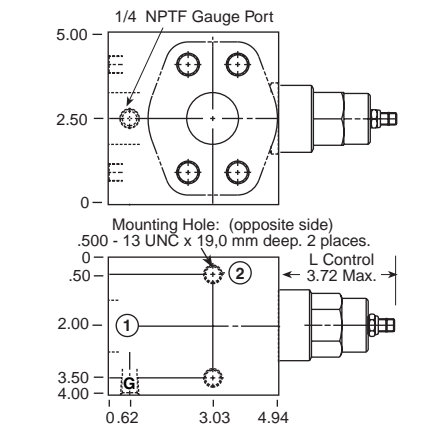
0-200 GPM Cavity T-18A



Ports 1 and 2	Assembly Model Code*
1 1/2" SAE C62	RPKC-LAN-LA6

*Add modifier /S to order Ductile Iron for pressure rating over 3000 psi.

0-200 GPM Cavity T-18A

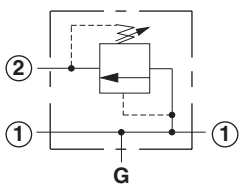


Ports 1 and 2	Assembly Model Code*
1 1/2" SAE C62	RDJA-LAN-LA6

*Add modifier /S to order Ductile Iron for pressure rating over 3000 psi.

NOTES: Page 2 for cartridge models RP*C-*** and RD*A-*** show performance curves, technical tips, and options. See page vii for technical information about line mount bodies including SAE flange pattern specifications. Consult your local Sun Distributor or the Sun Web Site for other port sizes available in the bodies shown above. Model Codes printed in red are Preferred Products and are readily available.

Line Mounted Assemblies

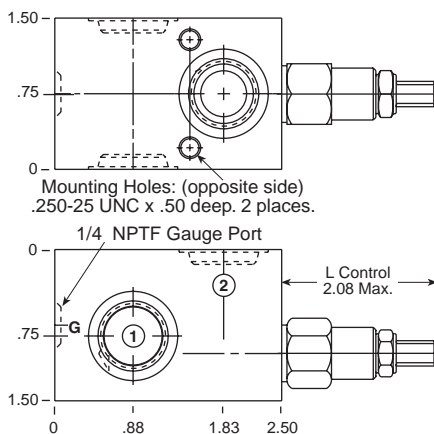
TWO PORT PRESSURE REGULATING RELIEF APPLICATIONS
(THROUGH PORT BODIES)PILOT OPERATED
ASSEMBLIES

Ports 1 and 2	Assembly Model Code*
1/4" NPTF	RPCC-LAN-AEA
3/8" NPTF	RPCC-LAN-AEB
SAE-4	RPCC-LAN-AEH
SAE-6	RPCC-LAN-AEI

*Add modifier **/S** to order Ductile Iron for pressure rating over 3000 psi.

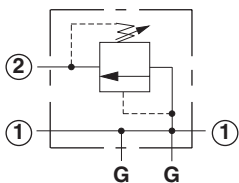
Go to www.sunhydraulics.com
for more product information and pricing.

0-12 GPM Cavity T-162A

DIRECT ACTING
ASSEMBLIES

Ports 1 and 2	Assembly Model Code*
1/4" NPTF	RDBA-LAN-AEA
3/8" NPTF	RDBA-LAN-AEB
SAE-4	RDBA-LAN-AEH
SAE-6	RDBA-LAN-AEI

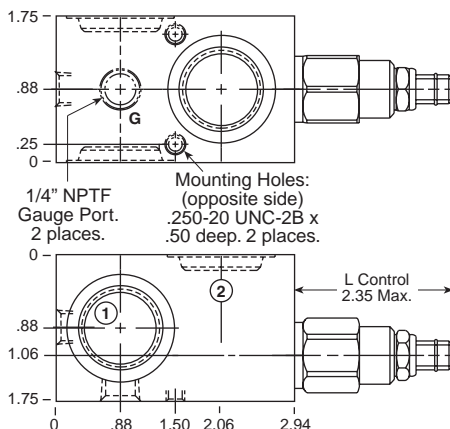
*Add modifier **/S** to order Ductile Iron for pressure rating over 3000 psi.



Ports 1 and 2	Assembly Model Code*
3/8" NPTF	RPEC-LAN-FEB
1/2" NPTF	RPEC-LAN-FEC
SAE-6	RPEC-LAN-FEI
SAE-8	RPEC-LAN-FEJ

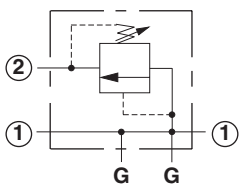
*Add modifier **/S** to order Ductile Iron for pressure rating over 3000 psi.

0-25 GPM Cavity T-10A



Ports 1 and 2	Assembly Model Code*
3/8" NPTF	RDDA-LAN-FEB
1/2" NPTF	RDDA-LAN-FEC
SAE-6	RDDA-LAN-FEI
SAE-8	RDDA-LAN-FEJ

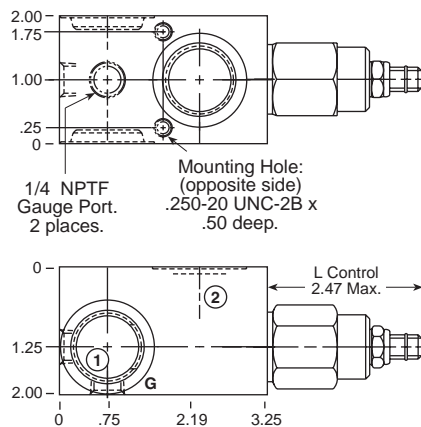
*Add modifier **/S** to order Ductile Iron for pressure rating over 3000 psi.



Ports 1 and 2	Assembly Model Code*
SAE-8	RPGC-LAN-CEJ
SAE-12	RPGC-LAN-CEL

*Add modifier **/S** to order Ductile Iron for pressure rating over 3000 psi.

0-50 GPM Cavity T-3A



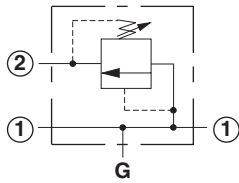
Ports 1 and 2	Assembly Model Code*
SAE-8	RDFA-LAN-CEJ
SAE-12	RDFA-LAN-CEL

*Add modifier **/S** to order Ductile Iron for pressure rating over 3000 psi.

NOTES: Page 2 for cartridge models RP*C-*** and RD*A-*** show performance curves, technical tips, and options.
See page vii for technical information about line mount bodies including SAE flange pattern specifications.
Consult your local Sun Distributor or the Sun Web Site for other port sizes available in the bodies shown above.
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TWO PORT PRESSURE REGULATING RELIEF APPLICATIONS (THROUGH PORT BODIES)

PILOT OPERATED ASSEMBLIES

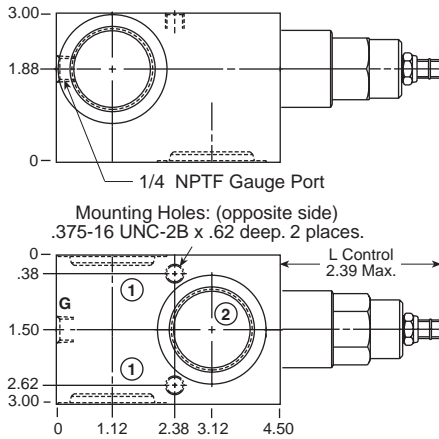


Ports 1 and 2	Assembly Model Code*
1" NPTF	RPIC-LAN-IEE
1 1/4" NPTF	RPIC-LAN-IEF
SAE-12	RPIC-LAN-IEL
SAE-16	RPIC-LAN-IEM

*Add modifier /S to order Ductile Iron for pressure rating over 3000 psi.

Go to www.sunhydraulics.com for more product information and pricing.

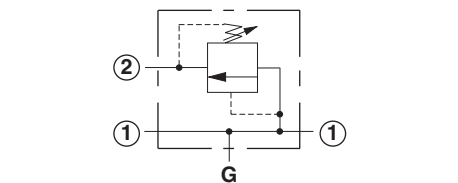
0-100 GPM Cavity T-16A



DIRECT ACTING ASSEMBLIES

Ports 1 and 2	Assembly Model Code*
1" NPTF	RDHA-LAN-IEE
1 1/4" NPTF	RDHA-LAN-IEF
SAE-12	RDHA-LAN-IEL
SAE-16	RDHA-LAN-IEM

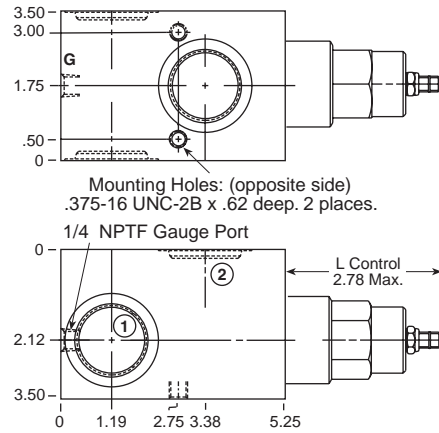
*Add modifier /S to order Ductile Iron for pressure rating over 3000 psi.



Ports 1 and 2	Assembly Model Code*
1" NPTF	RPKC-LAN-LEE
1 1/4" NPTF	RPKC-LAN-LEF
SAE-12	RPKC-LAN-LEL
SAE-16	RPKC-LAN-LEM

*Add modifier /S to order Ductile Iron for pressure rating over 3000 psi.

0-200 GPM Cavity T-18A



Ports 1 and 2	Assembly Model Code*
1" NPTF	RDJA-LAN-LEE
1 1/4" NPTF	RDJA-LAN-LEF
SAE-12	RDJA-LAN-LEL
SAE-16	RDJA-LAN-LEM

*Add modifier /S to order Ductile Iron for pressure rating over 3000 psi.

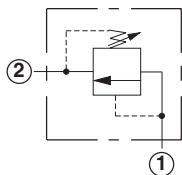
NOTES: Page 2 for cartridge models RP*C-*** and RD*A-*** show performance curves, technical tips, and options. See page vii for technical information about line mount bodies including SAE flange pattern specifications. Consult your local Sun Distributor or the Sun Web Site for other port sizes available in the bodies shown above. Model Codes printed in red are Preferred Products and are readily available.

Line Mounted Assemblies

TWO PORT PRESSURE REGULATING RELIEF APPLICATIONS (2.00" SAE C61/C62 FLANGE PORT BODIES 2 CAVITIES)

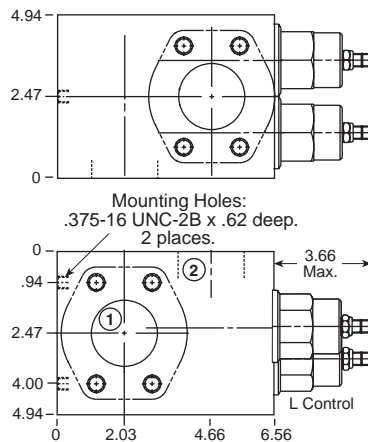
**PILOT OPERATED
ASSEMBLIES**

 Go to www.sunhydraulics.com
for more product information and pricing.

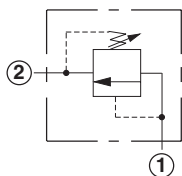
DIRECT ACTING ASSEMBLIES


Ports 1 and 2	Assembly Model Code*
2" SAE C61	RPKC-LAN-XZY

*Add modifier /S to order Ductile Iron for pressure rating over 3000 psi.

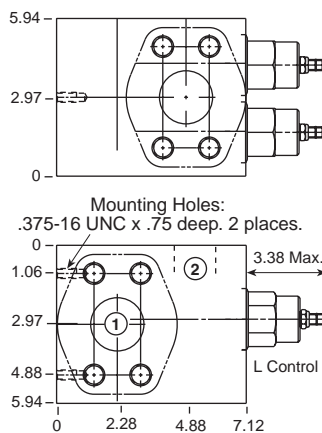
0-400 GPM Cavity T-18A


Ports 1 and 2	Assembly Model Code*
2" SAE C61	RDJA-LAN-XZY

0-400 GPM Cavity T-18A


Ports 1 and 2	Assembly Model Code*
2" SAE C62	RPKC-LAN-VTN

*Add modifier /S to order Ductile Iron for pressure rating over 3000 psi.



Ports 1 and 2	Assembly Model Code*
2" SAE C62	RDJA-LAN-VTN

NOTES: Page 2 for cartridge models RP*C-*** and RD*A-*** show performance curves, technical tips, and options.
See page vii for technical information about line mount bodies including SAE flange pattern specifications.
Consult your local Sun Distributor or the Sun Web Site for other port sizes available in the bodies shown above.

TWO PORT PRESSURE REGULATING RELIEF APPLICATIONS (CROSS-PORT BODIES, 2 CAVITIES)

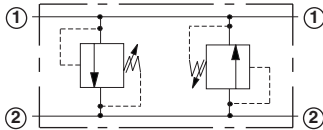
Cross-port relief assemblies are used to protect system components against hydraulic and structural damage which can be caused by the sudden stopping of an inertial load. These assemblies also protect "swing" circuits and other bi-directional installations against possible surges and cavitation.

Sun offers a series of cross-port relief assemblies for line mounting which are shown below, as well as a variety of single and dual models in sandwich bodies to simplify circuitry when using ISO 02, ISO 05, ISO 07 and ISO 08 solenoid valves.

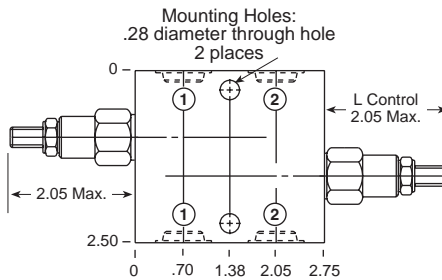
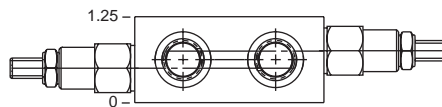
PILOT OPERATED ASSEMBLIES

Go to www.sunhydraulics.com for more product information and pricing.

DIRECT ACTING ASSEMBLIES



0-12 GPM Cavity T-162A

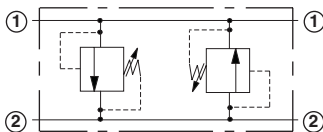


Ports 1 and 2	Assembly Model Code*
1/4" NPTF	RPCC-LAN-AYA
3/8" NPTF	RPCC-LAN-AYB
SAE-4	RPCC-LAN-AYH
SAE-6	RPCC-LAN-AYI

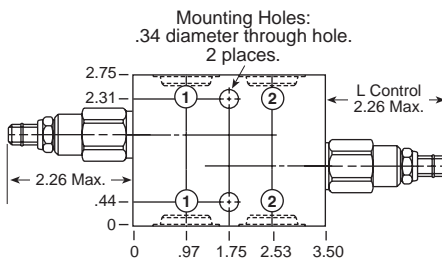
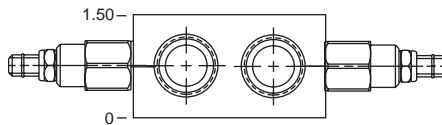
Ports 1 and 2	Assembly Model Code*
1/4" NPTF	RDBA-LAN-AYA
3/8" NPTF	RDBA-LAN-AYB
SAE-4	RDBA-LAN-AYH
SAE-6	RDBA-LAN-AYI

*Add modifier **/S** to order Ductile Iron for pressure rating over 3000 psi.

*Add modifier **/S** to order Ductile Iron for pressure rating over 3000 psi.



0-25 GPM Cavity T-10A

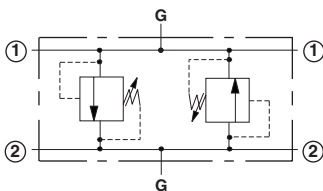


Ports 1 and 2	Assembly Model Code*
3/8" NPTF	RPEC-LAN-YFB
1/2" NPTF	RPEC-LAN-YFC
SAE-6	RPEC-LAN-YFI
SAE-8	RPEC-LAN-YFJ

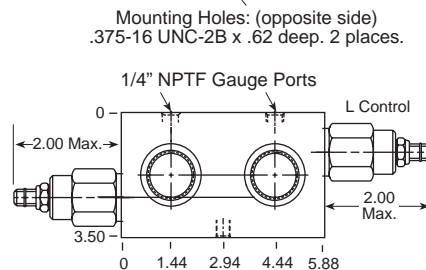
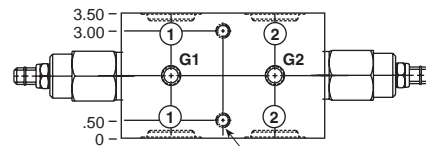
Ports 1 and 2	Assembly Model Code*
3/8" NPTF	RDDA-LAN-YFB
1/2" NPTF	RDDA-LAN-YFC
SAE-6	RDDA-LAN-YFI
SAE-8	RDDA-LAN-YFJ

*Add modifier **/S** to order Ductile Iron for pressure rating over 3000 psi.

*Add modifier **/S** to order Ductile Iron for pressure rating over 3000 psi.



0-50 GPM Cavity T-3A



Ports 1 and 2	Assembly Model Code*
3/4" NPTF	RPGC-LAN-YCD
1" NPTF	RPGC-LAN-YCE
SAE-12	RPGC-LAN-YCL
SAE-16	RPGC-LAN-YCM

Ports 1 and 2	Assembly Model Code*
3/4" NPTF	RDFA-LAN-YCD
1" NPTF	RDFA-LAN-YCE
SAE-12	RDFA-LAN-YCL
SAE-16	RDFA-LAN-YCM

*Add modifier **/S** to order Ductile Iron for pressure rating over 3000 psi.

*Add modifier **/S** to order Ductile Iron for pressure rating over 3000 psi.

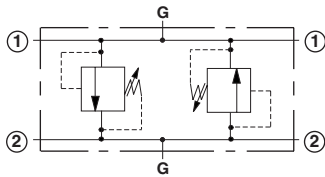
NOTES: Page 2 for cartridge models RP*C-*** and RD*A-*** show performance curves, technical tips, and options. See page vii for technical information about line mount bodies including SAE flange pattern specifications. Consult your local Sun Distributor or the Sun Web Site for other port sizes available in the bodies shown above. Model Codes printed in red are Preferred Products and are readily available.

Line Mounted Assemblies

TWO PORT PRESSURE REGULATING RELIEF APPLICATIONS (CROSS-PORT/CROSS-PORT, 1.50" SAE C61/C62 FLANGE PORT BODIES, 2 CAVITIES)

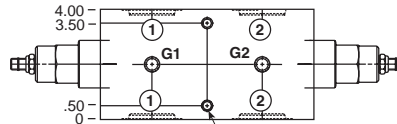
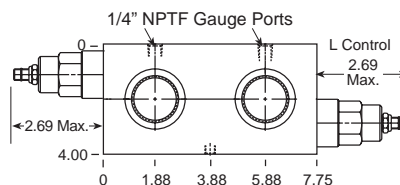
**PILOT OPERATED
ASSEMBLIES**

 Go to www.sunhydraulics.com
for more product information and pricing.

**DIRECT ACTING
ASSEMBLIES**


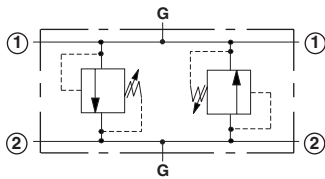
Ports 1 and 2	Assembly Model Code*
1 1/4" NPTF	RPIC-LAN-YIF
SAE-20	RPIC-LAN-YIN

*Add modifier /S to order Ductile Iron for pressure rating over 3000 psi.

0-100 GPM Cavity T-16A

 Mounting Holes: (opposite side)
.375-16 UNC-2B x .62 deep.
2 places.


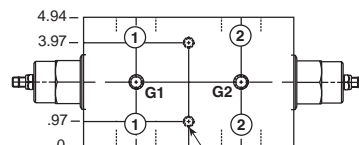
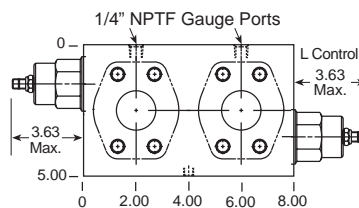
Ports 1 and 2	Assembly Model Code*
1 1/4" NPTF	RDHA-LAN-YIF
SAE-20	RDHA-LAN-YIN

*Add modifier /S to order Ductile Iron for pressure rating over 3000 psi.



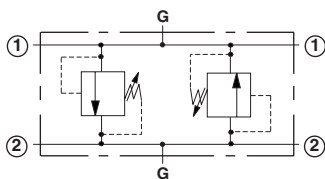
Ports 1 and 2	Assembly Model Code*
1 1/2" SAE C61	RPKC-LAN-YLR

*Add modifier /S to order Ductile Iron for pressure rating over 3000 psi.

0-200 GPM Cavity T-18A

 Mounting Holes: (opposite side)
.375-16 UNC-2B x .62 deep. 2 places.


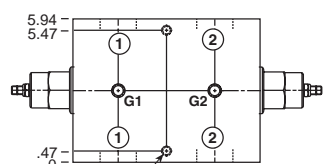
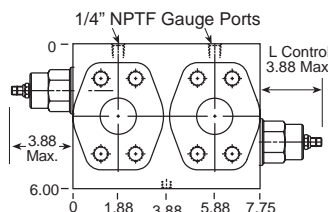
Ports 1 and 2	Assembly Model Code*
1 1/2" SAE C61	RDJA-LAN-YLR

*Add modifier /S to order Ductile Iron for pressure rating over 3000 psi.



Ports 1 and 2	Assembly Model Code*
1 1/2" SAE C62	RPKC-LAN-YL6

*Add modifier /S to order Ductile Iron for pressure rating over 3000 psi.

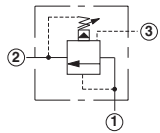
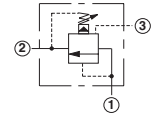
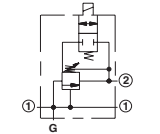
0-200 GPM Cavity T-18A

 Mounting Holes: (opposite side)
.375-16 UNC-2B x .62 deep. 2 places.


Ports 1 and 2	Assembly Model Code*
1 1/2" SAE C62	RDJA-LAN-YL6

*Add modifier /S to order Ductile Iron for pressure rating over 3000 psi.

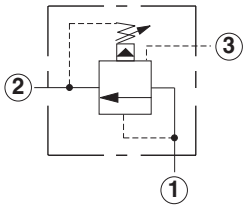
NOTES: Page 2 for cartridge models RP*C-*** and RD*A-*** show performance curves, technical tips, and options.
See page vii for technical information about line mount bodies including SAE flange pattern specifications.
Consult your local Sun Distributor or the Sun Web Site for other port sizes available in the bodies shown above.

Three Port Relief Assemblies

	<i>Cartridge Type</i>	<i>Page</i>
	Pilot Operated with Vent	12
<i>Line Mounted Assemblies (Body Type)</i>		
	90 Degree	14
	90 Degree 1.50" SAE C62 Flange Port	15
	90 Degree 2.00" SAE C61/C62 Flange Port, 2 Cavities	16
	Solenoid Operated with Vented Relief	17
	Solenoid Operated, Flange Mounted with Vented Relief	18

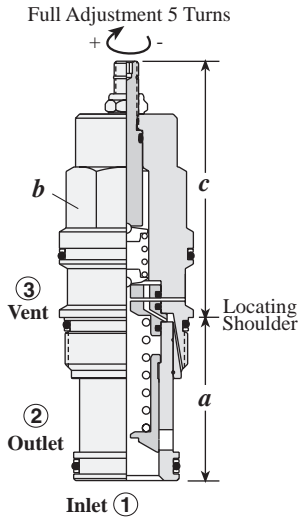
Relief Valves

PILOT OPERATED WITH VENT



Capacity	Typical Cartridge Model Code	Cavity	Cartridge Dimensions					Installation Torque (lb. ft.)
			a	b	c			
					L	C	K	
7.5 GPM	RVBA – LAN	T - 163A	1.22	3/4"	2.55	2.63	2.77	25/30
15 GPM	RVCA – LAN	T - 11A	1.38	7/8"	2.50	2.56	2.75	30/35
30 GPM	RVEA – LAN	T - 2A	1.38	1 1/8"	2.81	2.88	3.06	45/50
60 GPM	RVGA – LAN	T - 17A	1.81	1 1/4"	3.28	3.31	3.53	150/160
120 GPM	RVIA – LAN	T - 19A	2.50	1 5/8"	3.94	4.09	4.19	350/375

OPTION ORDERING INFORMATION



RV * A - * * *

Nominal Capacity	Control**	Adjustment Range	Seal
B 7.5 GPM*	L Standard Screw	A 100 - 3000 psi	N Buna-N
C 15 GPM	C Tamper Resistant	W 150 - 4500 psi	V Viton
E 30 GPM	K Handknob	B 50 - 1500 psi	
G 60 GPM		C 150 - 6000 psi	
I 120 GPM		N 60 - 800 psi	
		Q 60 - 400 psi	

Adjustment Range Options:

A, B, C, and W are standard set at 1000 psi.

N Option is standard set at 400 psi.

Q Option is standard set at 200 psi.

* Minimum setting 75 psi on all ranges.

Customer may specify pressure setting.

** See page 244 for information on Control Options

TECHNICAL TIPS / PERFORMANCE CURVES

Relief Valves, Pilot Operated with Vent

Applications

Ventable, pilot operated relief valves incorporate an additional port for remote control.

- To provide remote adjustment of the main cartridge through the use of the **RBAC-***** pilot cartridge or other suitable device.
- To unload the main relief valve by opening the vent port with a 2-way solenoid valve (**DAAA-*****). Normal relief operation is activated by blocking the bypass pilot flow.

Design Concepts and Features

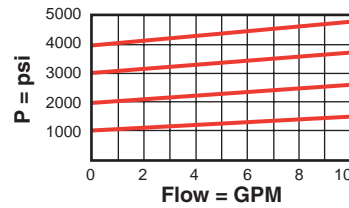
- Incorporates 150 micron stainless steel screen to protect the main stage control orifice.
- Low leakage, 2 to 5 in.³/min./1000 psi, dependent on frame size.
- Control pilot flow .05 to .07 GPM, dependent on frame size.
- Low hysteresis, less than $\pm 1\%$
- Low pressure drop when unloaded.

Note: Any pressure at port 2 is additive to the pressure setting of the valve. If absolute system pressure must be regulated at port 1 and variable pressure is present at port 2, consider using the 4 port **RV*D-***** series where an independent drain port is provided.

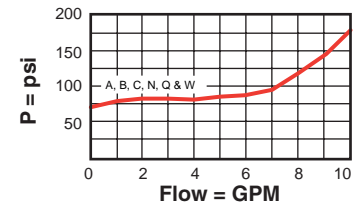
Performance Curves

Typical Pressure Rise

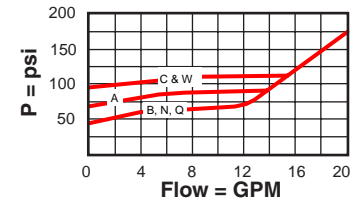
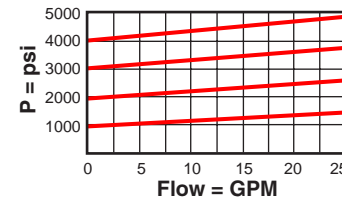
RVBA-L*N



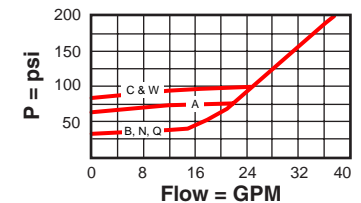
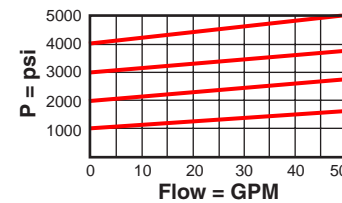
Vented Pressure



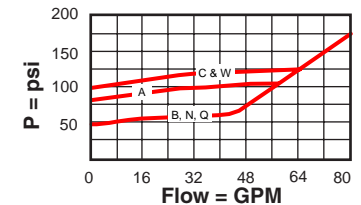
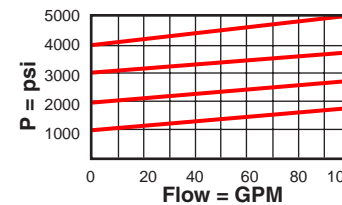
RVCA-L*N



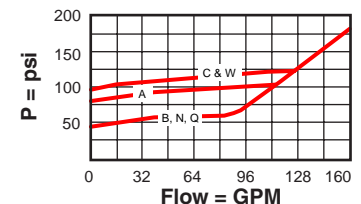
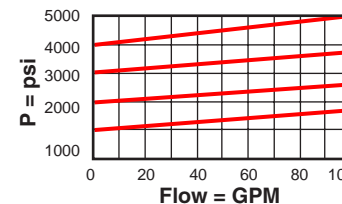
RVEA-L*N



RVGA-L*N



RVIA-L*N



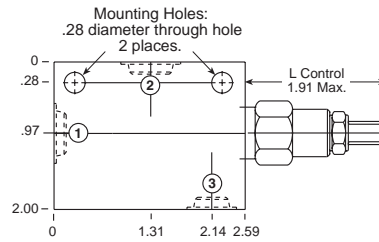
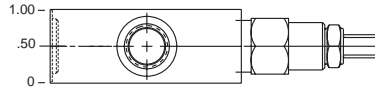
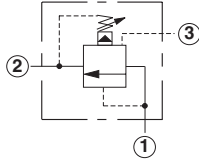
General Application Requirements

- Operating Temperature Range: Buna-N seals -50° F to 200° F, Viton seals 0° F to 250° F.
- Viscosity Range: 60-3000 SUS.
- Fluid Contamination Level: ISO 4406 18/15 or better; Recommend $\beta_{10} \geq 75$ to achieve ISO 18/15 or better in most systems.
- Factory Pressure Setting for cartridge is established at a 4 GPM flow rate.

Line Mounted Assemblies

THREE PORT PRESSURE REGULATING RELIEF APPLICATIONS
(90 DEGREE BODIES)PILOT OPERATED
ASSEMBLIESGo to www.sunhydraulics.com
for more product information and pricing.

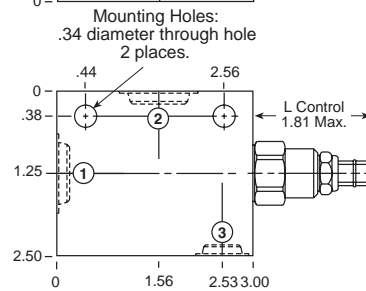
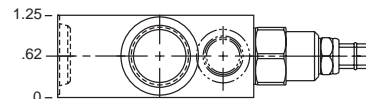
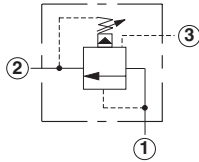
0-7.5 GPM Cavity T-163A



Ports 1 and 2	Port 3	Assembly Model Code*
1/4" NPTF	1/4" NPTF	RVBA-LAN-JCA
3/8" NPTF	1/4" NPTF	RVBA-LAN-JCB
SAE-4	SAE-4	RVBA-LAN-JCH
SAE-6	SAE-4	RVBA-LAN-JCI

*Add modifier /S to order Ductile Iron for pressure rating over 3000 psi.

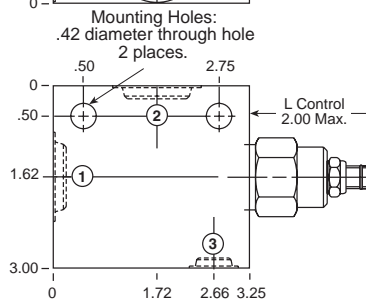
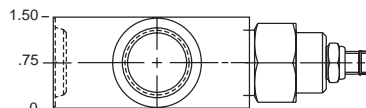
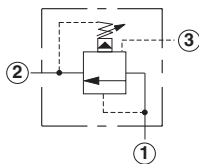
0-15 GPM Cavity T-11A



Ports 1 and 2	Port 3	Assembly Model Code*
3/8" NPTF	1/4" NPTF	RVCA-LAN-ECB
1/2" NPTF	1/4" NPTF	RVCA-LAN-ECC
SAE-4	SAE-4	RVCA-LAN-ECH
SAE-6	SAE-6	RVCA-LAN-ECI
SAE-8	SAE-6	RVCA-LAN-ECJ

*Add modifier /S to order Ductile Iron for pressure rating over 3000 psi.

0-30 GPM Cavity T-2A



Ports 1 and 2	Port 3	Assembly Model Code*
1/2" NPTF	1/4" NPTF	RVEA-LAN-BCC
3/4" NPTF	1/4" NPTF	RVEA-LAN-BCD
SAE-6	SAE-6	RVEA-LAN-BCI
SAE-8	SAE-6	RVEA-LAN-BCJ

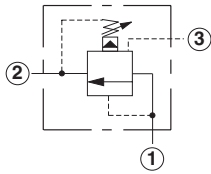
*Add modifier /S to order Ductile Iron for pressure rating over 3000 psi.

NOTES: Page 12 for cartridge model RV*A-*** shows performance curves, technical tips, and options.
See page vii for technical information about line mount bodies including SAE flange pattern specifications.
Consult your local Sun Distributor or the Sun Web Site for other port sizes available in the bodies shown above.
Model Codes printed in red are Preferred Products and are readily available.

THREE PORT PRESSURE REGULATING RELIEF APPLICATIONS (90 DEGREE/90 DEGREE 1.50" SAE C62 FLANGE PORT BODIES)

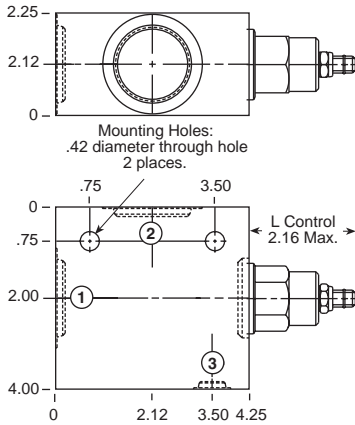
PILOT OPERATED ASSEMBLIES

Go to www.sunhydraulics.com for more product information and pricing.



0-60 GPM Cavity T-17A

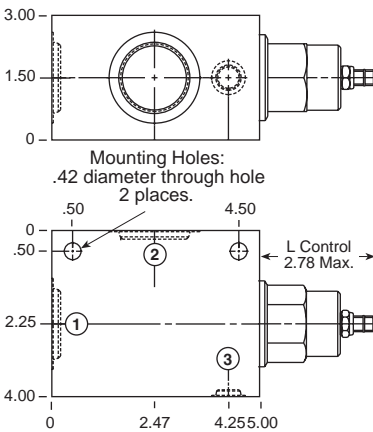
Ports 1 and 2	Port 3	Assembly Model Code*
3/4" NPTF	1/4" NPTF	RVGA-LAN-HCD
1" NPTF	1/4" NPTF	RVGA-LAN-HCE
1 1/4" NPTF	1/4" NPTF	RVGA-LAN-HCF
SAE-12	SAE-6	RVGA-LAN-HCL
SAE-16	SAE-6	RVGA-LAN-HCM



*Add modifier /S to order Ductile Iron for pressure rating over 3000 psi.

0-120 GPM Cavity T-19A

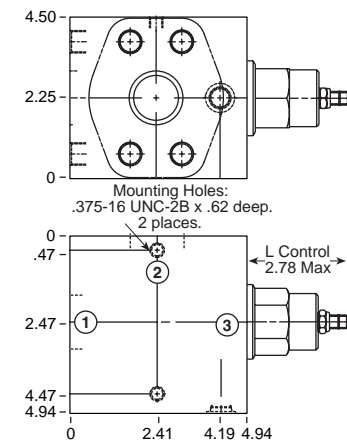
Ports 1 and 2	Port 3	Assembly Model Code*
1" NPTF	1/4" NPTF	RVIA-LAN-KCE
1 1/4" NPTF	1/4" NPTF	RVIA-LAN-KCF
SAE-20	SAE-6	RVIA-LAN-KCN



*Add modifier /S to order Ductile Iron for pressure rating over 3000 psi.

0-120 GPM Cavity T-19A

Ports 1 and 2	Port 3	Assembly Model Code*
1 1/2" SAE C62	SAE-6	RVIA-LAN-KC6



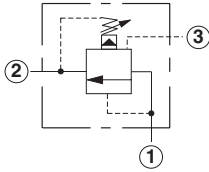
*Add modifier /S to order Ductile Iron for pressure rating over 3000 psi.

NOTES: Page 12 for cartridge model RV*A-*** shows performance curves, technical tips, and options. See page vii for technical information about line mount bodies including SAE flange pattern specifications. Consult your local Sun Distributor or the Sun Web Site for other port sizes available in the bodies shown above. Model Codes printed in red are Preferred Products and are readily available.

Line Mounted Assemblies

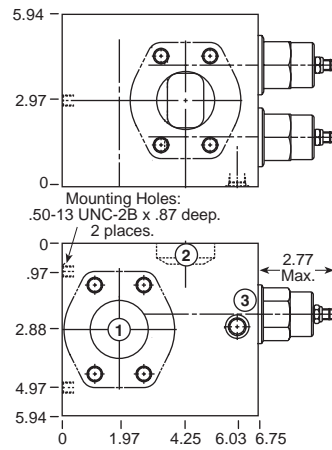
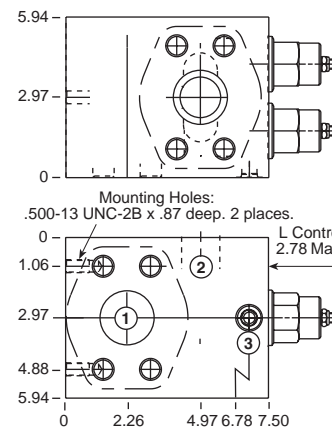
THREE PORT PRESSURE REGULATING RELIEF APPLICATIONS (90 DEGREE 2.00" SAE C61/C62 FLANGE PORT BODIES, 2 CAVITIES)

**PILOT OPERATED
ASSEMBLIES**

 Go to www.sunhydraulics.com
for more product information and pricing.


Ports 1 and 2	Port 3	Assembly Model Code*
2" SAE C61	SAE-6	RVIA-LAN-XZZ

*Add modifier /S to order Ductile Iron for pressure rating over 3000 psi.

0-240 GPM Cavity T-19A

0-240 GPM Cavity T-19A


*Add modifier /S to order Ductile Iron for pressure rating over 3000 psi.

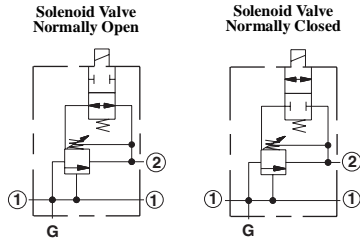
NOTES: Page 12 for cartridge model RV*A-*** shows performance curves, technical tips, and options.
See page vii for technical information about line mount bodies including SAE flange pattern specifications.
Consult your local Sun Distributor or the Sun Web Site for other port sizes available in the bodies shown above.

THREE PORT PRESSURE REGULATING RELIEF APPLICATIONS (SOLENOID OPERATED BODIES WITH VENTED RELIEF)

PILOT OPERATED ASSEMBLIES

Suitable for operation
up to 5000 psi

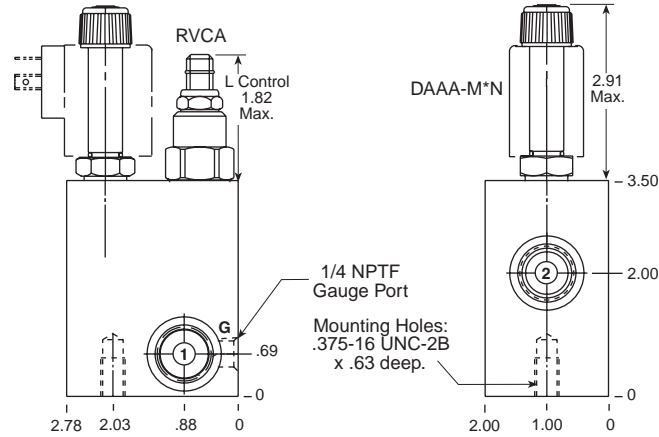
Go to www.sunhydraulics.com
for more product information and pricing.



Ports 1 and 2	Assembly Model Code*
1/4" NPTF	XRCA-LAN-A
3/8" NPTF	XRCA-LAN-B
1/2" NPTF	XRCA-LAN-C
SAE-6	XRCA-LAN-I
SAE-8	XRCA-LAN-J

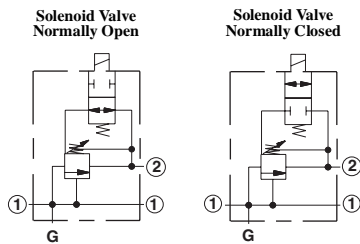
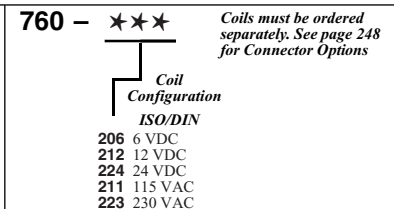
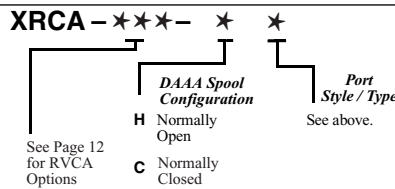
*Add modifier **/S** to order Ductile Iron for pressure rating over 3000 psi.

0-15 GPM Cavity T-11A



Assembly Order:

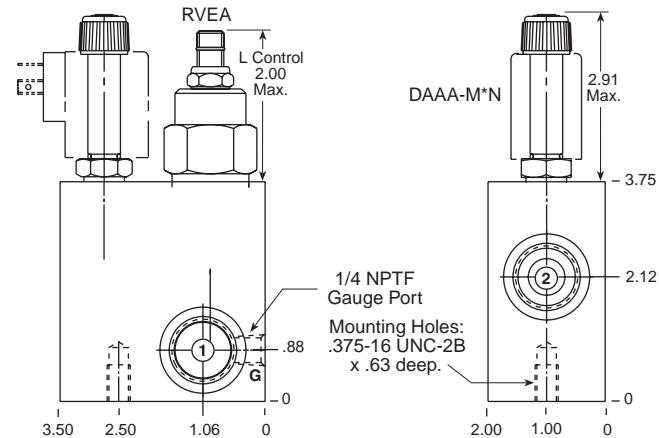
Solenoid Coil Order:



Ports 1 and 2	Assembly Model Code*
1/4" NPTF	XREA-LAN-A
3/8" NPTF	XREA-LAN-B
1/2" NPTF	XREA-LAN-C
3/4" NPTF	XREA-LAN-D
SAE-8	XREA-LAN-J
SAE-12	XREA-LAN-L

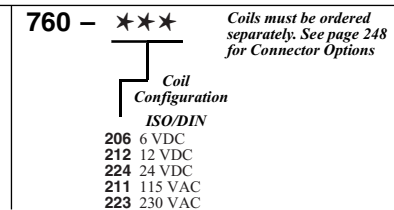
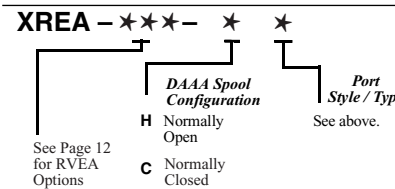
*Add modifier **/S** to order Ductile Iron for pressure rating over 3000 psi.

0-30 GPM Cavity T-2A



Assembly Order:

Solenoid Coil Order:



NOTES: Page 12 for cartridge model RV*A-*** shows performance curves, technical tips, and options.
See page vii for technical information about line mount bodies including SAE flange pattern specifications.
Consult your local Sun Distributor or the Sun Web Site for other port sizes available in the bodies shown above.
Model Codes printed in red are Preferred Products and are readily available.

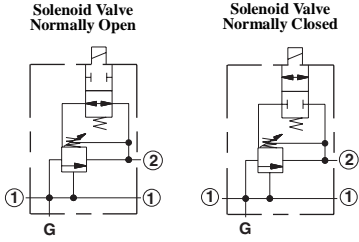
Line Mounted Assemblies

THREE PORT PRESSURE REGULATING RELIEF APPLICATIONS (SOLENOID OPERATED, FLANGE MOUNTED BODIES WITH VENTED RELIEF)

PILOT OPERATED ASSEMBLIES

Suitable for operation
up to 5000 psi

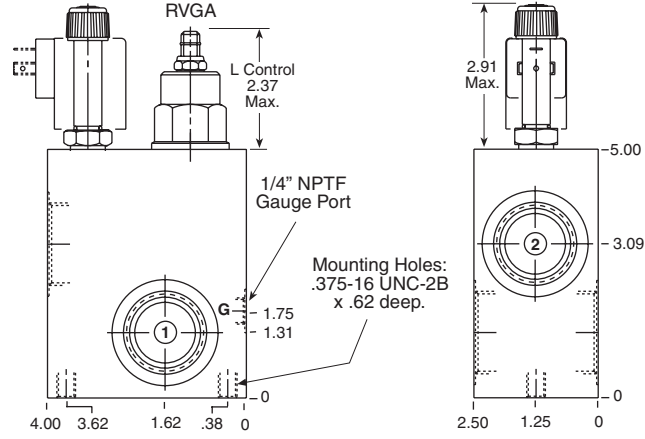
Go to www.sunhydraulics.com
for more product information and pricing.



Ports
1 and 2
1" SAE C61

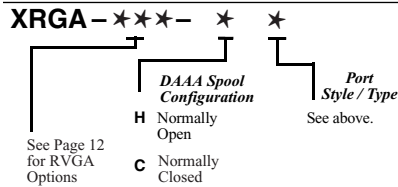
Assembly
Model Code*
XRGA-LAN-^{*}P

0-60 GPM Cavity T-17A

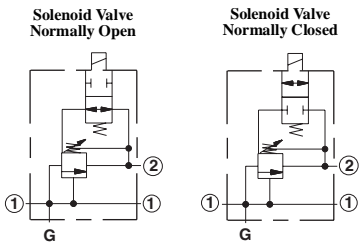
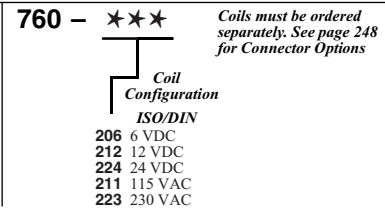


*Add modifier **/S** to order Ductile Iron for pressure rating over 3000 psi.

Assembly Order:



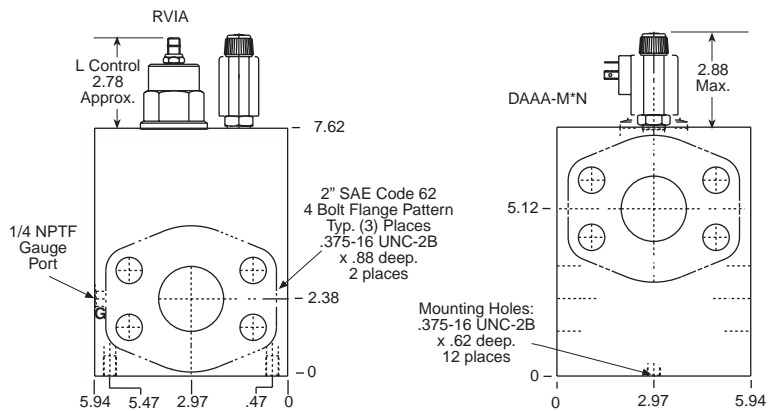
Solenoid Coil Order:



Ports
1 and 2
2" SAE C61

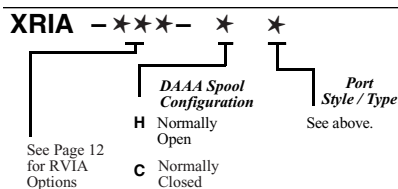
Assembly
Model Code*
XRIA-LAN-^{*}S

0-120 GPM Cavity T-19A

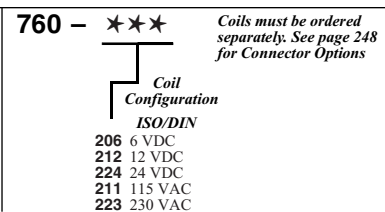


*Add modifier **/S** to order Ductile Iron for pressure rating over 3000 psi.

Assembly Order:

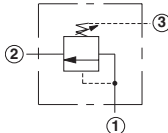
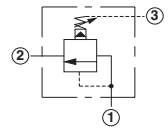
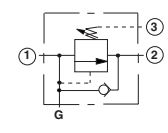
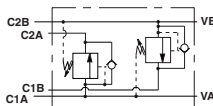
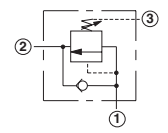


Solenoid Coil Order:



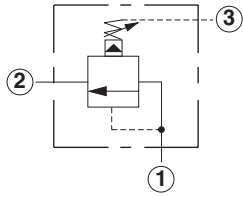
NOTES: Page 12 for cartridge model RV*A-*** shows performance curves, technical tips, and options.
See page vii for technical information about line mount bodies including SAE flange pattern specifications.
Consult your local Sun Distributor or the Sun Web Site for other port sizes available in the bodies shown above.

Sequence Assemblies

	<i>Cartridge Type</i>	<i>Page</i>
	Pilot Operated	20
	Direct Acting	20
	Direct Acting with Reverse Free Flow Check	28
<i>Line Mounted Assemblies (Body Type)</i>		
	90 Degree	22
	90 Degree with Reverse Free Flow Check	24
	90 Degree with Reverse Free Flow Check, 2 Cavities	26
	90 Degree	30

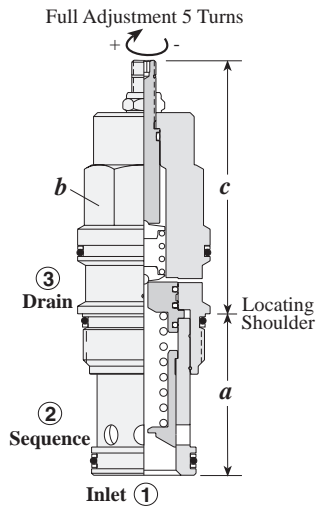
Sequence Valves

PILOT OPERATED



Capacity	Typical Cartridge Model Code	Cavity	Cartridge Dimensions					Installation Torque (lb. ft.)
			a	b	c		K	
7.5 GPM	RSBC – LAN	T - 163A	1.22	3/4"	2.55	2.63	2.77	25/30
15 GPM	RSDC – LAN	T - 11A	1.38	7/8"	2.50	2.56	2.75	30/35
30 GPM	RSFC – LAN	T - 2A	1.38	1 1/8"	2.81	2.88	3.06	45/50
60 GPM	RSHC – LAN	T - 17A	1.81	1 1/4"	3.28	3.31	3.53	150/160
120 GPM	RSJC – LAN	T - 19A	2.50	1 5/8"	3.94	4.09	4.19	350/375

OPTION ORDERING INFORMATION



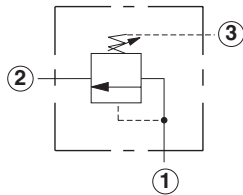
RS * C - * * *

Nominal Capacity	Control**	Adjustment Range	Seal
B 7.5 GPM*	L Standard Screw	A 100 - 3000 psi	N Buna-N
D 15 GPM	C Tamper Resistant	W 150 - 4500 psi	V Viton
F 30 GPM	K Handknob	B 50 - 1500 psi	
H 60 GPM		C 150 - 6000 psi	
J 120 GPM		N 60 - 800 psi	
		Q 60 - 400 psi	

Adjustment Range Options:
 A, B, C, and W are standard set at 1000 psi.
 N Option is standard set at 400 psi.
 Q Option is standard set at 200 psi.
 * Minimum setting 75 psi on all ranges.
Customer may specify pressure setting.

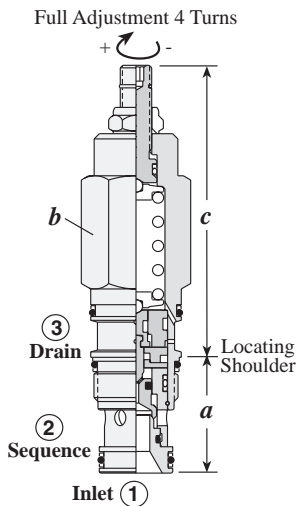
** See page 244 for information on Control Options

DIRECT ACTING



Capacity	Typical Cartridge Model Code	Cavity	Cartridge Dimensions				Installation Torque (lb. ft.)
			a	b	c		
15 GPM	SXCA – LAN	T - 11A	1.38	7/8"	3.09	3.15	30/35
30 GPM	SXEA – LAN	T - 2A	1.38	1 1/8"	3.47	3.53	45/50

OPTION ORDERING INFORMATION



SX * A - * * *

Nominal Capacity	Control**	Adjustment Range	Seal
C 15 GPM	L Standard Screw	A 500 - 3000 psi	N Buna-N
E 30 GPM	C Tamper Resistant	W 800 - 4500 psi	V Viton
		B 300 - 1500 psi	
		C 2000 - 6000 psi	
		D 200 - 800 psi	

Adjustment Range Options:
 A, B, and W are standard set at 1000 psi.
 C Option is standard set at 2000 psi.
 D Option is standard set at 400 psi.
Customer may specify pressure setting.

** See page 244 for information on Control Options

TECHNICAL TIPS / PERFORMANCE CURVES

Sequence Valves, Pilot Operated

Applications

Pilot operated sequence cartridges are similar to relief valves, but with an additional third port, to drain the spring chamber.

- May be used to regulate pressure more accurately than relief valve, as pressure is regulated on an absolute basis.
- To control the sequence of two or more cylinders or motors while maintaining the pressure on the actuator that moves first.

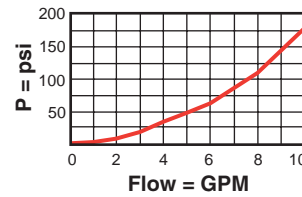
Design Concepts and Features

- Exceptionally flat pressure control over a wide range of settings.
- Low hysteresis and spool leakage:
2 to 5 in.³/min./1000 psi dependent on frame size.
- Wide selection of spring ranges to optimize adjustment sensitivity.
- Pilot flow will continue to increase when pilot section opens as pressure at port 1 increases above setting. *Maximum Pilot Flow May be 150 in.³/min.*

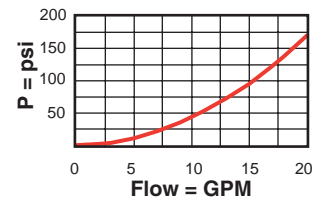
Performance Curves

Pressure Drop-full Sequence

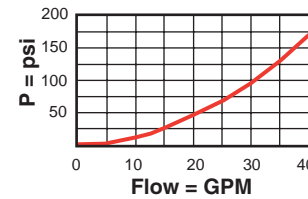
RSBC-L*N



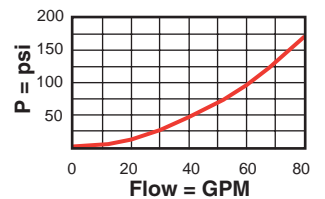
RSDC-L*N



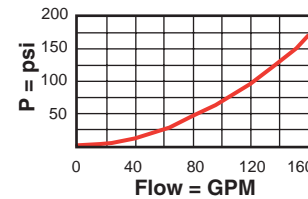
RSFC-L*N



RSHC-L*N



RSJC-L*N



Sequence Valves, Direct Acting

Applications

The direct acting sequence cartridges are interchangeable with the pilot operated models and may be used as an alternative to the pilot operated version.

Design Concepts and Features

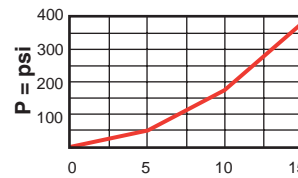
- Low hysteresis and low leakage on closing. Valve reseats with leakage less than 5 drops./min.
- Reseat at 85% of cracking pressure.
- Direct acting design provides fast opening and closing.
- Zero pilot flow (however, the spring chamber drain must not be plugged). See Note.

Note: For both types of sequence cartridge, any pressure at port 3 is directly additive to the valve setting.

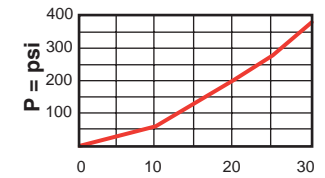
Performance Curves

Pressure Drop-full Sequence

SXCA-L*N



SXEA-L*N



General Application Requirements

- Operating Temperature Range: Buna-N seals -50° F to 200° F, Viton seals 0° F to 250° F.
- Viscosity Range: 60-3000 SUS.
- Fluid Contamination Level: ISO 4406 18/15 or better; Recommend $\beta_{10} \geq 75$ to achieve ISO 18/15 or better in most systems.
- Factory Pressure Setting for cartridge is established at a 4 GPM flow rate.

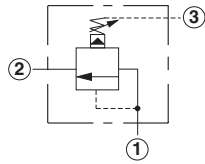
Line Mounted Assemblies

THREE PORT PRESSURE SEQUENCING APPLICATIONS (90 DEGREE BODIES)

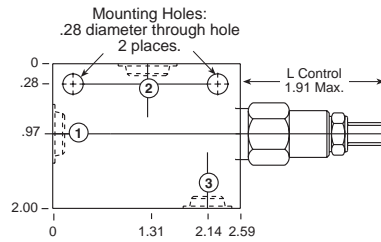
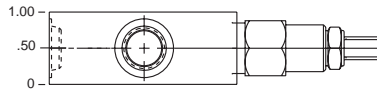
PILOT OPERATED ASSEMBLIES

Go to www.sunhydraulics.com for more product information and pricing.

DIRECT ACTING ASSEMBLIES

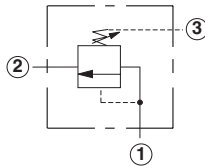


0-7.5 GPM Cavity T-163A

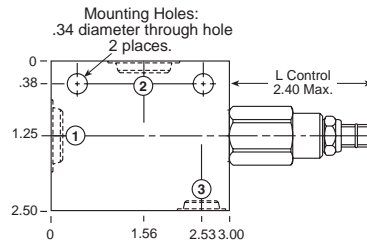
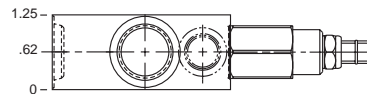


Ports 1 and 2	Port 3	Assembly Model Code*
1/4" NPTF	1/4" NPTF	RSBC-LAN-JCA
3/8" NPTF	1/4" NPTF	RSBC-LAN-JCB
SAE-4	SAE-4	RSBC-LAN-JCH
SAE-6	SAE-4	RSBC-LAN-JCI

*Add modifier /S to order Ductile Iron for pressure rating over 3000 psi.



0-15 GPM Cavity T-11A

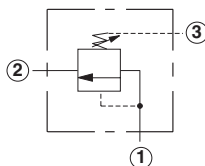


Ports 1 and 2	Port 3	Assembly Model Code*
3/8" NPTF	1/4" NPTF	RSDC-LAN-ECB
1/2" NPTF	1/4" NPTF	RSDC-LAN-ECC
SAE-4	SAE-4	RSDC-LAN-ECH
SAE-6	SAE-6	RSDC-LAN-ECI
SAE-8	SAE-6	RSDC-LAN-ECJ

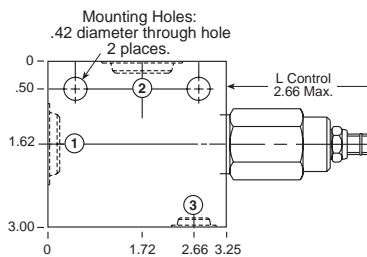
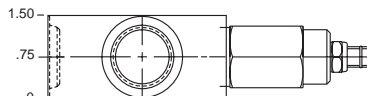
*Add modifier /S to order Ductile Iron for pressure rating over 3000 psi.

Ports 1 and 2	Port 3	Assembly Model Code*
3/8" NPTF	1/4" NPTF	SXCA-LAN-ECB
1/2" NPTF	1/4" NPTF	SXCA-LAN-ECC
SAE-4	SAE-4	SXCA-LAN-ECH
SAE-6	SAE-6	SXCA-LAN-ECI
SAE-8	SAE-6	SXCA-LAN-ECJ

*Add modifier /S to order Ductile Iron for pressure rating over 3000 psi.



0-30 GPM Cavity T-2A



Ports 1 and 2	Port 3	Assembly Model Code*
3/4" NPTF	1/4" NPTF	RSFC-LAN-BCD
SAE-6	SAE-6	RSFC-LAN-BCI
SAE-8	SAE-6	RSFC-LAN-BCJ
SAE-12	SAE-6	RSFC-LAN-BCL

*Add modifier /S to order Ductile Iron for pressure rating over 3000 psi.

Ports 1 and 2	Port 3	Assembly Model Code*
3/4" NPTF	1/4" NPTF	SXEA-LAN-BCD
SAE-6	SAE-6	SXEA-LAN-BCI
SAE-8	SAE-6	SXEA-LAN-BCJ
SAE-12	SAE-6	SXEA-LAN-BCL

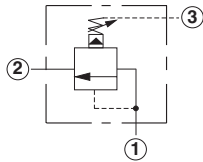
*Add modifier /S to order Ductile Iron for pressure rating over 3000 psi.

NOTES: Page 20 for cartridge models RS*C-*** and SX*A-*** shows performance curves, technical tips, and options. See page vii for technical information about line mount bodies including SAE flange pattern specifications. Consult your local Sun Distributor or the Sun Web Site for other port sizes available in the bodies shown above. Model Codes printed in red are Preferred Products and are readily available.

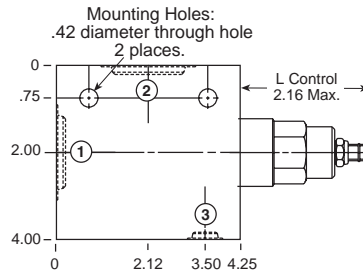
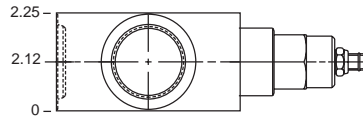
THREE PORT PRESSURE SEQUENCING APPLICATIONS (90 DEGREE BODIES)

PILOT OPERATED ASSEMBLIES

Go to www.sunhydraulics.com for more product information and pricing.

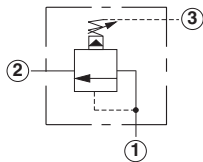


0-60 GPM Cavity T-17A

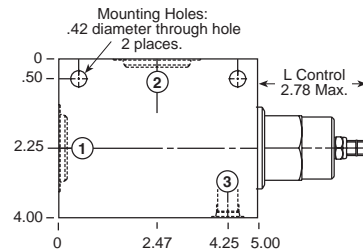
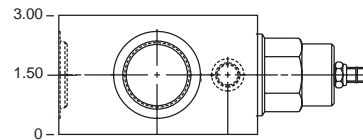


Ports 1 and 2	Port 3	Assembly Model Code*
1" NPTF	1/4" NPTF	RSHC-LAN-HCE
1 1/4" NPTF	1/4" NPTF	RSHC-LAN-HCF
SAE-12	SAE-6	RSHC-LAN-HCL
SAE-16	SAE-6	RSHC-LAN-HCM

*Add modifier /S to order Ductile Iron for pressure rating over 3000 psi.



0-120 GPM Cavity T-19A



Ports 1 and 2	Port 3	Assembly Model Code*
1" NPTF	1/4" NPTF	RSJC-LAN-KCE
1 1/4" NPTF	1/4" NPTF	RSJC-LAN-KCF

*Add modifier /S to order Ductile Iron for pressure rating over 3000 psi.

NOTES: Page 20 for cartridge models RS*C-*** and SX*A-*** shows performance curves, technical tips, and options. See page vii for technical information about line mount bodies including SAE flange pattern specifications. Consult your local Sun Distributor or the Sun Web Site for other port sizes available in the bodies shown above. **Model Codes printed in red are Preferred Products and are readily available.**

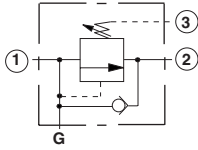
Line Mounted Assemblies

THREE PORT PRESSURE SEQUENCING APPLICATIONS (BODIES WITH REVERSE FREE FLOW CHECK)

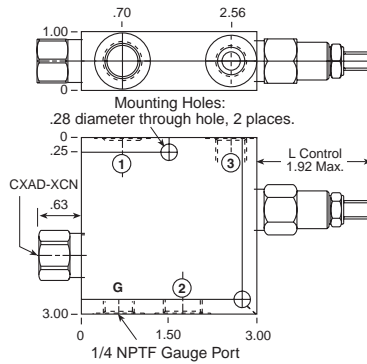
PILOT OPERATED ASSEMBLIES

Go to www.sunhydraulics.com for more product information and pricing.

DIRECT ACTING ASSEMBLIES

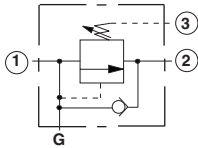


0-7.5 GPM Cavity T-163A

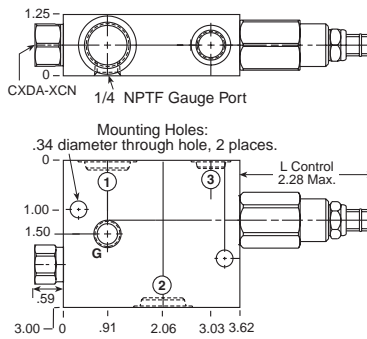


Ports 1 and 2	Port 3	Assembly Model Code*
1/4" NPTF	1/4" NPTF	RSBC-LAN-J6*
3/8" NPTF	1/4" NPTF	RSBC-LAN-J6*
SAE-4	SAE-4	RSBC-LAN-J6*
SAE-6	SAE-4	RSBC-LAN-J6*

*Add modifier /S to order Ductile Iron for pressure rating over 3000 psi.



0-15 GPM Cavity T-11A

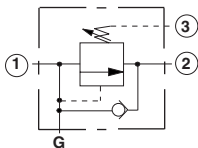


Ports 1 and 2	Port 3	Assembly Model Code*
3/8" NPTF	1/4" NPTF	RSDC-LAN-E6B
1/2" NPTF	1/4" NPTF	RSDC-LAN-E6C
SAE-6	SAE-6	RSDC-LAN-E6I
SAE-8	SAE-6	RSDC-LAN-E6J
SAE-10	SAE-6	RSDC-LAN-E6K

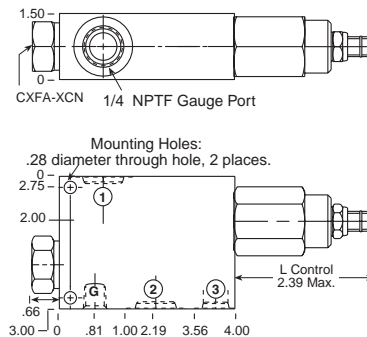
*Add modifier /S to order Ductile Iron for pressure rating over 3000 psi.

Ports 1 and 2	Port 3	Assembly Model Code*
3/8" NPTF	1/4" NPTF	SXCA-LAN-E6B
1/2" NPTF	1/4" NPTF	SXCA-LAN-E6C
SAE-6	SAE-6	SXCA-LAN-E6I
SAE-8	SAE-6	SXCA-LAN-E6J
SAE-10	SAE-6	SXCA-LAN-E6K

*Add modifier /S to order Ductile Iron for pressure rating over 3000 psi.



0-30 GPM Cavity T-2A



Ports 1 and 2	Port 3	Assembly Model Code*
3/8" NPTF	1/4" NPTF	RSFC-LAN-B6B
1/2" NPTF	1/4" NPTF	RSFC-LAN-B6C
3/4" NPTF	1/4" NPTF	RSFC-LAN-B6D
SAE-8	SAE-6	RSFC-LAN-B6J
SAE-10	SAE-6	RSFC-LAN-B6K

*Add modifier /S to order Ductile Iron for pressure rating over 3000 psi.

Ports 1 and 2	Port 3	Assembly Model Code*
3/8" NPTF	1/4" NPTF	SXEA-LAN-B6B
1/2" NPTF	1/4" NPTF	SXEA-LAN-B6C
3/4" NPTF	1/4" NPTF	SXEA-LAN-B6D
SAE-8	SAE-6	SXEA-LAN-B6J
SAE-10	SAE-6	SXEA-LAN-B6K

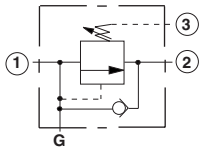
*Add modifier /S to order Ductile Iron for pressure rating over 3000 psi.

NOTES: Page 20 for cartridge models RS*C-*** and SX*A-*** shows performance curves, technical tips, and options. See page vii for technical information about line mount bodies including SAE flange pattern specifications. Consult your local Sun Distributor or the Sun Web Site for other port sizes available in the bodies shown above. **Model Codes printed in red are Preferred Products and are readily available.**

THREE PORT PRESSURE SEQUENCING APPLICATIONS (BODIES WITH REVERSE FREE FLOW CHECK)

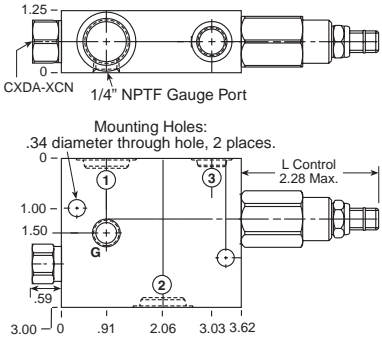
PILOT OPERATED ASSEMBLIES

Go to www.sunhydraulics.com for more product information and pricing.



0-60 GPM Cavity T-17A

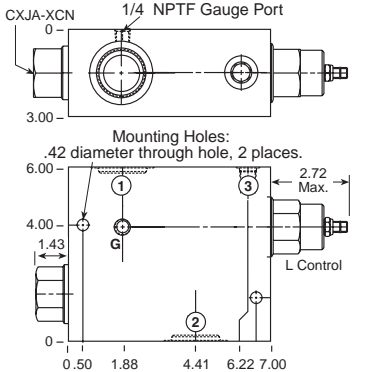
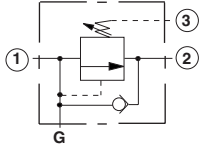
Ports 1 and 2	Port 3	Assembly Model Code*
1" NPTF	1/4" NPTF	RSHC-LAN-H6E
1 1/4" NPTF	1/4" NPTF	RSHC-LAN-H6F
SAE-12	SAE-6	RSHC-LAN-H6L
SAE-16	SAE-6	RSHC-LAN-H6M



*Add modifier **/S** to order Ductile Iron for pressure rating over 3000 psi.

0-120 GPM Cavity T-19A

Ports 1 and 2	Port 3	Assembly Model Code*
1" NPTF	1/4" NPTF	RSJC-LAN-K6E
1 1/4" NPTF	1/4" NPTF	RSJC-LAN-K6F



*Add modifier **/S** to order Ductile Iron for pressure rating over 3000 psi.

NOTES: Page 20 for cartridge models RS*C-*** and SX*A-*** shows performance curves, technical tips, and options. See page vii for technical information about line mount bodies including SAE flange pattern specifications. Consult your local Sun Distributor or the Sun Web Site for other port sizes available in the bodies shown above. **Model Codes printed in red are Preferred Products and are readily available.**



Line Mounted Assemblies

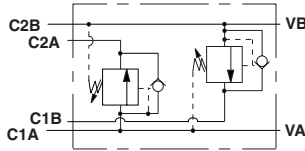
THREE PORT DUAL PRESSURE SEQUENCING APPLICATIONS (2 CAVITY BODIES WITH REVERSE FREE FLOW CHECKS)

The line-mounted dual sequencing assembly can be used in applications where two hydraulic cylinders are to be operated in a particular sequence when both extending and retracting. The block eliminates a great deal of pipework when compared to using conventional line mounted valves.

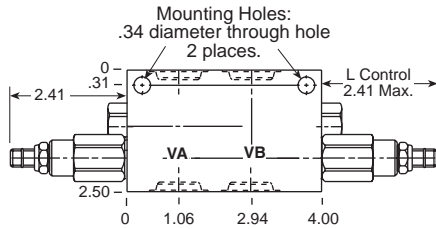
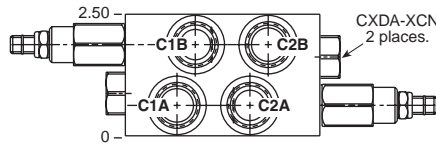
PILOT OPERATED ASSEMBLIES

Go to www.sunhydraulics.com for more product information and pricing.

DIRECT ACTING ASSEMBLIES



0-15 GPM Cavity T-11A

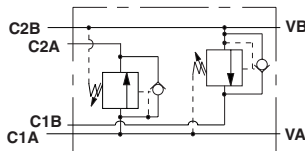


All Ports	Assembly Model Code*
3/8" NPTF	RSDC-LAN-E8B
1/2" NPTF	RSDC-LAN-E8C
SAE-6	RSDC-LAN-E8I
SAE-8	RSDC-LAN-E8J

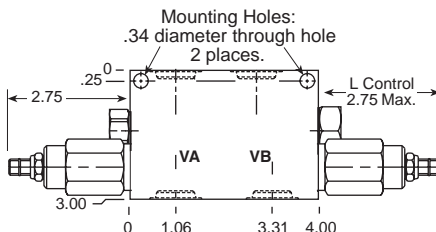
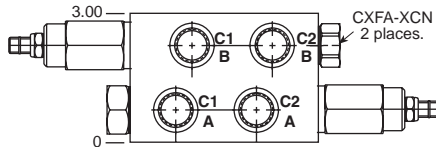
All Ports	Assembly Model Code*
3/8" NPTF	SXCA-LAN-E8B
1/2" NPTF	SXCA-LAN-E8C
SAE-4	SXCA-LAN-E8I
SAE-6	SXCA-LAN-E8J

*Add modifier /S to order Ductile Iron for pressure rating over 3000 psi.

*Add modifier /S to order Ductile Iron for pressure rating over 3000 psi.



0-30 GPM Cavity T-2A

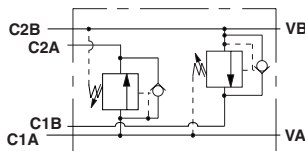


All Ports	Assembly Model Code*
1/2" NPTF	RSFC-LAN-B8C
3/4" NPTF	RSFC-LAN-B8D
SAE-8	RSFC-LAN-B8J

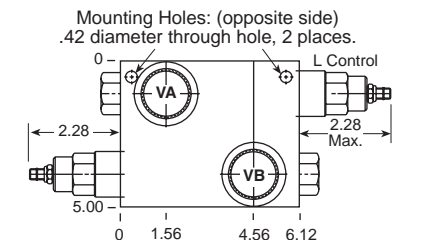
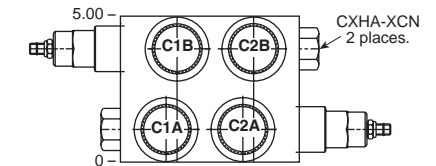
All Ports	Assembly Model Code*
1/2" NPTF	SXEA-LAN-B8C
3/4" NPTF	SXEA-LAN-B8D
SAE-8	SXEA-LAN-B8J

*Add modifier /S to order Ductile Iron for pressure rating over 3000 psi.

*Add modifier /S to order Ductile Iron for pressure rating over 3000 psi.



0-60 GPM Cavity T-17A



All Ports	Assembly Model Code*
1" NPTF	RSHC-LAN-H8E
1 1/4" NPTF	RSHC-LAN-H8F

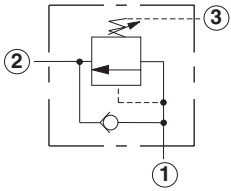
*Add modifier /S to order Ductile Iron for pressure rating over 3000 psi.

NOTES: Page 20 for cartridge models RS*C-*** and SX*A-*** shows performance curves, technical tips, and options. See page vii for technical information about line mount bodies including SAE flange pattern specifications. Consult your local Sun Distributor or the Sun Web Site for other port sizes available in the bodies shown above.

NOTES

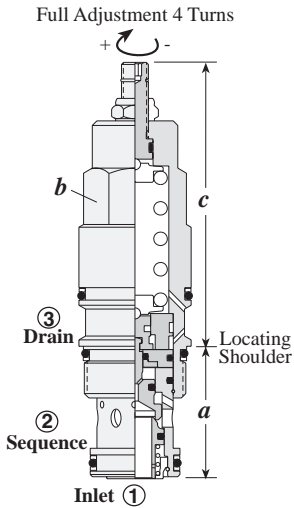
Sequence Valves

DIRECT ACTING WITH REVERSE FREE FLOW CHECK



Capacity	Typical Cartridge Model Code	Cavity	Cartridge Dimensions				Installation Torque (lb. ft.)
			a	b	L	C	
15 GPM	SCCA - LAN	T - 11A	1.38	7/8"	3.09	3.15	35/30
30 GPM	SCEA - LAN	T - 2A	1.38	1 1/8"	3.47	3.53	45/50
60 GPM	SCGA - LAN	T - 17A	1.81	1 1/4"	3.94	4.00	150/160
120 GPM	SCIA - LAN	T - 19A	2.50	1 5/8"	4.72	4.92	350/375

OPTION ORDERING INFORMATION



SC * A - * * *

Nominal Capacity	Control**	Adjustment Range	Seal
C 15 GPM	L Standard Screw	A 500 - 3000 psi	N Buna-N
E 30 GPM	C Tamper Resistant	W 800 - 4500 psi	V Viton
G 60 GPM		B 300 - 1500 psi	
I 120 GPM		D 200 - 800 psi	
		C 2000 - 6000 psi	

Adjustment Range Options:
 A, B and W are standard set at 1000 psi.
 C Option is standard set at 2000 psi.
 D Option is standard set at 400 psi.
 Customer may specify pressure setting.

** See page 244 for information on Control Options

TECHNICAL TIPS / PERFORMANCE CURVES

Sequence Valves, Reverse Free Flow Check

Applications

SC*A series of sequence valves have an integral reverse free flow check and may be used in a similar manner to the cartridges without the check.

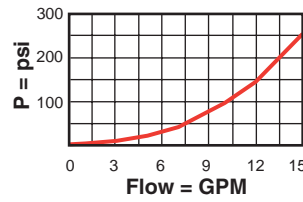
Design Concepts and Features

- This is a zero pilot flow valve. Port 3 must not be plugged.
- Pressure at Port 3 is directly additive to valve setting.
- Typical response time is 2 ms.
- Maximum leakage is 10 drops/min. at reseal.
- Reseat exceeds 85% of set pressure.
- Reverse free flow check cracking pressure is 20 psi to 45 psi, depending on frame size.

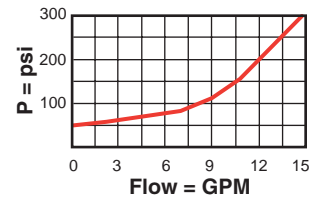
Performance Curves

Pressure Drop-full Sequence

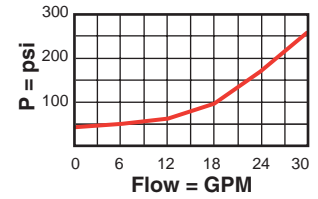
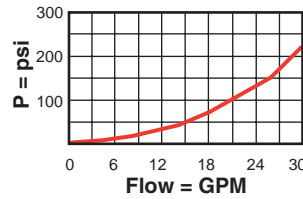
SCCA-L*N



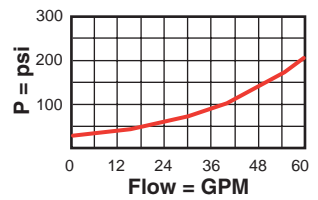
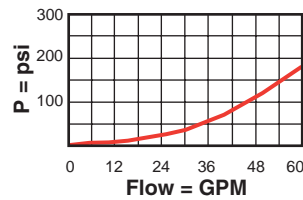
Reverse Free Flow



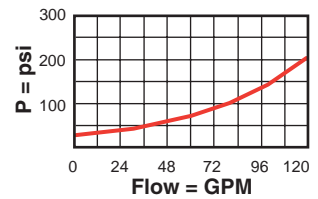
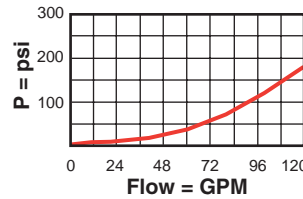
SCEA-L*N



SCGA-L*N



SCIA-L*N



General Application Requirements

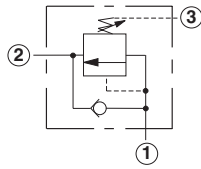
- Operating Temperature Range: Buna-N seals -50° F to 200° F, Viton seals 0° F to 250° F.
- Viscosity Range: 60-3000 SUS.
- Fluid Contamination Level: ISO 4406 18/15 or better; Recommend $\beta_{10} \geq 75$ to achieve ISO 18/15 or better in most systems.
- Factory Pressure Setting for cartridge is established at a 4 GPM flow rate.

Line Mounted Assemblies

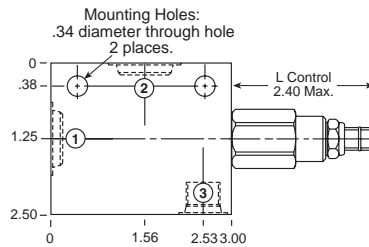
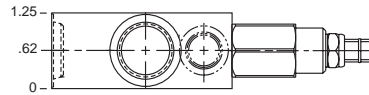
THREE PORT PRESSURE SEQUENCING APPLICATIONS (90 DEGREE BODIES)

Go to www.sunhydraulics.com
for more product information and pricing.

**DIRECT ACTING
ASSEMBLIES**

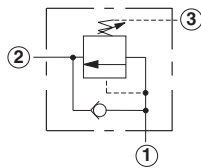


0-15 GPM Cavity T-11A

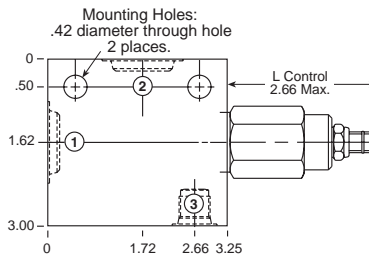
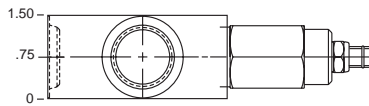


Ports 1 and 2	Port 3	Assembly Model Code*
3/8" NPTF	1/4" NPTF	SCCA-LAN-ECB
1/2" NPTF	1/4" NPTF	SCCA-LAN-ECC
SAE-4	SAE-4	SCCA-LAN-ECH
SAE-6	SAE-6	SCCA-LAN-ECI
SAE-8	SAE-6	SCCA-LAN-ECJ

*Add modifier **/S** to order Ductile Iron for pressure rating over 3000 psi.



0-30 GPM Cavity T-2A



Ports 1 and 2	Port 3	Assembly Model Code*
3/8" NPTF	1/4" NPTF	SCEA-LAN-BCB
1/2" NPTF	1/4" NPTF	SCEA-LAN-BCC
3/4" NPTF	1/4" NPTF	SCEA-LAN-BCD
SAE-6	SAE-6	SCEA-LAN-BCH
SAE-8	SAE-6	SCEA-LAN-BCI

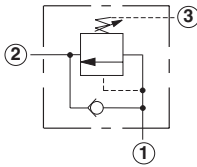
*Add modifier **/S** to order Ductile Iron for pressure rating over 3000 psi.

NOTES: Page 28 for cartridge model SC*A-*** shows performance curves, technical tips, and options.
See page vii for technical information about line mount bodies including SAE flange pattern specifications.
Consult your local Sun Distributor or the Sun Web Site for other port sizes available in the bodies shown above.
Model Codes printed in red are Preferred Products and are readily available.

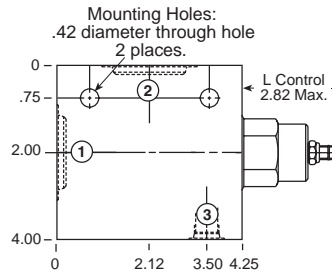
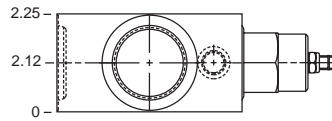
THREE PORT PRESSURE SEQUENCING APPLICATIONS (90 DEGREE BODIES)

Go to www.sunhydraulics.com for more product information and pricing.

**DIRECT ACTING
ASSEMBLIES**

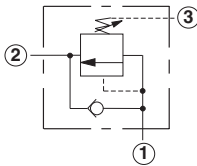


0-60 GPM Cavity T-17A

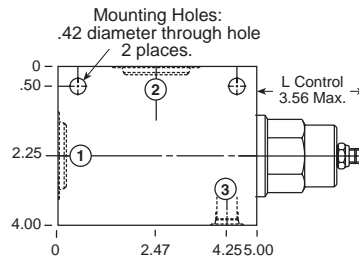
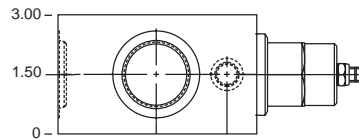


Ports 1 and 2	Port 3	Assembly Model Code*
1" NPTF	1/4" NPTF	SCGA-LAN-HCE
1 1/4" NPTF	1/4" NPTF	SCGA-LAN-HCF
SAE-12	SAE-6	SCGA-LAN-HCL
SAE-16	SAE-6	SCGA-LAN-HCM

*Add modifier /S to order Ductile Iron for pressure rating over 3000 psi.



0-120 GPM Cavity T-19A



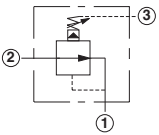
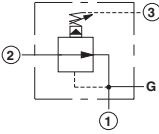
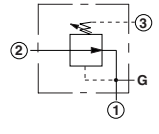
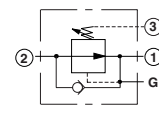
Ports 1 and 2	Port 3	Assembly Model Code*
1" NPTF	1/4" NPTF	SCIA-LAN-KCE
1 1/4" NPTF	1/4" NPTF	SCIA-LAN-KCF

*Add modifier /S to order Ductile Iron for pressure rating over 3000 psi.

NOTES: Page 28 for cartridge model SC*A-*** shows performance curves, technical tips, and options.
See page vii for technical information about line mount bodies including SAE flange pattern specifications.
Consult your local Sun Distributor or the Sun Web Site for other port sizes available in the bodies shown above.
Model Codes printed in red are Preferred Products and are readily available.

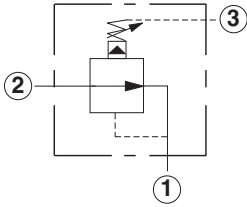
NOTES

Pressure Reducing Assemblies

	<i>Cartridge Type</i>	<i>Page</i>
	Pilot Operated	34
<i>Line Mounted Assemblies (Body Type)</i>		
	90 Degree	36
	90 Degree 1.50" SAE C61/C62 Flange Port	38
	90 Degree with Reverse Free Flow Check	39

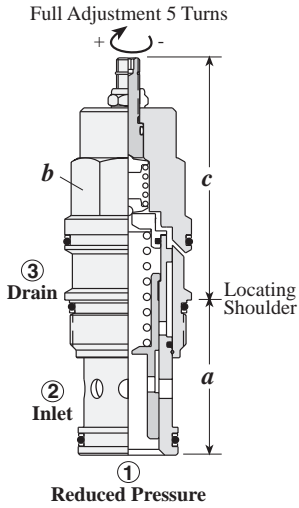
Pressure Reducing Valves

PILOT OPERATED REDUCING



Capacity	Typical Cartridge Model Code	Cavity	Cartridge Dimensions					Installation Torque (lb. ft.)
			a	b	c			
					L	C	K	
5 GPM	PBBB – LAN	T - 163A	1.22	3/4"	2.55	2.63	2.77	25/30
10 GPM	PBDB – LAN	T - 11A	1.38	7/8"	2.50	2.56	2.75	30/35
20 GPM	PBFB – LAN	T - 2A	1.38	1 1/8"	2.81	2.88	3.06	45/50
40 GPM	PBHB – LAN	T - 17A	1.81	1 1/4"	3.28	3.31	3.53	150/160
80 GPM	PBJB – LAN	T - 19A	2.50	1 5/8"	3.94	4.09	4.19	350/375

OPTION ORDERING INFORMATION



PB * B - * * *

Nominal Capacity	Control**	Adjustment Range	Seal
B 5 GPM*	L Standard Screw	A 100 - 3000 psi	N Buna-N
D 10 GPM	C Tamper Resistant	W 150 - 4500 psi	V Viton
F 20 GPM	K Handknob	B 50 - 1500 psi	
H 40 GPM		N 60 - 800 psi	
J 80 GPM		Q 60 - 400 psi	

Adjustment Range Options:
 All are standard set at 200 psi.
 Maximum pressure differentials for spring ranges:
 A and B are 3000 psi.
 N and Q are 2000 psi.
 W is 5000 psi inlet pressure.
 * Minimum setting 75 psi on all ranges.
Customer may specify pressure setting.

** See page 244 for information on Control Options

TECHNICAL TIPS / PERFORMANCE CURVES

Pressure Reducing Valves, Pilot Operated

Applications

Pilot operated reducing cartridges reduce high primary pressure at port 2 (inlet) to a controlled lower pressure at port 1. Port 3 is the pilot drain connection and pressure in this port is directly additive to the reduced pressure setting.

- Provide a controlled lower pressure to a secondary circuit function.
- Provide accurate reduced pressure control for clamp and hold down circuits.

Design Concepts and Features

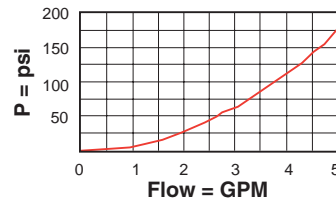
- Low hysteresis for accurate pressure regulation.
- High flow capacity relative to physical size.
- Low pilot flow (from 7 to 20 in.³/min.) dependent on frame size.
- Incorporates a 150 micron screen to protect main stage control orifice from contamination.
- Multiple spring ranges for optimum adjustment control.
- See page 34 for maximum operating pressure differentials for individual spring ranges.

Note: Sun also offers reducing/relieving cartridges (PP*B) that are functionally interchangeable with reducing cartridges. However, with the reducing/relieving valves it is necessary to have a full flow capacity return passage from port 3. See page 42 for further details.

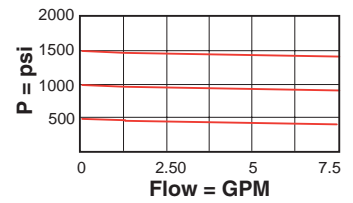
Performance Curves

No Load Pressure Drop with Valve Full Open

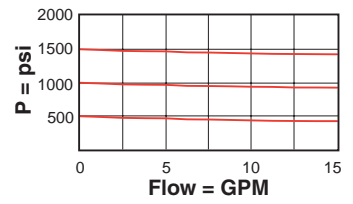
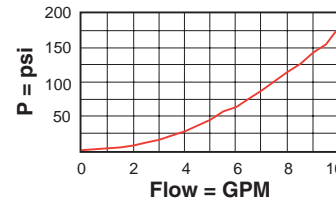
PBBB-L*N



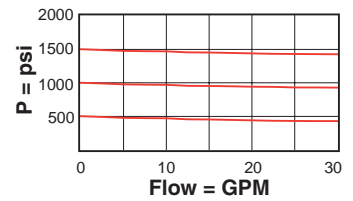
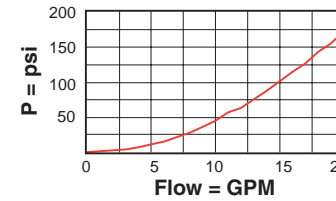
Regulated Pressure



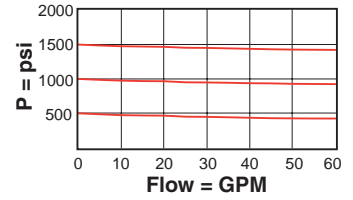
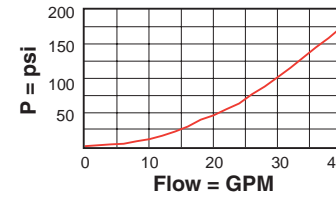
PBDB-L*N



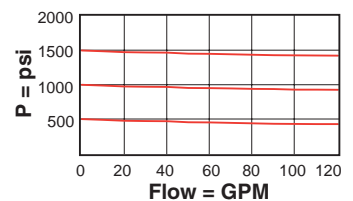
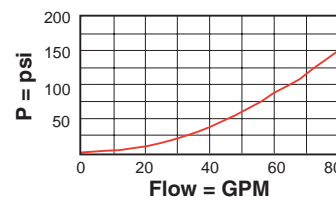
PBFB-L*N



PBHB-L*N



PBJB-L*N



General Application Requirements

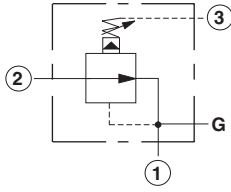
- Operating Temperature Range: Buna-N seals -50° F to 200° F, Viton seals 0° F to 250° F.
- Viscosity Range: 60-3000 SUS.
- Fluid Contamination Level: ISO 4406 18/15 or better; Recommend $\beta_{10} \geq 75$ to achieve ISO 18/15 or better in most systems.
- Factory Pressure Setting for cartridge is established at zero flow rate.

Line Mounted Assemblies

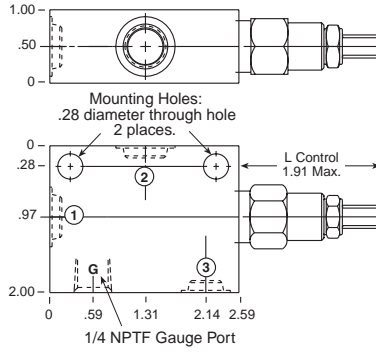
THREE PORT PRESSURE REDUCING APPLICATIONS (90 DEGREE BODIES)

PILOT OPERATED ASSEMBLIES

Go to www.sunhydraulics.com for more product information and pricing.

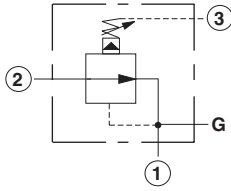


0-5 GPM Cavity T-163A

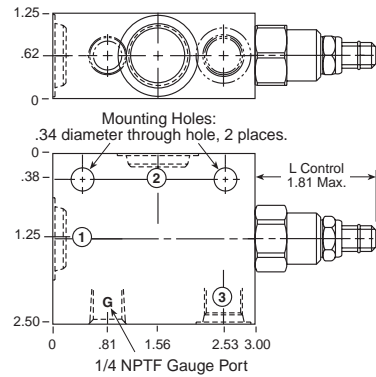


Ports 1 and 2	Port 3	Assembly Model Code*
3/8" NPTF	1/4" NPTF	PBBB-LAN-JFB
SAE-4	SAE-4	PBBB-LAN-JFH
SAE-6	SAE-4	PBBB-LAN-JFI

*Add modifier /S to order Ductile Iron for pressure rating over 3000 psi.

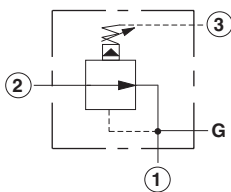


0-10 GPM Cavity T-11A

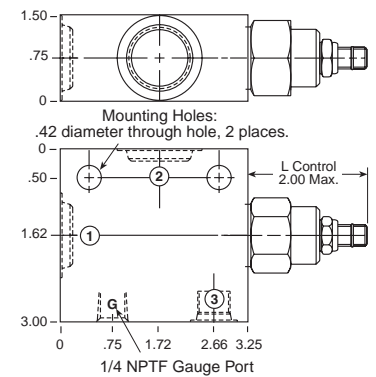


Ports 1 and 2	Port 3	Assembly Model Code*
3/8" NPTF	1/4" NPTF	PBDB-LAN-EFB
1/2" NPTF	1/4" NPTF	PBDB-LAN-EFC
SAE-4	SAE-4	PBDB-LAN-EFH
SAE-6	SAE-6	PBDB-LAN-EFI
SAE-8	SAE-6	PBDB-LAN-EFJ

*Add modifier /S to order Ductile Iron for pressure rating over 3000 psi.



0-20 GPM Cavity T-2A



Ports 1 and 2	Port 3	Assembly Model Code*
1/2" NPTF	1/4" NPTF	PBFB-LAN-BFC
3/4" NPTF	1/4" NPTF	PBFB-LAN-BFD
SAE-10	SAE-6	PBFB-LAN-BFK
SAE-12	SAE-6	PBFB-LAN-BFL

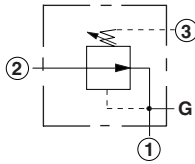
*Add modifier /S to order Ductile Iron for pressure rating over 3000 psi.

NOTES: Page 34 for cartridge model PB*B-*** shows performance curves, technical tips, and options.
See page vii for technical information about line mount bodies including SAE flange pattern specifications.
Consult your local Sun Distributor or the Sun Web Site for other port sizes available in the bodies shown above.
Model Codes printed in red are Preferred Products and are readily available.

THREE PORT PRESSURE REDUCING APPLICATIONS (90 DEGREE BODIES)

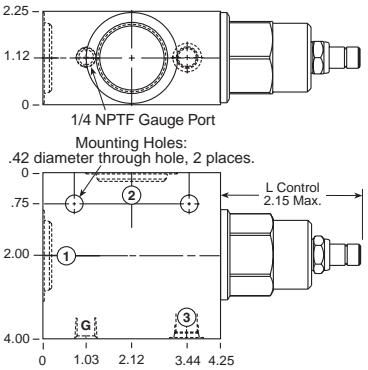
PILOT OPERATED ASSEMBLIES

Go to www.sunhydraulics.com for more product information and pricing.



0-40 GPM Cavity T-17A

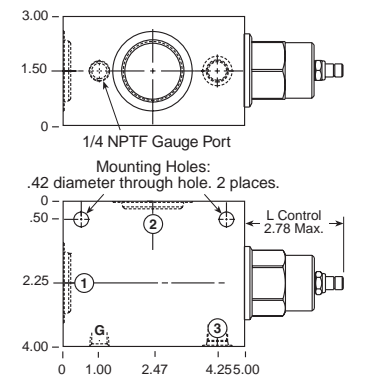
Ports 1 and 2	Port 3	Assembly Model Code*
1" NPTF	1/4" NPTF	PBHB-LAN-HFE
1 1/4" NPTF	1/4" NPTF	PBHB-LAN-HFF
SAE-12	SAE-6	PBHB-LAN-HFL
SAE-16	SAE-6	PBHB-LAN-HFM



*Add modifier /S to order Ductile Iron for pressure rating over 3000 psi.

0-80 GPM Cavity T-19A

Ports 1 and 2	Port 3	Assembly Model Code*
1" NPTF	1/4" NPTF	PBJB-LAN-KFE
1 1/4" NPTF	1/4" NPTF	PBJB-LAN-KFF



*Add modifier /S to order Ductile Iron for pressure rating over 3000 psi.

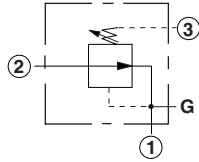
NOTES: Page 34 for cartridge model PB*B-*** shows performance curves, technical tips, and options.
See page vii for technical information about line mount bodies including SAE flange pattern specifications.
Consult your local Sun Distributor or the Sun Web Site for other port sizes available in the bodies shown above.
Model Codes printed in red are Preferred Products and are readily available.

Line Mounted Assemblies

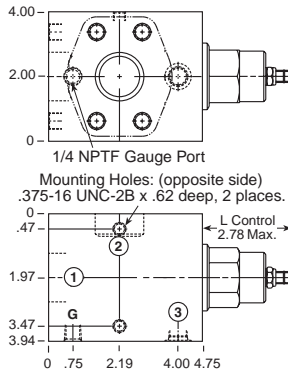
THREE PORT PRESSURE REDUCING APPLICATIONS (90 DEGREE, 1.50" SAE C61/C62 FLANGE PORT BODIES)

PILOT OPERATED ASSEMBLIES

Go to www.sunhydraulics.com
for more product information and pricing.



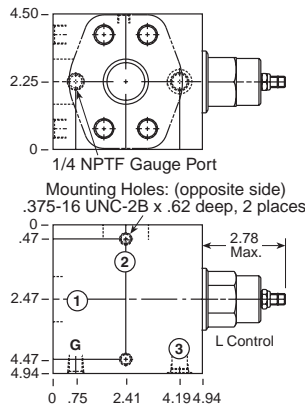
0-80 GPM Cavity T-19A



Ports 1 and 2	Port 3	Assembly Model Code*
1 1/2" SAE C61	SAE-6	PBJB-LAN-KFR

*Add modifier **/S** to order Ductile Iron for pressure rating over 3000 psi.

0-80 GPM Cavity T-19A



Ports 1 and 2	Port 3	Assembly Model Code*
1 1/2" SAE C62	SAE-6	PBJB-LAN-KF6

*Add modifier **/S** to order Ductile Iron for pressure rating over 3000 psi.

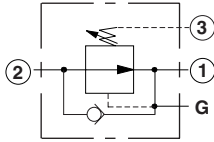
NOTES: Page 34 for cartridge model PB*B-*** shows performance curves, technical tips, and options.
See page vii for technical information about line mount bodies including SAE flange pattern specifications.
Consult your local Sun Distributor or the Sun Web Site for other port sizes available in the bodies shown above.

THREE PORT PRESSURE REDUCING APPLICATIONS (BODIES WITH REVERSE FREE FLOW CHECK)

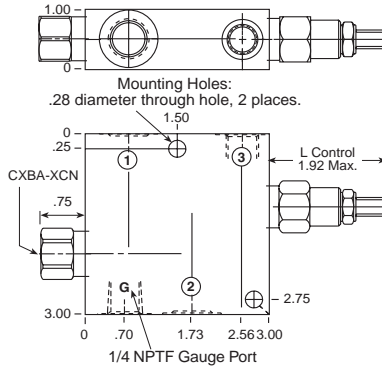
PILOT OPERATED ASSEMBLIES

Go to www.sunhydraulics.com for more product information and pricing.

0-5 GPM Cavity T-163A

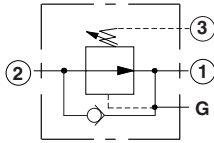


Ports 1 and 2	Port 3	Assembly Model Code*
1/4" NPTF	1/4" NPTF	PBBB-LAN-J2A
3/8" NPTF	1/4" NPTF	PBBB-LAN-J2B
SAE-4	SAE-4	PBBB-LAN-J2H
SAE-6	SAE-4	PBBB-LAN-J2I

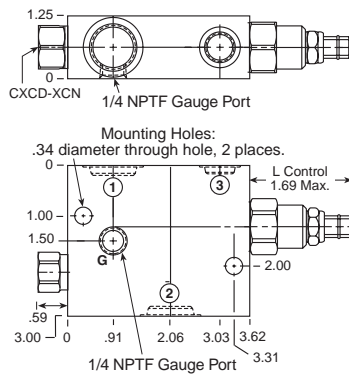


*Add modifier /S to order Ductile Iron for pressure rating over 3000 psi.

0-10 GPM Cavity T-11A

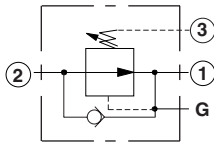


Ports 1 and 2	Port 3	Assembly Model Code*
3/8" NPTF	1/4" NPTF	PBDB-LAN-E6B
1/2" NPTF	1/4" NPTF	PBDB-LAN-E6C
SAE-6	SAE-4	PBDB-LAN-E6I
SAE-8	SAE-6	PBDB-LAN-E6J

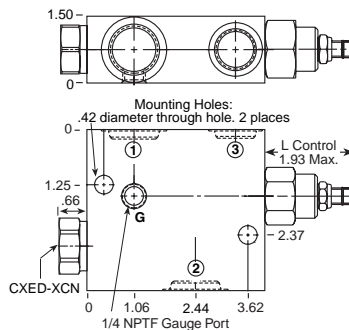


*Add modifier /S to order Ductile Iron for pressure rating over 3000 psi.

0-20 GPM Cavity T-2A



Ports 1 and 2	Port 3	Assembly Model Code*
3/8" NPTF	1/4" NPTF	PBFB-LAN-B6B
1/2" NPTF	1/4" NPTF	PBFB-LAN-B6C
3/4" NPTF	1/4" NPTF	PBFB-LAN-B6D
SAE-6	SAE-6	PBFB-LAN-B6I
SAE-8	SAE-6	PBFB-LAN-B6J



*Add modifier /S to order Ductile Iron for pressure rating over 3000 psi.

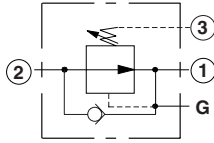
NOTES: Page 34 for cartridge model PB*B-*** shows performance curves, technical tips, and options.
See page vii for technical information about line mount bodies including SAE flange pattern specifications.
Consult your local Sun Distributor or the Sun Web Site for other port sizes available in the bodies shown above.

Line Mounted Assemblies

THREE PORT PRESSURE REDUCING APPLICATIONS (BODIES WITH REVERSE FREE FLOW CHECK)

PILOT OPERATED ASSEMBLIES

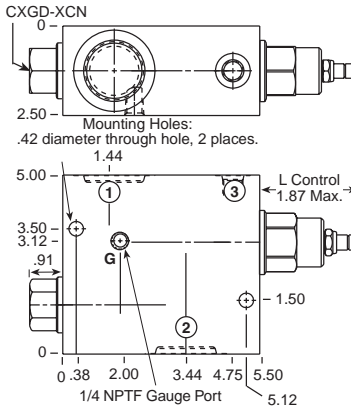
Go to www.sunhydraulics.com
for more product information and pricing.



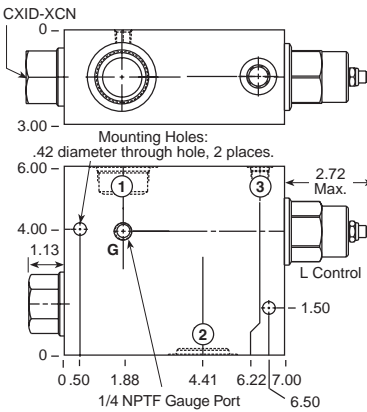
Ports 1 and 2	Port 3	Assembly Model Code*
1" NPTF	1/4" NPTF	PBHB-LAN-H2*
1 1/4" NPTF	1/4" NPTF	PBHB-LAN-H2*
SAE-12	SAE-6	PBHB-LAN-H2*
SAE-16	SAE-6	PBHB-LAN-H2*

*Add modifier /S to order Ductile Iron for pressure rating over 3000 psi.

0-40 GPM Cavity T-17A



0-80 GPM Cavity T-19A

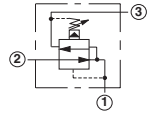
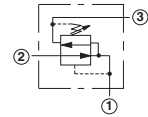
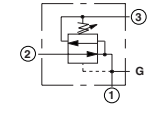
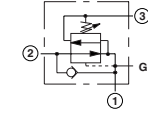
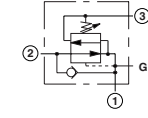
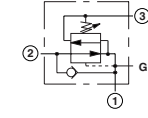


Ports 1 and 2	Port 3	Assembly Model Code*
1" NPTF	1/4" NPTF	PBJB-LAN-KK2*
1 1/4" NPTF	1/4" NPTF	PBJB-LAN-KK2*

*Add modifier /S to order Ductile Iron for pressure rating over 3000 psi.

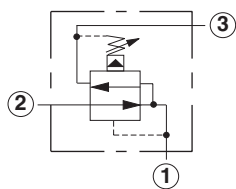
NOTES: Page 34 for cartridge model PB*B shows performance curves, technical tips, and options.
See page vii for technical information about line mount bodies including SAE flange pattern specifications.
Consult your local Sun Distributor or the Sun Web Site for other port sizes available in the bodies shown above.

Reducing/Relieving Assemblies

	<i>Cartridge Type</i>	<i>Page</i>
	Pilot Operated	42
	Direct Acting	42
<i>Line Mounted Assemblies (Body Type)</i>		
	90 Degree, High Capacity Port 3	44
	90 Degree, 1.50 SAE C61/C62 Flange Port, High Capacity Port 3	46
	90 Degree with Reverse Free Flow Check	47
	90 Degree with Reverse Free Flow Check, High Capacity Port 3	48

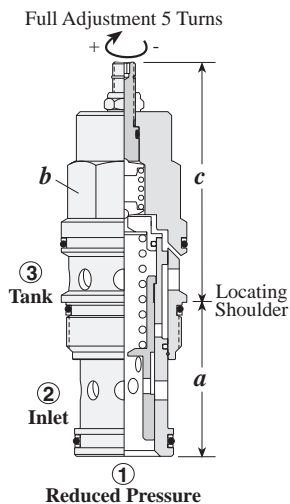
Reducing/Relieving Valves

PILOT OPERATED REDUCING/RELIEVING



Capacity	Typical Cartridge Model Code	Cavity	Cartridge Dimensions					Installation Torque (lb. ft.)
			a	b	c			
					L	C	K	
10 GPM	PPDB – LAN	T - 11A	1.38	7/8"	2.50	2.56	2.75	30/35
20 GPM	PPFB – LAN	T - 2A	1.38	1 1/8"	2.81	2.88	3.06	45/50
40 GPM	PPHB – LAN	T - 17A	1.81	1 1/4"	3.28	3.31	3.53	150/160
80 GPM	PPJB – LAN	T - 19A	2.50	1 5/8"	3.94	4.09	4.19	350/375

OPTION ORDERING INFORMATION



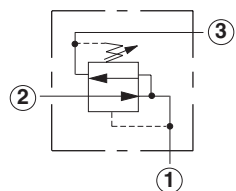
PP * B - * * *

Nominal Capacity	Base Price	Control**	Adjustment Range	Seal
D 10 GPM		L Standard Screw	A 100 - 3000 psi	N Buna-N
F 20 GPM		C Tamper Resistant	W 150 - 4500 psi	V Viton
H 40 GPM		K Handknob	B 50 - 1500 psi	
J 80 GPM			N 60 - 800 psi	
			Q 60 - 400 psi	

Adjustment Range Options:
 All are standard set at 200 psi.
 Maximum pressure differentials for spring ranges:
 A and B are 3000 psi.
 N and Q are 2000 psi.
 W is 5000 psi inlet pressure.
Customer may specify pressure setting.

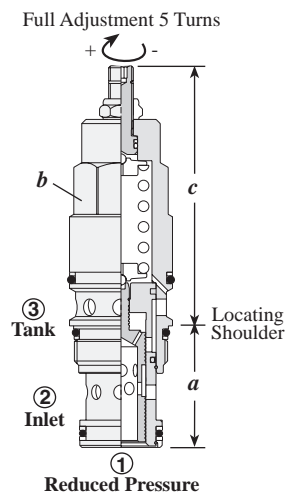
** See page 244 for information on Control Options

DIRECT ACTING REDUCING/RELIEVING



Capacity	Typical Cartridge Model Code	Cavity	Cartridge Dimensions					Installation Torque (lb. ft.)
			a	b	c			
					L	C	K	
10 GPM	PRDB – LAN	T - 11A	1.38	7/8"	3.09	3.16	3.34	30/35
20 GPM	PRFB – LAN	T - 2A	1.38	1 1/8"	3.47	3.53	3.75	45/50
40 GPM	PRHB – LAN	T - 17A	1.81	1 1/4"	3.94	4.00	4.19	150/160
80 GPM	PRJB – LAN	T - 19A	2.50	1 5/8"	4.87	5.03	5.13	350/375

OPTION ORDERING INFORMATION



PR * B - * * *

Nominal Capacity	Base Price	Control**	Adjustment Range	Seal
D 10 GPM		L Standard Screw	A 500 - 3000 psi	N Buna-N
F 20 GPM		C Tamper Resistant	W 750 - 4500 psi	V Viton
H 40 GPM		K Handknob	B 50 - 1500 psi	
J 80 GPM			D 20 - 800 psi	
			E 20 - 400 psi	
			S 20 - 200 psi	

Adjustment Range Options:
PRDB Only:
 A, W are standard set at 1000 psi.
 B, D, E, S are standard set at 200 psi.
PRFB, PRHB, PRJB:
 A, W are standard set at 1000 psi.
 B is standard set at 500 psi.
 D is standard set at 400 psi.
 E is standard set at 200 psi.
 S is standard set at 100 psi.

** See page 244 for information on Control Options

Maximum Inlet Pressure: 5000 psi
Customer may specify pressure setting.

TECHNICAL TIPS / PERFORMANCE CURVES

Reducing/Relieving Valves, Pilot Operated

Applications

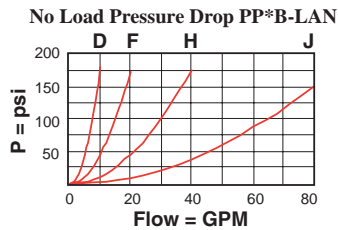
Pilot operated reducing/relieving cartridges may be used interchangeably with reducing valve, however, they have one additional function; they will maintain a constant pressure at port 1 during reverse flow conditions to port three.

Design Concepts and Features

- Low hysteresis for accurate pressure regulation.
- Minimal dead-band provides low transition pressure between reducing and relieving modes.
- Low pilot control flow, 7 to 20 in.³/min. dependent on frame size.
- Pressure at port 3 is directly additive to valve setting and should not exceed 3000 psi.

Note: Maximum pressure differentials, inlet to outlet, see adjustment ranges on page 42.

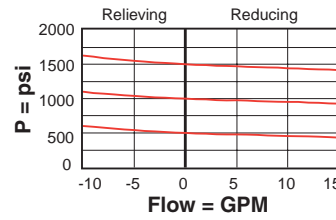
Note: Reducing/relieving valves require a body with a high capacity third port.



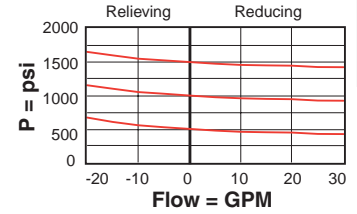
Performance Curves

Regulated Pressure

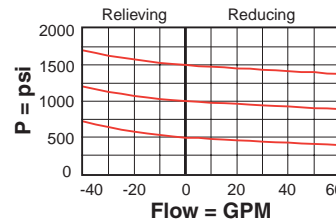
PPDB-L*N



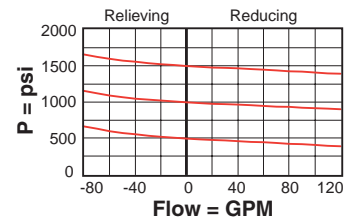
PPFB-L*N



PPHB-L*N



PPJB-L*N



Reducing/Relieving Valves, Direct Acting

Applications

Direct acting reducing/relieving cartridges may be used interchangeably with pilot operated units. These valves offer low internal leakage and increased reliability in contaminated systems, this makes them ideal choices in accumulator and brake circuits. They exhibit lower overshoot characteristics than pilot operated valves and should therefore be considered in clamping circuits.

Design Concepts and Features

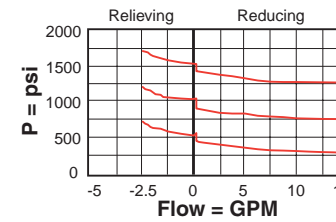
- Damped differential construction for stable operation.
- Low internal leakage in both no flow and control flow modes; less than 2 in.³/min.
- Multiple spring ranges for optimum control

Note: Maximum pressure differentials, inlet to outlet, see adjustment ranges on page 42.

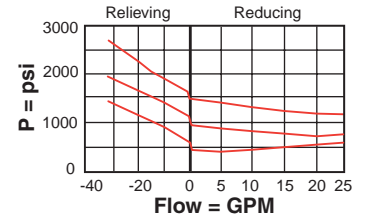
Performance Curves

Regulated Pressure

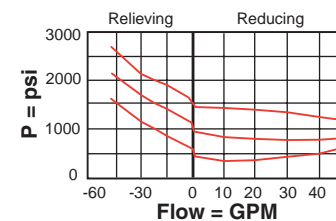
PRDB-L*N



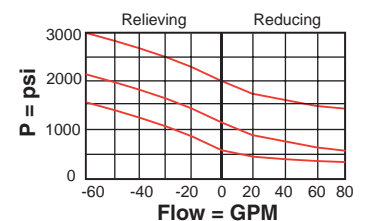
PRFB-L*N



PRHB-L*N



PRJB-L*N



General Application Requirements

- Operating Temperature Range: Buna-N seals -50° F to 200° F, Viton seals 0° F to 250° F.
- Viscosity Range: 60-3000 SUS.
- Fluid Contamination Level: ISO 4406 18/15 or better; Recommend $\beta_{10} \geq 75$ to achieve ISO 18/15 or better in most systems.
- Factory Pressure Setting for cartridge is established at zero flow rate.

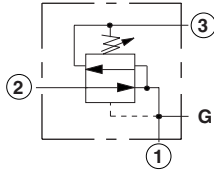
Line Mounted Assemblies

THREE PORT PRESSURE REDUCING/RELIEVING APPLICATIONS (90 DEGREE, HIGH CAPACITY PORT 3 BODIES)

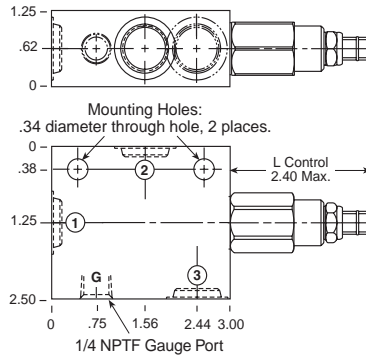
PILOT OPERATED ASSEMBLIES

Go to www.sunhydraulics.com for more product information and pricing.

DIRECT ACTING ASSEMBLIES



0-10 GPM Cavity T-11A

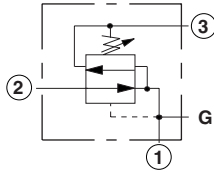


Ports 1 and 2	Port 3	Assembly Model Code*
3/8" NPTF	3/8" NPTF	PPDB-LAN-ELB
1/2" NPTF	3/8" NPTF	PPDB-LAN-ELC
SAE-6	SAE-6	PPDB-LAN-ELI
SAE-8	SAE-8	PPDB-LAN-ELJ
SAE-10	SAE-8	PPDB-LAN-ELK

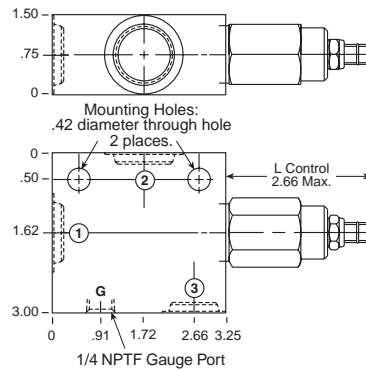
*Add modifier /S to order Ductile Iron for pressure rating over 3000 psi.

Ports 1 and 2	Port 3	Assembly Model Code*
3/8" NPTF	3/8" NPTF	PRDB-LAN-ELB
1/2" NPTF	3/8" NPTF	PRDB-LAN-ELC
SAE-6	SAE-6	PRDB-LAN-ELI
SAE-8	SAE-8	PRDB-LAN-ELJ
SAE-10	SAE-8	PRDB-LAN-ELK

*Add modifier /S to order Ductile Iron for pressure rating over 3000 psi.



0-20 GPM Cavity T-2A



Ports 1 and 2	Port 3	Assembly Model Code*
1/2" NPTF	1/2" NPTF	PPFB-LAN-BLC
3/4" NPTF	1/2" NPTF	PPFB-LAN-BLD
SAE-6	SAE-6	PPFB-LAN-BLI
SAE-8	SAE-8	PPFB-LAN-BLJ
SAE-10	SAE-10	PPFB-LAN-BLK

*Add modifier /S to order Ductile Iron for pressure rating over 3000 psi.

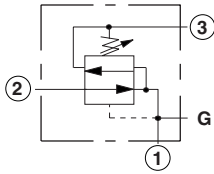
Ports 1 and 2	Port 3	Assembly Model Code*
1/2" NPTF	1/2" NPTF	PRFB-LAN-BLC
3/4" NPTF	1/2" NPTF	PRFB-LAN-BLD
SAE-6	SAE-6	PRFB-LAN-BLI
SAE-8	SAE-8	PRFB-LAN-BLJ
SAE-10	SAE-10	PRFB-LAN-BLK

*Add modifier /S to order Ductile Iron for pressure rating over 3000 psi.

NOTES: Page 42 for cartridge models PP*B-*** and PR*B-*** shows performance curves, technical tips, and options. See page vii for technical information about line mount bodies including SAE flange pattern specifications. Consult your local Sun Distributor or the Sun Web Site for other port sizes available in the bodies shown above. Model Codes printed in red are Preferred Products and are readily available.

THREE PORT PRESSURE REDUCING/RELIEVING APPLICATIONS (90 DEGREE, HIGH CAPACITY PORT 3 BODIES)

PILOT OPERATED ASSEMBLIES



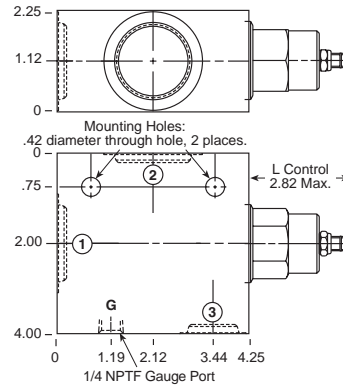
Ports 1 and 2	Port 3	Assembly Model Code*
1" NPTF	3/4" NPTF	PPHB-LAN-HEE
1 1/4" NPTF	3/4" NPTF	PPHB-LAN-HEF
SAE-12	SAE-12	PPHB-LAN-HEL
SAE-16	SAE-12	PPHB-LAN-HEM

*Add modifier /S to order Ductile Iron for pressure rating over 3000 psi.

Go to www.sunhydraulics.com for more product information and pricing.

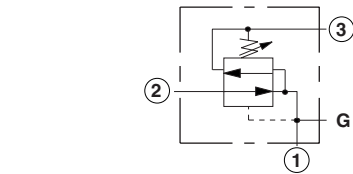
DIRECT ACTING ASSEMBLIES

0-40 GPM Cavity T-17A



Ports 1 and 2	Port 3	Assembly Model Code*
1" NPTF	3/4" NPTF	PRHB-LAN-HEE
1 1/4" NPTF	3/4" NPTF	PRHB-LAN-HEF
SAE-12	SAE-12	PRHB-LAN-HEL
SAE-16	SAE-12	PRHB-LAN-HEM

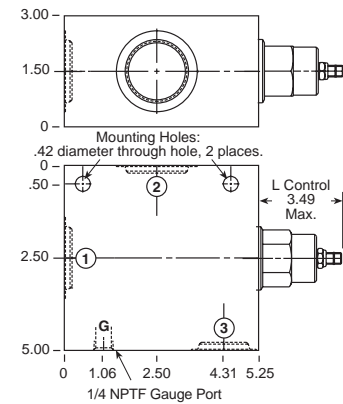
*Add modifier /S to order Ductile Iron for pressure rating over 3000 psi.



Ports 1 and 2	Port 3	Assembly Model Code*
1" NPTF	1" NPTF	PPJB-LAN-KEE
1 1/4" NPTF	1" NPTF	PPJB-LAN-KEF
SAE-16	SAE-16	PPJB-LAN-KEM
SAE-20	SAE-16	PPJB-LAN-KEN

*Add modifier /S to order Ductile Iron for pressure rating over 3000 psi.

0-80 GPM Cavity T-19A



Ports 1 and 2	Port 3	Assembly Model Code*
1" NPTF	1" NPTF	PRJB-LAN-KEE
1 1/4" NPTF	1" NPTF	PRJB-LAN-KEF
SAE-16	SAE-16	PRJB-LAN-KEM
SAE-20	SAE-16	PRJB-LAN-KEN

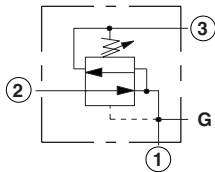
*Add modifier /S to order Ductile Iron for pressure rating over 3000 psi.

NOTES: Page 42 for cartridge models PP*B-*** and PR*B-*** shows performance curves, technical tips, and options. See page vii for technical information about line mount bodies including SAE flange pattern specifications. Consult your local Sun Distributor or the Sun Web Site for other port sizes available in the bodies shown above. Model Codes printed in red are Preferred Products and are readily available.

Line Mounted Assemblies

THREE PORT PRESSURE REDUCING/RELIEVING APPLICATIONS (90 DEGREE, 1.50" SAE C61/C62 FLANGE PORT BODIES, HIGH CAPACITY PORT 3)

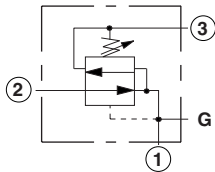
PILOT OPERATED ASSEMBLIES



Ports
1, 2, and 3
1 1/2" SAE C61

Assembly Model Code*
PPJB-LAN-KER

*Add modifier /S to order Ductile Iron for pressure rating over 3000 psi.



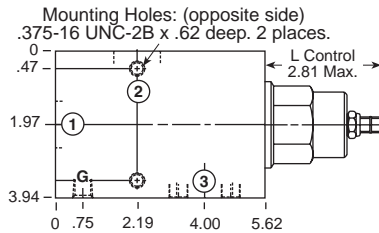
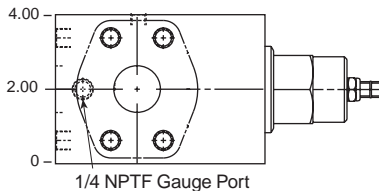
Ports
1, 2, and 3
1 1/2" SAE C62

Assembly Model Code*
PPJB-LAN-KE6

*Add modifier /S to order Ductile Iron for pressure rating over 3000 psi.

Go to www.sunhydraulics.com for more product information and pricing.

0-80 GPM Cavity T-19A



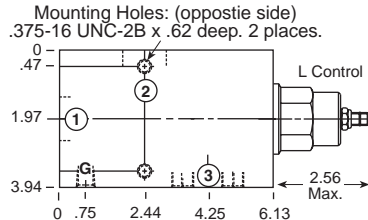
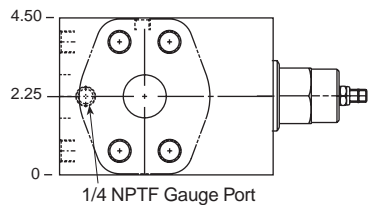
DIRECT ACTING ASSEMBLIES

Ports
1, 2, and 3
1 1/2" SAE C61

Assembly Model Code*
PRJB-LAN-KER

*Add modifier /S to order Ductile Iron for pressure rating over 3000 psi.

0-80 GPM Cavity T-19A



Ports
1, 2, and 3
1 1/2" SAE C62

Assembly Model Code*
PRJB-LAN-KE6

*Add modifier /S to order Ductile Iron for pressure rating over 3000 psi.

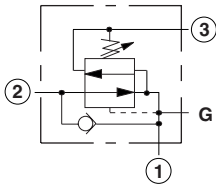
NOTES: Page 42 for cartridge models PP*B-*** and PR*B-*** shows performance curves, technical tips, and options.
See page vii for technical information about line mount bodies including SAE flange pattern specifications.
Consult your local Sun Distributor or the Sun Web Site for other port sizes available in the bodies shown above.

THREE PORT PRESSURE REDUCING/RELIEVING APPLICATIONS (BODIES WITH REVERSE FREE FLOW CHECK)

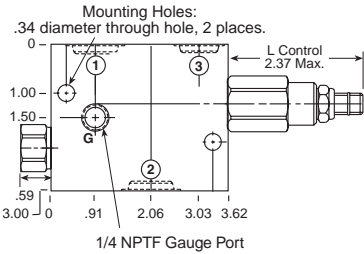
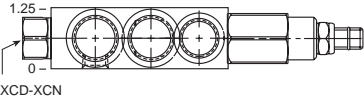
PILOT OPERATED ASSEMBLIES

Go to www.sunhydraulics.com for more product information and pricing.

DIRECT ACTING ASSEMBLIES



0-10 GPM Cavity T-11A

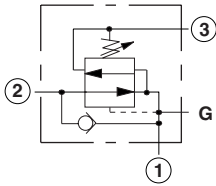


Ports 1 and 2	Port 3	Assembly Model Code*
3/8" NPTF	3/8" NPTF	PPDB-LAN-E4B
1/2" NPTF	3/8" NPTF	PPDB-LAN-E4C
SAE-6	SAE-6	PPDB-LAN-E4I
SAE-8	SAE-8	PPDB-LAN-E4J
SAE-10	SAE-8	PPDB-LAN-E4K

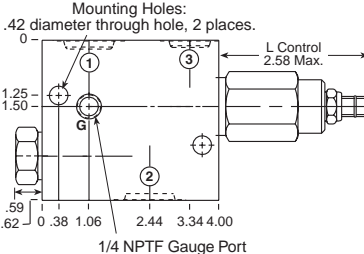
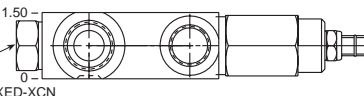
Ports 1 and 2	Port 3	Assembly Model Code*
3/8" NPTF	3/8" NPTF	PRDB-LAN-E4B
1/2" NPTF	3/8" NPTF	PRDB-LAN-E4C
SAE-6	SAE-6	PRDB-LAN-E4I
SAE-8	SAE-8	PRDB-LAN-E4J
SAE-10	SAE-8	PRDB-LAN-E4K

*Add modifier /S to order Ductile Iron for pressure rating over 3000 psi.

*Add modifier /S to order Ductile Iron for pressure rating over 3000 psi.



0-20 GPM Cavity T-2A



Ports 1 and 2	Port 3	Assembly Model Code*
1/2" NPTF	1/2" NPTF	PPFB-LAN-B4C
3/4" NPTF	1/2" NPTF	PPFB-LAN-B4D
SAE-8	SAE-8	PPFB-LAN-B4J
SAE-10	SAE-10	PPFB-LAN-B4K

Ports 1 and 2	Port 3	Assembly Model Code*
1/2" NPTF	1/2" NPTF	PRFB-LAN-B4C
3/4" NPTF	1/2" NPTF	PRFB-LAN-B4D
SAE-8	SAE-8	PRFB-LAN-B4J
SAE-10	SAE-10	PRFB-LAN-B4K

*Add modifier /S to order Ductile Iron for pressure rating over 3000 psi.

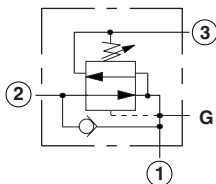
*Add modifier /S to order Ductile Iron for pressure rating over 3000 psi.

NOTES: Page 42 for cartridge models PP*B-*** and PR*B-*** shows performance curves, technical tips, and options. See page vii for technical information about line mount bodies including SAE flange pattern specifications. Consult your local Sun Distributor or the Sun Web Site for other port sizes available in the bodies shown above.

Line Mounted Assemblies

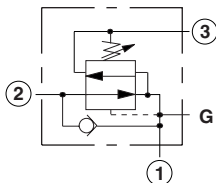
THREE PORT PRESSURE REDUCING/RELIEVING APPLICATIONS (BODIES WITH REVERSE FREE FLOW CHECK, HIGH CAPACITY PORT 3)

PILOT OPERATED ASSEMBLIES



Ports 1 and 2	Port 3	Assembly Model Code*
1" NPTF	3/4" NPTF	PPHB-LAN-H4E
1 1/4" NPTF	3/4" NPTF	PPHB-LAN-H4F
SAE-12	SAE-12	PPHB-LAN-H4L
SAE-16	SAE-12	PPHB-LAN-H4M

*Add modifier /S to order Ductile Iron for pressure rating over 3000 psi.

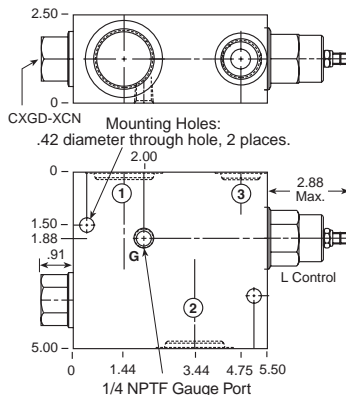


Ports 1 and 2	Port 3	Assembly Model Code*
1" NPTF	3/4" NPTF	PPJB-LAN-K4E
1 1/4" NPTF	3/4" NPTF	PPJB-LAN-K4F

*Add modifier /S to order Ductile Iron for pressure rating over 3000 psi.

Go to www.sunhydraulics.com for more product information and pricing.

0-40 GPM Cavity T-17A

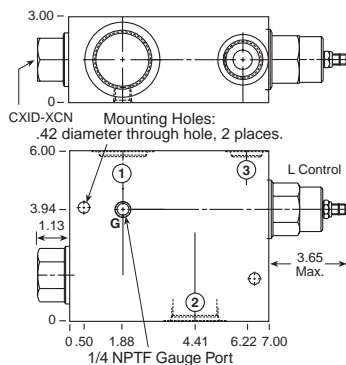


DIRECT ACTING ASSEMBLIES

Ports 1 and 2	Port 3	Assembly Model Code*
1" NPTF	3/4" NPTF	PRHB-LAN-H4E
1 1/4" NPTF	3/4" NPTF	PRHB-LAN-H4F
SAE-12	SAE-12	PRHB-LAN-H4L
SAE-16	SAE-12	PRHB-LAN-H4M

*Add modifier /S to order Ductile Iron for pressure rating over 3000 psi.

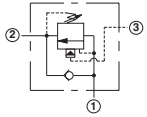
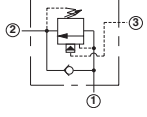
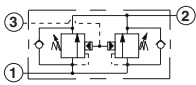
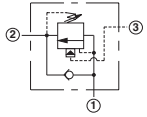
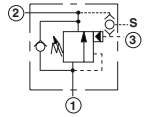
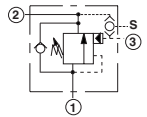
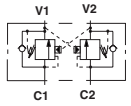
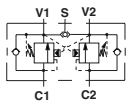
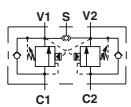
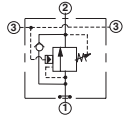
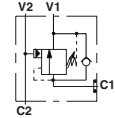
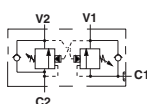
0-80 GPM Cavity T-19A



Ports 1 and 2	Port 3	Assembly Model Code*
1" NPTF	3/4" NPTF	PRJB-LAN-K4E
1 1/4" NPTF	3/4" NPTF	PRJB-LAN-K4F

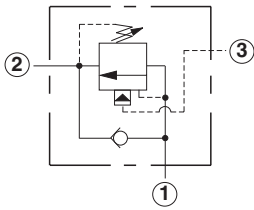
NOTES: Page 42 for cartridge models PP*B-*** and PR*B-*** shows performance curves, technical tips, and options.
See page vii for technical information about line mount bodies including SAE flange pattern specifications.
Consult your local Sun Distributor or the Sun Web Site for other port sizes available in the bodies shown above.

Three Port Counterbalance Assemblies

	<i>Cartridge Type</i>	<i>Page</i>
	Standard, 4000 psi Maximum Setting	50
	Standard, 5000 psi Maximum Setting	50
<i>Line Mounted Assemblies (Body Type)</i>		
	90 Degree	52
	90 Degree 2.00" C61/C62 Flange Port, 2 Cavities	54
	Inline	55
	90 Degree with Shuttle	56
	90 Degree 1.50" C61/C62 SAE Flange Port with Shuttle, 2 Cavities	57
	90 Degree Cross-Piloted, 2 Cavities	58
	90 Degree Cross-Piloted, 1.50" SAE C61/C62 Flange Port, 2 Cavities	59
	Inline/Inline Cross-Piloted, 1.50" SAE C61 Flange Port, 2 Cavities	60
	90 Degree Cross-Piloted with Shuttle, 2 Cavities	61
	Cross-Piloted, 1.50" SAE C61/C62 Flange Port with Shuttle, 2 Cavities	62
	Inline Cross-Piloted with Shuttle, 2 Cavities	63
	Direct Mount .75"/1.00"/1.25" SAE C61 Flange Port, Through Pilot	64
	Gasket Mount	66
	Gasket Mount, 2 Cavities	67

Counterbalance Valves

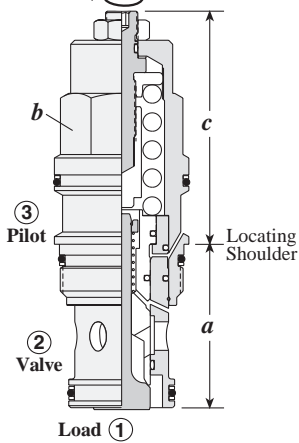
STANDARD, 4000 PSI MAXIMUM SETTING



Capacity	Typical Cartridge Model Code	Cavity	Cartridge Dimensions				Installation Torque (lb. ft.)
			a	b	L	C	
15 GPM	CBCA – LHN	T - 11A	1.38	7/8"	1.97	2.19	30/35
30 GPM	CBEA – LHN	T - 2A	1.38	1 1/8"	2.38	2.50	45/50
60 GPM	CBGA – LHN	T - 17A	1.81	1 1/4"	2.75	3.31	150/160
120 GPM	CBIA – LHN	T - 19A	2.50	1 5/8"	3.50	4.09	350/375

OPTION ORDERING INFORMATION

Turn screw clockwise to reduce setting and release load. Complete Adjustment 3 Turns



CB * * - * * *

Nominal Capacity	Control**	Cracking Pressure	Seal
C 15 GPM	L Standard Screw	30 psi Check Spring	N Buna-N
E 30 GPM	C Tamper Resistant	H 1000 - 4000 psi	V Viton
G 60 GPM		I 400 - 1500 psi	
I 120 GPM			

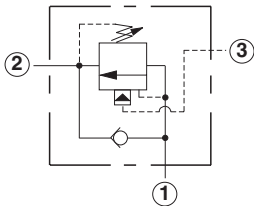
Version

- A** 3:1 Pilot Ratio **5 psi Check Spring**
- B** 1.5:1 Pilot Ratio (with sealed pilot) **A** 1000 - 4000 psi **B** 400 - 1500 psi
- Y** 2:1 Pilot Ratio (with bleed through pilot)

Adjustment Range Options:
A and **H** are standard set at 3000 psi.
I and **B** are standard set at 1000 psi.
Customer may specify setting.

** See page 244 for information on Control Options

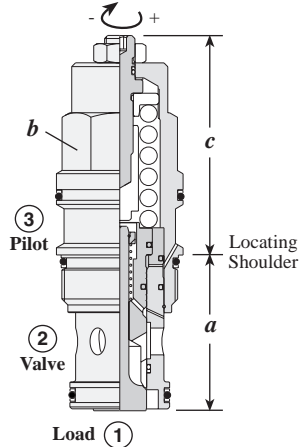
STANDARD, 5000 PSI MAXIMUM SETTING



Capacity	Typical Cartridge Model Code	Cavity	Cartridge Dimensions				Installation Torque (lb. ft.)
			a	b	L	C	
15 GPM	CBCG – LJN	T - 11A	1.38	7/8"	1.97	2.19	30/35
30 GPM	CBEG – LJN	T - 2A	1.38	1 1/8"	2.38	2.50	45/50
60 GPM	CBGG – LJN	T - 17A	1.81	1 1/4"	2.75	3.31	150/160
120 GPM	CBIG – LJN	T - 19A	2.50	1 5/8"	3.50	4.09	350/375

OPTION ORDERING INFORMATION

Turn screw clockwise to reduce setting and release load. Complete Adjustment 3 Turns



CB * * - * * *

Nominal Capacity	Control**	Cracking Pressure	Seal
C 15 GPM	L Standard Screw	30 psi Check Spring	N Buna-N
E 30 GPM	C Tamper Resistant	J 2000 - 5000 psi	V Viton
G 60 GPM		K 1000 - 2500 psi	
I 120 GPM			

Version

- G** 4.5:1 Pilot Ratio **5 psi Check Spring**
- H** 10:1 Pilot Ratio **C** 2000 - 5000 psi
- L** 2.3:1 Pilot Ratio (with sealed pilot) **D** 1000 - 2500 psi

Adjustment Range Options:
J and **C** are standard set at 3000 psi.
K and **D** are standard set at 2000 psi.
Customer may specify setting.

** See page 244 for information on Control Options

TECHNICAL TIPS / PERFORMANCE CURVES

Counterbalance Valves, 3:1, 1.5:1 and 2:1 Pilot Ratio, External Pilot, Non-vented

Applications

The Sun three port counterbalance cartridges (with pilot to open assist) are modulating devices that allow free flow from port 2 (inlet) to port 1 (load) and then block reverse flow until a pilot pressure inversely proportional to the load pressure is sensed at port 3 (pilot) or load pressure exceeds relief setting. These valves improve the motion control of most control valve systems by ensuring that the actuator always sees a positive load pressure, even under overrunning load situations.

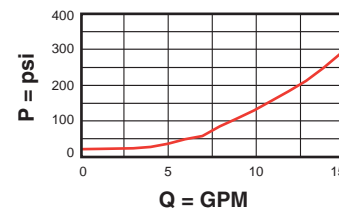
Design Concepts and Features

- Recommended minimum setting should be 1.3 times maximum load induced pressure.
- 3:1, 1.5:1, 2:1 pilot ratio, load holding to 3000 psi (with 4000 psi setting).
- Load reactive pilot assist for overcenter load control applications.
- 5 drops/min. maximum leakage at reseal.
- Reseat exceeds 85% of set pressure at standard setting.
- Back pressure at Port 2 may adversely affect operation of valve. For circuits with back pressure Sun recommends vented counterbalance valves CW** (vented valves).

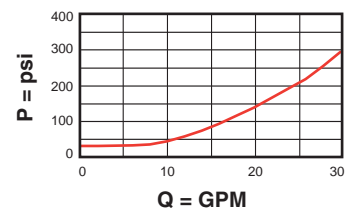
Performance Curves

Free Flow and Pilot Open Pressure Drop

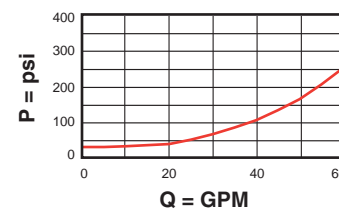
CBC*-L*N



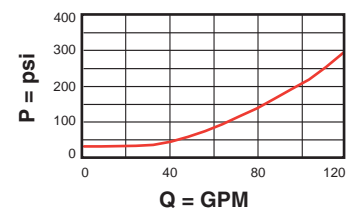
CBE*-L*N



CBG*-L*N



CBI*-L*N



Counterbalance Valves, 4.5:1, 10:1 and 2.3:1 Pilot Ratio, External Pilot, Non-vented

Applications

The Sun three port counterbalance cartridges (with pilot to open assist) are modulating devices that allow free flow from port 2 (inlet) to port 1 (load) and then block reverse flow until a pilot pressure inversely proportional to the load pressure is sensed at port 3 (pilot) or load pressure exceeds relief setting. These valves improve the motion control of most control valve systems by ensuring that the actuator always sees a positive load pressure, even under overrunning load situations.

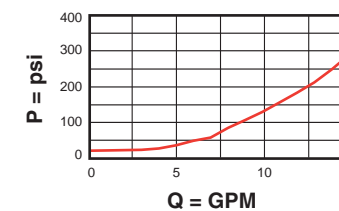
Design Concepts and Features

- Recommended minimum setting should be 1.3 times maximum load induced pressure.
- 4.5:1 10:1, 2.3:1 pilot ratio, load holding to 3760 psi (with 5000 psi setting).
- Load reactive pilot assist for overcenter load control applications.
- 5 drops/min. maximum leakage at reseal.
- Reseat exceeds 85% of set pressure at standard setting.
- Back pressure at Port 2 may adversely affect operation of valve. For circuits with back pressure Sun recommends vented counterbalance valves CW** (vented valves).

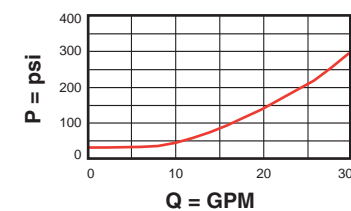
Performance Curves

Free Flow and Pilot Open Pressure Drop

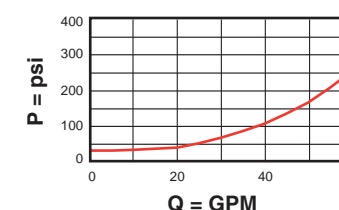
CBC*-L*N



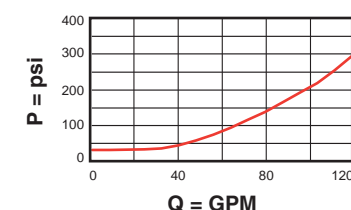
CBE*-L*N



CBG*-L*N



CBI*-L*N



General Application Requirements

- Operating Temperature Range: Buna-N seals -50° F to 200° F, Viton seals 0° F to 250° F.
- Viscosity Range: 60-3000 SUS.
- Fluid Contamination Level: ISO 4406 18/15 or better; Recommend $\beta_{10} \geq 75$ to achieve ISO 18/15 or better in most systems.
- Factory Pressure Setting for cartridge is established at cracking flow 35 cc/min.

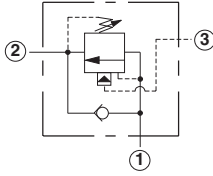
Line Mounted Assemblies

THREE PORT LOAD CONTROL APPLICATIONS (90 DEGREE BODIES)

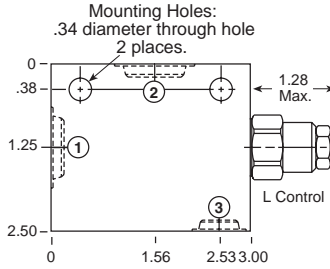
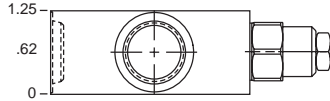
PILOT RATIO
3:1, 1.5:1, 2:1

Go to www.sunhydraulics.com
for more product information and pricing.

PILOT RATIO
2.3:1, 4.5:1, 10:1



0-15 GPM Cavity T-11A

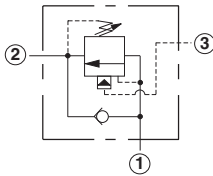


Ports 1 and 2	Port 3	Assembly Model Code*
3/8" NPTF	1/4" NPTF	CBC*-LHN-ECB
1/2" NPTF	1/4" NPTF	CBC*-LHN-ECC
SAE-4	SAE-4	CBC*-LHN-ECH
SAE-6	SAE-6	CBC*-LHN-ECI
SAE-8	SAE-6	CBC*-LHN-ECJ

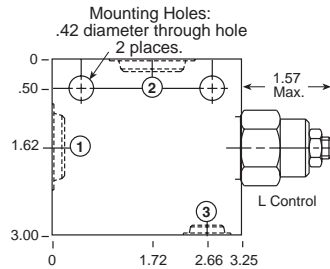
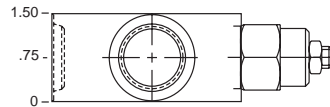
The asterisk () shown in the fourth digit of the model code indicates the counterbalance pilot ratio of the cartridge and must be specified by customer. See page 50. Add modifier /S to order Ductile Iron for pressure rating over 3000 psi.

Ports 1 and 2	Port 3	Assembly Model Code*
3/8" NPTF	1/4" NPTF	CBC*-LJN-ECB
1/2" NPTF	1/4" NPTF	CBC*-LJN-ECC
SAE-4	SAE-4	CBC*-LJN-ECH
SAE-6	SAE-6	CBC*-LJN-ECI
SAE-8	SAE-6	CBC*-LJN-ECJ

The asterisk () shown in the fourth digit of the model code indicates the counterbalance pilot ratio of the cartridge and must be specified by customer. See page 50. Add modifier /S to order Ductile Iron for pressure rating over 3000 psi.



0-30 GPM Cavity T-2A



Ports 1 and 2	Port 3	Assembly Model Code*
1/2" NPTF	1/4" NPTF	CBE*-LHN-BCC
3/4" NPTF	1/4" NPTF	CBE*-LHN-BCD
SAE-10	SAE-6	CBE*-LHN-BCK
SAE-12	SAE-6	CBE*-LHN-BCL

The asterisk () shown in the fourth digit of the model code indicates the counterbalance pilot ratio of the cartridge and must be specified by customer. See page 50. Add modifier /S to order Ductile Iron for pressure rating over 3000 psi.

Ports 1 and 2	Port 3	Assembly Model Code*
1/2" NPTF	1/4" NPTF	CBE*-LJN-BCC
3/4" NPTF	1/4" NPTF	CBE*-LJN-BCD
SAE-10	SAE-6	CBE*-LJN-BCK
SAE-12	SAE-6	CBE*-LJN-BCL

The asterisk () shown in the fourth digit of the model code indicates the counterbalance pilot ratio of the cartridge and must be specified by customer. See page 50. Add modifier /S to order Ductile Iron for pressure rating over 3000 psi.

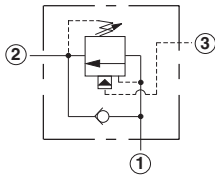
NOTES: Page 50 for cartridge models CB**-* shows performance curves, technical tips, and options.
See page vii for technical information about line mount bodies including SAE flange pattern specifications.
Consult your local Sun Distributor or the Sun Web Site for other port sizes available in the bodies shown above.
Model Codes printed in red are Preferred Products and are readily available.

THREE PORT LOAD CONTROL APPLICATIONS (90 DEGREE BODIES)

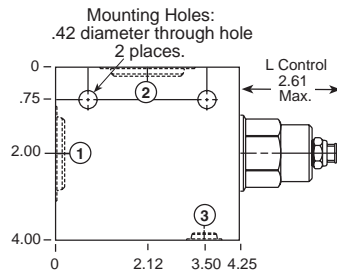
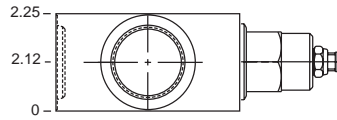
**PILOT RATIO
3:1, 1.5:1, 2:1**

Go to www.sunhydraulics.com
for more product information and pricing.

**PILOT RATIO
2.3:1, 4.5:1, 10:1**



0-60 GPM Cavity T-17A



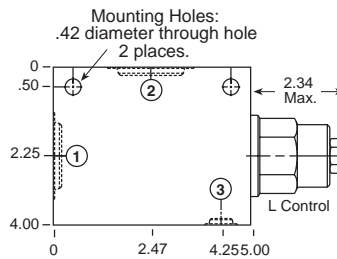
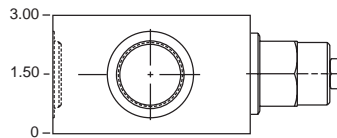
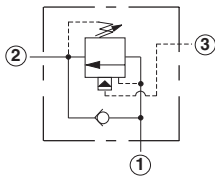
Ports 1 and 2	Port 3	Assembly Model Code*
1" NPTF	1/4" NPTF	CBG*-LHN-HCE
1 1/4" NPTF	1/4" NPTF	CBG*-LHN-HCF
SAE-12	SAE-6	CBG*-LHN-HCL
SAE-16	SAE-6	CBG*-LHN-HCM

Ports 1 and 2	Port 3	Assembly Model Code*
1" NPTF	1/4" NPTF	CBG*-LJN-HCE
1 1/4" NPTF	1/4" NPTF	CBG*-LJN-HCF
SAE-12	SAE-6	CBG*-LJN-HCL
SAE-16	SAE-6	CBG*-LJN-HCM

The asterisk () shown in the fourth digit of the model code indicates the counterbalance pilot ratio of the cartridge and must be specified by customer. See page 50. Add modifier /S to order Ductile Iron for pressure rating over 3000 psi.

The asterisk () shown in the fourth digit of the model code indicates the counterbalance pilot ratio of the cartridge and must be specified by customer. See page 50. Add modifier /S to order Ductile Iron for pressure rating over 3000 psi.

0-120 GPM Cavity T-19A



Ports 1 and 2	Port 3	Assembly Model Code*
1" NPTF	1/4" NPTF	CBI*-LHN-KCE
1 1/4" NPTF	1/4" NPTF	CBI*-LHN-KCF
SAE-16	SAE-6	CBI*-LHN-KCM
SAE-20	SAE-6	CBI*-LHN-KCN

Ports 1 and 2	Port 3	Assembly Model Code*
1" NPTF	1/4" NPTF	CBI*-LJN-KCE
1 1/4" NPTF	1/4" NPTF	CBI*-LJN-KCF
SAE-16	SAE-6	CBI*-LJN-KCM
SAE-20	SAE-6	CBI*-LJN-KCN

The asterisk () shown in the fourth digit of the model code indicates the counterbalance pilot ratio of the cartridge and must be specified by customer. See page 50. Add modifier /S to order Ductile Iron for pressure rating over 3000 psi.

The asterisk () shown in the fourth digit of the model code indicates the counterbalance pilot ratio of the cartridge and must be specified by customer. See page 50. Add modifier /S to order Ductile Iron for pressure rating over 3000 psi.

NOTES: Page 50 for cartridge models CB**-* shows performance curves, technical tips, and options.
See page vii for technical information about line mount bodies including SAE flange pattern specifications.
Consult your local Sun Distributor or the Sun Web Site for other port sizes available in the bodies shown above.
Model Codes printed in red are Preferred Products and are readily available.

Line Mounted Assemblies

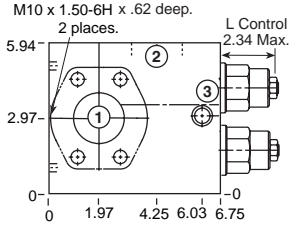
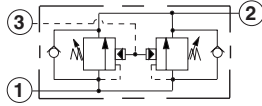
**THREE PORT LOAD CONTROL APPLICATIONS
(90 DEGREE 2.00" C61/C62 FLANGE PORT BODIES, 2 CAVITIES)**

**PILOT RATIO
3:1, 1.5:1, 2:1**

Go to www.sunhydraulics.com
for more product information and pricing.

**PILOT RATIO
2.3:1, 4.5:1, 10:1**

0-240 GPM Cavity T-11A



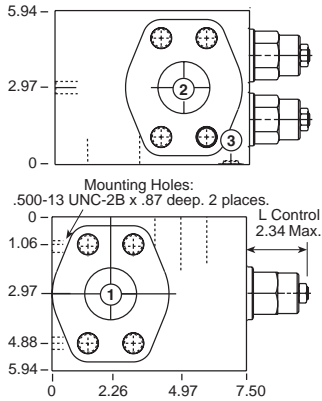
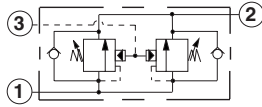
Ports 1 and 2	Port 3	Assembly Model Code*
2" SAE C61	SAE-6	CBI*-LHN-XZZ

Ports 1 and 2	Port 3	Assembly Model Code*
2" SAE C61	SAE-6	CBI*-LHN-XZZ

The asterisk () shown in the fourth digit of the model code indicates the counterbalance pilot ratio of the cartridge and must be specified by customer. See page 50. Add modifier /S to order Ductile Iron for pressure rating over 3000 psi.

The asterisk () shown in the fourth digit of the model code indicates the counterbalance pilot ratio of the cartridge and must be specified by customer. See page 50. Add modifier /S to order Ductile Iron for pressure rating over 3000 psi.

0-240 GPM Cavity T-19A



Ports 1 and 2	Port 3	Assembly Model Code*
2" SAE C62	SAE-6	CBI*-LJN-Z8Z

Ports 1 and 2	Port 3	Assembly Model Code*
2" SAE C62	SAE-6	CBI*-LJN-Z8Z

The asterisk () shown in the fourth digit of the model code indicates the counterbalance pilot ratio of the cartridge and must be specified by customer. See page 50. Add modifier /S to order Ductile Iron for pressure rating over 3000 psi.

The asterisk () shown in the fourth digit of the model code indicates the counterbalance pilot ratio of the cartridge and must be specified by customer. See page 50. Add modifier /S to order Ductile Iron for pressure rating over 3000 psi.

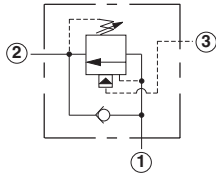
NOTES: Page 50 for cartridge models CB**-* shows performance curves, technical tips, and options.
See page vii for technical information about line mount bodies including SAE flange pattern specifications.
Consult your local Sun Distributor or the Sun Web Site for other port sizes available in the bodies shown above.

THREE PORT LOAD CONTROL APPLICATIONS (INLINE BODIES)

PILOT RATIO
3:1, 1.5:1, 2:1

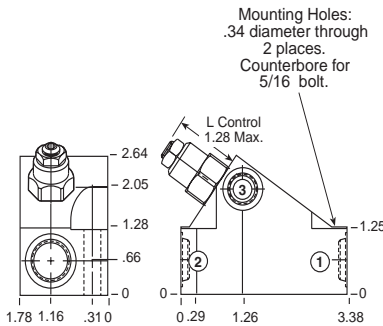
Go to www.sunhydraulics.com
for more product information and pricing.

PILOT RATIO
2.3:1, 4.5:1, 10:1



0-15 GPM Cavity T-11A

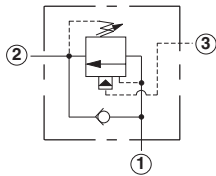
Ports 1 and 2	Port 3	Assembly Model Code*
3/8" NPTF	1/4" NPTF	CBC*-LHN-EJB
SAE-6	SAE-6	CBC*-LHN-EJI
SAE-8	SAE-6	CBC*-LHN-EJJ



Ports 1 and 2	Port 3	Assembly Model Code*
3/8" NPTF	1/4" NPTF	CBC*-LJN-EJB
SAE-6	SAE-6	CBC*-LJN-EJI
SAE-8	SAE-6	CBC*-LJN-EJJ

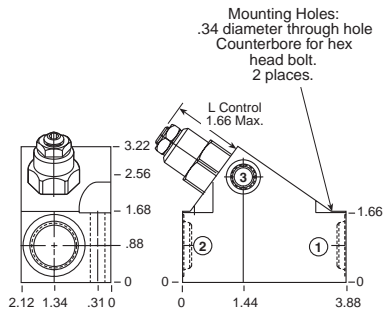
The asterisk () shown in the fourth digit of the model code indicates the counterbalance pilot ratio of the cartridge and must be specified by customer. See page 50. Add modifier /S to order Ductile Iron for pressure rating over 3000 psi.

The asterisk () shown in the fourth digit of the model code indicates the counterbalance pilot ratio of the cartridge and must be specified by customer. See page 50. Add modifier /S to order Ductile Iron for pressure rating over 3000 psi.



0-30 GPM Cavity T-2A

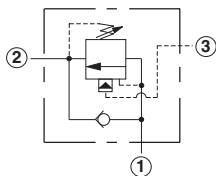
Ports 1 and 2	Port 3	Assembly Model Code*
1/2" NPTF	1/4" NPTF	CBE*-LHN-BVC
3/4" NPTF	1/4" NPTF	CBE*-LHN-BVD
SAE-6	SAE-6	CBE*-LHN-BVI
SAE-8	SAE-6	CBE*-LHN-BVJ



Ports 1 and 2	Port 3	Assembly Model Code*
1/2" NPTF	1/4" NPTF	CBE*-LJN-BVC
3/4" NPTF	1/4" NPTF	CBE*-LJN-BVD
SAE-6	SAE-6	CBE*-LJN-BVI
SAE-8	SAE-6	CBE*-LJN-BVJ

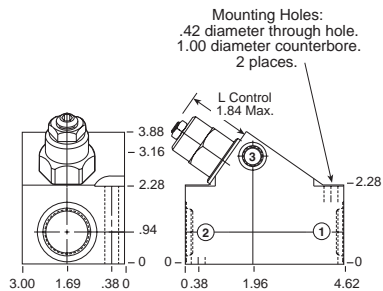
The asterisk () shown in the fourth digit of the model code indicates the counterbalance pilot ratio of the cartridge and must be specified by customer. See page 50. Add modifier /S to order Ductile Iron for pressure rating over 3000 psi.

The asterisk () shown in the fourth digit of the model code indicates the counterbalance pilot ratio of the cartridge and must be specified by customer. See page 50. Add modifier /S to order Ductile Iron for pressure rating over 3000 psi.



0-60 GPM Cavity T-17A

Ports 1 and 2	Port 3	Assembly Model Code*
3/4" NPTF	1/4" NPTF	CBG*-LHN-HDD
1" NPTF	1/4" NPTF	CBG*-LHN-HDE
SAE-12	SAE-6	CBG*-LHN-HDL
SAE-16	SAE-6	CBG*-LHN-HDM



Ports 1 and 2	Port 3	Assembly Model Code*
3/4" NPTF	1/4" NPTF	CBG*-LJN-HDD
1" NPTF	1/4" NPTF	CBG*-LJN-HDE
SAE-12	SAE-6	CBG*-LJN-HDL
SAE-16	SAE-6	CBG*-LJN-HDM

The asterisk () shown in the fourth digit of the model code indicates the counterbalance pilot ratio of the cartridge and must be specified by customer. See page 50. Add modifier /S to order Ductile Iron for pressure rating over 3000 psi.

The asterisk () shown in the fourth digit of the model code indicates the counterbalance pilot ratio of the cartridge and must be specified by customer. See page 50. Add modifier /S to order Ductile Iron for pressure rating over 3000 psi.

NOTES: Page 50 for cartridge models CB*-*** shows performance curves, technical tips, and options.
See page vii for technical information about line mount bodies including SAE flange pattern specifications.
Consult your local Sun Distributor or the Sun Web Site for other port sizes available in the bodies shown above.
Model Codes printed in red are Preferred Products and are readily available.

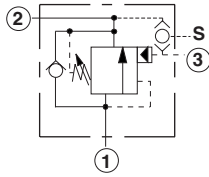
Line Mounted Assemblies

THREE PORT LOAD CONTROL APPLICATIONS (90 DEGREE BODIES WITH SHUTTLE)

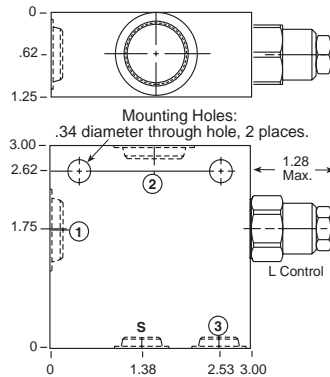
PILOT RATIO
3:1, 1.5:1, 2:1

Go to www.sunhydraulics.com
for more product information and pricing.

PILOT RATIO
2.3:1, 4.5:1, 10:1



0-15 GPM Cavity T-11A

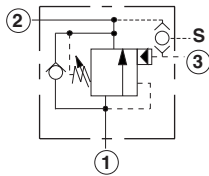


Ports 1 and 2	Ports Shuttle and 3	Assembly Model Code*
3/8" NPTF	1/4" NPTF	CBC*-LHN-EGB
1/2" NPTF	1/4" NPTF	CBC*-LHN-EGC
SAE-6	SAE-6	CBC*-LHN-EGI
SAE-8	SAE-6	CBC*-LHN-EGJ
SAE-10	SAE-6	CBC*-LHN-EGK

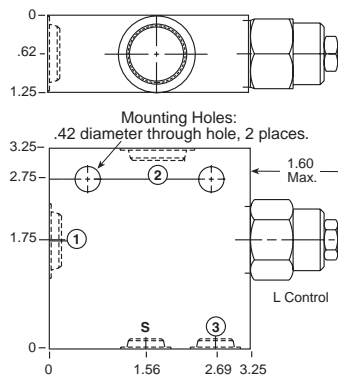
The asterisk () shown in the fourth digit of the model code indicates the counterbalance pilot ratio of the cartridge and must be specified by customer. See page 50. Add modifier /S to order Ductile Iron for pressure rating over 3000 psi.

Ports 1 and 2	Ports Shuttle and 3	Assembly Model Code*
3/8" NPTF	1/4" NPTF	CBC*-LJN-EGB
1/2" NPTF	1/4" NPTF	CBC*-LJN-EGC
SAE-6	SAE-6	CBC*-LJN-EGI
SAE-8	SAE-6	CBC*-LJN-EGJ
SAE-10	SAE-6	CBC*-LJN-EGK

The asterisk () shown in the fourth digit of the model code indicates the counterbalance pilot ratio of the cartridge and must be specified by customer. See page 50. Add modifier /S to order Ductile Iron for pressure rating over 3000 psi.



0-30 GPM Cavity T-2A

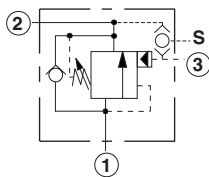


Ports 1 and 2	Ports Shuttle and 3	Assembly Model Code*
1/2" NPTF	1/4" NPTF	CBE*-LHN-BGC
3/4" NPTF	1/4" NPTF	CBE*-LHN-BGD
SAE-6	SAE-6	CBE*-LHN-BGI
SAE-8	SAE-6	CBE*-LHN-BGJ

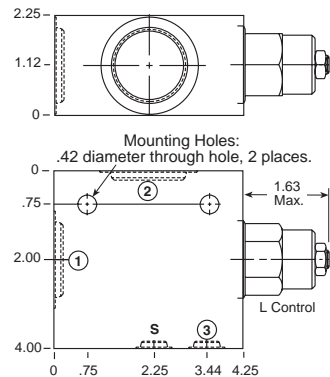
The asterisk () shown in the fourth digit of the model code indicates the counterbalance pilot ratio of the cartridge and must be specified by customer. See page 50. Add modifier /S to order Ductile Iron for pressure rating over 3000 psi.

Ports 1 and 2	Ports Shuttle and 3	Assembly Model Code*
1/2" NPTF	1/4" NPTF	CBE*-LJN-BGC
3/4" NPTF	1/4" NPTF	CBE*-LJN-BGD
SAE-6	SAE-6	CBE*-LJN-BGI
SAE-8	SAE-6	CBE*-LJN-BGJ

The asterisk () shown in the fourth digit of the model code indicates the counterbalance pilot ratio of the cartridge and must be specified by customer. See page 50. Add modifier /S to order Ductile Iron for pressure rating over 3000 psi.



0-60 GPM Cavity T-17A



Ports 1 and 2	Ports Shuttle and 3	Assembly Model Code*
1" NPTF	1/4" NPTF	CBG*-LHN-HDE
1 1/4" NPTF	1/4" NPTF	CBG*-LHN-HDF
SAE-12	SAE-6	CBG*-LHN-HDL
SAE-16	SAE-6	CBG*-LHN-HDM

The asterisk () shown in the fourth digit of the model code indicates the counterbalance pilot ratio of the cartridge and must be specified by customer. See page 50. Add modifier /S to order Ductile Iron for pressure rating over 3000 psi.

Ports 1 and 2	Ports Shuttle and 3	Assembly Model Code*
1" NPTF	1/4" NPTF	CBG*-LJN-HDE
1 1/4" NPTF	1/4" NPTF	CBG*-LJN-HDF
SAE-12	SAE-6	CBG*-LJN-HDL
SAE-16	SAE-6	CBG*-LJN-HDM

The asterisk () shown in the fourth digit of the model code indicates the counterbalance pilot ratio of the cartridge and must be specified by customer. See page 50. Add modifier /S to order Ductile Iron for pressure rating over 3000 psi.

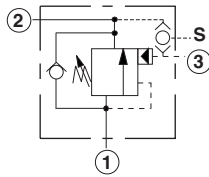
NOTES: Page 50 for cartridge models CB**-* shows performance curves, technical tips, and options.
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THREE PORT LOAD CONTROL APPLICATIONS (90 DEGREE 1.50" SAE FLANGE PORT C61/C62 BODIES WITH SHUTTLE)

PILOT RATIO
3:1, 1.5:1, 2:1

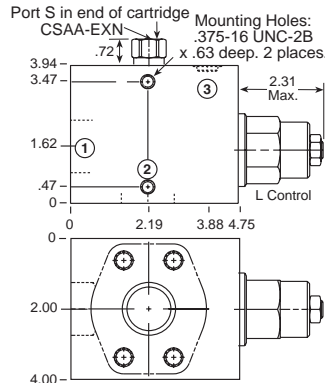
Go to www.sunhydraulics.com
for more product information and pricing.

PILOT RATIO
2.3:1, 4.5:1, 10:1



Ports 1 and 2	Ports Shuttle and 3	Assembly Model Code*
1 1/2" SAE C61	SAE-4	CBI*-LHN-KGR

0-240 GPM Cavity T-19A

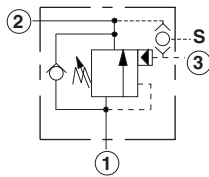


Ports 1 and 2	Ports Shuttle and 3	Assembly Model Code*
1 1/2" SAE C61	SAE-4	CBI*-LJN-KGR

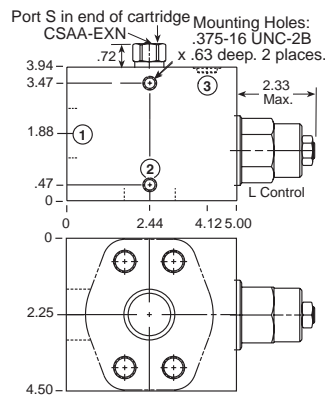
The asterisk () shown in the fourth digit of the model code indicates the counterbalance pilot ratio of the cartridge and must be specified by customer. See page 50. Add modifier /S to order Ductile Iron for pressure rating over 3000 psi.

The asterisk () shown in the fourth digit of the model code indicates the counterbalance pilot ratio of the cartridge and must be specified by customer. See page 50. Add modifier /S to order Ductile Iron for pressure rating over 3000 psi.

0-240 GPM Cavity T-19A



Ports 1 and 2	Ports Shuttle and 3	Assembly Model Code*
1 1/2" SAE C62	SAE-6	CBI*-LHN-KG6



Ports 1 and 2	Ports Shuttle and 3	Assembly Model Code*
1 1/2" SAE C62	SAE-6	CBI*-LJN-KG6

The asterisk () shown in the fourth digit of the model code indicates the counterbalance pilot ratio of the cartridge and must be specified by customer. See page 50. Add modifier /S to order Ductile Iron for pressure rating over 3000 psi.

The asterisk () shown in the fourth digit of the model code indicates the counterbalance pilot ratio of the cartridge and must be specified by customer. See page 50. Add modifier /S to order Ductile Iron for pressure rating over 3000 psi.

NOTES: Page 50 for cartridge models CB**-* shows performance curves, technical tips, and options.
See page vii for technical information about line mount bodies including SAE flange pattern specifications.
Consult your local Sun Distributor or the Sun Web Site for other port sizes available in the bodies shown above.

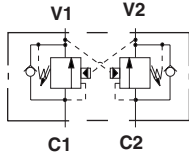
Line Mounted Assemblies

THREE PORT LOAD CONTROL APPLICATIONS (90 DEGREE CROSS-PILOTED BODIES, 2 CAVITIES)

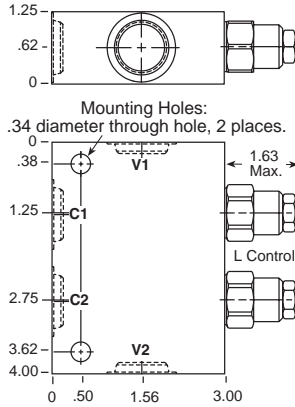
PILOT RATIO
3:1, 1.5:1, 2:1

Go to www.sunhydraulics.com
for more product information and pricing.

PILOT RATIO
2.3:1, 4.5:1, 10:1



0-15 GPM Cavity T-11A

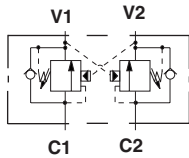


Ports C1, C2, V1 & V2	Assembly Model Code*
3/8" NPTF	CBC*-LHN-YEB
1/2" NPTF	CBC*-LHN-YEC
SAE-6	CBC*-LHN-YEI
SAE-8	CBC*-LHN-YEJ
SAE-10	CBC*-LHN-YEK

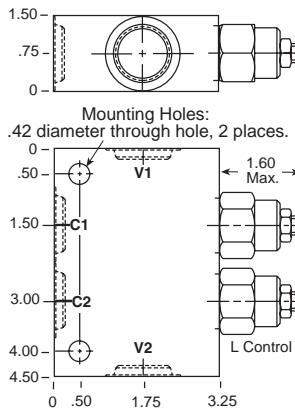
The asterisk () shown in the fourth digit of the model code indicates the counterbalance pilot ratio of the cartridge and must be specified by customer. See page 50. Add modifier /S to order Ductile Iron for pressure rating over 3000 psi.

Ports C1, C2, V1 & V2	Assembly Model Code*
3/8" NPTF	CBC*-LJN-YEB
1/2" NPTF	CBC*-LJN-YEC
SAE-6	CBC*-LJN-YEI
SAE-8	CBC*-LJN-YEJ
SAE-10	CBC*-LJN-YEK

The asterisk () shown in the fourth digit of the model code indicates the counterbalance pilot ratio of the cartridge and must be specified by customer. See page 50. Add modifier /S to order Ductile Iron for pressure rating over 3000 psi.



0-30 GPM Cavity T-2A



Ports C1, C2, V1 & V2	Assembly Model Code*
3/8" NPTF	CBE*-LHN-YAB
1/2" NPTF	CBE*-LHN-YAC
3/4" NPTF	CBE*-LHN-YAD
SAE-10	CBE*-LHN-YAK
SAE-12	CBE*-LHN-YAL

The asterisk () shown in the fourth digit of the model code indicates the counterbalance pilot ratio of the cartridge and must be specified by customer. See page 50. Add modifier /S to order Ductile Iron for pressure rating over 3000 psi.

Ports C1, C2, V1 & V2	Assembly Model Code*
3/8" NPTF	CBE*-LJN-YAB
1/2" NPTF	CBE*-LJN-YAC
3/4" NPTF	CBE*-LJN-YAD
SAE-10	CBE*-LJN-YAK
SAE-12	CBE*-LJN-YAL

The asterisk () shown in the fourth digit of the model code indicates the counterbalance pilot ratio of the cartridge and must be specified by customer. See page 50. Add modifier /S to order Ductile Iron for pressure rating over 3000 psi.

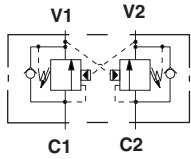
NOTES: Page 50 for cartridge models CB**-* shows performance curves, technical tips, and options.
See page vii for technical information about line mount bodies including SAE flange pattern specifications.
Consult your local Sun Distributor or the Sun Web Site for other port sizes available in the bodies shown above.
Model Codes printed in red are Preferred Products and are readily available.

**THREE PORT LOAD CONTROL APPLICATIONS
(90 DEGREE CROSS-PILOTED, 1.50" SAE C61/C62 FLANGE PORT BODIES, 2 CAVITIES)**

**PILOT RATIO
3:1, 1.5:1, 2:1**

Go to www.sunhydraulics.com
for more product information and pricing.

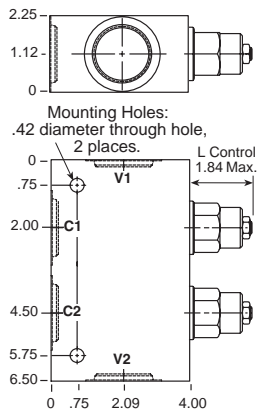
**PILOT RATIO
2.3:1, 4.5:1, 10:1**



Ports C1, C2, V1 & V2	Assembly Model Code*
1" NPTF	CBG*-LHN-YJE
1 1/4" NPTF	CBG*-LHN-YJF
SAE-12	CBG*-LHN-YJL
SAE-16	CBG*-LHN-YJM

The asterisk () shown in the fourth digit of the model code indicates the counterbalance pilot ratio of the cartridge and must be specified by customer. See page 50. Add modifier /S to order Ductile Iron for pressure rating over 3000 psi.

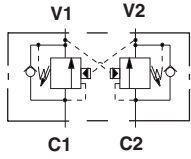
0-60 GPM Cavity T-17A



Ports C1, C2, V1 & V2	Assembly Model Code*
1" NPTF	CBG*-LJN-YJE
1 1/4" NPTF	CBG*-LJN-YJF
SAE-12	CBG*-LJN-YJL
SAE-16	CBG*-LJN-YJM

The asterisk () shown in the fourth digit of the model code indicates the counterbalance pilot ratio of the cartridge and must be specified by customer. See page 50. Add modifier /S to order Ductile Iron for pressure rating over 3000 psi.

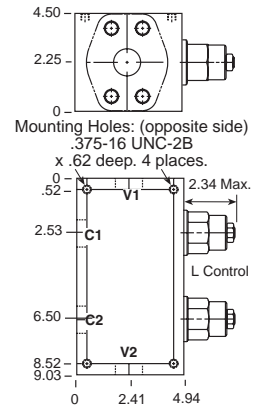
0-120 GPM Cavity T-19A



Ports C1, C2, V1 & V2	Assembly Model Code*
1 1/2" SAE C62	CBI*-LHN-YM6

The asterisk () shown in the fourth digit of the model code indicates the counterbalance pilot ratio of the cartridge and must be specified by customer. See page 50. Add modifier /S to order Ductile Iron for pressure rating over 3000 psi.

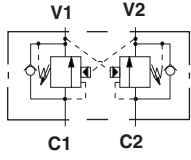
0-120 GPM Cavity T-19A



Ports C1, C2, V1 & V2	Assembly Model Code*
1 1/2" SAE C61	CBI*-LJN-YM6

The asterisk () shown in the fourth digit of the model code indicates the counterbalance pilot ratio of the cartridge and must be specified by customer. See page 50. Add modifier /S to order Ductile Iron for pressure rating over 3000 psi.

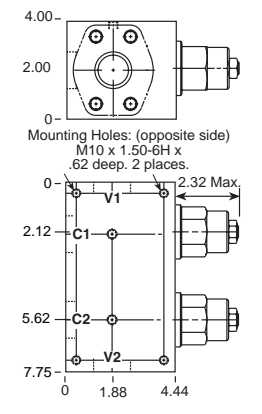
0-120 GPM Cavity T-19A



Ports C1, C2, V1 & V2	Assembly Model Code*
1 1/2" SAE C61	CBI*-LHN-YMR

The asterisk () shown in the fourth digit of the model code indicates the counterbalance pilot ratio of the cartridge and must be specified by customer. See page 50. Add modifier /S to order Ductile Iron for pressure rating over 3000 psi.

0-120 GPM Cavity T-19A



Ports C1, C2, V1 & V2	Assembly Model Code*
1 1/2" SAE C61	CBI*-LJN-YMR

The asterisk () shown in the fourth digit of the model code indicates the counterbalance pilot ratio of the cartridge and must be specified by customer. See page 50. Add modifier /S to order Ductile Iron for pressure rating over 3000 psi.

NOTES: Page 50 for cartridge models CB**-* shows performance curves, technical tips, and options. See page vii for technical information about line mount bodies including SAE flange pattern specifications. Consult your local Sun Distributor or the Sun Web Site for other port sizes available in the bodies shown above. **Model Codes printed in red are Preferred Products and are readily available.**

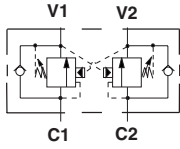
Line Mounted Assemblies

THREE PORT LOAD CONTROL APPLICATIONS (INLINE/INLINE CROSS-PILOTED, 1.50" SAE C61 FLANGE PORT BODIES, 2 CAVITIES)

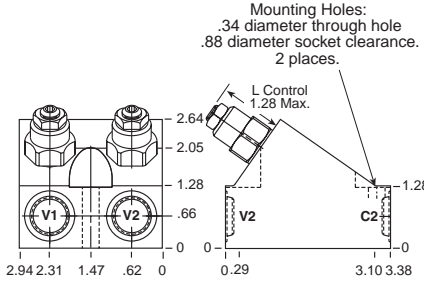
PILOT RATIO
3:1, 1.5:1, 2:1

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for more product information and pricing.

PILOT RATIO
2.3:1, 4.5:1, 10:1



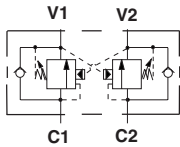
0-15 GPM Cavity T-11A



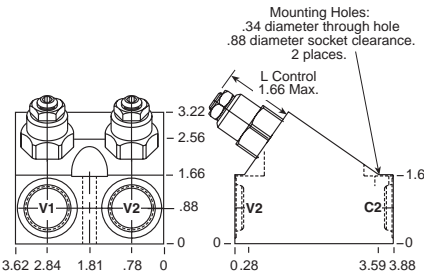
Ports C1, C2, V1 & V2	Assembly Model Code*
3/8" NPTF	CBC*-LHN-XVG
SAE-6	CBC*-LHN-XVH
SAE-8	CBC*-LHN-XVI

The asterisk () shown in the fourth digit of the model code indicates the counterbalance pilot ratio of the cartridge and must be specified by customer. See page 50. Add modifier /S to order Ductile Iron for pressure rating over 3000 psi.

The asterisk () shown in the fourth digit of the model code indicates the counterbalance pilot ratio of the cartridge and must be specified by customer. See page 50. Add modifier /S to order Ductile Iron for pressure rating over 3000 psi.



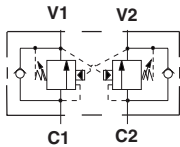
0-30 GPM Cavity T-2A



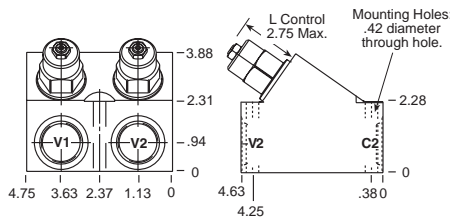
Ports C1, C2, V1 & V2	Assembly Model Code*
SAE-10	CBE*-LHN-XAL
SAE-12	CBE*-LHN-XAK

The asterisk () shown in the fourth digit of the model code indicates the counterbalance pilot ratio of the cartridge and must be specified by customer. See page 50. Add modifier /S to order Ductile Iron for pressure rating over 3000 psi.

The asterisk () shown in the fourth digit of the model code indicates the counterbalance pilot ratio of the cartridge and must be specified by customer. See page 50. Add modifier /S to order Ductile Iron for pressure rating over 3000 psi.

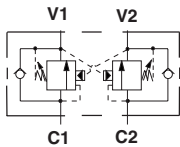


0-60 GPM Cavity T-17A

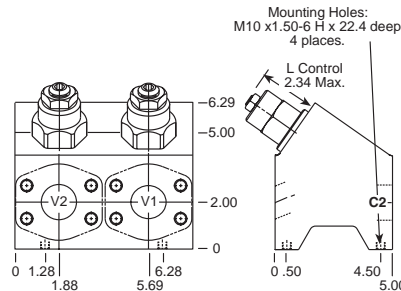


Ports C1, C2, V1 & V2	Assembly Model Code*
SAE-16	CBG*-LHN-XJM
SAE-20	CBG*-LHN-XJL

The asterisk () shown in the fourth digit of the model code indicates the counterbalance pilot ratio of the cartridge and must be specified by customer. See page 50. Add modifier /S to order Ductile Iron for pressure rating over 3000 psi.



0-120 GPM Cavity T-19A



Ports C1, C2, V1 & V2	Assembly Model Code*
1 1/2" SAE C61	CBIA-LHN-XZP

The asterisk () shown in the fourth digit of the model code indicates the counterbalance pilot ratio of the cartridge and must be specified by customer. See page 50. Add modifier /S to order Ductile Iron for pressure rating over 3000 psi.

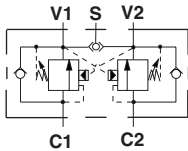
NOTES: Page 50 for cartridge models CB**-* shows performance curves, technical tips, and options. See page vii for technical information about line mount bodies including SAE flange pattern specifications. Consult your local Sun Distributor or the Sun Web Site for other port sizes available in the bodies shown above.
Model Codes printed in red are Preferred Products and are readily available.

THREE PORT LOAD CONTROL APPLICATIONS (90 DEGREE CROSS-PILOTED BODIES WITH SHUTTLE, 2 CAVITIES)

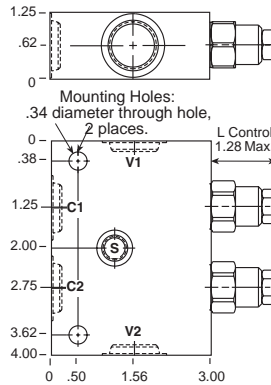
PILOT RATIO
3:1, 1.5:1, 2:1

Go to www.sunhydraulics.com
for more product information and pricing.

PILOT RATIO
2.3:1, 4.5:1, 10:1



0-15 GPM Cavity T-11A

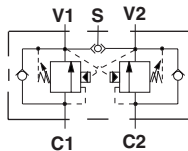


Ports C1, C2, V1 & V2	S Port	Assembly Model Code*
3/8" NPTF	1/4" NPTF	CBC*-LHN-YGB
1/2" NPTF	1/4" NPTF	CBC*-LHN-YGC
SAE-6	SAE-4	CBC*-LHN-YGI
SAE-8	SAE-4	CBC*-LHN-YGJ
SAE-10	SAE-4	CBC*-LHN-YGK

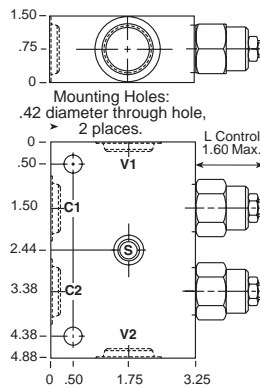
The asterisk () shown in the fourth digit of the model code indicates the counterbalance pilot ratio of the cartridge and must be specified by customer. See page 50. Add modifier /S to order Ductile Iron for pressure rating over 3000 psi.

Ports C1, C2, V1 & V2	S Port	Assembly Model Code*
3/8" NPTF	1/4" NPTF	CBC*-LJN-YGB
1/2" NPTF	1/4" NPTF	CBC*-LJN-YGC
SAE-6	SAE-4	CBC*-LJN-YGI
SAE-8	SAE-4	CBC*-LJN-YGJ
SAE-10	SAE-4	CBC*-LJN-YGK

The asterisk () shown in the fourth digit of the model code indicates the counterbalance pilot ratio of the cartridge and must be specified by customer. See page 50. Add modifier /S to order Ductile Iron for pressure rating over 3000 psi.



0-30 GPM Cavity T-2A

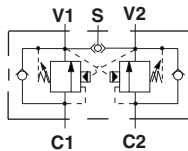


Ports C1, C2, V1 & V2	S Port	Assembly Model Code*
1/2" NPTF	1/4" NPTF	CBE*-LHN-YHC
3/4" NPTF	1/4" NPTF	CBE*-LHN-YHD
SAE-10	SAE-4	CBE*-LHN-YHK
SAE-12	SAE-4	CBE*-LHN-YHL

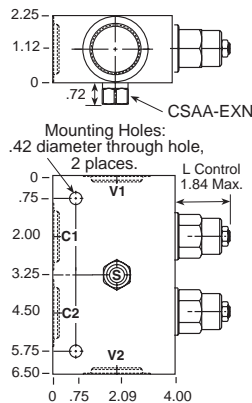
The asterisk () shown in the fourth digit of the model code indicates the counterbalance pilot ratio of the cartridge and must be specified by customer. See page 50. Add modifier /S to order Ductile Iron for pressure rating over 3000 psi.

Ports C1, C2, V1 & V2	S Port	Assembly Model Code*
1/2" NPTF	1/4" NPTF	CBE*-LJN-YHC
3/4" NPTF	1/4" NPTF	CBE*-LJN-YHD
SAE-10	SAE-4	CBE*-LJN-YHK
SAE-12	SAE-4	CBE*-LJN-YHL

The asterisk () shown in the fourth digit of the model code indicates the counterbalance pilot ratio of the cartridge and must be specified by customer. See page 50. Add modifier /S to order Ductile Iron for pressure rating over 3000 psi.



0-60 GPM Cavity T-17A



Ports C1, C2, V1 & V2	S Port	Assembly Model Code*
1" NPTF	SAE-4	CBG*-LHN-YKE
1 1/4" NPTF	SAE-4	CBG*-LHN-YKF
SAE-12	SAE-4	CBG*-LHN-YKL
SAE-16	SAE-4	CBG*-LHN-YKM

The asterisk () shown in the fourth digit of the model code indicates the counterbalance pilot ratio of the cartridge and must be specified by customer. See page 50. Add modifier /S to order Ductile Iron for pressure rating over 3000 psi.

Ports C1, C2, V1 & V2	S Port	Assembly Model Code*
1" NPTF	SAE-4	CBG*-LJN-YKE
1 1/4" NPTF	SAE-4	CBG*-LJN-YKF
SAE-12	SAE-4	CBG*-LJN-YKL
SAE-16	SAE-4	CBG*-LJN-YKM

The asterisk () shown in the fourth digit of the model code indicates the counterbalance pilot ratio of the cartridge and must be specified by customer. See page 50. Add modifier /S to order Ductile Iron for pressure rating over 3000 psi.

NOTES: Page 50 for cartridge models CB**-* shows performance curves, technical tips, and options.
See page vii for technical information about line mount bodies including SAE flange pattern specifications.
Consult your local Sun Distributor or the Sun Web Site for other port sizes available in the bodies shown above.

Line Mounted Assemblies

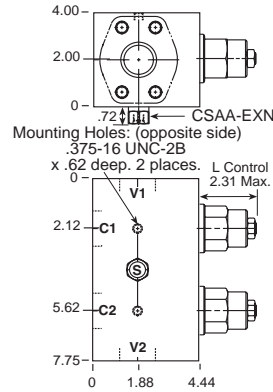
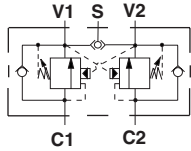
THREE PORT LOAD CONTROL APPLICATIONS (CROSS-PILOTED 1.50" SAE C61/C62 FLANGE PORT BODIES WITH SHUTTLE, 2 CAVITIES)

PILOT RATIO
3:1, 1.5:1, 2:1

Go to www.sunhydraulics.com
for more product information and pricing.

PILOT RATIO
2.3:1, 4.5:1, 10:1

0-120 GPM Cavity T-19A



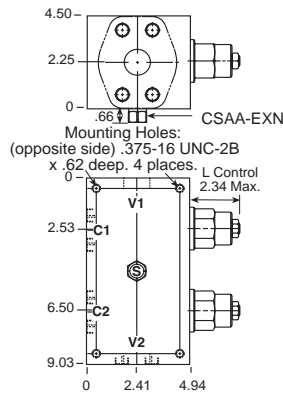
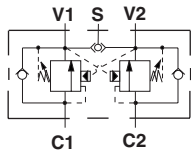
Ports C1, C2, V1, V2	S Port	Assembly Model Code*
1 1/2" SAE C61	SAE-4	CBI*-LHN-YNR

The asterisk () shown in the fourth digit of the model code indicates the counterbalance pilot ratio of the cartridge and must be specified by customer. See page 50. Add modifier /S to order Ductile Iron for pressure rating over 3000 psi.

Ports C1, C2, V1, V2	S Port	Assembly Model Code*
1 1/2" SAE C61	SAE-4	CBI*-LJN-YNR

The asterisk () shown in the fourth digit of the model code indicates the counterbalance pilot ratio of the cartridge and must be specified by customer. See page 50. Add modifier /S to order Ductile Iron for pressure rating over 3000 psi.

0-120 GPM Cavity T-19A



Ports C1, C2, V1, V2	S Port	Assembly Model Code*
1 1/2" SAE C62	SAE-4	CBI*-LHN-YN6

The asterisk () shown in the fourth digit of the model code indicates the counterbalance pilot ratio of the cartridge and must be specified by customer. See page 50. Add modifier /S to order Ductile Iron for pressure rating over 3000 psi.

Ports C1, C2, V1, V2	S Port	Assembly Model Code*
1 1/2" SAE C62	SAE-4	CBI*-LJN-YN6

The asterisk () shown in the fourth digit of the model code indicates the counterbalance pilot ratio of the cartridge and must be specified by customer. See page 50. Add modifier /S to order Ductile Iron for pressure rating over 3000 psi.

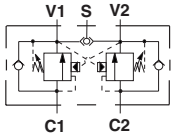
NOTES: Page 50 for cartridge models CB**_*** shows performance curves, technical tips, and options.
See page vii for technical information about line mount bodies including SAE flange pattern specifications.
Consult your local Sun Distributor or the Sun Web Site for other port sizes available in the bodies shown above.

THREE PORT LOAD CONTROL APPLICATIONS (INLINE CROSS-PILOTED BODIES WITH SHUTTLE, 2 CAVITIES)

PILOT RATIO
3:1, 1.5:1, 2:1

Go to www.sunhydraulics.com
for more product information and pricing.

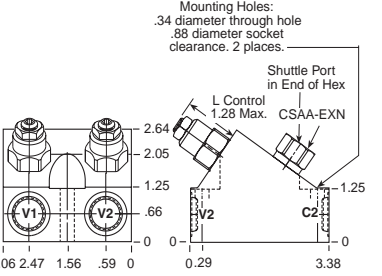
PILOT RATIO
2.3:1, 4.5:1, 10:1



Ports C1, C2, V1, V2	Shuttle Port	Assembly Model Code*
3/8" NPTF	SAE-4	CBC*-LHN-XGB
SAE-6	SAE-4	CBC*-LHN-XGI
SAE-8	SAE-4	CBC*-LHN-XGJ

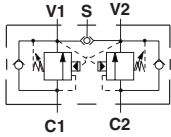
The asterisk () shown in the fourth digit of the model code indicates the counterbalance pilot ratio of the cartridge and must be specified by customer. See page 50. Add modifier /S to order Ductile Iron for pressure rating over 3000 psi.

0-15 GPM Cavity T-11A



Ports C1, C2, V1, V2	Shuttle Port	Assembly Model Code*
3/8" NPTF	SAE-4	CBC*-LJN-XGB
SAE-6	SAE-4	CBC*-LJN-XGI
SAE-8	SAE-4	CBC*-LJN-XGJ

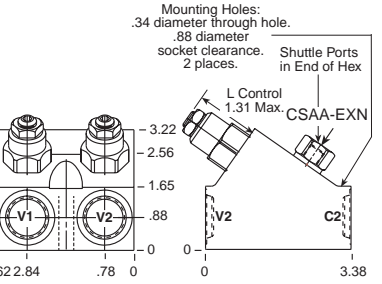
The asterisk () shown in the fourth digit of the model code indicates the counterbalance pilot ratio of the cartridge and must be specified by customer. See page 50. Add modifier /S to order Ductile Iron for pressure rating over 3000 psi.



Ports C1, C2, V1, V2	Shuttle Port	Assembly Model Code*
1/2" NPTF	SAE-4	CBE*-LHN-XHC
3/4" NPTF	SAE-4	CBE*-LHN-XHD

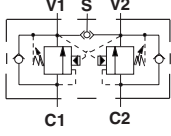
The asterisk () shown in the fourth digit of the model code indicates the counterbalance pilot ratio of the cartridge and must be specified by customer. See page 50. Add modifier /S to order Ductile Iron for pressure rating over 3000 psi.

0-30 GPM Cavity T-2A



Ports C1, C2, V1, V2	Shuttle Port	Assembly Model Code*
1/2" NPTF	SAE-4	CBE*-LJN-XHC
3/4" NPTF	SAE-4	CBE*-LJN-XHD

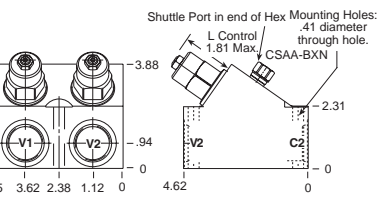
The asterisk () shown in the fourth digit of the model code indicates the counterbalance pilot ratio of the cartridge and must be specified by customer. See page 50. Add modifier /S to order Ductile Iron for pressure rating over 3000 psi.



Ports C1, C2, V1, V2	Shuttle Port	Assembly Model Code*
3/4" NPTF	SAE-4	CBE*-LHN-XKD
1" NPTF	SAE-4	CBE*-LHN-XKE

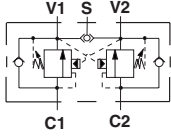
The asterisk () shown in the fourth digit of the model code indicates the counterbalance pilot ratio of the cartridge and must be specified by customer. See page 50. Add modifier /S to order Ductile Iron for pressure rating over 3000 psi.

0-60 GPM Cavity T-17A



Ports C1, C2, V1, V2	Shuttle Port	Assembly Model Code*
3/4" NPTF	SAE-4	CBE*-LHN-XKD
1" NPTF	SAE-4	CBE*-LHN-XKE

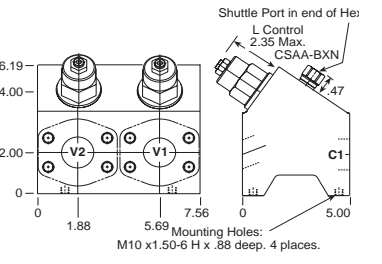
0-120 GPM Cavity T-19A



Ports C1, C2, V1, V2	Shuttle Port	Assembly Model Code*
1 1/2" C61	SAE-4	CBE*-LHN-XZQ

The asterisk () shown in the fourth digit of the model code indicates the counterbalance pilot ratio of the cartridge and must be specified by customer. See page 50. Add modifier /S to order Ductile Iron for pressure rating over 3000 psi.

0-120 GPM Cavity T-19A



Ports C1, C2, V1, V2	Shuttle Port	Assembly Model Code*
1 1/2" C61	SAE-4	CBE*-LJN-XZQ

NOTES: Page 50 for cartridge models CB**-* shows performance curves, technical tips, and options.
See page vii for technical information about line mount bodies including SAE flange pattern specifications.
Consult your local Sun Distributor or the Sun Web Site for other port sizes available in the bodies shown above.

Line Mounted Assemblies

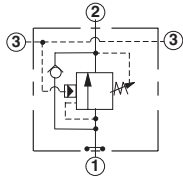
THREE PORT LOAD CONTROL APPLICATIONS (DIRECT MOUNT .75"/1.00"/1.25" SAE C61 FLANGE PORT BODIES, THROUGH PILOT)

The direct mounted SAE flange port bodies provide the opportunity to mount load control valves directly onto the ports of an actuator.

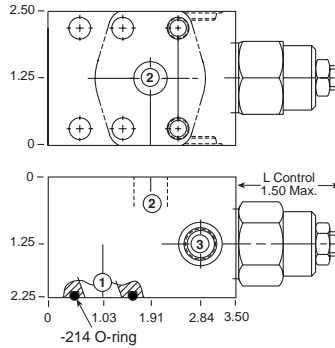
PILOT RATIO
3:1, 1.5:1, 2:1

Go to www.sunhydraulics.com
for more product information and pricing.

PILOT RATIO
2.3:1, 4.5:1, 10:1



0-30 GPM Cavity T-2A

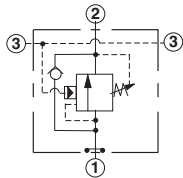


Ports 1 and 2	Port 3	Assembly Model Code*
3/4" SAE C61	SAE-6	CBE*-LHN-ZNV

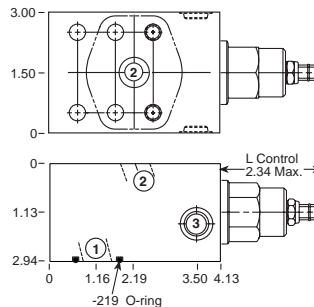
Ports 1 and 2	Port 3	Assembly Model Code*
3/4" SAE C61	SAE-6	CBE*-LJN-ZNV

The asterisk () shown in the fourth digit of the model code indicates the counterbalance pilot ratio of the cartridge and must be specified by customer. See page 50. Add modifier /S to order Ductile Iron for pressure rating over 3000 psi.

The asterisk () shown in the fourth digit of the model code indicates the counterbalance pilot ratio of the cartridge and must be specified by customer. See page 50. Add modifier /S to order Ductile Iron for pressure rating over 3000 psi.



0-30 GPM Cavity T-17A

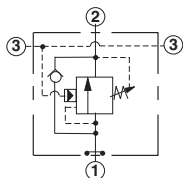


Ports 1 and 2	Port 3	Assembly Model Code*
1" SAE C61	SAE-6	CBG*-LHN-ZNV

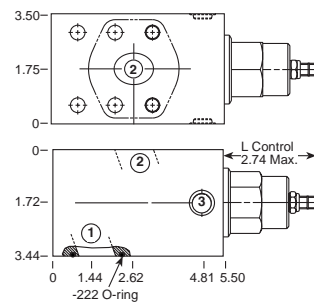
Ports 1 and 2	Port 3	Assembly Model Code*
1/2" NPTF	SAE-8	CBG*-LJN-ZNV

The asterisk () shown in the fourth digit of the model code indicates the counterbalance pilot ratio of the cartridge and must be specified by customer. See page 50. Add modifier /S to order Ductile Iron for pressure rating over 3000 psi.

The asterisk () shown in the fourth digit of the model code indicates the counterbalance pilot ratio of the cartridge and must be specified by customer. See page 50. Add modifier /S to order Ductile Iron for pressure rating over 3000 psi.



0-60 GPM Cavity T-19A



Ports 1 and 2	Port 3	Assembly Model Code*
1 1/4 SAE C61	SAE-6	CBG*-LHN-ZNX

Ports 1 and 2	Port 3	Assembly Model Code*
1 1/4 SAE C6		CBG*-LJN-ZNX

The asterisk () shown in the fourth digit of the model code indicates the counterbalance pilot ratio of the cartridge and must be specified by customer. See page 50. Add modifier /S to order Ductile Iron for pressure rating over 3000 psi.

The asterisk () shown in the fourth digit of the model code indicates the counterbalance pilot ratio of the cartridge and must be specified by customer. See page 50. Add modifier /S to order Ductile Iron for pressure rating over 3000 psi.

NOTES: Page 50 for cartridge models CB**-* shows performance curves, technical tips, and options.
See page vii for technical information about line mount bodies including SAE flange pattern specifications.
Consult your local Sun Distributor or the Sun Web Site for other port sizes available in the bodies shown above.

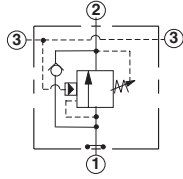
THREE PORT LOAD CONTROL APPLICATIONS (DIRECT MOUNT .75"/1.00"/1.25" SAE C62 FLANGE BODIES, THROUGH PILOT)

The direct mounted SAE flange port bodies provide the opportunity to mount load control valves directly onto the ports of an actuator.

PILOT RATIO
3:1, 1.5:1, 2:1

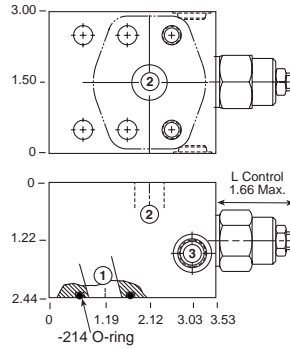
Go to www.sunhydraulics.com
for more product information and pricing.

PILOT RATIO
2.3:1, 4.5:1, 10:1



Ports 1 and 2	Port 3	Assembly Model Code*
3/4" SAE C62	SAE-6	CBE*-LHN-ZDS

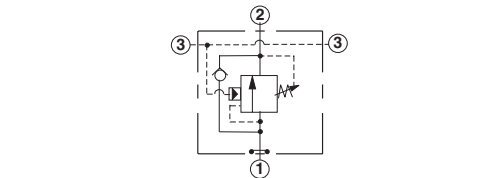
0-30 GPM Cavity T-2A



Ports 1 and 2	Port 3	Assembly Model Code*
3/4" SAE C62	SAE-6	CBE*-LJN-ZDS

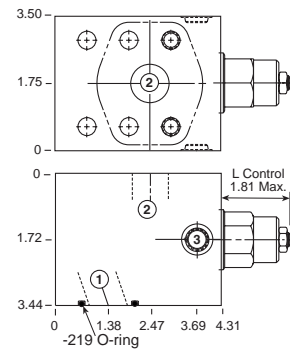
The asterisk () shown in the fourth digit of the model code indicates the counterbalance pilot ratio of the cartridge and must be specified by customer. See page 50. Add modifier /S to order Ductile Iron for pressure rating over 3000 psi.

The asterisk () shown in the fourth digit of the model code indicates the counterbalance pilot ratio of the cartridge and must be specified by customer. See page 50. Add modifier /S to order Ductile Iron for pressure rating over 3000 psi.



Ports 1 and 2	Port 3	Assembly Model Code*
1" SAE C62	SAE-6	CBG*-LHN-ZDR

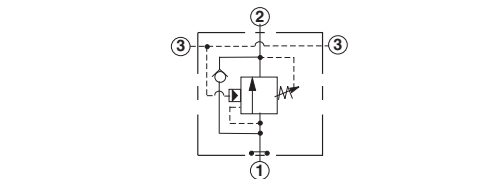
0-60 GPM Cavity T-17A



Ports 1 and 2	Port 3	Assembly Model Code*
1" SAE C62	SAE-6	CBG*-LJN-ZDR

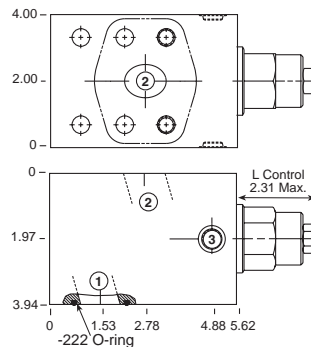
The asterisk () shown in the fourth digit of the model code indicates the counterbalance pilot ratio of the cartridge and must be specified by customer. See page 50. Add modifier /S to order Ductile Iron for pressure rating over 3000 psi.

The asterisk () shown in the fourth digit of the model code indicates the counterbalance pilot ratio of the cartridge and must be specified by customer. See page 50. Add modifier /S to order Ductile Iron for pressure rating over 3000 psi.



Ports 1 and 2	Port 3	Assembly Model Code*
1 1/4" SAE C62	SAE-6	CBI*-LHN-ZFD

0-120 GPM Cavity T-19A



Ports 1 and 2	Port 3	Assembly Model Code*
1 1/4" SAE C62	SAE-6	CBI*-LJN-ZFD

The asterisk () shown in the fourth digit of the model code indicates the counterbalance pilot ratio of the cartridge and must be specified by customer. See page 50. Add modifier /S to order Ductile Iron for pressure rating over 3000 psi.

The asterisk () shown in the fourth digit of the model code indicates the counterbalance pilot ratio of the cartridge and must be specified by customer. See page 50. Add modifier /S to order Ductile Iron for pressure rating over 3000 psi.

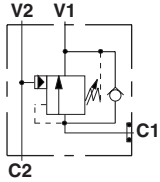
NOTES: Page 50 for cartridge models CB**-* shows performance curves, technical tips, and options.
See page vii for technical information about line mount bodies including SAE flange pattern specifications.
Consult your local Sun Distributor or the Sun Web Site for other port sizes available in the bodies shown above.

Line Mounted Assemblies

THREE PORT LOAD CONTROL APPLICATIONS (GASKET MOUNT BODIES)

These compact gasket-mounted bodies provide the opportunity to mount load control valves directly onto the ports of an actuator.

PILOT RATIO
3:1, 1.5:1, 2:1

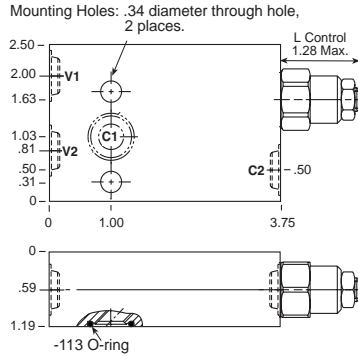


Ports C2, V1 & V2	Assembly Model Code*
3/8" NPTF	CBC*-LHN-ZTN
SAE-6	CBC*-LHN-ZTC

The asterisk () shown in the fourth digit of the model code indicates the counterbalance pilot ratio of the cartridge and must be specified by customer. See page 50. Add modifier /S to order Ductile Iron for pressure rating over 3000 psi.

Go to www.sunhydraulics.com
for more product information and pricing.

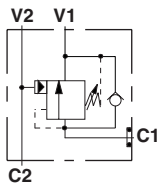
0-15 GPM Cavity T-11A



PILOT RATIO
2.3:1, 4.5:1, 10:1

Ports C2, V1 & V2	Assembly Model Code*
3/8" NPTF	CBC*-LJN-ZTN
SAE-6	CBC*-LJN-ZTC

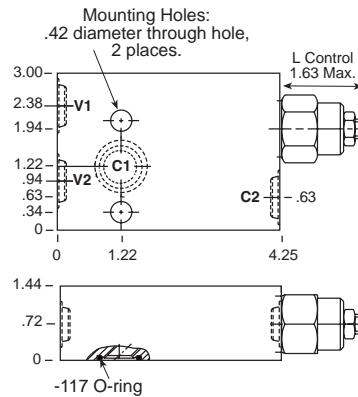
The asterisk () shown in the fourth digit of the model code indicates the counterbalance pilot ratio of the cartridge and must be specified by customer. See page 50. Add modifier /S to order Ductile Iron for pressure rating over 3000 psi.



Ports C2, V1 & V2	Assembly Model Code*
1/2" NPTF	CBE*-LHN-ZTF
SAE-8	CBE*-LHN-ZTG

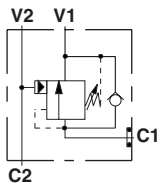
The asterisk () shown in the fourth digit of the model code indicates the counterbalance pilot ratio of the cartridge and must be specified by customer. See page 50. Add modifier /S to order Ductile Iron for pressure rating over 3000 psi.

0-30 GPM Cavity T-2A



Ports C2, V1 & V2	Assembly Model Code*
1/2" NPTF	CBE*-LJN-ZTF
SAE-8	CBE*-LJN-ZTG

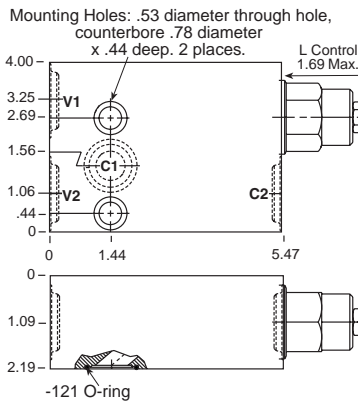
The asterisk () shown in the fourth digit of the model code indicates the counterbalance pilot ratio of the cartridge and must be specified by customer. See page 50. Add modifier /S to order Ductile Iron for pressure rating over 3000 psi.



Ports C2, V1 & V2	Assembly Model Code*
3/4" NPTF	CBG*-LHN-ZTJ
SAE-12	CBG*-LHN-ZTK

The asterisk () shown in the fourth digit of the model code indicates the counterbalance pilot ratio of the cartridge and must be specified by customer. See page 50. Add modifier /S to order Ductile Iron for pressure rating over 3000 psi.

0-60 GPM Cavity T-17A



Ports C2, V1 & V2	Assembly Model Code*
3/4" NPTF	CBG*-LJN-ZTJ
SAE-12	CBG*-LJN-ZTK

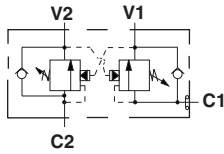
The asterisk () shown in the fourth digit of the model code indicates the counterbalance pilot ratio of the cartridge and must be specified by customer. See page 50. Add modifier /S to order Ductile Iron for pressure rating over 3000 psi.

NOTES: Page 50 for cartridge models CB**.* shows performance curves, technical tips, and options.
See page vii for technical information about line mount bodies including SAE flange pattern specifications.
Consult your local Sun Distributor or the Sun Web Site for other port sizes available in the bodies shown above.
Model Codes printed in red are Preferred Products and are readily available.

THREE PORT LOAD CONTROL APPLICATIONS (GASKET MOUNT BODIES, 2 CAVITIES)

The gasket-mounted bodies provide the opportunity to mount load control valves directly onto the ports of an actuator.

**PILOT RATIO
3:1, 1.5:1**

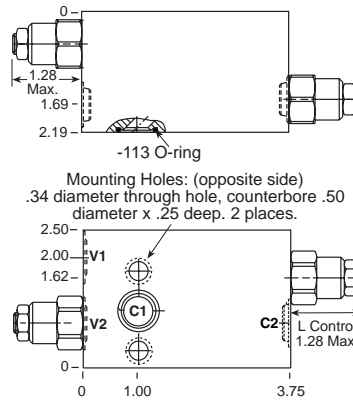


Ports C2, V1 & V2	Assembly Model Code*
3/8" NPTF	CBC*-LHN-YVM
SAE-6	CBC*-LHN-YVY

The asterisk () shown in the fourth digit of the model code indicates the counterbalance pilot ratio of the cartridge and must be specified by customer. See page 50. Add modifier / **S** to order Ductile Iron for pressure rating over 3000 psi.

Go to www.sunhydraulics.com
for more product information and pricing.

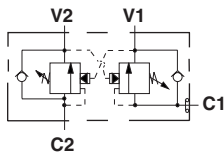
0-15 GPM Cavity T-11A



**PILOT RATIO
2.3:1, 4.5:1, 10:1**

Ports C2, V1 & V2	Assembly Model Code*
3/8" NPTF	CBC*-LJN-YVM
SAE-6	CBC*-LJN-YVY

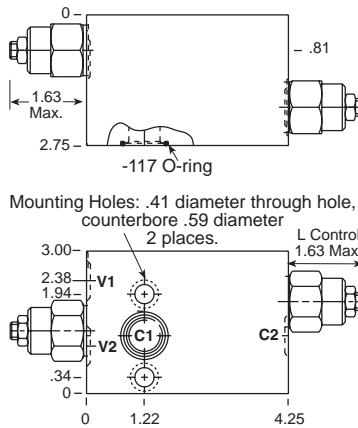
The asterisk () shown in the fourth digit of the model code indicates the counterbalance pilot ratio of the cartridge and must be specified by customer. See page 50. Add modifier / **S** to order Ductile Iron for pressure rating over 3000 psi.



Ports C2, V1 & V2	Assembly Model Code*
1/2" NPTF	CBE*-LHN-YVM
SAE-8	CBE*-LHN-YVY

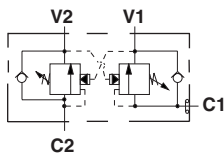
The asterisk () shown in the fourth digit of the model code indicates the counterbalance pilot ratio of the cartridge and must be specified by customer. See page 50. Add modifier / **S** to order Ductile Iron for pressure rating over 3000 psi.

0-30 GPM Cavity T-2A



Ports C2, V1 & V2	Assembly Model Code*
1/2" NPTF	CBE*-LJN-YVM
SAE-8	CBE*-LJN-YVY

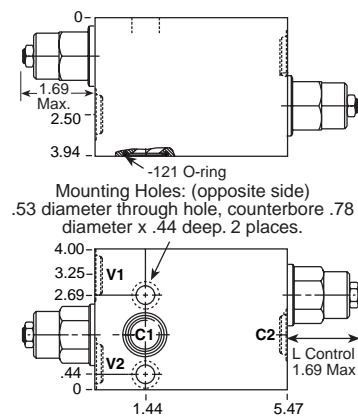
The asterisk () shown in the fourth digit of the model code indicates the counterbalance pilot ratio of the cartridge and must be specified by customer. See page 50. Add modifier / **S** to order Ductile Iron for pressure rating over 3000 psi.



Ports C2, V1 & V2	Assembly Model Code*
3/4" NPTF	CBG*-LHN-YVT
SAE-12	CBG*-LHN-YVS

The asterisk () shown in the fourth digit of the model code indicates the counterbalance pilot ratio of the cartridge and must be specified by customer. See page 50. Add modifier / **S** to order Ductile Iron for pressure rating over 3000 psi.

0-60 GPM Cavity T-17A



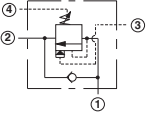
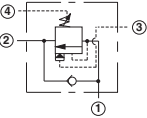
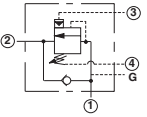
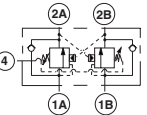
Ports C2, V1 & V2	Assembly Model Code*
3/4" NPTF	CBG*-LJN-YVT
SAE-12	CBG*-LJN-YVS

The asterisk () shown in the fourth digit of the model code indicates the counterbalance pilot ratio of the cartridge and must be specified by customer. See page 50. Add modifier / **S** to order Ductile Iron for pressure rating over 3000 psi.

NOTES: Page 50 for cartridge models CB**-* shows performance curves, technical tips, and options.
See page vii for technical information about line mount bodies including SAE flange pattern specifications.
Consult your local Sun Distributor or the Sun Web Site for other port sizes available in the bodies shown above.

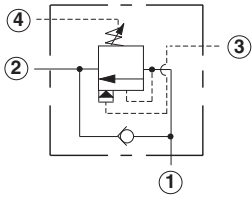
NOTES

Four Port Counterbalance Assemblies

	<i>Cartridge Type</i>	<i>Page</i>
	Vented, 4000 psi Maximum Setting	70
	Vented, 6000 psi Maximum Setting	70
<i>Line Mounted Assemblies (Body Type)</i>		
	90 Degree	72
	90 Degree with Gauge Port	73
	2.00" SAE C62 Flange Port, 2 Cavities	74
	90 Degree Cross-Piloted, 2 Cavities, Common Port 4	75

Counterbalance Valves

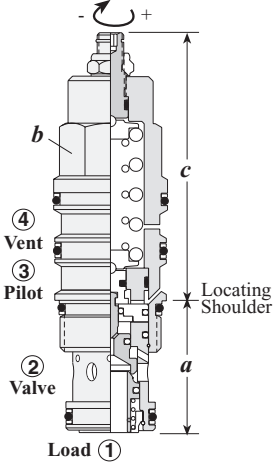
VENTED, 4000 PSI MAXIMUM SETTING



Capacity	Typical Cartridge Model Code	Cavity	Cartridge Dimensions				Installation Torque (lb. ft.)
			a	b	L	C	
15 GPM	CWCA- LHN	T - 21A	1.38	7/8"	2.91	3.16	30/35
30 GPM	CWEA- LHN	T - 22A	1.38	1 1/8"	3.29	3.54	45/50
60 GPM	CWGA- LHN	T - 23A	1.81	1 1/4"	3.75	3.97	150/160
120 GPM	CWIA - LHN	T - 24A	2.50	1 7/8"	4.58	4.78	350/375

OPTION ORDERING INFORMATION

Turn screw clockwise to reduce setting and release load. Complete Adjustment 5 Turns



CW * * - * * *

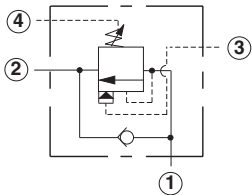
Nominal Capacity	Control**	Cracking Pressure	Seal
C 15 GPM	L Standard Screw	A and K Pilot Ratios	N Buna-N
E 30 GPM	C Tamper Resistant	H 1000 - 4000 psi	V Viton
G 60 GPM		I 400 - 1500 psi	
I 120 GPM			

Version
A 3:1 Pilot Ratio
K 1:1 Pilot Ratio

Adjustment Range Options:
H is standard set at 3000 psi.
I is standard set at 1000 psi.
Customer may specify setting.

** See page 244 for information on Control Options

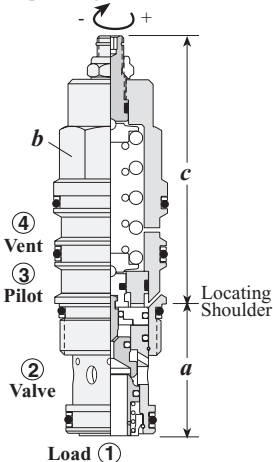
VENTED, 6000 PSI MAXIMUM SETTING



Capacity	Typical Cartridge Model Code	Cavity	Cartridge Dimensions				Installation Torque (lb. ft.)
			a	b	L	C	
15 GPM	CWCG- LFN	T - 21A	1.38	7/8"	2.91	3.16	30/35
30 GPM	CWEG- LFN	T - 22A	1.38	1 1/8"	3.29	3.54	45/50
60 GPM	CWGG- LFN	T - 23A	1.81	1 1/4"	3.75	3.97	150/160
120 GPM	CWIG - LFN	T - 24A	2.50	1 7/8"	4.58	4.78	350/375

OPTION ORDERING INFORMATION

Turn screw clockwise to reduce setting and release load. Complete Adjustment 5 Turns



CW * * - * * *

Nominal Capacity	Control**	Cracking Pressure	Seal
C 15 GPM	L Standard Screw	G and L Pilot Ratios	N Buna-N
E 30 GPM	C Tamper Resistant	F 1000 - 3500 psi	V Viton
G 60 GPM		G 2000 - 6000 psi	
I 120 GPM			

Version
G 5:1 Pilot Ratio
L 2:1 Pilot Ratio

Adjustment Range Options:
F is standard set at 2000 psi.
G is standard set at 4000 psi.
Customer may specify setting.

** See page 244 for information on Control Options

TECHNICAL TIPS / PERFORMANCE CURVES

Counterbalance Valves, 3:1, 5:1, 1:1 and 2:1 Pilot Ratios, Vented

Applications

Sun counterbalance valves with pilot assist are used for load holding and to provide smooth motion control. When used with vertical actuators they help to ensure control of the load during lowering. With horizontal rotary motion, such as slewing, they can help provide good control of acceleration and deceleration.

The vented type are used to provide load control on applications where there is a variable back-pressure downstream of the valve which could cause instability in a standard valve. The spring chamber is vented externally to tank through a fourth port making it insensitive to back pressure. Any pressure generated on the drain port will be additive to the setting.

Counterbalance valves are load control valves and not speed control valves. Separate meter-in flow control valves should be included to provide speed control. It is always better to undersize rather than oversize the valve used and mount it as close to the actuator as possible. It is always advisable to set the pressure setting of a counterbalance valve before fitting it to the application as it is difficult to set up on a machine.

It is always advisable to select a low pilot ratio to provide the best stability, particularly on cylinder applications. High pilot ratios should only be used on stable motor applications.

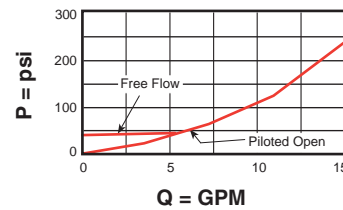
Design Concepts and Features

- All cartridges are fully tested and supplied at a standard setting. The setting of a counterbalance valve is always the cracking pressure.
- The valve reseats after opening at 85% of the cracking pressure.
- Maximum leakage on reseat is 5 drops/min.
- The standard free reverse flow check varies between 20 psi and 45 psi depending on the frame size.
- Recommended setting for counterbalance valves is 1.3 times the maximum load induced pressure.
- Increase setting by turning adjust screw anti-clockwise.
- The valve is opened by a combination of the load induced pressure on the main seat area and the pilot pressure on the pilot area.
- The cartridge has a sealed pilot.
- All cartridges have 3 nominal adjustment turns from minimum to maximum pressure setting.
- A press fit tamper resistant cap is available to fit over the screw adjustment.
- Valves are unaffected by back pressure at Port 2.
- Vent port should not be blocked.

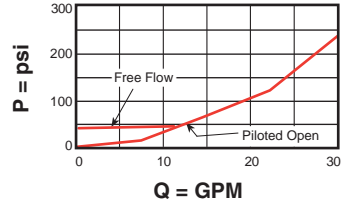
Performance Curves

Free Flow and Pilot Open Pressure Drop

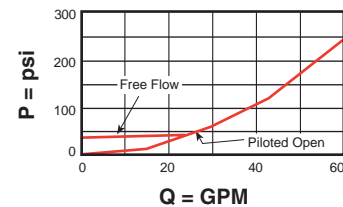
CWC*-L*N



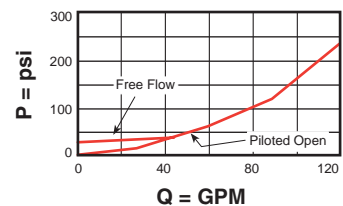
CWE*-L*N



CWG*-L*N



CWI*-L*N



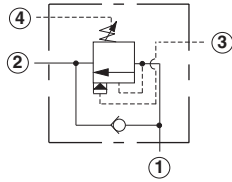
General Application Requirements

- Operating Temperature Range: Buna-N seals -50° F to 200° F, Viton seals 0° F to 250° F.
- Viscosity Range: 60-3000 SUS.
- Fluid Contamination Level: ISO 4406 18/15 or better; Recommend $\beta_{10} \geq 75$ to achieve ISO 18/15 or better in most systems.
- Factory Pressure Setting for cartridge is established at cracking flow.

Line Mounted Assemblies

FOUR PORT LOAD CONTROL APPLICATIONS (90 DEGREE BODIES)

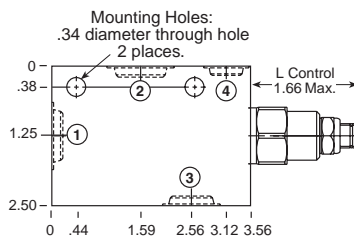
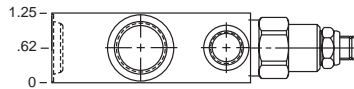
PILOT RATIO
3:1, 1:1



Go to www.sunhydraulics.com
for more product information and pricing.

PILOT RATIO
4.5:1, 2:1

0-15 GPM Cavity T-21A

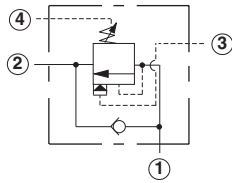


Ports 1 and 2	Ports 3 and 4	Assembly Model Code*
3/8" NPTF	3: 3/8" NPTF 4: 1/4" NPTF	CWC*-LHN-MAB
1/2" NPTF	3: 3/8" NPTF 4: 1/4" NPTF	CWC*-LHN-MAC
SAE-6	3: SAE-6 4: SAE-6	CWC*-LHN-MAI
SAE-8	3: SAE-8 4: SAE-6	CWC*-LHN-MAJ
SAE-10	3: SAE-8 4: SAE-6	CWC*-LHN-MAK

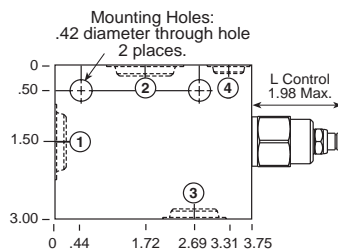
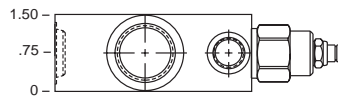
The asterisk () shown in the fourth digit of the model code indicates the counterbalance pilot ratio of the cartridge and must be specified by customer. See page 70. Add modifier /S to order Ductile Iron for pressure rating over 3000 psi.

Ports 1 and 2	Ports 3 and 4	Assembly Model Code*
3/8" NPTF	3: 3/8" NPTF 4: 1/4" NPTF	CWC*-LGN-MAB
1/2" NPTF	3: 3/8" NPTF 4: 1/4" NPTF	CWC*-LGN-MAC
SAE-6	3: SAE-6 4: SAE-6	CWC*-LGN-MAI
SAE-8	3: SAE-8 4: SAE-6	CWC*-LGN-MAJ
SAE-10	3: SAE-8 4: SAE-6	CWC*-LGN-MAK

The asterisk () shown in the fourth digit of the model code indicates the counterbalance pilot ratio of the cartridge and must be specified by customer. See page 70. Add modifier /S to order Ductile Iron for pressure rating over 3000 psi.



0-30 GPM Cavity T-22A



Ports 1 and 2	Ports 3 and 4	Assembly Model Code*
1/2" NPTF	3: 1/2" NPTF 4: 1/4" NPTF	CWE*-LHN-NAC
3/4" NPTF	3: 1/2" NPTF 4: 1/4" NPTF	CWE*-LHN-NAD
SAE-8	3: SAE-8 4: SAE-6	CWE*-LHN-NAJ
SAE-10	3: SAE-10 4: SAE-6	CWE*-LHN-NAK

The asterisk () shown in the fourth digit of the model code indicates the counterbalance pilot ratio of the cartridge and must be specified by customer. See page 70. Add modifier /S to order Ductile Iron for pressure rating over 3000 psi.

Ports 1 and 2	Ports 3 and 4	Assembly Model Code*
1/2" NPTF	3: 1/2" NPTF 4: 1/4" NPTF	CWE*-LGN-NAC
3/4" NPTF	3: 1/2" NPTF 4: 1/4" NPTF	CWE*-LGN-NAD
SAE-8	3: SAE-8 4: SAE-6	CWE*-LGN-NAJ
SAE-10	3: SAE-10 4: SAE-6	CWE*-LGN-NAK

The asterisk () shown in the fourth digit of the model code indicates the counterbalance pilot ratio of the cartridge and must be specified by customer. See page 70. Add modifier /S to order Ductile Iron for pressure rating over 3000 psi.

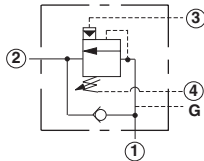
NOTES: Page 70 for cartridge models CW**.* shows performance curves, technical tips, and options.
See page vii for technical information about line mount bodies including SAE flange pattern specifications.
Consult your local Sun Distributor or the Sun Web Site for other port sizes available in the bodies shown above.
Model Codes printed in red are Preferred Products and are readily available.

FOUR PORT LOAD CONTROL APPLICATIONS (90 DEGREE BODIES)

**PILOT RATIO
3:1, 1:1**

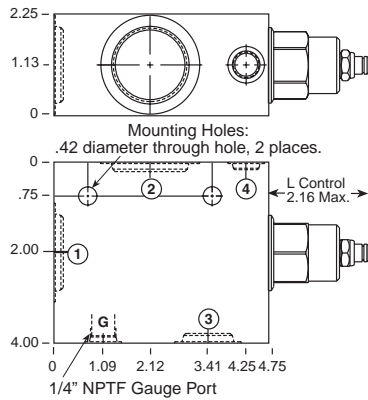
Go to www.sunhydraulics.com
for more product information and pricing.

**PILOT RATIO
5:1, 2:1**



0-60 GPM Cavity T-23A

Ports 1 and 2	Ports 3 and 4	Assembly Model Code*
1" NPTF	3: 3/4" NPTF 4: 1/4" NPTF	CWG*-LHN-PAE
1 1/4" NPTF	3: 3/4" NPTF 4: 1/4" NPTF	CWG*-LHN-PAF
SAE-12	3: SAE-12 4: SAE-6	CWG*-LHN-PAL
SAE-16	3: SAE-12 4: SAE-6	CWG*-LHN-PAM



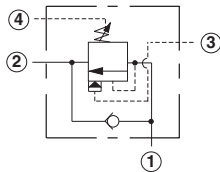
Ports 1 and 2	Ports 3 and 4	Assembly Model Code*
1" NPTF	3: 3/4" NPTF 4: 1/4" NPTF	CWG*-LGN-PAE
1 1/4" NPTF	3: 3/4" NPTF 4: 1/4" NPTF	CWG*-LGN-PAF
SAE-12	3: SAE-12 4: SAE-6	CWG*-LGN-PAL
SAE-16	3: SAE-12 4: SAE-6	CWG*-LGN-PAM

The asterisk () shown in the fourth digit of the model code indicates the counterbalance pilot ratio of the cartridge and must be specified by customer. See page 70. Add modifier /S to order Ductile Iron for pressure rating over 3000 psi.

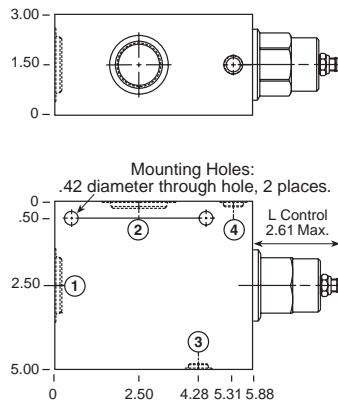
The asterisk () shown in the fourth digit of the model code indicates the counterbalance pilot ratio of the cartridge and must be specified by customer. See page 70. Add modifier /S to order Ductile Iron for pressure rating over 3000 psi.

**PILOT RATIO
3:1, 1:1**

0-120 GPM Cavity T-24A



Ports 1 and 2	Ports 3 and 4	Assembly Model Code*
1" NPTF	1/4" NPTF	CWI*-LHN-QCE
1 1/4" NPTF	1/4" NPTF	CWI*-LHN-QCF
SAE-16	SAE-6	CWI*-LHN-QCM
SAE-20	SAE-6	CWI*-LHN-QCN



Ports 1 and 2	Ports 3 and 4	Assembly Model Code*
1" NPTF	1/4" NPTF	CWI*-LGN-QCE
1 1/4" NPTF	1/4" NPTF	CWI*-LGN-QCF
SAE-16	SAE-6	CWI*-LGN-QCM
SAE-20	SAE-6	CWI*-LGN-QCN

The asterisk () shown in the fourth digit of the model code indicates the counterbalance pilot ratio of the cartridge and must be specified by customer. See page 70. Add modifier /S to order Ductile Iron for pressure rating over 3000 psi.

The asterisk () shown in the fourth digit of the model code indicates the counterbalance pilot ratio of the cartridge and must be specified by customer. See page 70. Add modifier /S to order Ductile Iron for pressure rating over 3000 psi.

NOTES: Page 70 for cartridge models CW**.* shows performance curves, technical tips, and options.
See page vii for technical information about line mount bodies including SAE flange pattern specifications.
Consult your local Sun Distributor or the Sun Web Site for other port sizes available in the bodies shown above.
Model Codes printed in red are Preferred Products and are readily available.

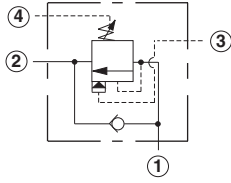
Line Mounted Assemblies

**FOUR PORT LOAD CONTROL APPLICATIONS
(2.00" SAE C62 FLANGE PORT BODY, 2 CAVITIES)**

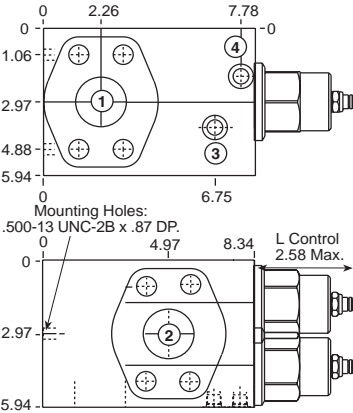
**PILOT RATIO
3:1, 1:1**

Go to www.sunhydraulics.com
for more product information and pricing.

**PILOT RATIO
4:5:1, 2:1**



0-240 GPM Cavity T-24A



Ports 1 and 2	Ports 3 and 4	Assembly Model Code*
2" SAE C62	SAE-6	CW1*-LHN-Z9T

Ports 1 and 2	Ports 3 and 4	Assembly Model Code*
2" SAE C62	SAE-6	CW1*-LGN-Z9T

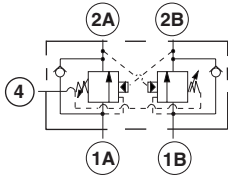
The asterisk () shown in the fourth digit of the model code indicates the counterbalance pilot ratio of the cartridge and must be specified by customer. See page 70. Add modifier /S to order Ductile Iron for pressure rating over 3000 psi.

The asterisk () shown in the fourth digit of the model code indicates the counterbalance pilot ratio of the cartridge and must be specified by customer. See page 70. Add modifier /S to order Ductile Iron for pressure rating over 3000 psi.

NOTES: Page 70 for cartridge models CW**.* shows performance curves, technical tips, and options.
See page vii for technical information about line mount bodies including SAE flange pattern specifications.
Consult your local Sun Distributor or the Sun Web Site for other port sizes available in the bodies shown above.

**FOUR PORT LOAD CONTROL APPLICATIONS
(90 DEGREE CROSS-PILOTED BODIES, 2 CAVITIES, COMMON PORT 4)**

**PILOT RATIO
3:1, 1:1**



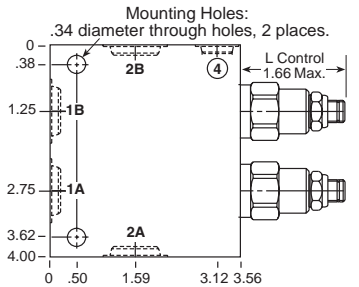
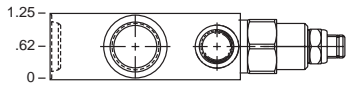
Ports 1A, 1B, 2A & 2B	Port 4	Assembly Model Code*
3/8" NPTF	1/4" NPTF	CWC*-LHN-XPB
1/2" NPTF	1/4" NPTF	CWC*-LHN-XPC
SAE-6	SAE-6	CWC*-LHN-XPI
SAE-8	SAE-6	CWC*-LHN-XPJ
SAE-10	SAE-6	CWC*-LHN-XPK

The asterisk () shown in the fourth digit of the model code indicates the counterbalance pilot ratio of the cartridge and must be specified by customer. See page 70. Add modifier /S to order Ductile Iron for pressure rating over 3000 psi.

Go to www.sunhydraulics.com for more product information and pricing.

**PILOT RATIO
5:1, 2:1**

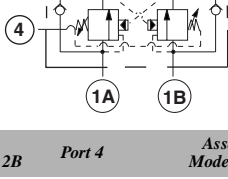
0-15 GPM Cavity T-21A



Ports 1A, 1B, 2A & 2B	Port 4	Assembly Model Code*
3/8" NPTF	1/4" NPTF	CWC*-LFN-XPB
1/2" NPTF	1/4" NPTF	CWC*-LFN-XPC
SAE-6	SAE-6	CWC*-LFN-XPI
SAE-8	SAE-6	CWC*-LFN-XPJ
SAE-10	SAE-6	CWC*-LFN-XPK

The asterisk () shown in the fourth digit of the model code indicates the counterbalance pilot ratio of the cartridge and must be specified by customer. See page 70. Add modifier /S to order Ductile Iron for pressure rating over 3000 psi.

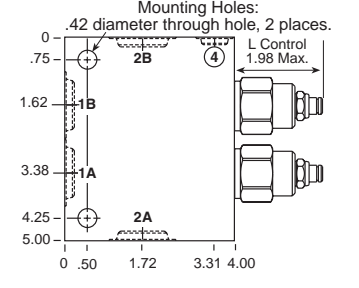
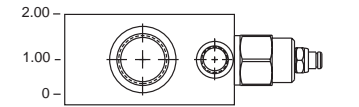
**PILOT RATIO
3:1, 1:1**



Ports 1A, 1B, 2A & 2B	Port 4	Assembly Model Code*
1/2" NPTF	1/4" NPTF	CWE*-LHN-XIC
3/4" NPTF	1/4" NPTF	CWE*-LHN-XID
SAE-6	SAE-6	CWE*-LHN-XII
SAE-8	SAE-6	CWE*-LHN-XIJ

The asterisk () shown in the fourth digit of the model code indicates the counterbalance pilot ratio of the cartridge and must be specified by customer. See page 70. Add modifier /S to order Ductile Iron for pressure rating over 3000 psi.

0-30 GPM Cavity T-22A



Ports 1A, 1B, 2A & 2B	Port 4	Assembly Model Code*
1/2" NPTF	1/4" NPTF	CWE*-LFN-XIC
3/4" NPTF	1/4" NPTF	CWE*-LFN-XID
SAE-6	SAE-6	CWE*-LFN-XII
SAE-8	SAE-6	CWE*-LFN-XIJ

The asterisk () shown in the fourth digit of the model code indicates the counterbalance pilot ratio of the cartridge and must be specified by customer. See page 70. Add modifier /S to order Ductile Iron for pressure rating over 3000 psi.

NOTES: Page 70 for cartridge models CW**.* shows performance curves, technical tips, and options.
See page vii for technical information about line mount bodies including SAE flange pattern specifications.
Consult your local Sun Distributor or the Sun Web Site for other port sizes available in the bodies shown above.

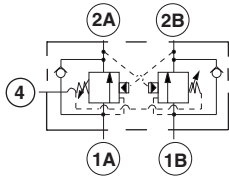
Line Mounted Assemblies

FOUR PORT LOAD CONTROL APPLICATIONS (90 DEGREE CROSS-PILOTED BODIES, 2 CAVITIES, COMMON PORT 4)

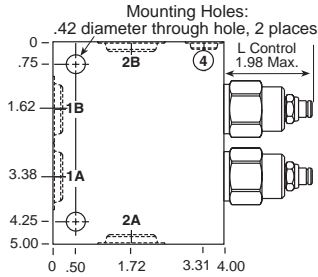
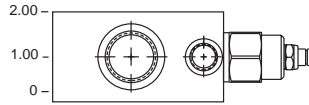
PILOT RATIO
3:1, 1:1

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for more product information and pricing.

PILOT RATIO
5:1, 2:1



0-60 GPM Cavity T-23A

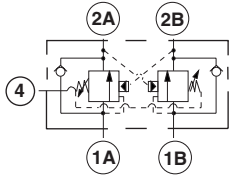


Ports 1A 1B, 2A & 2B	Port 4	Assembly Model Code*
1" NPTF	1/4" NPTF	CWG*-LHN-XME
1 1/4" NPTF	1/4" NPTF	CWG*-LHN-XMF
SAE-12	1/4" NPTF	CWG*-LHN-XML
SAE-16	1/4" NPTF	CWG*-LHN-XMM

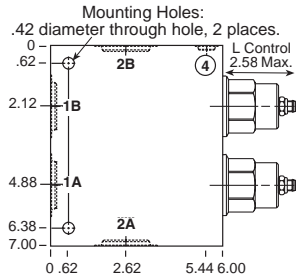
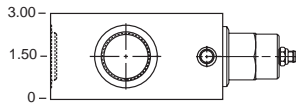
The asterisk () shown in the fourth digit of the model code indicates the counterbalance pilot ratio of the cartridge and must be specified by customer. See page 70. Add modifier /S to order Ductile Iron for pressure rating over 3000 psi.

Ports 1A 1B, 2A & 2B	Port 4	Assembly Model Code*
1" NPTF	1/4" NPTF	CWG*-LFN-XME
1 1/4" NPTF	1/4" NPTF	CWG*-LFN-XMF
SAE-12	1/4" NPTF	CWG*-LFN-XML
SAE-16	1/4" NPTF	CWG*-LFN-XMM

The asterisk () shown in the fourth digit of the model code indicates the counterbalance pilot ratio of the cartridge and must be specified by customer. See page 70. Add modifier /S to order Ductile Iron for pressure rating over 3000 psi.



0-120 GPM Cavity T-24A



Ports 1A 1B, 2A & 2B	Port 4	Assembly Model Code*
1" NPTF	1/4" NPTF	CWI*-LHN-XLE
1 1/4" NPTF	1/4" NPTF	CWI*-LHN-XLF

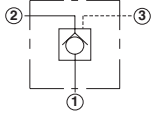
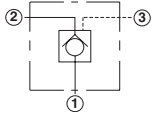
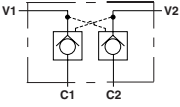
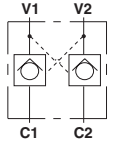
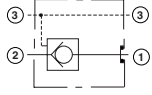
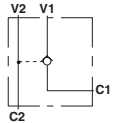
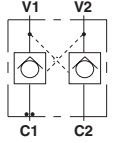
The asterisk () shown in the fourth digit of the model code indicates the counterbalance pilot ratio of the cartridge and must be specified by customer. See page 70. Add modifier /S to order Ductile Iron for pressure rating over 3000 psi.

Ports 1A 1B, 2A & 2B	Port 4	Assembly Model Code*
1" NPTF	1/4" NPTF	CWI*-LFN-XLE
1 1/4" NPTF	1/4" NPTF	CWI*-LFN-XLF

The asterisk () shown in the fourth digit of the model code indicates the counterbalance pilot ratio of the cartridge and must be specified by customer. See page 70. Add modifier /S to order Ductile Iron for pressure rating over 3000 psi.

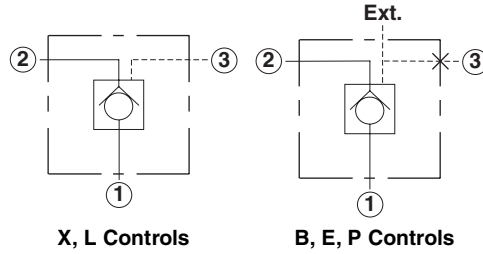
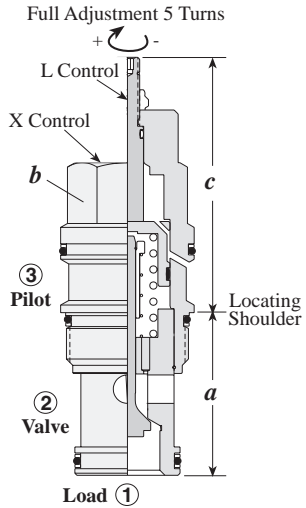
NOTES: Page 70 for cartridge models CW**.* shows performance curves, technical tips, and options.
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Consult your local Sun Distributor or the Sun Web Site for other port sizes available in the bodies shown above.

Three Port Pilot-to-Open Check Assemblies

	<i>Cartridge Type</i>	<i>Page</i>
	Pilot Operated	78
<i>Line Mounted Assemblies (Body Type)</i>		
	90 Degree Inline	80 82
	90 Degree 2" SAE C61/C62 Flange Port, 2 Cavities	84
	90 Degree Cross-Piloted, 2 Cavities	85
	Inline Cross-Piloted, 2 Cavities	88
	Direct Mount .75"/1.00"/1.25" SAE C61 Flange Port/ Gasket Mount, Through Pilot Port	89
	Direct Mount .75"/1.00"/1.25" SAE C62 Flange Port/ Gasket Mount, Through Pilot Port	90
	Gasket Mount	91
	Gasket Mount, 2 Cavities	92

Pilot-to-Open Check Valves

PILOT OPERATED



Capacity	Typical Cartridge Model Code	Cavity	Cartridge Dimensions				Installation Torque (lb. ft.)
			a	b	c		
					X, B, E, P	L	
7.5 GPM	CKBB - XCN	T - 163A	1.22	3/4"	1.25	2.55	25/30
15 GPM	CKCB - XCN	T - 11A	1.38	7/8"	1.19	2.50	30/35
30 GPM	CKEB - XCN	T - 2A	1.38	1 1/8"	1.38	2.81	45/50
60 GPM	CKGB - XCN	T - 17A	1.81	1 1/4"	1.81	3.28	150/160
120 GPM	CKIB - XCN	T - 19A	2.50	1 5/8"	2.31	3.94	350/375

OPTION ORDERING INFORMATION

Nominal Capacity	Version	Control**	Cracking Pressure	Seal
B *7.5 GPM	B Bleed through Pilot	X Standard Pilot	A 4 psi	N Buna-N
C 15 GPM	D Sealed Pilot Piston	L Manual Load Release	B 15 psi	V Viton
E 30 GPM		B 1/4" BSPP External Pilot Port 3 blocked	C 30 psi	
G 60 GPM		E SAE-4 External Pilot Port 3 blocked	D 50 psi	
I 120 GPM		P 1/4" NPTF External Pilot Port 3 blocked	E 75 psi	
			F 100 psi	

** See page 244 for information on Control Options

*CKBB, CKBD available with C and E Cracking Pressure Only.

TECHNICAL TIPS / PERFORMANCE CURVES

Pilot-to-Open Check Valves, External Pilot, Non-vented

Applications

Pilot operated checks are used to hold loads in position and for that reason should be mounted as close to the actuator as possible. Pilot-to-open checks are non-modulating, on/off devices that allow free flow through the check valve from port 2 (valve) to port 1 (load). Reverse flow is blocked until a pilot pressure directly proportional to the load pressure is sensed at port 3 (pilot), so that a pilot piston displaces the check from its seat.

Design Concepts and Features

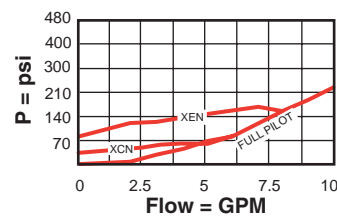
- 3:1 pilot ratio is suitable for most applications.
- Low leakage when closed, less than 1 drop/min.
- Optional, emergency manual release screw, in case pilot pressure is not available.
- Pilot piston leakage is present on **CK*B** models between port 3 and port 2 in order to purge trapped air in the pilot line. Optional models (**CK*D**) feature a sealed pilot piston for applications where cross-port leakage is undesirable.

Note: Pressure at port 2 is directly additive to the pilot pressure required at port 3 (pilot). For applications where this occurs, a 4 port vented pilot operated check cartridge (**CV*V-*****) should be considered.

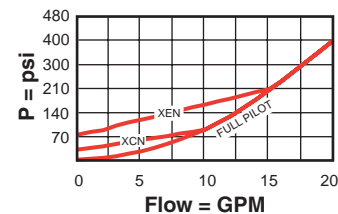
Performance Curves

Typical Pressure Drop

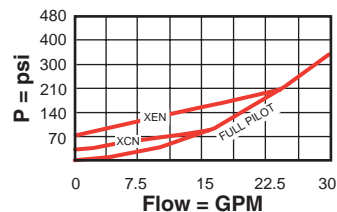
CKBB-X*N



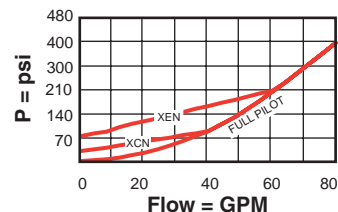
CKCB-X*N



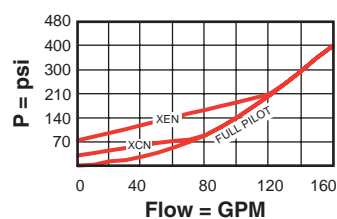
CKEB-X*N



CKGB-X*N



CKIB-X*N



General Application Requirements

- Operating Temperature Range: Buna-N seals -50° F to 200° F, Viton seals 0° F to 250° F.
- Viscosity Range: 60-3000 SUS.
- Fluid Contamination Level: ISO 4406 18/15 or better; Recommend $\beta_{10} \geq 75$ to achieve ISO 18/15 or better in most systems.
- Factory Pressure Setting for cartridge is established at cracking flow.

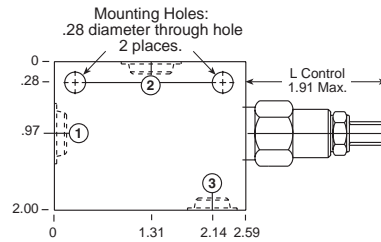
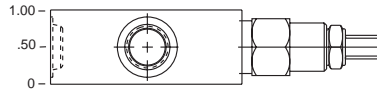
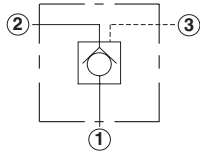
Line Mounted Assemblies

THREE PORT PILOT-TO-OPEN CHECK APPLICATIONS (90 DEGREE BODIES)

PILOT OPERATED ASSEMBLIES

Go to www.sunhydraulics.com for more product information and pricing.

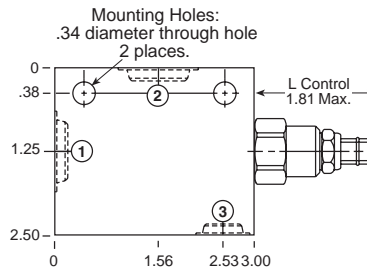
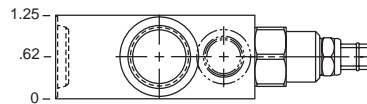
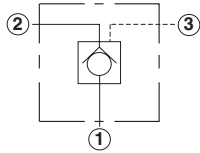
0-7.5 GPM Cavity T-163A



Ports 1 and 2	Port 3	Assembly Model Code*
1/4" NPTF	1/4" NPTF	CKBB-XCN-JCA
3/8" NPTF	1/4" NPTF	CKBB-XCN-JCB
SAE-4	SAE-4	CKBB-XCN-JCH
SAE-6	SAE-4	CKBB-XCN-JCI

*Add modifier /S to order Ductile Iron for pressure rating over 3000 psi.

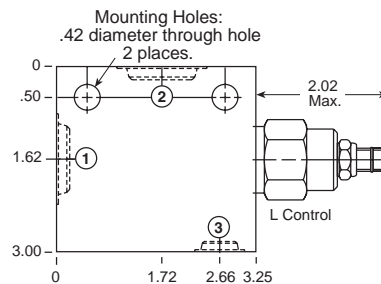
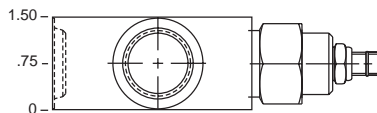
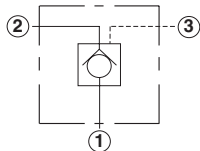
0-15 GPM Cavity T-11A



Ports 1 and 2	Port 3	Assembly Model Code*
3/8" NPTF	1/4" NPTF	CKCB-XCN-ECB
1/2" NPTF	1/4" NPTF	CKCB-XCN-ECC
SAE-4	SAE-4	CKCB-XCN-ECH
SAE-6	SAE-6	CKCB-XCN-ECI
SAE-8	SAE-6	CKCB-XCN-ECJ

*Add modifier /S to order Ductile Iron for pressure rating over 3000 psi.

0-30 GPM Cavity T-2A



Ports 1 and 2	Port 3	Assembly Model Code*
1/2" NPTF	1/4" NPTF	CKEB-XCN-BCC
3/4" NPTF	1/4" NPTF	CKEB-XCN-BCD
SAE-6	SAE-6	CKEB-XCN-BCI
SAE-8	SAE-6	CKEB-XCN-BCJ

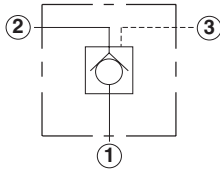
*Add modifier /S to order Ductile Iron for pressure rating over 3000 psi.

NOTES: Page 78 for cartridge model CK*B-*** shows performance curves, technical tips, and options.
See page vii for technical information about line mount bodies including SAE flange pattern specifications.
Consult your local Sun Distributor or the Sun Web Site for other port sizes available in the bodies shown above.
Model Codes printed in red are Preferred Products and are readily available.

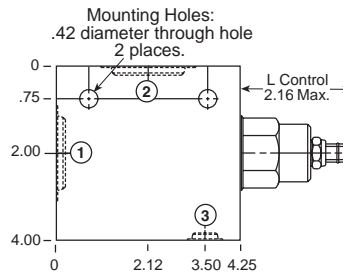
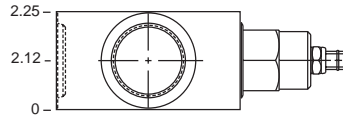
THREE PORT PILOT-TO-OPEN CHECK APPLICATIONS (90 DEGREE BODIES)

PILOT OPERATED ASSEMBLIES

Go to www.sunhydraulics.com for more product information and pricing.



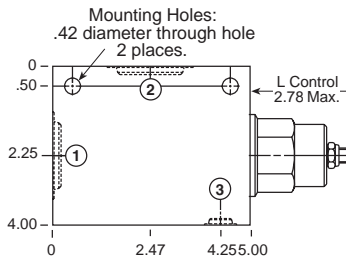
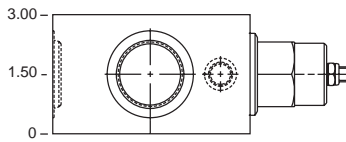
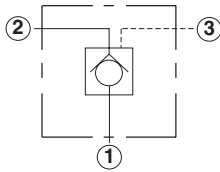
0-60 GPM Cavity T-17A



Ports 1 and 2	Port 3	Assembly Model Code*
1" NPTF	1/4" NPTF	CKGB-XCN-HCE
1 1/4" NPTF	1/4" NPTF	CKGB-XCN-HCF
SAE-12	SAE-6	CKGB-XCN-HCL
SAE-16	SAE-6	CKGB-XCN-HCM

*Add modifier /S to order Ductile Iron for pressure rating over 3000 psi.

0-120 GPM Cavity T-19A



Ports 1 and 2	Port 3	Assembly Model Code*
1" NPTF	1/4" NPTF	CKIB-XCN-KCE
1 1/4" NPTF	1/4" NPTF	CKIB-XCN-KCF
SAE-16	SAE-6	CKIB-XCN-KCM
SAE-20	SAE-6	CKIB-XCN-KCN

*Add modifier /S to order Ductile Iron for pressure rating over 3000 psi.

NOTES: Page 78 for cartridge model CK*B-*** shows performance curves, technical tips, and options.
See page vii for technical information about line mount bodies including SAE flange pattern specifications.
Consult your local Sun Distributor or the Sun Web Site for other port sizes available in the bodies shown above.
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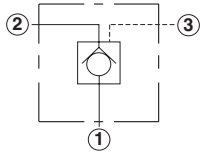
Line Mounted Assemblies

THREE PORT PILOT-TO-OPEN CHECK APPLICATIONS (INLINE BODIES)

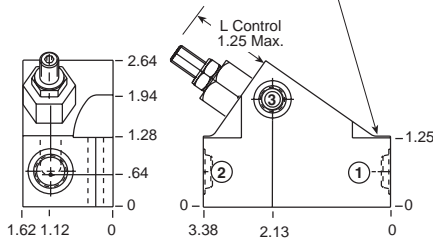
PILOT OPERATED ASSEMBLIES

Go to www.sunhydraulics.com
for more product information and pricing.

0-7.5 GPM Cavity T-163A



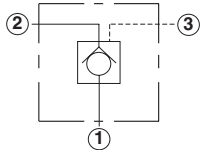
Mounting Holes:
.28 diameter through
2 places.
Counterbore for
1/4 bolt.



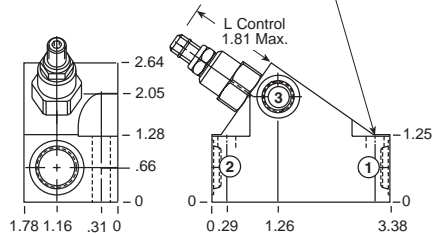
Ports 1 and 2	Port 3	Assembly Model Code*
1/4" NPTF	1/4" NPTF	CKBB-XCN-JJA
3/8" NPTF	1/4" NPTF	CKBB-XCN-JJB
SAE-4	SAE-4	CKBB-XCN-JJH
SAE-6	SAE-4	CKBB-XCN-JJI

*Add modifier /S to order Ductile Iron for pressure rating over 3000 psi.

0-15 GPM Cavity T-11A



Mounting Holes:
.34 diameter through
2 places.
Counterbore for
5/16 bolt.



Ports 1 and 2	Port 3	Assembly Model Code*
3/8" NPTF	1/4" NPTF	CKCB-XCN-EJB
SAE-6	SAE-6	CKCB-XCN-EJI
SAE-8	SAE-6	CKCB-XCN-EJJ

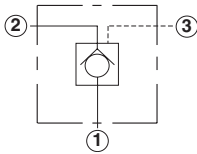
*Add modifier /S to order Ductile Iron for pressure rating over 3000 psi.

NOTES: Page 78 for cartridge model CK*B-*** shows performance curves, technical tips, and options.
See page vii for technical information about line mount bodies including SAE flange pattern specifications.
Consult your local Sun Distributor or the Sun Web Site for other port sizes available in the bodies shown above.
Model Codes printed in red are Preferred Products and are readily available.

THREE PORT PILOT-TO-OPEN CHECK APPLICATIONS (INLINE BODIES)

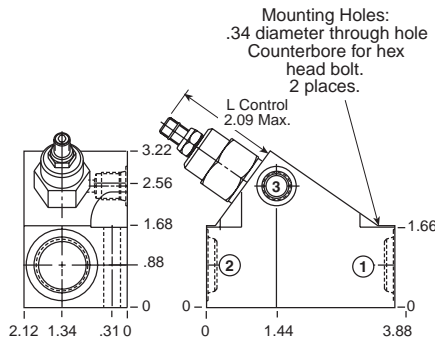
PILOT OPERATED ASSEMBLIES

Go to www.sunhydraulics.com for more product information and pricing.

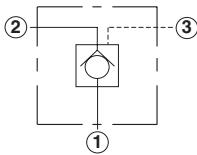


0-30 GPM Cavity T-2A

Ports 1 and 2	Port 3	Assembly Model Code*
1/2" NPTF	1/4" NPTF	CKEB-XCN-BVC
3/4" NPTF	1/4" NPTF	CKEB-XCN-BVD
SAE-6	SAE-6	CKEB-XCN-BVI
SAE-8	SAE-6	CKEB-XCN-BVJ

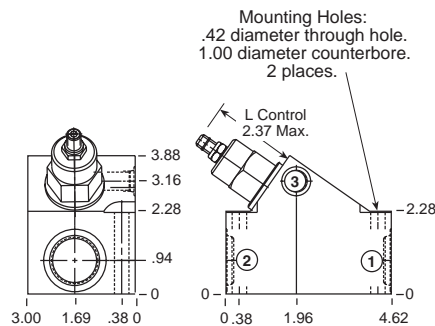


*Add modifier /S to order Ductile Iron for pressure rating over 3000 psi.



0-60 GPM Cavity T-17A

Ports 1 and 2	Port 3	Assembly Model Code*
3/4" NPTF	1/4" NPTF	CKGB-XCN-HDD
1" NPTF	1/4" NPTF	CKGB-XCN-HDE
SAE-12	SAE-6	CKGB-XCN-HDL
SAE-16	SAE-6	CKGB-XCN-HDM



*Add modifier /S to order Ductile Iron for pressure rating over 3000 psi.

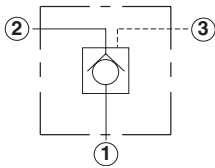
NOTES: Page 78 for cartridge model CK*B-*** shows performance curves, technical tips, and options.
See page vii for technical information about line mount bodies including SAE flange pattern specifications.
Consult your local Sun Distributor or the Sun Web Site for other port sizes available in the bodies shown above.
Model Codes printed in red are Preferred Products and are readily available.

Line Mounted Assemblies

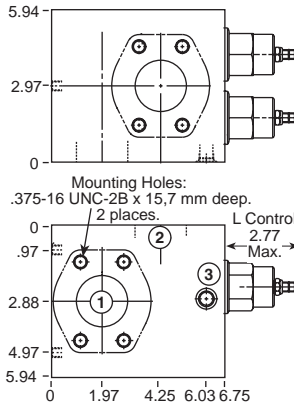
THREE PORT PILOT-TO-OPEN CHECK APPLICATIONS (90 DEGREE 2.00" SAE C61/C62 FLANGE PORT BODIES, 2 CAVITIES)

PILOT OPERATED ASSEMBLIES

Go to www.sunhydraulics.com
for more product information and pricing.



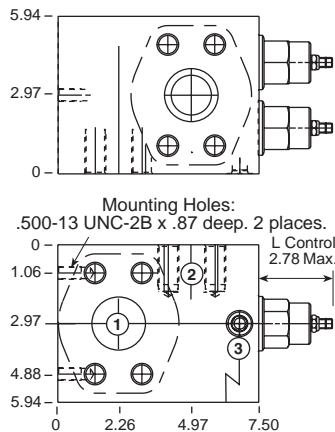
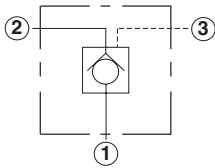
0-240 GPM Cavity T-19A



Ports 1 and 2	Port 3	Assembly Model Code*
2" SAE C61	SAE-6	CKIB-XCN-XZZ

*Add modifier /S to order Ductile Iron for pressure rating over 3000 psi.

0-240 GPM Cavity T-19A



Ports 1 and 2	Port 3	Assembly Model Code*
2" SAE C62	SAE-6	CKIB-XCN-Z8Z

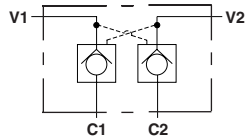
*Add modifier /S to order Ductile Iron for pressure rating over 3000 psi.

NOTES: Page 78 for cartridge model CK*B-*** shows performance curves, technical tips, and options.
See page vii for technical information about line mount bodies including SAE flange pattern specifications.
Consult your local Sun Distributor or the Sun Web Site for other port sizes available in the bodies shown above.

**THREE PORT PILOT-TO-OPEN CHECK APPLICATIONS
(90 DEGREE CROSS-PILOTED BODIES, 2 CAVITIES)**

**PILOT OPERATED
ASSEMBLIES**

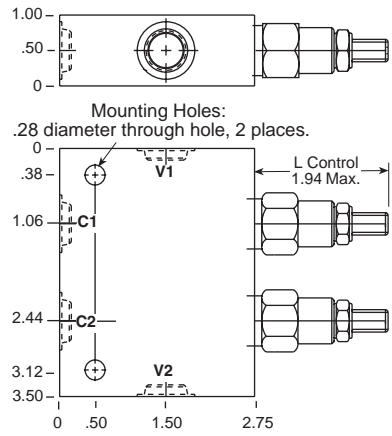
Go to www.sunhydraulics.com
for more product information and pricing.



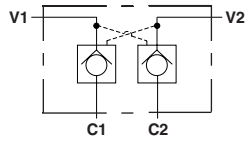
Ports C1, C2, V1 & V2	Assembly Model Code*
1/4" NPTF	CKBB-XCN-JYA
3/8" NPTF	CKBB-XCN-JYB
1/2" NPTF	CKBB-XCN-JYH
SAE-6	CKBB-XCN-JYI

*Add modifier /S to order Ductile Iron for pressure rating over 3000 psi.

0-7.5 GPM Cavity T-163A

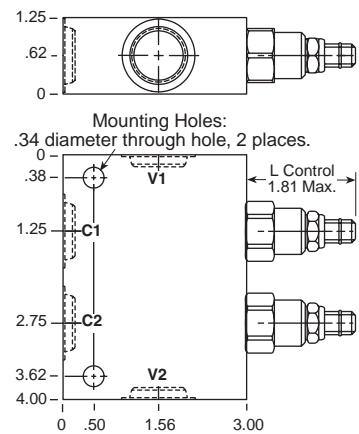


0-15 GPM Cavity T-11A



Ports C1, C2, V1 & V2	Assembly Model Code*
3/8" NPTF	CKCB-XCN-YEB
1/2" NPTF	CKCB-XCN-YEC
SAE-6	CKCB-XCN-YEI
SAE-8	CKCB-XCN-YEJ
SAE-10	CKCB-XCN-YEK

*Add modifier /S to order Ductile Iron for pressure rating over 3000 psi.



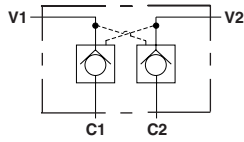
NOTES: Page 78 for cartridge model CK*B-*** shows performance curves, technical tips, and options.
See page vii for technical information about line mount bodies including SAE flange pattern specifications.
Consult your local Sun Distributor or the Sun Web Site for other port sizes available in the bodies shown above.
Model Codes printed in red are Preferred Products and are readily available.

Line Mounted Assemblies

**THREE PORT PILOT-TO-OPEN CHECK APPLICATIONS
(90 DEGREE CROSS-PILOTED BODIES, 2 CAVITIES)**

**PILOT OPERATED
ASSEMBLIES**

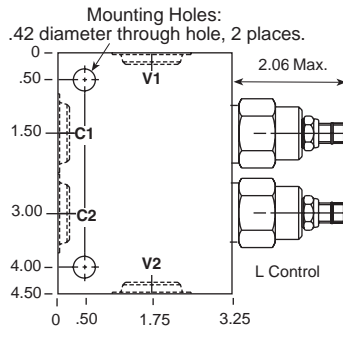
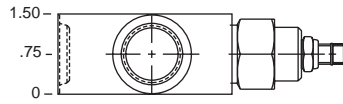
Go to www.sunhydraulics.com
for more product information and pricing.



Ports C1, C2, V1 & V2	Assembly Model Code*
1/2" NPTF	CKEB-XCN-YAC
3/4" NPTF	CKEB-XCN-YAD
SAE-8	CKEB-XCN-YAJ
SAE-10	CKEB-XCN-YAK

*Add modifier **/S** to order Ductile Iron for pressure rating over 3000 psi.

0-30 GPM Cavity T-2A

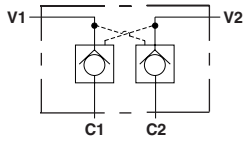


NOTES: Page 78 for cartridge model CK*B-*** shows performance curves, technical tips, and options.
See page vii for technical information about line mount bodies including SAE flange pattern specifications.
Consult your local Sun Distributor or the Sun Web Site for other port sizes available in the bodies shown above.
Model Codes printed in red are Preferred Products and are readily available.

THREE PORT PILOT-TO-OPEN CHECK APPLICATIONS (90 DEGREE CROSS-PILOTED BODIES, 2 CAVITIES)

PILOT OPERATED ASSEMBLIES

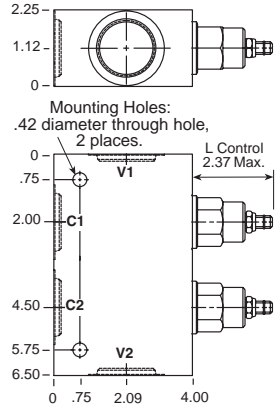
Go to www.sunhydraulics.com for more product information and pricing.



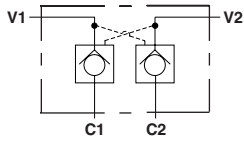
Ports C1, C2, V1 & V2	Assembly Model Code*
1" NPTF	CKGB-XCN-YJE
1 1/4" NPTF	CKGB-XCN-YJF
SAE-12	CKGB-XCN-YJL
SAE-16	CKGB-XCN-YJM

*Add modifier /S to order Ductile Iron for pressure rating over 3000 psi.

0-60 GPM Cavity T-17A

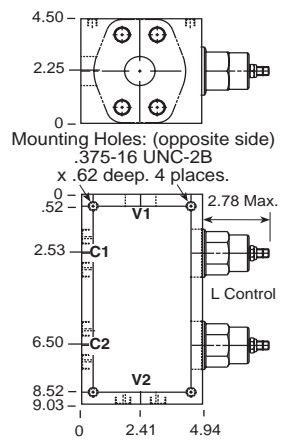


0-120 GPM Cavity T-19A



Ports C1, C2, V1 & V2	Assembly Model Code*
1 1/2" SAE C62	CKIB-XCN-YM6

*Add modifier /S to order Ductile Iron for pressure rating over 3000 psi.



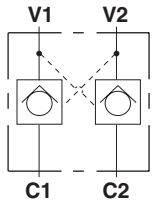
NOTES: Page 78 for cartridge model CK*B-*** shows performance curves, technical tips, and options.
See page vii for technical information about line mount bodies including SAE flange pattern specifications.
Consult your local Sun Distributor or the Sun Web Site for other port sizes available in the bodies shown above.
Model Codes printed in red are Preferred Products and are readily available.

Line Mounted Assemblies

THREE PORT PILOT-TO-OPEN CHECK APPLICATIONS (INLINE CROSS-PILOTED BODIES, 2 CAVITIES)

PILOT OPERATED ASSEMBLIES

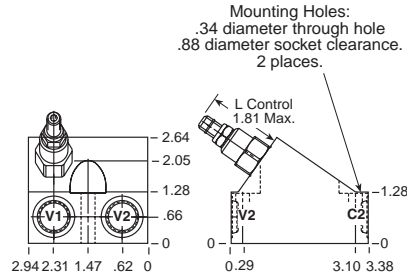
Go to www.sunhydraulics.com
for more product information and pricing.



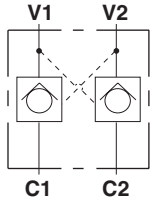
0-15 GPM

Cavity T-11A

Ports C1, C2, V1 & V2	Assembly Model Code*
3/8" NPTF	CKCB-XCN-XEB
SAE-6	CKCB-XCN-XEI
SAE-8	CKCB-XCN-XEJ



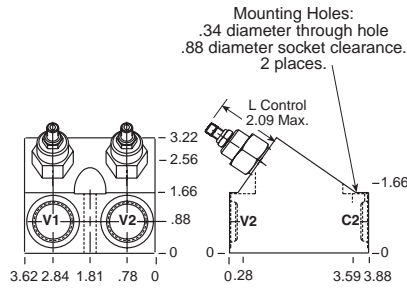
*Add modifier **/S** to order Ductile Iron for pressure rating over 3000 psi.



0-30 GPM

Cavity T-2A

Ports C1, C2, V1 & V2	Assembly Model Code*
1/2" NPTF	CKEB-XCN-XAC
3/4" NPTF	CKEB-XCN-XAD
SAE-6	CKEB-XCN-XAI
SAE-8	CKEB-XCN-XAJ



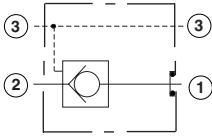
*Add modifier **/S** to order Ductile Iron for pressure rating over 3000 psi.

NOTES: Page 78 for cartridge model CK*B-*** shows performance curves, technical tips, and options.
See page vii for technical information about line mount bodies including SAE flange pattern specifications.
Consult your local Sun Distributor or the Sun Web Site for other port sizes available in the bodies shown above.
Model Codes printed in red are Preferred Products and are readily available.

**THREE PORT PILOT-TO-OPEN CHECK APPLICATIONS
(DIRECT MOUNT .75"/1.00"/1.25" SAE C61 FLANGE PORT/GASKET MOUNT BODIES,
THROUGH PILOT PORT)**

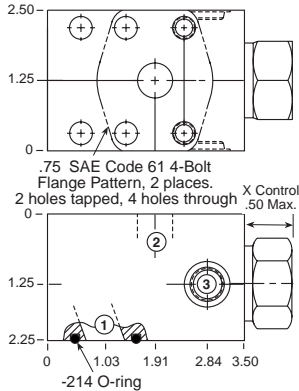
**PILOT OPERATED
ASSEMBLIES**

Go to www.sunhydraulics.com for more product information and pricing.



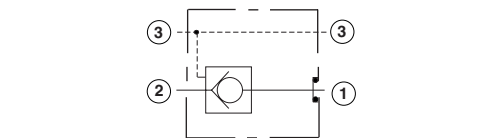
0-30 GPM Cavity T-2A

Ports 1 and 2	Port 3	Assembly Model Code*
3/4" SAE C61	SAE-6	CKEB-XCN-ZNV

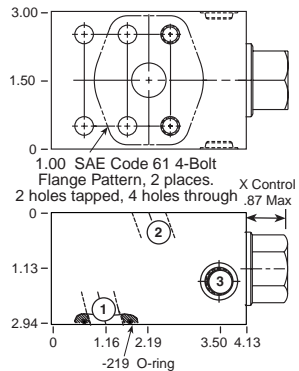


*Add modifier /S to order Ductile Iron for pressure rating over 3000 psi.

0-60 GPM Cavity T-17A

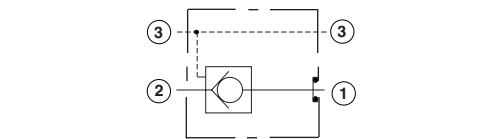


Ports 1 and 2	Port 3	Assembly Model Code*
1" SAE C61	SAE-6	CKGB-XCN-ZNW

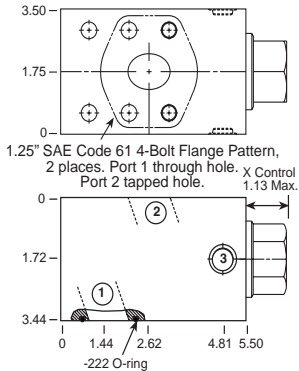


*Add modifier /S to order Ductile Iron for pressure rating over 3000 psi.

0-120 GPM Cavity T-19A



Ports 1 and 2	Port 3	Assembly Model Code*
1 1/4" SAE C61	SAE-6	CKIB-XCN-ZNX



*Add modifier /S to order Ductile Iron for pressure rating over 3000 psi.

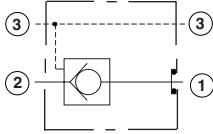
NOTES: Page 78 for cartridge model CK*B-*** shows performance curves, technical tips, and options.
See page vii for technical information about line mount bodies including SAE flange pattern specifications.
Consult your local Sun Distributor or the Sun Web Site for other port sizes available in the bodies shown above.

Line Mounted Assemblies

THREE PORT PILOT-TO-OPEN CHECK APPLICATIONS (DIRECT MOUNT .75"/1.00"/1.25" C62 FLANGE PORT/GASKET MOUNT BODIES, THROUGH PILOT/DRAIN PORT)

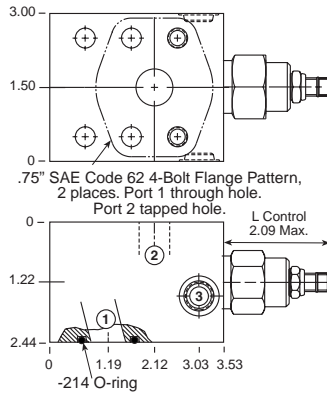
PILOT OPERATED ASSEMBLIES

Go to www.sunhydraulics.com
for more product information and pricing.

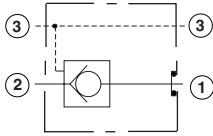


Ports 1 and 2	Port 3	Assembly Model Code*
3/4" SAE C62	SAE-6	CKEB-XCN-ZDS

0-30 GPM Cavity T-2A

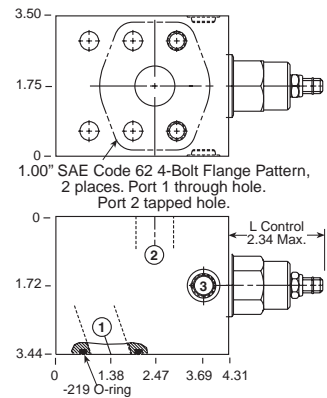


*Add modifier /S to order Ductile Iron for pressure rating over 3000 psi.

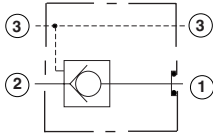


Ports 1 and 2	Port 3	Assembly Model Code*
1" SAE C62	SAE-6	CKGB-XCN-ZDR

0-60 GPM Cavity T-17A

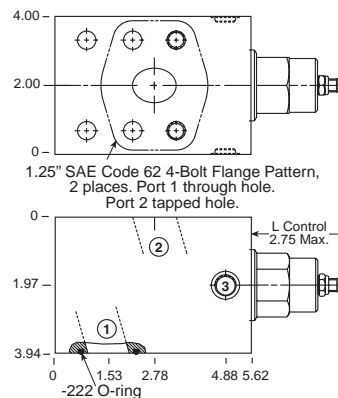


*Add modifier /S to order Ductile Iron for pressure rating over 3000 psi.



Ports 1 and 2	Port 3	Assembly Model Code*
1 1/4" SAE C62	SAE-6	CKIB-XCN-ZFD

0-120 GPM Cavity T-19A



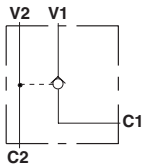
*Add modifier /S to order Ductile Iron for pressure rating over 3000 psi.

NOTES: Page 78 for cartridge model CK*B-*** shows performance curves, technical tips, and options.
See page vii for technical information about line mount bodies including SAE flange pattern specifications.
Consult your local Sun Distributor or the Sun Web Site for other port sizes available in the bodies shown above.

THREE PORT PILOT-TO-OPEN CHECK APPLICATIONS (GASKET MOUNT BODIES)

PILOT OPERATED ASSEMBLIES

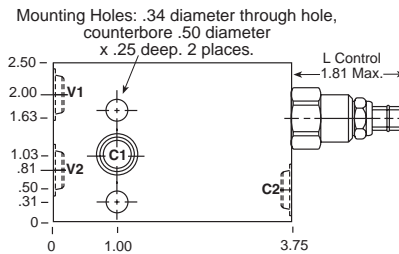
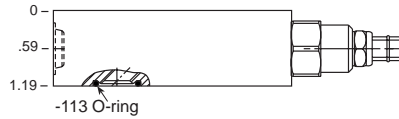
Go to www.sunhydraulics.com for more product information and pricing.



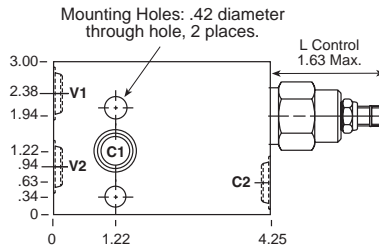
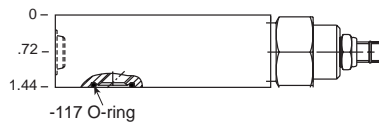
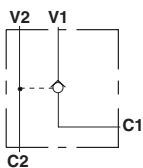
Ports C1, C2, V1 & V2	Assembly Model Code*
3/8" NPTF	CKCB-XCN-ZTN
SAE-6	CKCB-XCN-ZTC

*Add modifier /S to order Ductile Iron for pressure rating over 3000 psi.

0-15 GPM Cavity T-11A



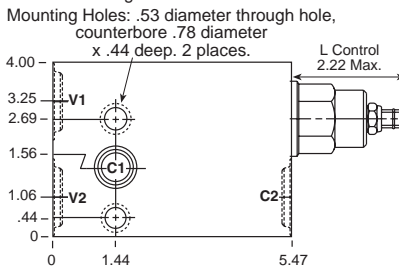
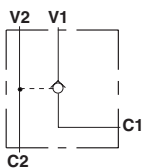
0-30 GPM Cavity T-2A

Ports C1, C2, V1 & V2	Assembly Model Code*
1/2" NPTF	CKEB-XCN-ZTF
SAE-8	CKEB-XCN-ZTG

*Add modifier /S to order Ductile Iron for pressure rating over 3000 psi.

0-60 GPM Cavity T-17A

Ports C1, C2, V1 & V2	Assembly Model Code*
3/4" NPTF	CKGB-XCN-ZTJ
SAE-12	CKGB-XCN-ZTK

*Add modifier /S to order Ductile Iron for pressure rating over 3000 psi.

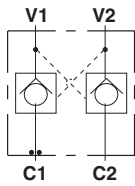
NOTES: Page 78 for cartridge model CK*B-*** shows performance curves, technical tips, a7nd options.
See page vii for technical information about line mount bodies including SAE flange pattern specifications.
Consult your local Sun Distributor or the Sun Web Site for other port sizes available in the bodies shown above.
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Line Mounted Assemblies

THREE PORT PILOT-TO-OPEN CHECK APPLICATIONS (GASKET MOUNT BODIES, 2 CAVITIES)

PILOT OPERATED ASSEMBLIES

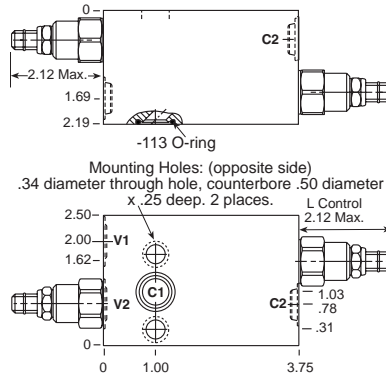
Go to www.sunhydraulics.com
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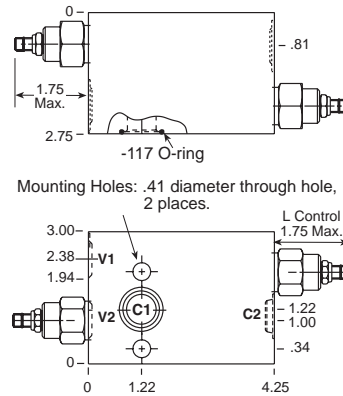
Ports C2, V1 & V2	Assembly Model Code*
3/8" NPTF	CKCB-XCN-YVM
SAE-6	CKCB-XCN-YVY

*Add modifier /S to order SG Iron for pressure rating over .

0-15 GPM Cavity T-11A

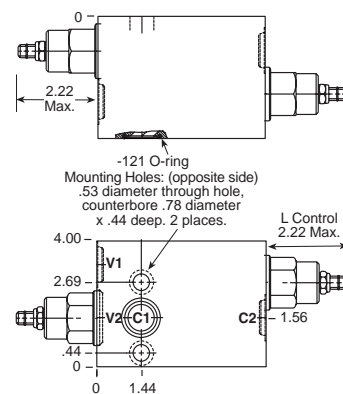


0-30 GPM Cavity T-2A



*Add modifier /S to order SG Iron for pressure rating over .

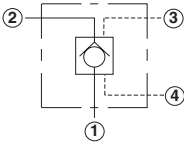
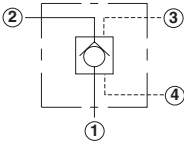
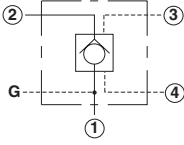
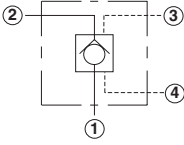
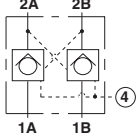
0-60 GPM Cavity T-17A



*Add modifier /S to order SG Iron for pressure rating over .

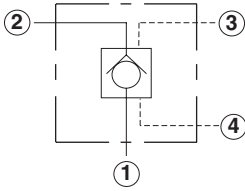
NOTES: Page 78 for cartridge model CK*B-*** shows performance curves, technical tips, and options.
See page vii for technical information about line mount bodies including SAE flange pattern specifications.
Consult your local Sun Distributor or the Sun Web Site for other port sizes available in the bodies shown above.

Four Port Pilot-to-Open Check Assemblies

	<i>Cartridge Type</i>	<i>Page</i>
	Vented, 4 Port Cavity	94
<i>Line Mounted Assemblies (Body Type)</i>		
	90 Degree	96
	90 Degree with Gauge Port	97
	2.00" SAE C62 Flange Port, 2 Cavities	98
	90 Degree Cross-Piloted, 2 Cavities, Common Port 4	99

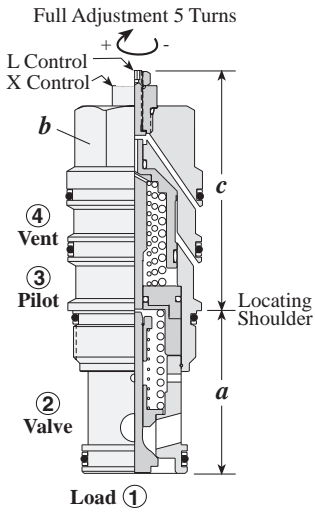
Pilot-to-Open Check Valves

VENTED, 4 PORT CAVITY



Capacity	Typical Cartridge Model Code	Cavity	Cartridge Dimensions				Installation Torque (lb. ft.)
			a	b	X	L	
15 GPM	CVCV - XCN	T - 21A	1.38	7/8"	2.11	2.34	30/35
30 GPM	CVEV - XCN	T - 22A	1.38	1 1/8"	2.34	2.56	45/50
60 GPM	CVGV - XCN	T - 23A	1.81	1 1/4"	2.81	3.03	150/160
120 GPM	CVIV - XCN	T - 24A	2.50	1 5/8"	3.50	3.77	350/375

OPTION ORDERING INFORMATION



Nominal Capacity	CV * V - * * *		
	Control**	Cracking Pressure	Seal
C 15 GPM	X Standard Pilot	A 4 psi	N Buna-N
E 30 GPM	L Manual Load Release	B 15 psi	V Viton
G 60 GPM		C 30 psi	
I 120 GPM		D 50 psi	
		E 75 psi	
		F 100 psi	

** See page 244 for information on Control Options

TECHNICAL TIPS / PERFORMANCE CURVES

Pilot-to-Open Check Valves, Vented

Applications

Sun pilot-to-open check valves are non-modulating, *on/off* valves used for load locking only, therefore *do not* provide smooth motion control. They allow free flow through check valve from port 2 to port 1, then block reverse flow until a pilot pressure directly proportional to the load pressure is sensed at port 3 so that a pilot piston can push the check poppet off of its seat.

Because of the on/off action of the pilot-to-open check valve it makes them unsuitable for use with overrunning loads that will cause a loss of pilot pressure. Without pilot pressure the check valve will close until adequate pilot pressure is again restored, causing a ratcheting motion.

Pilot-to-open check valves should never be used with paired cylinders. Pilot pressure will open the valve with the least load first, transferring the combined load to the second valve at double the pressure.

The *vented* type is used on applications where there is variable back-pressure downstream of the valve which could cause instability in a standard valve. The pilot spring chamber is vented externally to tank through a fourth port making it insensitive to back pressure. Any pressure generated on the drain port will be additive to the pilot pressure required.

NOTE: The vent port should never be plugged, as seal weepage will eventually cause valves to malfunction.

It is preferable that the pilot-to-open check valve is mounted as close as possible to the actuator to provide maximum protection in the event of a hydraulic line failure. This can be achieved by incorporating them directly into the actuator, or, Sun offers a range of gasket mounted bodies that bolt directly onto the mounting face of a cylinder or motor.

Design Concepts and Features

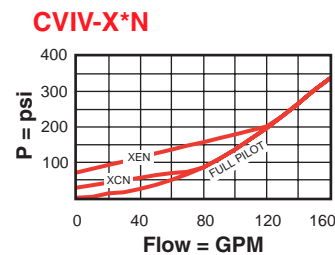
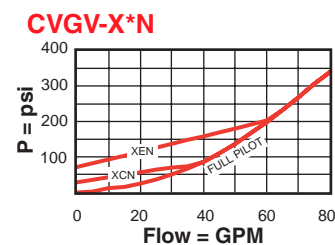
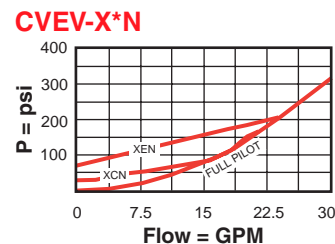
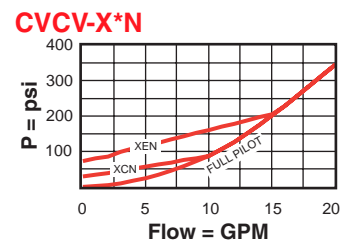
- Pilot-to-open check valves have a pilot ratio of 3:1, which is suitable for most applications.
- Operating pressures up to 5000 psi. Flow capacities up to 120 GPM
- Low leakage when closed, less than 1 drop/min. *This leakage figure is checked at both low and high pressure during test.*
- Optional free flow check springs available, from 4 psi to avoid cavitation up to 100 psi for severe applications.
- These cartridges have a sealed pilot piston.
- Valve with emergency manual release screw available, in case pilot pressure is not available.
- Hardened poppet and seat provides long life and better resistance to contamination.

General Application Requirements

- Operating Temperature Range: Buna-N seals -50° F to 200° F, Viton seals 0° F to 250° F.
- Viscosity Range: 60-3000 SUS.
- Fluid Contamination Level: ISO 4406 18/15 or better; Recommend $\beta_{10} \geq 75$ to achieve ISO 18/15 or better in most systems.
- Factory Pressure Setting for cartridge is established at cracking flow.

Performance Curves

Typical Pressure Drop



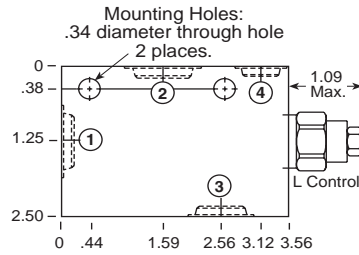
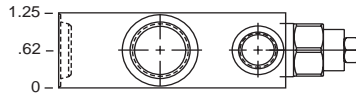
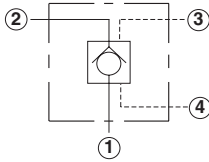
Line Mounted Assemblies

FOUR PORT PILOT-TO-OPEN CHECK APPLICATIONS (90 DEGREE BODIES)

VENTED

Go to www.sunhydraulics.com
for more product information and pricing.

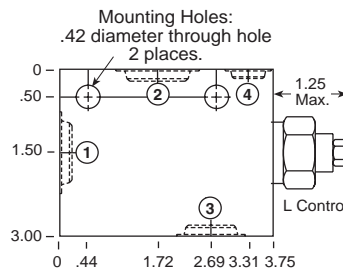
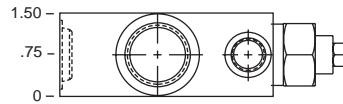
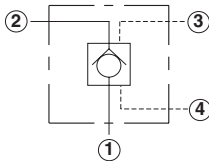
0-15 GPM Cavity T-21A



Ports 1 and 2	Ports 3 and 4	Assembly Model Code*
1/4" NPTF	3: 1/4" NPTF 4: 1/4" NPTF	CVCV-XCN-MAA
3/8" NPTF	3: 3/8" NPTF 4: 1/4" NPTF	CVCV-XCN-MAB
1/2" NPTF	3: 3/8" NPTF 4: 1/4" NPTF	CVCV-XCN-MAC
SAE-6	3: SAE-6 4: SAE-6	CVCV-XCN-MAI
SAE-8	3: SAE-8 4: SAE-6	CVCV-XCN-MAJ
SAE-10	3: SAE-8 4: SAE-6	CVCV-XCN-MAK

*Add modifier /S to order Ductile Iron for pressure rating over 3000 psi.

0-30 GPM Cavity T-22A



Ports 1 and 2	Ports 3 and 4	Assembly Model Code*
3/8" NPTF	3: 3/8" NPTF 4: 1/4" NPTF	CVEV-XCN-NAB
1/2" NPTF	3: 1/2" NPTF 4: 1/4" NPTF	CVEV-XCN-NAC
3/4" NPTF	3: 1/2" NPTF 4: 1/4" NPTF	CVEV-XCN-NAD
SAE-8	3: SAE-8 4: SAE-6	CVEV-XCN-NAJ
SAE-10	3: SAE-10 4: SAE-6	CVEV-XCN-NAK

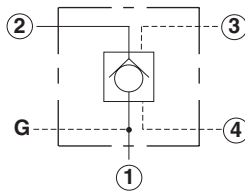
*Add modifier /S to order Ductile Iron for pressure rating over 3000 psi.

NOTES: Page 94 for cartridge model CV*V-*** shows performance curves, technical tips, and options.
See page vii for technical information about line mount bodies including SAE flange pattern specifications.
Consult your local Sun Distributor or the Sun Web Site for other port sizes available in the bodies shown above.
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FOUR PORT PILOT-TO-OPEN CHECK APPLICATIONS (90 DEGREE BODIES)

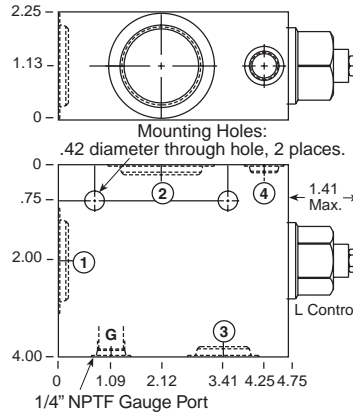
VENTED

Go to www.sunhydraulics.com for more product information and pricing.

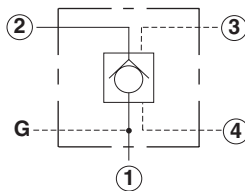


0-60 GPM Cavity T-23A

Ports 1 and 2	Ports 3 and 4	Assembly Model Code*
3/4" NPTF	3: 3/4" NPTF 4: 1/4" NPTF	CVGV-XCN-PCD
1" NPTF	3: 3/4" NPTF 4: 1/4" NPTF	CVGV-XCN-PCE
1 1/4" NPTF	3: 3/4" NPTF 4: 1/4" NPTF	CVGV-XCN-PCF
SAE-12	3: SAE-12 4: SAE-6	CVGV-XCN-PCL
SAE-16	3: SAE-12 4: SAE-6	CVGV-XCN-PCM

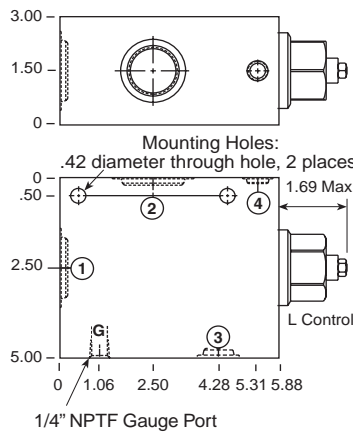


*Add modifier /S to order Ductile Iron for pressure rating over 3000 psi.



0-120 GPM Cavity T-24A

Ports 1 and 2	Ports 3 and 4	Assembly Model Code*
1" NPTF	3: 1" NPTF 4: 1/4" NPTF	CVIV-XCN-QAE
1 1/4" NPTF	3: 1/4" NPTF 4: 1/4" NPTF	CVIV-XCN-QAF
SAE-16	3: SAE-16 4: SAE-6	CVIV-XCN-QAM
SAE-20	3: SAE-16 4: SAE-6	CVIV-XCN-QAN



*Add modifier /S to order Ductile Iron for pressure rating over 3000 psi.

NOTES: Page 94 for cartridge model CV*V-*** shows performance curves, technical tips, and options.
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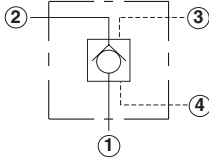
Line Mounted Assemblies

**FOUR PORT PILOT-TO-OPEN CHECK APPLICATIONS
(2.00" SAE C62 FLANGE PORT BODY, 2 CAVITIES)**

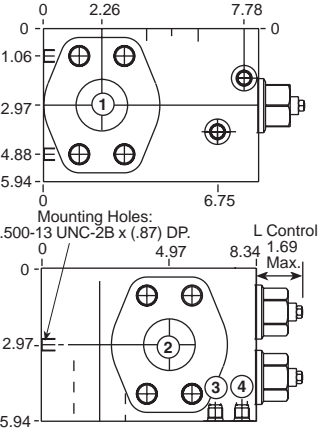
VENTED

Go to www.sunhydraulics.com
for more product information and pricing.

0-240 GPM Cavity T-24A



Ports 1 and 2	Ports 3 and 4	Assembly Model Code*
2" SAE C62	3: SAE-6 4: SAE-6	CVIV-XCN-Z9T



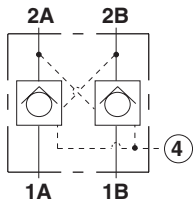
*Add modifier /S to order Ductile Iron for pressure rating over 3000 psi.

NOTES: Page 94 for cartridge model CV*V-*** shows performance curves, technical tips, and options.
See page vii for technical information about line mount bodies including SAE flange pattern specifications.
Consult your local Sun Distributor or the Sun Web Site for other port sizes available in the bodies shown above.

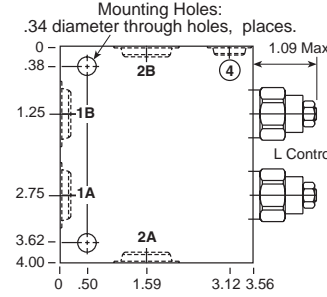
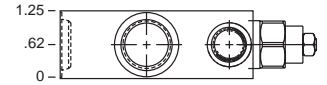
**FOUR PORT PILOT-TO-OPEN CHECK APPLICATIONS
(90 DEGREE CROSS-PILOTED BODIES, 2 CAVITIES, COMMON PORT 4)**

VENTED

Go to www.sunhydraulics.com for more product information and pricing.



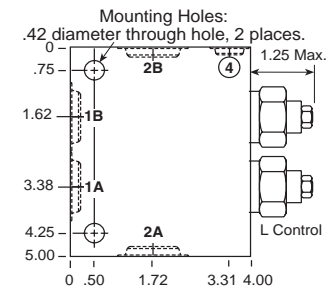
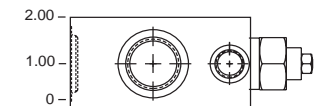
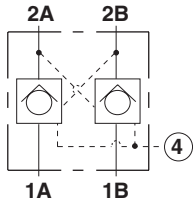
0-15 GPM Cavity T-21A



Ports 1B, 2A & 2B	Port 4	Assembly Model Code*
1/4" NPTF	1/4" NPTF	CVCV-XCN-XPA
3/8" NPTF	1/4" NPTF	CVCV-XCN-XPB
1/2" NPTF	1/4" NPTF	CVCV-XCN-XPC
SAE-6	SAE-6	CVCV-XCN-XPI
SAE-8	SAE-6	CVCV-XCN-XPJ
SAE-10	SAE-6	CVCV-XCN-XPK

*Add modifier /S to order Ductile Iron for pressure rating over 3000 psi.

0-30 GPM Cavity T-22A



Ports 1B, 2A & 2B	Port 4	Assembly Model Code*
3/8" NPTF	1/4" NPTF	CVEV-XCN-XIB
1/2" NPTF	1/4" NPTF	CVEV-XCN-XIC
3/4" NPTF	1/4" NPTF	CVEV-XCN-XID
SAE-6	SAE-6	CVEV-XCN-XII
SAE-8	SAE-6	CVEV-XCN-XIJ

*Add modifier /S to order Ductile Iron for pressure rating over 3000 psi.

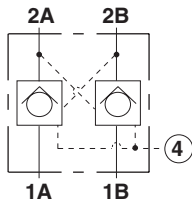
NOTES: Page 94 for cartridge model CV*V-*** shows performance curves, technical tips, and options.
See page vii for technical information about line mount bodies including SAE flange pattern specifications.
Consult your local Sun Distributor or the Sun Web Site for other port sizes available in the bodies shown above.

Line Mounted Assemblies

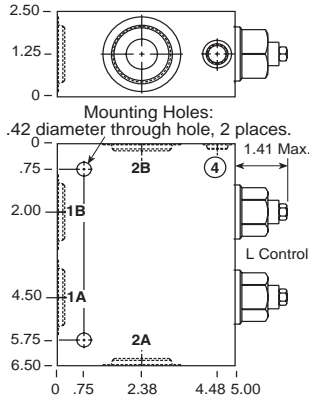
**FOUR PORT PILOT-TO-OPEN CHECK APPLICATIONS
(90 DEGREE CROSS-PILOTED BODIES, 2 CAVITIES, COMMON PORT 4)**

VENTED

Go to www.sunhydraulics.com for more product information and pricing.



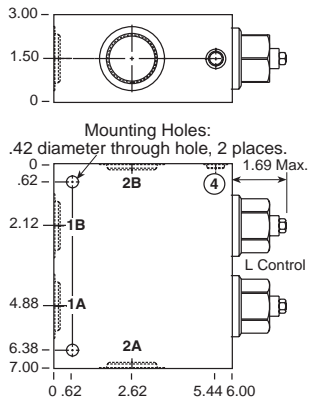
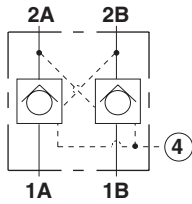
0-60 GPM Cavity T-23A



Ports 1A 1B, 2A & 2B	Port 4	Assembly Model Code*
3/4" NPTF	1/4" NPTF	CVGV-XCN-XMD
1" NPTF	1/4" NPTF	CVGV-XCN-XME
1 1/4" NPTF	1/4" NPTF	CVGV-XCN-XMF
SAE-12	1/4" NPTF	CVGV-XCN-XML
SAE-16	1/4" NPTF	CVGV-XCN-XMM

*Add modifier **/S** to order Ductile Iron for pressure rating over 3000 psi.

0-120 GPM Cavity T-24A

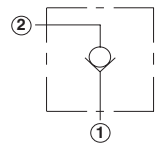
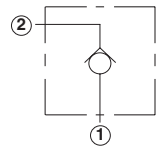
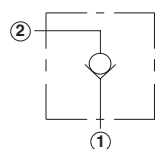
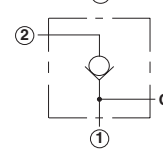
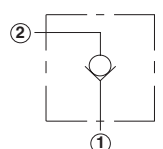


Ports 1A 1B, 2A & 2B	Port 4	Assembly Model Code*
1" NPTF	1/4" NPTF	CVIV-XCN-XLE
1 1/4" NPTF	1/4" NPTF	CVIV-XCN-XLF

*Add modifier **/S** to order Ductile Iron for pressure rating over 3000 psi.

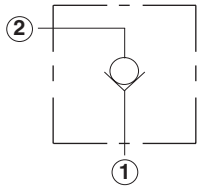
NOTES: Page 94 for cartridge model CV*V-*** shows performance curves, technical tips, and options.
See page vii for technical information about line mount bodies including SAE flange pattern specifications.
Consult your local Sun Distributor or the Sun Web Site for other port sizes available in the bodies shown above.

Check Assemblies

	<i>Cartridge Type</i>	<i>Page</i>
	1 to 2 Free Flow	102
	2 to 1 Free Flow	102
<i>Line Mounted Assemblies (Body Type)</i>		
	90 Degree	104
	90 Degree with Gauge Port	105
	Inline	106
	Inline/Inline 1.50"/2.00" SAE C61 Flange Port	107
	2.00" SAE C61/C62 Flange Port, 2 Port Cavity in Parallel	108

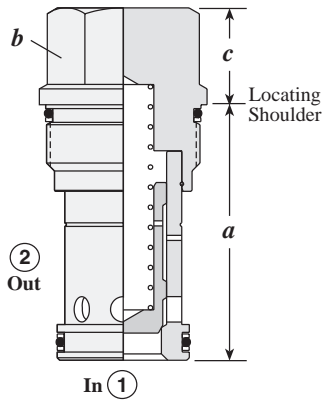
Check Valves

1 TO 2 FREE FLOW



Capacity	Typical Cartridge Model Code	Cavity	Cartridge Dimensions			Installation Torque (lb. ft.)
			a	b	c X	
10 GPM	CXBA – XCN	T - 162A	1.22	3/4"	.82	25/30
20 GPM	CXDA – XCN	T - 13A	1.38	7/8"	.75	30/35
40 GPM	CXFA – XCN	T - 5A	1.62	1 1/8"	.69	45/50
80 GPM	CXHA – XCN	T - 16A	2.44	1 1/4"	.97	150/160
160 GPM	CXJA – XCN	T - 18A	3.13	1 5/8"	1.19	350/375

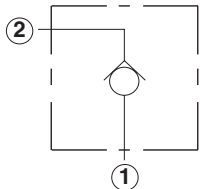
OPTION ORDERING INFORMATION



Nominal Capacity	Control**		Cracking Pressure		Seal
	B	D	F	H	J
10 GPM	X Non-adjustable		A 4 psi		N Buna-N
20 GPM			B 15 psi		V Viton
40 GPM			C 30 psi		
80 GPM			D 50 psi		
160 GPM			E 75 psi		
			F 100 psi		

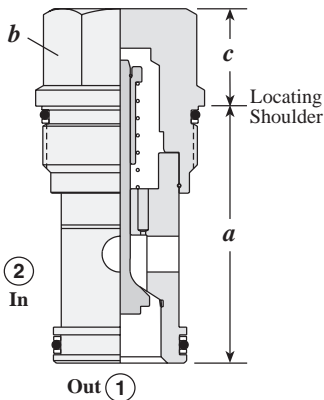
** See page 244 for information on Control Options

2 TO 1 FREE FLOW



Capacity	Typical Cartridge Model Code	Cavity	Cartridge Dimensions			Installation Torque (lb. ft.)
			a	b	c X	
7.5 GPM	CXAD – XCN	T - 162A	1.22	3/4"	.82	25/30
15 GPM	CXCD – XCN	T - 13A	1.38	7/8"	.75	30/35
30 GPM	CXED – XCN	T - 5A	1.62	1 1/8"	.69	45/50
60 GPM	CXGD – XCN	T - 16A	2.44	1 1/4"	.97	150/160
120 GPM	CXID – XCN	T - 18A	3.13	1 5/8"	1.19	350/375

OPTION ORDERING INFORMATION



Nominal Capacity	Control**		Cracking Pressure		Seal
	A*	C	E	G	I
7.5 GPM	X Non-adjustable		A 4 psi		N Buna-N
15 GPM			B 15 psi		V Viton
30 GPM			C 30 psi		
60 GPM			D 50 psi		
120 GPM			E 75 psi		
			F 100 psi		

** See page 244 for information on Control Options

*CXAD available with A,C,E Cracking Pressures Only.

TECHNICAL TIPS / PERFORMANCE CURVES

Check Valves, Free Flow, Port 1 to 2

Applications

Check valves are used to provide free flow in one direction and blocked flow in the opposite direction. The preferred check CX*A-X*N (free flow 1 to 2) should be used wherever possible.

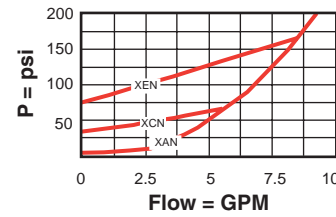
Design Concepts and Features

- Hardened and lapped sealing surfaces provide low leakage (less than 1 drop / min.) and long life.
- Extensive range of spring options.
- Available in five frame sizes with operating pressures to 5000 psi.

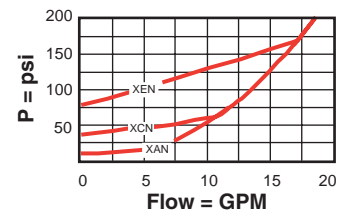
Performance Curves

Typical Pressure Rise

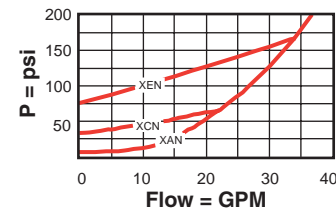
CXBA-X*N



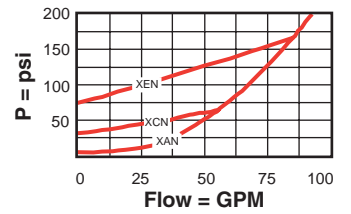
CXDA-X*N



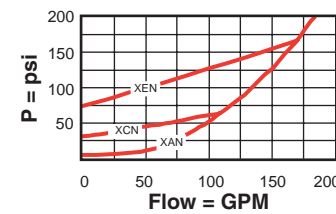
CXFA-X*N



CXHA-X*N



CXJA-X*N



Check Valves, Free Flow, Port 2 to 1

Applications

The CX*D-X*N non-preferred check (free flow 2 to 1) should only be used to simplify complex manifold designs.

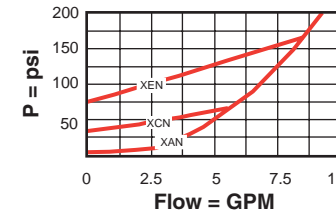
Design Concepts and Features

- Hardened and lapped sealing surfaces provide low leakage (less than 1 drop / min.) and long life.
- Extensive range of spring options.
- Available in five frame sizes with operating pressures to 5000 psi.

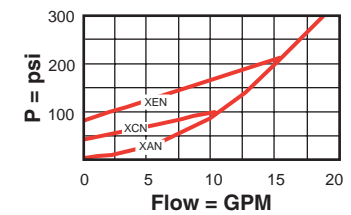
Performance Curves

Typical Pressure Rise

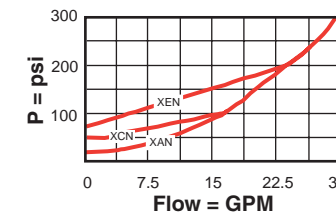
CXAD-X*N



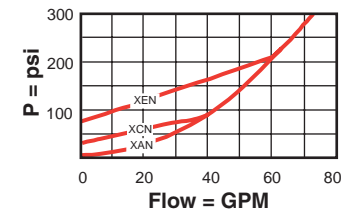
CXCD-X*N



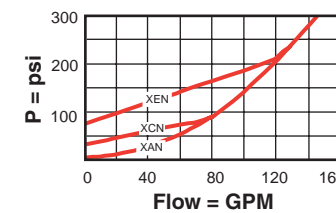
CXED-X*N



CXGD-X*N



CXID-X*N



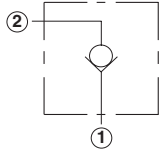
General Application Requirements

- Operating Temperature Range: Buna-N seals -50° F to 200° F, Viton seals 0° F to 250° F.
- Viscosity Range: 60-3000 SUS.
- Fluid Contamination Level: ISO 4406 18/15 or better; Recommend $\beta_{10} \geq 75$ to achieve ISO 18/15 or better in most systems.
- Factory Pressure Setting for cartridge is established at a crack flow rate.

Line Mounted Assemblies

TWO PORT FLOW CONTROL APPLICATIONS
(90 DEGREE BODIES)FREE FLOW
Port 1 to Port 2

0-10 GPM

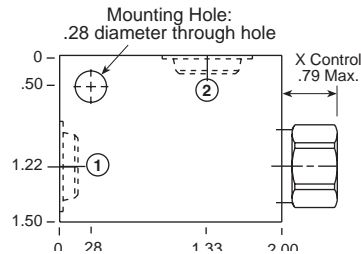
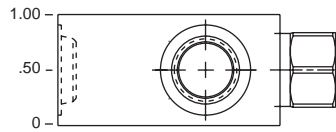


Ports 1 and 2	Assembly Model Code*
1/4" NPTF	CXBA-X*N-AAA
3/8" NPTF	CXBA-X*N-AAB
SAE-4	CXBA-X*N-AAH
SAE-6	CXBA-X*N-AAI

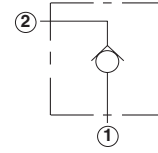
*Add modifier /S to order Ductile Iron for pressure rating over 3000 psi.

Go to www.sunhydraulics.com for more product information and pricing.

Cavity T-162A

FREE FLOW
Port 2 to Port 1

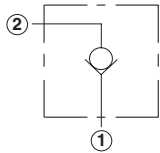
0-8 GPM



Ports 1 and 2	Assembly Model Code*
1/4" NPTF	CXAD-X*N-AAA
3/8" NPTF	CXAD-X*N-AAB
SAE-4	CXAD-X*N-AAH
SAE-6	CXAD-X*N-AAI

*Add modifier /S to order Ductile Iron for pressure rating over 3000 psi.

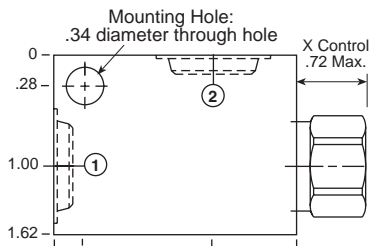
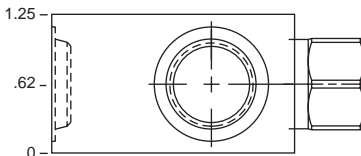
0-20 GPM



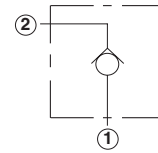
Ports 1 and 2	Assembly Model Code*
1/4" NPTF	CXDA-X*N-GAA
3/8" NPTF	CXDA-X*N-GAB
SAE-4	CXDA-X*N-GAH
SAE-6	CXDA-X*N-GAI
SAE-8	CXDA-X*N-GAJ

*Add modifier /S to order Ductile Iron for pressure rating over 3000 psi.

Cavity T-13A



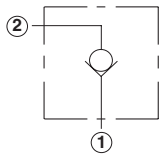
0-16 GPM



Ports 1 and 2	Assembly Model Code*
1/4" NPTF	CXCD-X*N-GAA
3/8" NPTF	CXCD-X*N-GAB
SAE-4	CXCD-X*N-GAH
SAE-6	CXCD-X*N-GAI
SAE-8	CXCD-X*N-GAJ

*Add modifier /S to order Ductile Iron for pressure rating over 3000 psi.

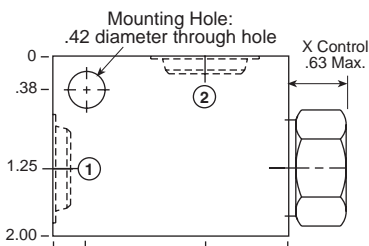
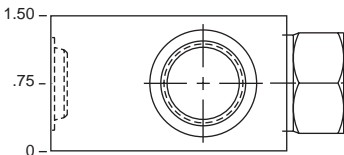
0-40 GPM



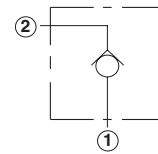
Ports 1 and 2	Assembly Model Code*
3/8" NPTF	CXFA-X*N-DAB
1/2" NPTF	CXFA-X*N-DAC
SAE-6	CXFA-X*N-DAJ
SAE-8	CXFA-X*N-DAK

*Add modifier /S to order Ductile Iron for pressure rating over 3000 psi.

Cavity T-5A



0-31 GPM



Ports 1 and 2	Assembly Model Code*
3/8" NPTF	CXED-X*N-DAB
1/2" NPTF	CXED-X*N-DAC
SAE-6	CXED-X*N-DAJ
SAE-8	CXED-X*N-DAK

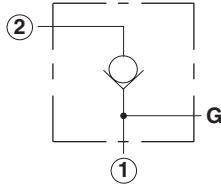
*Add modifier /S to order Ductile Iron for pressure rating over 3000 psi.

NOTES: Page 102 for cartridge models CX*A-*** and CX*D-*** shows performance curves, technical tips, and options. See page vii for technical information about line mount bodies including SAE flange pattern specifications. Consult your local Sun Distributor or the Sun Web Site for other port sizes available in the bodies shown above. Model Codes printed in red are Preferred Products and are readily available.

**TWO PORT FLOW CONTROL APPLICATIONS
(90 DEGREE BODIES)**

**FREE FLOW
Port 1 to Port 2**

0-80 GPM

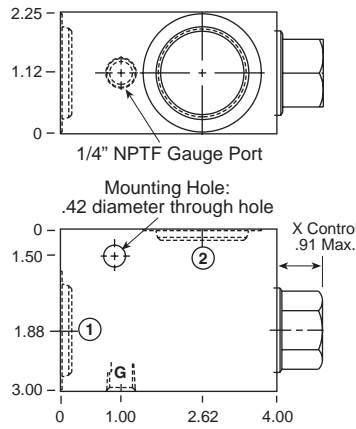


Ports 1 and 2	Assembly Model Code*
3/4" NPTF	CXHA-X*N-IAD
1" NPTF	CXHA-X*N-IAE
1 1/4" NPTF	CXHA-X*N-IAF
SAE-12	CXHA-X*N-IAL
SAE-16	CXHA-X*N-IAM

*Add modifier /S to order Ductile Iron for pressure rating over 3000 psi.

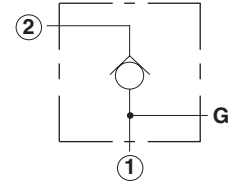
Go to www.sunhydraulics.com for more product information and pricing.

Cavity T-16A



**FREE FLOW
Port 2 to Port 1**

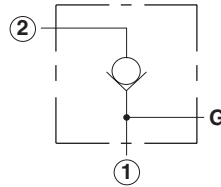
0-60 GPM



Ports 1 and 2	Assembly Model Code*
3/4" NPTF	CXGD-X*N-IAD
1" NPTF	CXGD-X*N-IAE
1 1/4" NPTF	CXGD-X*N-IAF
SAE-12	CXGD-X*N-IAL
SAE-16	CXGD-X*N-IAM

*Add modifier /S to order Ductile Iron for pressure rating over 3000 psi.

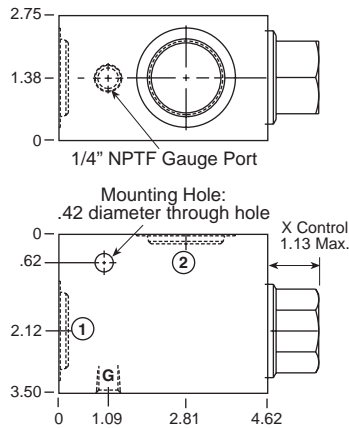
0-160 GPM



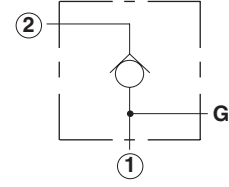
Ports 1 and 2	Assembly Model Code*
3/4" NPTF	CXJA-X*N-LAD
1" NPTF	CXJA-X*N-LAE
1 1/4" NPTF	CXJA-X*N-LAF
SAE-12	CXJA-X*N-LAL
SAE-16	CXJA-X*N-LAM

*Add modifier /S to order Ductile Iron for pressure rating over 3000 psi.

Cavity T-18A



0-120 GPM



Ports 1 and 2	Assembly Model Code*
3/4" NPTF	CXID-X*N-LAD
1" NPTF	CXID-X*N-LAE
1 1/4" NPTF	CXID-X*N-LAF
SAE-12	CXID-X*N-LAL
SAE-16	CXID-X*N-LAM

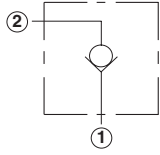
*Add modifier /S to order Ductile Iron for pressure rating over 3000 psi.

NOTES: Page 102 for cartridge models CX*A-*** and CX*D-*** shows performance curves, technical tips, and options. See page vii for technical information about line mount bodies including SAE flange pattern specifications. Consult your local Sun Distributor or the Sun Web Site for other port sizes available in the bodies shown above. Model Codes printed in red are Preferred Products and are readily available.

Line Mounted Assemblies

TWO PORT FLOW CONTROL APPLICATIONS
(INLINE BODIES)FREE FLOW
Port 1 to Port 2

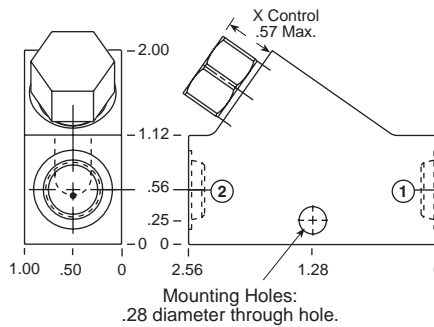
0-10 GPM



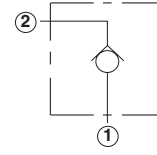
Ports 1 and 2	Assembly Model Code*
1/4" NPTF	CXBA-X*N-ACA
3/8" NPTF	CXBA-X*N-ACB
SAE-4	CXBA-X*N-ACH
SAE-6	CXBA-X*N-ACI

Go to www.sunhydraulics.com
for more product information and pricing.

Cavity T-162A



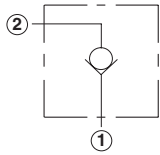
0-8 GPM



Ports 1 and 2	Assembly Model Code*
1/4" NPTF	CXAD-X*N-ACA
3/8" NPTF	CXAD-X*N-ACB
SAE-4	CXAD-X*N-ACH
SAE-6	CXAD-X*N-ACI

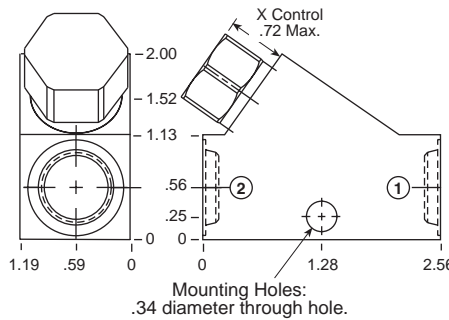
*Add modifier /S to order Ductile Iron for pressure
rating over 3000 psi.*Add modifier /S to order Ductile Iron for pressure
rating over 3000 psi.

0-20 GPM

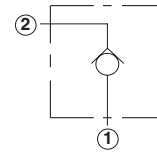


Ports 1 and 2	Assembly Model Code*
1/4" NPTF	CXDA-X*N-GCA
3/8" NPTF	CXDA-X*N-GCB
SAE-6	CXDA-X*N-GCI
SAE-8	CXDA-X*N-GCJ

Cavity T-13A



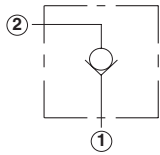
0-16 GPM



Ports 1 and 2	Assembly Model Code*
1/4" NPTF	CXCD-X*N-GCA
3/8" NPTF	CXCD-X*N-GCB
SAE-6	CXCD-X*N-GCI
SAE-8	CXCD-X*N-GCJ

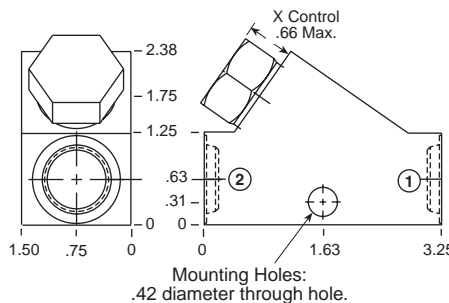
*Add modifier /S to order Ductile Iron for pressure
rating over 3000 psi.*Add modifier /S to order Ductile Iron for pressure
rating over 3000 psi.

0-40 GPM

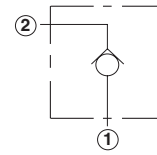


Ports 1 and 2	Assembly Model Code*
3/8" NPTF	CXFA-X*N-DCB
1/2" NPTF	CXFA-X*N-DCC
SAE-6	CXFA-X*N-DCI
SAE-8	CXFA-X*N-DCJ
SAE-10	CXFA-X*N-DCK

Cavity T-5A



0-31 GPM



Ports 1 and 2	Assembly Model Code*
3/8" NPTF	CXED-X*N-DCB
1/2" NPTF	CXED-X*N-DCC
SAE-6	CXED-X*N-DCI
SAE-8	CXED-X*N-DCJ
SAE-10	CXED-X*N-DCK

*Add modifier /S to order Ductile Iron for pressure
rating over 3000 psi.*Add modifier /S to order Ductile Iron for pressure
rating over 3000 psi.

NOTES: Page 102 for cartridge models CX*A-*** and CX*D-*** shows performance curves, technical tips, and options. See page vii for technical information about line mount bodies including SAE flange pattern specifications. Consult your local Sun Distributor or the Sun Web Site for other port sizes available in the bodies shown above. Model Codes printed in red are Preferred Products and are readily available.

**TWO PORT FLOW CONTROL APPLICATIONS
(INLINE/INLINE 1.50"/2.00" SAE C61 FLANGE PORT BODIES)**

**FREE FLOW
Port 1 to Port 2**

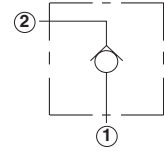
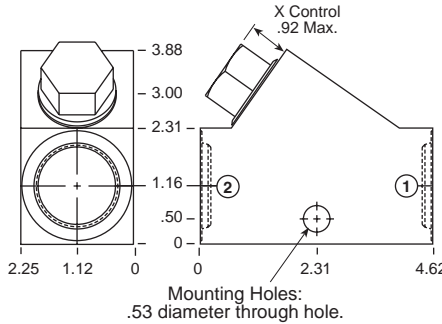
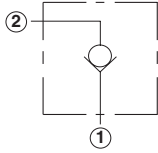
Go to www.sunhydraulics.com
for more product information and pricing.

**FREE FLOW
Port 2 to Port 1**

0-80 GPM

Cavity T-16A

0-60 GPM



Ports 1 and 2	Assembly Model Code*
3/4" NPTF	CXHA-X*N-ICD
1" NPTF	CXHA-X*N-ICE
1 1/4" NPTF	CXHA-X*N-ICF
SAE-12	CXHA-X*N-ICL
SAE-16	CXHA-X*N-ICM

Ports 1 and 2	Assembly Model Code*
3/4" NPTF	CXGD-X*N-ICD
1" NPTF	CXGD-X*N-ICE
1 1/4" NPTF	CXGD-X*N-ICF
SAE-12	CXGD-X*N-ICL
SAE-16	CXGD-X*N-ICM

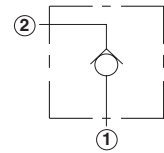
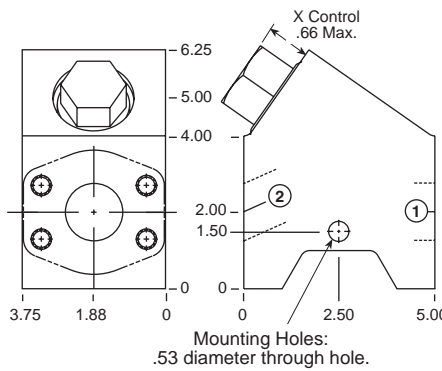
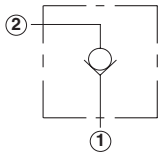
*Add modifier /S to order Ductile Iron for pressure rating over 3000 psi.

*Add modifier /S to order Ductile Iron for pressure rating over 3000 psi.

0-160 GPM

Cavity T-18A

0-120 GPM



Ports 1 and 2	Assembly Model Code*
1 1/2" SAE C61	CXJA-X*N-ZLS

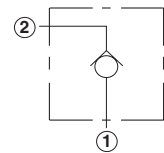
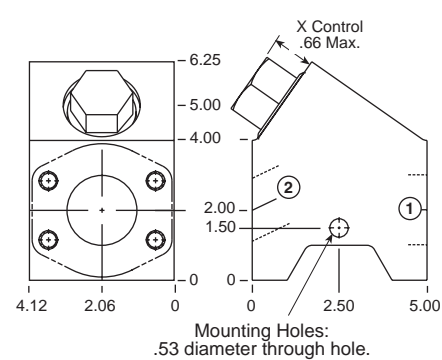
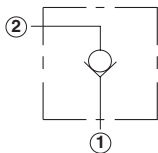
Ports 1 and 2	Assembly Model Code*
1 1/2" SAE C61	CXID-X*N-ZLS

*Add modifier /S to order Ductile Iron for pressure rating over 3000 psi.

0-160 GPM

Cavity T-18A

0-120 GPM



Ports 1 and 2	Assembly Model Code*
2" SAE C61	CXJA-X*N-ZLR

Ports 1 and 2	Assembly Model Code*
2" SAE C61	CXID-X*N-ZLR

*Add modifier /S to order Ductile Iron for pressure rating over 3000 psi.

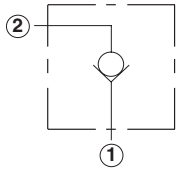
NOTES: Page 102 for cartridge models CX*A-*** and CX*D-*** shows performance curves, technical tips, and options. See page vii for technical information about line mount bodies including SAE flange pattern specifications. Consult your local Sun Distributor or the Sun Web Site for other port sizes available in the bodies shown above. Model Codes printed in red are Preferred Products and are readily available.

Line Mounted Assemblies

TWO PORT FLOW CONTROL APPLICATIONS (2.00" SAE C61/C62 FLANGE PORT BODIES, 2 PORT CAVITY IN PARALLEL)

FREE FLOW
Port 1 to Port 2

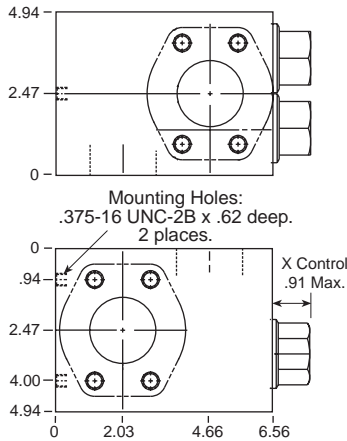
0-320 GPM



Ports 1 and 2	Assembly Model Code*
2" SAE C61	CXJA-X*N-XZY

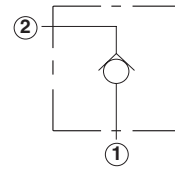
Go to www.sunhydraulics.com
for more product information and pricing.

Cavity T-18A



FREE FLOW
Port 2 to Port 1

0-240 GPM



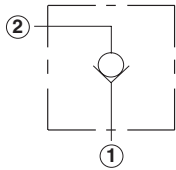
Ports 1 and 2	Assembly Model Code*
2" SAE C61	CXID-X*N-XZY

*Add modifier **/S** to order Ductile Iron for pressure rating over 3000 psi.

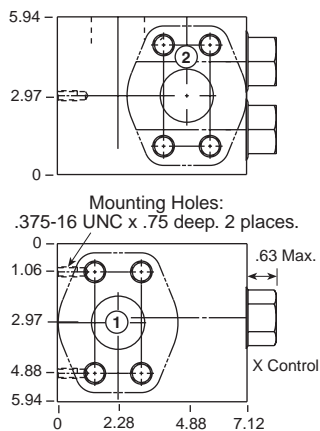
0-320 GPM

Cavity T-18A

0-240 GPM



Ports 1 and 2	Assembly Model Code*
2" SAE C62	CXJA-X*N-VTN

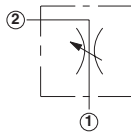
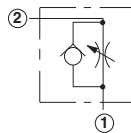
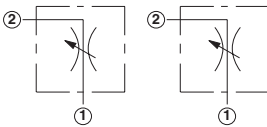
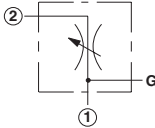
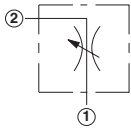


Ports 1 and 2	Assembly Model Code*
2" SAE C62	CXID-X*N-VTN

*Add modifier **/S** to order Ductile Iron for pressure rating over 3000 psi.

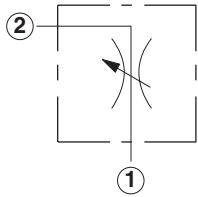
NOTES: Page 102 for cartridge models CX*A-*** and CX*D-*** shows performance curves, technical tips, and options.
See page vii for technical information about line mount bodies including SAE flange pattern specifications.
Consult your local Sun Distributor or the Sun Web Site for other port sizes available in the bodies shown above.

Needle Assemblies

	<i>Cartridge Type</i>	<i>Page</i>
	Fully Adjustable Needle	110
	Fully Adjustable Needle with Reverse Free Flow Check	110
<i>Line Mounted Assemblies (Body Type)</i>		
	90 Degree	112
	90 Degree with Gauge Port	113
	Inline Inline/Inline 1.50"/2.00" SAE C61 Flange Port 2.00" SAE C61/C62 Flange Port, 2 Port Cavity in Parallel	114 115 116

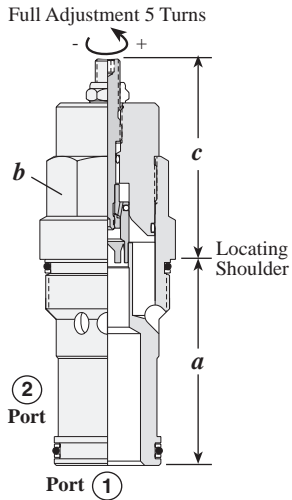
Needle Valves

FULLY ADJUSTABLE NEEDLE



Capacity	Typical Cartridge Model Code	Cavity	Cartridge Dimensions					Installation Torque (lb. ft.)
			a	b	c			
					L	H	K	
.16 in.	NFBC – LCN	T - 162A	1.22	3/4"	1.59	-	1.73	25/30
.19 in.	NFCC – LCN	T - 13A	1.38	7/8"	2.06	2.44	2.31	30/35
.25 in.	NFDC – LAN	T - 5A	1.38	1 1/8"	2.44	2.82	2.73	45/50
.38 in.	NFEC – LEN	T - 16A	1.81	1 1/4"	2.66	3.06	2.91	150/160
.56 in.	NFFC – LGN	T - 18A	2.50	1 5/8"	3.31	3.50	3.47	350/375

OPTION ORDERING INFORMATION

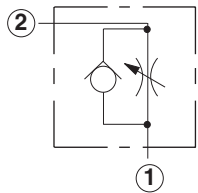


NF * C - * * *

Nominal Capacity	Control**	Maximum Diameter Orifice	Seal
B .16 in.	L Standard Screw	C .16 in. <i>NFBC</i>	N Buna-N
C .19 in.	H Calibrated Handknob with Detent Lock	C .19 in. <i>NFCC</i>	V Viton
D .25 in.		D .10 in. <i>NFDC</i>	
E .38 in.	K Handknob	A .25 in. <i>NFEC</i>	
F .56 in.		B .13 in. <i>NFEC</i>	
		E .38 in. <i>NFFC</i>	
		F .28 in. <i>NFFC</i>	
		G .56 in. <i>NFFC</i>	
		H .38 in. <i>NFFC</i>	

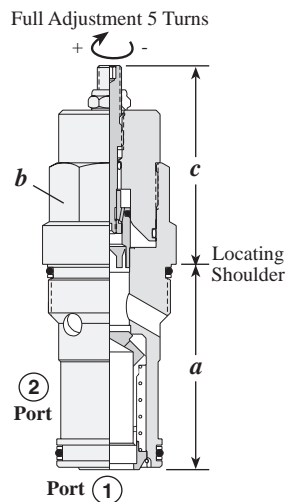
** See page 244 for information on Control Options

FULLY ADJUSTABLE NEEDLE WITH REVERSE FREE FLOW CHECK



Capacity	Typical Cartridge Model Code	Cavity	Cartridge Dimensions					Installation Torque (lb. ft.)
			a	b	c			
					L	H	K	
.16	NCBB – LCN	T - 162A	1.22	3/4"	1.59	-	1.73	25/30
.19	NCCB – LCN	T - 13A	1.38	7/8"	2.06	2.44	2.31	30/35
.25	NCEB – LCN	T - 5A	1.38	1 1/8"	2.44	2.82	2.73	45/50
.38	NCFB – LCN	T - 16A	1.81	1 1/4"	2.66	3.06	2.91	150/160
.56	NCGB – LCN	T - 18A	2.50	1 5/8"	3.31	3.50	3.47	350/375

OPTION ORDERING INFORMATION



NC * B - * * *

Nominal Capacity	Control**	Cracking Pressure*	Seal
NCBB *.16" dia.	L Standard Screw	A 4 psi	N Buna-N
NCCB *.19" dia. NCCC *.09" dia.	H Calibrated Handknob with Detent Lock	C 30 psi	V Viton
NCEB *.25" dia. NCEC *.13" dia.	K Handknob	E 75 psi	
NCFB *.38" dia. NCFC *.28" dia.			
NCGB *.56" dia. NCGC *.38" dia.			

** See page 244 for information on Control Options

*Cracking Pressure Ranges:
A and E ranges are not available in T-162A cavity

TECHNICAL TIPS / PERFORMANCE CURVES

Needle Valves, Fully Adjustable

Applications

These adjustable needle valves offer accurate and precise flow control because of their balanced adjustment design. They may be used for bi-directional operation.

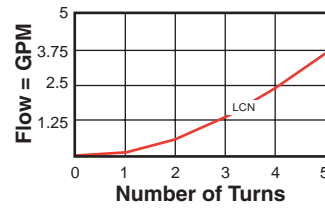
Design Concepts and Features

- Sharp-edge orifice minimizes flow variation with viscosity changes.
- Optional needle orifice ranges. See page 110.
- Positive shut-off of flow when closed.

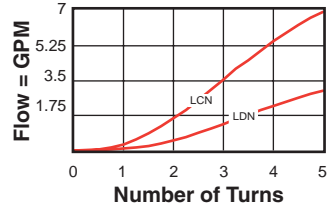
Performance Curves

Adjustment Sensitivity at 100 psi Differential

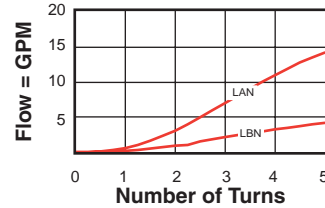
NFBC-L*N



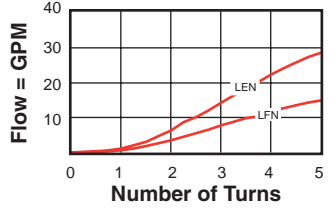
NFCC-L*N



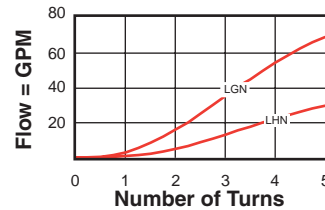
NFDC-L*N



NFEC-L*N



NFFC-L*N



Needle Valves, Fully Adjustable with Reverse Free Flow Check

Applications

These adjustable needle valves with integral reverse free flow check fit the same cavity as the needle valve without check.

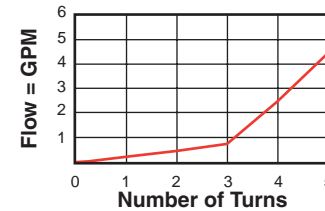
Design Concepts and Features

- Performance parameters of the adjustable needle cartridge with check are similar to the NF*C.
- However, the leakage rate when closed is approximately 5 drops / min. or less.

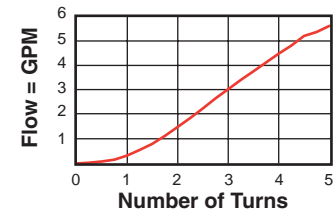
Performance Curves

Adjustment Sensitivity at 100 psi Differential

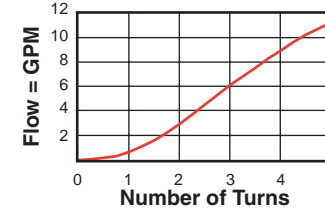
NCBB-L*N



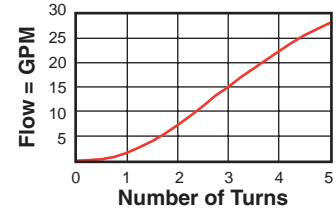
NCCB-L*N



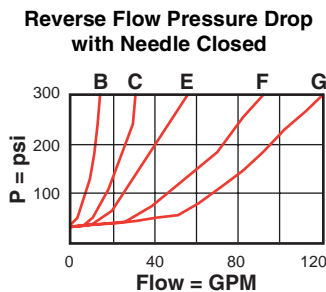
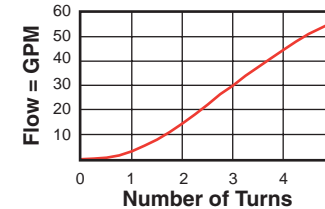
NCEB-L*N



NCFB-L*N



NCGB-L*N



General Application Requirements

- Operating Temperature Range: Buna-N seals -50° F to 200° F, Viton seals 0° F to 250° F.
- Viscosity Range: 60-3000 SUS.
- Fluid Contamination Level: ISO 4406 18/15 or better; Recommend $\beta_{10} \geq 75$ to achieve ISO 18/15 or better in most systems.
- Factory Pressure Setting for cartridge is established at a 4 GPM flow rate.

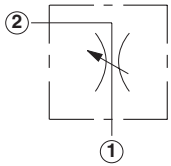
Line Mounted Assemblies

TWO PORT FLOW CONTROL APPLICATIONS (90 DEGREE BODIES)

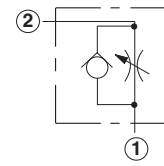
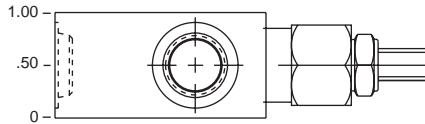
FULLY ADJUSTABLE NEEDLE

Go to www.sunhydraulics.com
for more product information and pricing.

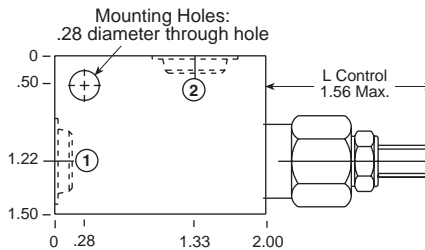
FULLY ADJUSTABLE NEEDLE WITH REVERSE FREE FLOW CHECK



0-.16 in. Cavity T-162A



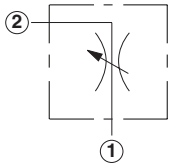
Ports 1 and 2	Assembly Model Code*
1/4" NPTF	NFBC-L*N-AAA
3/8" NPTF	NFBC-L*N-AAB
SAE-4	NFBC-L*N-AAH
SAE-6	NFBC-L*N-AAI



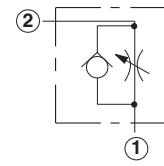
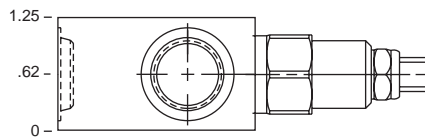
Ports 1 and 2	Assembly Model Code*
1/4" NPTF	NCBB-L*N-AAA
3/8" NPTF	NCBB-L*N-AAB
SAE-4	NCBB-L*N-AAH
SAE-6	NCBB-L*N-AAI

*Add modifier /S to order Ductile Iron for pressure rating over 3000 psi.

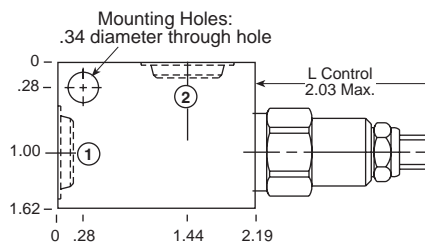
*Add modifier /S to order Ductile Iron for pressure rating over 3000 psi.



0-.19 in. Cavity T-13A



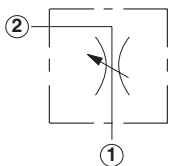
Ports 1 and 2	Assembly Model Code*
1/4" NPTF	NFCC-L*N-GAA
3/8" NPTF	NFCC-L*N-GAB
SAE-4	NFCC-L*N-GAH
SAE-6	NFCC-L*N-GAI
SAE-8	NFCC-L*N-GAJ



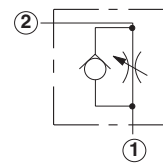
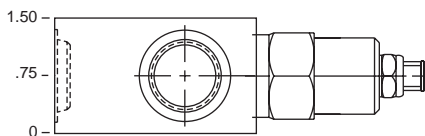
Ports 1 and 2	Assembly Model Code*
1/4" NPTF	NCCB-L*N-GAA
3/8" NPTF	NCCB-L*N-GAB
SAE-4	NCCB-L*N-GAH
SAE-6	NCCB-L*N-GAI
SAE-8	NCCB-L*N-GAJ

*Add modifier /S to order Ductile Iron for pressure rating over 3000 psi.

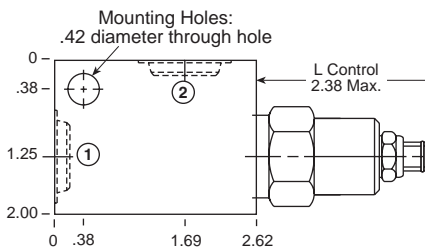
*Add modifier /S to order Ductile Iron for pressure rating over 3000 psi.



0-.25 in. Cavity T-5A



Ports 1 and 2	Assembly Model Code*
1/4" NPTF	NFDC-L*N-DAA
3/8" NPTF	NFDC-L*N-DAB
1/2" NPTF	NFDC-L*N-DAC
SAE-4	NFDC-L*N-DAI
SAE-6	NFDC-L*N-DAJ
SAE-8	NFDC-L*N-DAK



Ports 1 and 2	Assembly Model Code*
1/4" NPTF	NCEB-L*N-DAA
3/8" NPTF	NCEB-L*N-DAB
1/2" NPTF	NCEB-L*N-DAC
SAE-4	NCEB-L*N-DAI
SAE-6	NCEB-L*N-DAJ
SAE-8	NCEB-L*N-DAK

*Add modifier /S to order Ductile Iron for pressure rating over 3000 psi.

*Add modifier /S to order Ductile Iron for pressure rating over 3000 psi.

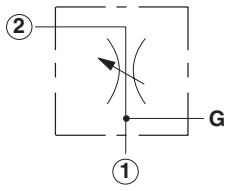
NOTES: Page 110 for cartridge models NF*C-*** and NC*B-*** shows performance curves, technical tips, and options. See page vii for technical information about line mount bodies including SAE flange pattern specifications. Consult your local Sun Distributor or the Sun Web Site for other port sizes available in the bodies shown above. Model Codes printed in red are Preferred Products and are readily available.

TWO PORT FLOW CONTROL APPLICATIONS (90 DEGREE BODIES)

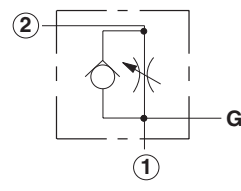
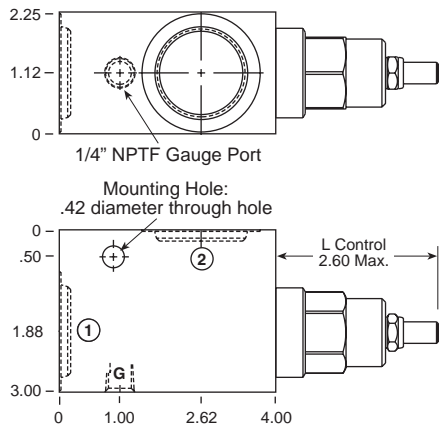
FULLY ADJUSTABLE

Go to www.sunhydraulics.com for more product information and pricing.

FULLY ADJUSTABLE WITH REVERSE FREE FLOW CHECK



0-.38 in. Cavity T-16A



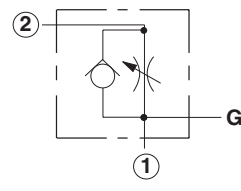
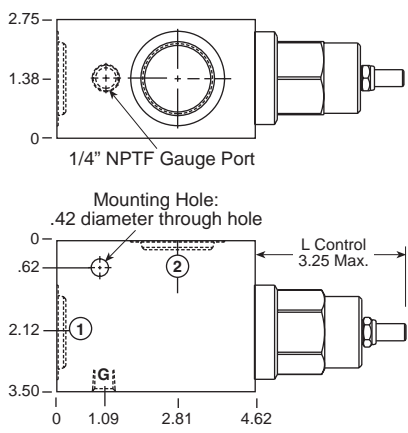
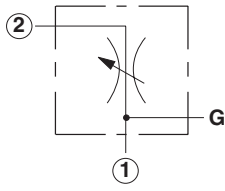
Ports 1 and 2	Assembly Model Code*
3/4" NPTF	NFEC-L*N-IAD
1" NPTF	NFEC-L*N-IAE
1 1/4" NPTF	NFEC-L*N-IAF
SAE-12	NFEC-L*N-IAL
SAE-16	NFEC-L*N-IAM

Ports 1 and 2	Assembly Model Code*
3/4" NPTF	NCFB-L*N-IAD
1" NPTF	NCFB-L*N-IAE
1 1/4" NPTF	NCFB-L*N-IAF
SAE-12	NCFB-L*N-IAL
SAE-16	NCFB-L*N-IAM

*Add modifier /S to order Ductile Iron for pressure rating over 3000 psi.

*Add modifier /S to order Ductile Iron for pressure rating over 3000 psi.

0-.56 in. Cavity T-18A



Ports 1 and 2	Assembly Model Code*
3/4" NPTF	NFFC-L*N-LAD
1" NPTF	NFFC-L*N-LAE
1 1/4" NPTF	NFFC-L*N-LAF
SAE-12	NFFC-L*N-LAL
SAE-16	NFFC-L*N-LAM

Ports 1 and 2	Assembly Model Code*
3/4" NPTF	NCGB-L*N-LAD
1" NPTF	NCGB-L*N-LAE
1 1/4" NPTF	NCGB-L*N-LAF
SAE-12	NCGB-L*N-LAL
SAE-16	NCGB-L*N-LAM

*Add modifier /S to order Ductile Iron for pressure rating over 3000 psi.

*Add modifier /S to order Ductile Iron for pressure rating over 3000 psi.

NOTES: Page 110 for cartridge models NF*C-*** and NC*B-*** shows performance curves, technical tips, and options. See page vii for technical information about line mount bodies including SAE flange pattern specifications. Consult your local Sun Distributor or the Sun Web Site for other port sizes available in the bodies shown above. Model Codes printed in red are Preferred Products and are readily available.



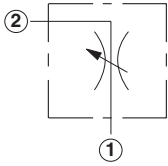
Line Mounted Assemblies

TWO PORT FLOW CONTROL APPLICATIONS (INLINE BODIES)

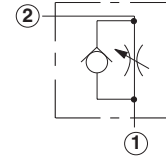
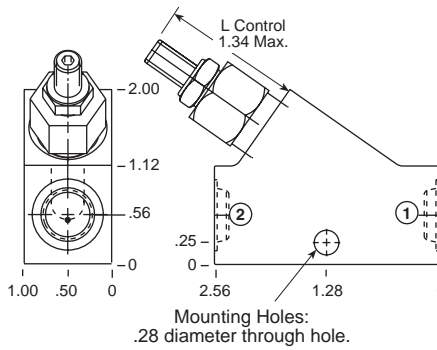
FULLY ADJUSTABLE NEEDLE

Go to www.sunhydraulics.com
for more product information and pricing.

FULLY ADJUSTABLE NEEDLE WITH REVERSE FREE FLOW CHECK



0-.16 in. Cavity T-162A

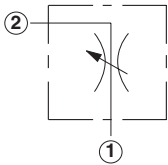


Ports 1 and 2	Assembly Model Code*
1/4" NPTF	NFBC-L*N-ACA
3/8" NPTF	NFBC-L*N-ACB
SAE-4	NFBC-L*N-ACH
SAE-6	NFBC-L*N-ACI

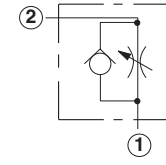
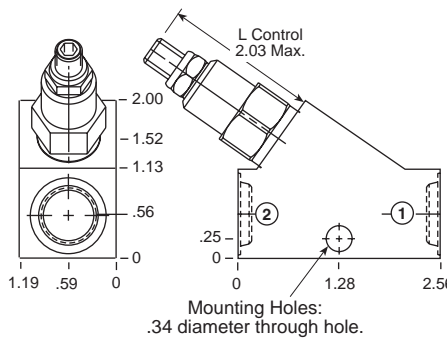
Ports 1 and 2	Assembly Model Code*
1/4" NPTF	NCBB-L*N-ACA
3/8" NPTF	NCBB-L*N-ACB
SAE-4	NCBB-L*N-ACH
SAE-6	NCBB-L*N-ACI

*Add modifier **/S** to order Ductile Iron for pressure rating over 3000 psi.

*Add modifier **/S** to order Ductile Iron for pressure rating over 3000 psi.



0-.19 in. Cavity T-13A

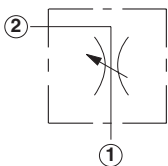


Ports 1 and 2	Assembly Model Code*
1/4" NPTF	NFCC-L*N-GCA
3/8" NPTF	NFCC-L*N-GCB
SAE-4	NFCC-L*N-GCH
SAE-6	NFCC-L*N-GCI
SAE-8	NFCC-L*N-GCJ

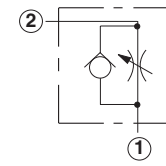
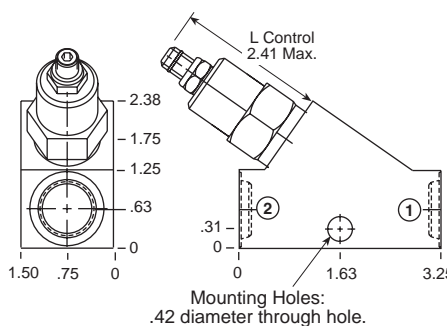
Ports 1 and 2	Assembly Model Code*
1/4" NPTF	NCCB-L*N-GCA
3/8" NPTF	NCCB-L*N-GCB
SAE-4	NCCB-L*N-GCH
SAE-6	NCCB-L*N-GCI
SAE-8	NCCB-L*N-GCJ

*Add modifier **/S** to order Ductile Iron for pressure rating over 3000 psi.

*Add modifier **/S** to order Ductile Iron for pressure rating over 3000 psi.



0-.25 in. Cavity T-5A



Ports 1 and 2	Assembly Model Code*
3/8" NPTF	NFDC-L*N-DCB
1/2" NPTF	NFDC-L*N-DCC
SAE-6	NFDC-L*N-DCI
SAE-8	NFDC-L*N-DCJ
SAE-10	NFDC-L*N-DCK

Ports 1 and 2	Assembly Model Code*
3/8" NPTF	NCEB-L*N-DCB
1/2" NPTF	NCEB-L*N-DCC
SAE-6	NCEB-L*N-DCI
SAE-8	NCEB-L*N-DCJ
SAE-10	NCEB-L*N-DCK

*Add modifier **/S** to order Ductile Iron for pressure rating over 3000 psi.

*Add modifier **/S** to order Ductile Iron for pressure rating over 3000 psi.

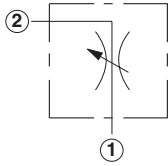
NOTES: Page 110 for cartridge models NF*C-*** and NC*B-*** shows performance curves, technical tips, and options. See page vii for technical information about line mount bodies including SAE flange pattern specifications. Consult your local Sun Distributor or the Sun Web Site for other port sizes available in the bodies shown above. Model Codes printed in red are Preferred Products and are readily available.

**TWO PORT FLOW CONTROL APPLICATIONS
(INLINE/INLINE 1.50"/2.00" SAE C61 FLANGE PORT BODIES)**

FULLY ADJUSTABLE NEEDLE

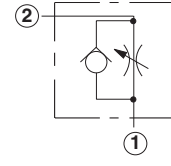
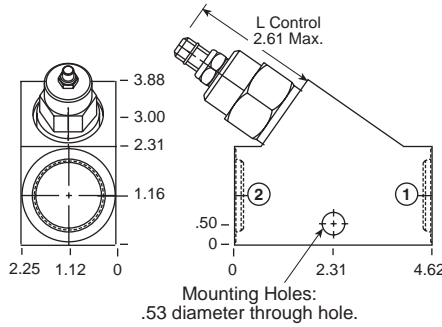
Go to www.sunhydraulics.com for more product information and pricing.

FULLY ADJUSTABLE NEEDLE WITH REVERSE FREE FLOW CHECK



Ports 1 and 2	Assembly Model Code*
3/4" NPTF	NFEC-L*N-ICD
1" NPTF	NFEC-L*N-ICE
1 1/4" NPTF	NFEC-L*N-ICF
SAE-12	NFEC-L*N-ICL
SAE-16	NFEC-L*N-ICM

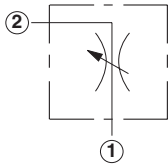
0-.38 in. Cavity T-16A



Ports 1 and 2	Assembly Model Code*
3/4" NPTF	NCFB-L*N-ICD
1" NPTF	NCFB-L*N-ICE
1 1/4" NPTF	NCFB-L*N-ICF
SAE-12	NCFB-L*N-ICL
SAE-16	NCFB-L*N-ICM

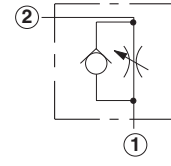
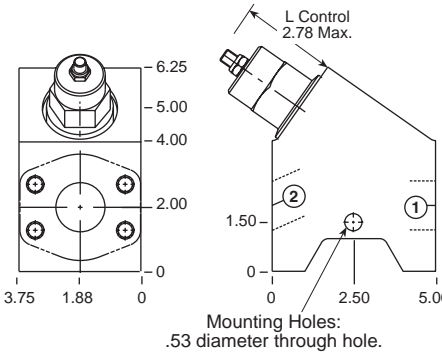
*Add modifier /S to order Ductile Iron for pressure rating over 3000 psi.

*Add modifier /S to order Ductile Iron for pressure rating over 3000 psi.



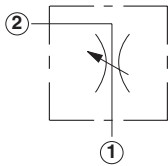
Ports 1 and 2	Assembly Model Code*
1 1/2" SAE C61	NFFC-L*N-ZLS

0-.56 in. Cavity T-18A



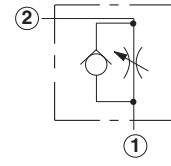
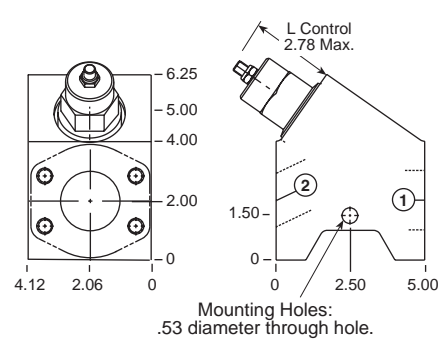
Ports 1 and 2	Assembly Model Code*
1 1/2" SAE C61	NCGB-L*N-ZLS

*Add modifier /S to order Ductile Iron for pressure rating over 3000 psi.



Ports 1 and 2	Assembly Model Code*
2" SAE C61	NFFC-L*N-ZLR

0-.56 in. Cavity T-18A



Ports 1 and 2	Assembly Model Code*
2" SAE C61	NCGB-L*N-ZLR

*Add modifier /S to order Ductile Iron for pressure rating over 3000 psi.

NOTES: Page 110 for cartridge models NF*C-*** and NC*B-*** shows performance curves, technical tips, and options. See page vii for technical information about line mount bodies including SAE flange pattern specifications. Consult your local Sun Distributor or the Sun Web Site for other port sizes available in the bodies shown above. **Model Codes printed in red are Preferred Products and are readily available.**

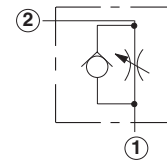
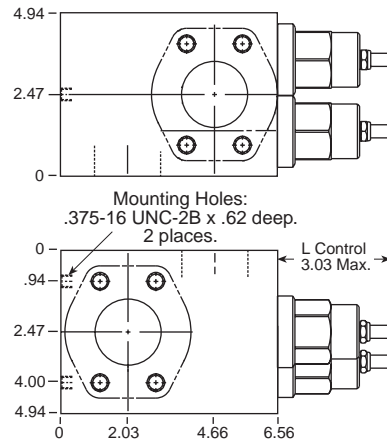
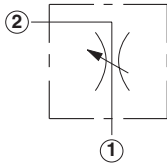
Line Mounted Assemblies

TWO PORT FLOW CONTROL APPLICATIONS (2.00" SAE C61/C62 FLANGE PORT BODIES, 2 PORT CAVITY IN PARALLEL)

FULLY ADJUSTABLE NEEDLE

Go to www.sunhydraulics.com
for more product information and pricing.FULLY ADJUSTABLE NEEDLE WITH
REVERSE FREE FLOW CHECK

0-1.10 in. Cavity T-18A

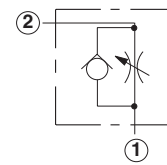
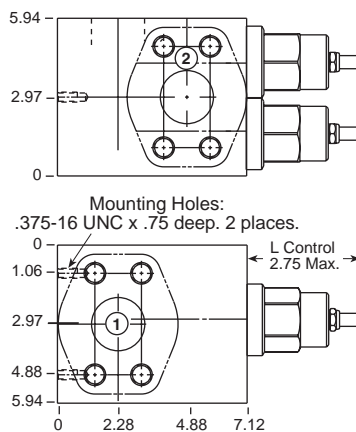
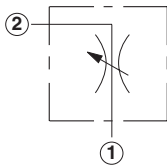


Ports 1 and 2	Assembly Model Code*
2" SAE C61	NFFC-L*N-XZY

Ports 1 and 2	Assembly Model Code*
2" SAE C61	NCGB-L*N-XZY

*Add modifier /S to order Ductile Iron for pressure rating over 3000 psi.

0-1.10 in. Cavity T-18A



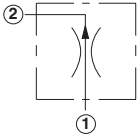
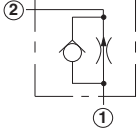
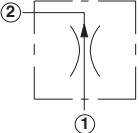
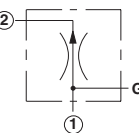
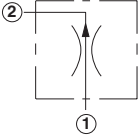
Ports 1 and 2	Assembly Model Code*
2" SAE C62	NFFC-L*N-VTN

Ports 1 and 2	Assembly Model Code*
2" SAE C62	NCGB-L*N-VTN

*Add modifier /S to order Ductile Iron for pressure rating over 3000 psi.

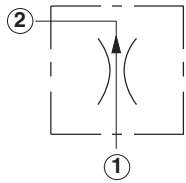
NOTES: Page 110 for cartridge models NF*C-*** and NC*B-*** shows performance curves, technical tips, and options.
See page vii for technical information about line mount bodies including SAE flange pattern specifications.
Consult your local Sun Distributor or the Sun Web Site for other port sizes available in the bodies shown above.

Fixed Orifice Pressure Compensated Flow Control Assemblies

	<i>Cartridge Type</i>	<i>Page</i>
	Fixed Orifice, Pressure Compensated	118
	Fixed Orifice, Pressure Compensated with Free Flow Check	118
<i>Line Mounted Assemblies (Body Type)</i>		
	90 Degree	120
	90 Degree with Gauge Port	121
	Inline Inline/Inline 1.50"/2.00" SAE C61 Flange Port 2.00" SAE C61/ C62 Flange Port, 2 Port Cavity in Parallel	122 123 124

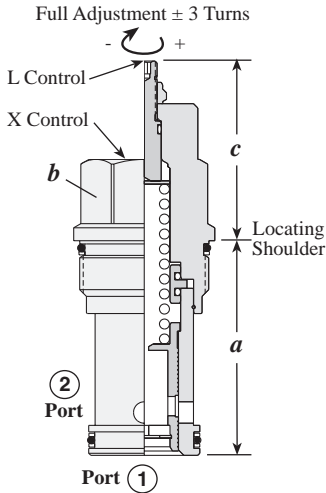
Flow Control Valves

FIXED ORIFICE, PRESSURE COMPENSATED



Capacity	Typical Cartridge Model Code	Cavity	Cartridge Dimensions					Installation Torque (lb. ft.)
			a	b	c			
					X	L	K	
.1-3 GPM	FXBA - LAN	T - 162A	1.22	3/4"	.82	2.11	2.25	25/30
.1-6.0 GPM	FXCA - LAN	T - 13A	1.38	7/8"	.75	2.00	2.25	30/35
.1-12.0 GPM	FXDA - LAN	T - 5A	1.62	1 1/8"	.69	2.12	2.38	45/50
.2-25 GPM	FXEA - LAN	T - 16A	2.44	1 1/4"	.97	2.44	2.69	150/160
.2-50 GPM	FXFA - LAN	T - 18A	3.13	1 5/8"	1.19	2.81	3.06	350/375

OPTION ORDERING INFORMATION



FX * A - * A *

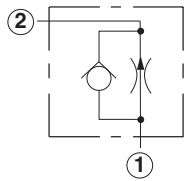
Nominal Capacity	Control**	Adjustment Range	Seal
B .1-3 GPM	X Non-adjustable Factory set at customer specified flow	A Fixed Orifice	N Buna-N
C .1-6.0 GPM		L Tuning Adjustment ±25% of customer specified flow	V Viton
D .1-12.0 GPM		K Handknob for L control	
E .2-25 GPM			
F .2-50 GPM			

Customer must specify flow

Flow Ranges by Frame Size:
 FXBA: .1 - 3 GPM
 FXCA: .1 - 6.0 GPM
 FXDA: .1 - 12.0 GPM
 FXEA: .2 - 25 GPM
 FXFA: .2 - 50 GPM

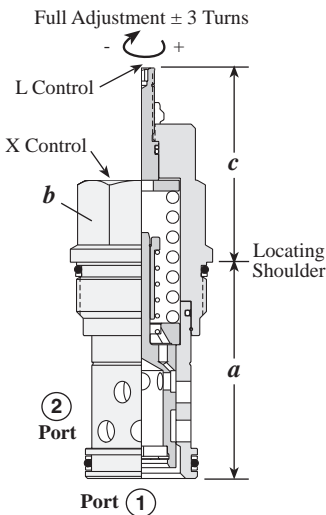
** See page 244 for information on Control Options

FIXED ORIFICE, PRESSURE COMPENSATED WITH FREE FLOW CHECK



Capacity	Typical Cartridge Model Code	Cavity	Cartridge Dimensions					Installation Torque (lb. ft.)
			a	b	c			
					X	L	K	
.1-3 GPM	FCBB - LAN	T - 162A	1.22	3/4"	.82	2.11	2.55	25/30
.1-6.0 GPM	FCCB - LAN	T - 13A	1.38	7/8"	.75	2.00	2.25	30/35
.1-12.0 GPM	FCDB - LAN	T - 5A	1.62	1 1/8"	.69	2.12	2.38	45/50
.2-25 GPM	FCEB - LAN	T - 16A	2.44	1 1/4"	.97	2.44	2.69	150/160
.2-50 GPM	FCFB - LAN	T - 18A	3.13	1 5/8"	1.19	2.81	3.06	350/375

OPTION ORDERING INFORMATION



FC * B - * A *

Nominal Capacity	Control**	Adjustment Range	Seal
B .1-3 GPM	X Non-adjustable Factory set at customer specified flow	A Fixed Orifice	N Buna-N
C .1-6.0 GPM		L Tuning Adjustment ±25% of customer specified flow	V Viton
D .1-12.0 GPM		K Handknob for L control	
E .2-25 GPM			
F .2-50 GPM			

Customer must specify flow

Flow Ranges by Frame Size:
 FCBB: .1 - 3 GPM
 FCCB: .1 - 6.0 GPM
 FCDB: .1 - 12.0 GPM
 FCEB: .2 - 25 GPM
 FCFB: .2 - 50 GPM

** See page 244 for information on Control Options

TECHNICAL TIPS / PERFORMANCE CURVES

Flow Control Valves, Fixed Orifice, Pressure Compensated

Applications

These pressure-compensated cartridges provide precise flow regulation for meter-in and meter-out applications. They also offer accurate control in bleed-off circuits where the load pressure and inlet flow are relatively constant.

NOTE: Accurate pressure-compensated control requires a 195 psi minimum pressure differential be maintained across the valve

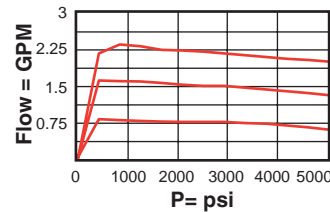
Design Concepts and Features

- Minimum flow change over widely varying load pressure changes (less than $\pm 5\%$ over 4500 psi load change).
- Selectable fixed orifice size (flow capacity 0.1 to 50 GPM, dependent on frame size).
- Tunable control option to provide $\pm 25\%$ variation of the nominal factory set flow.

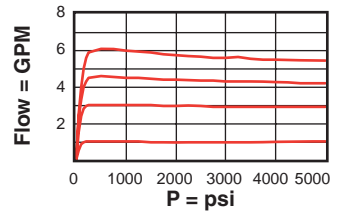
Performance Curves

Typical Performance

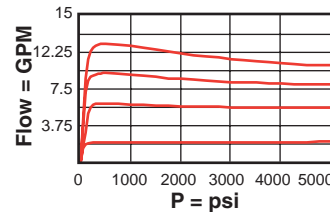
FXBA-*A*



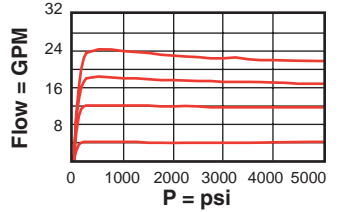
FXCA-*A*



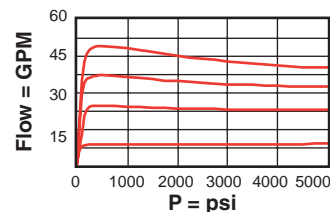
FXDA-*A*



FXEA-*A*



FXFA-*A*



Flow Control Valves, Fixed Orifice, Pressure Compensated with Free Flow Check

Applications

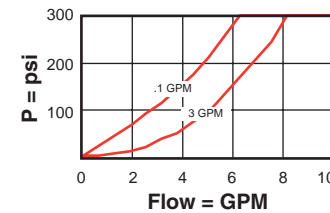
The performance parameters of the FC*B pressure compensated flow control with free flow check are identical to the FX*A, but with the addition of a high capacity free flow check.

Note: Accurate pressure-compensated control requires a 195 psi minimum pressure differential be maintained across the valve

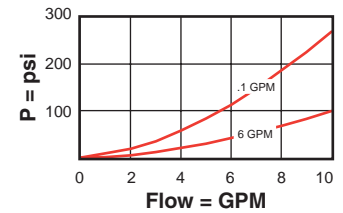
Performance Curves

Reverse Free Flow Pressure Drop

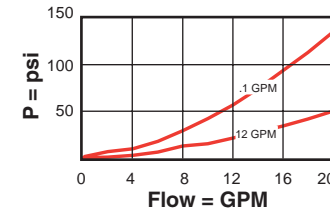
FCBB-*A*



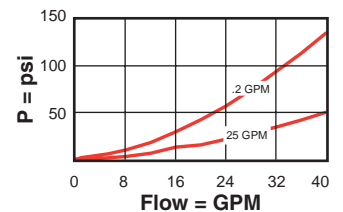
FCCB-*A*



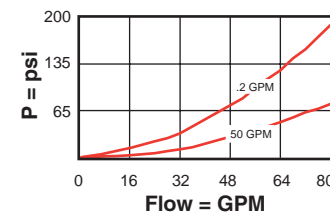
FCDB-*A*



FCEB-*A*



FCFB-*A*



General Application Requirements

- Operating Temperature Range: Buna-N seals -50° F to 200° F, Viton seals 0° F to 250° F.
- Viscosity Range: 60-3000 SUS.
- Fluid Contamination Level: ISO 4406 18/15 or better; Recommend $\beta_{10} \geq 75$ to achieve ISO 18/15 or better in most systems.
- Factory Pressure Setting for cartridge is established at a 4 GPM flow rate.

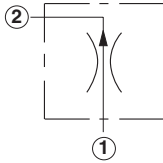
Line Mounted Assemblies

TWO PORT FLOW CONTROL APPLICATIONS (90 DEGREE BODIES)

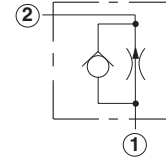
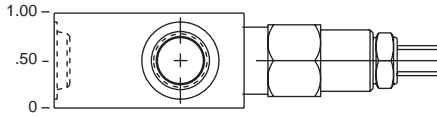
FIXED ORIFICE

Go to www.sunhydraulics.com
for more product information and pricing.

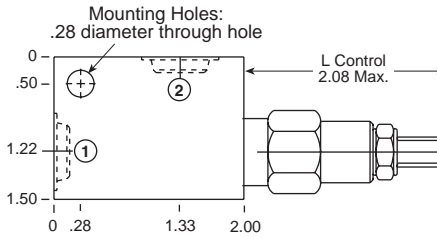
FIXED ORIFICE WITH REVERSE FREE FLOW CHECK



.1-3 GPM Cavity T-162A



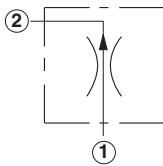
Ports 1 and 2	Assembly Model Code*
1/4" NPTF	FXBA-LAN-AAA
3/8" NPTF	FXBA-LAN-AAB
SAE-4	FXBA-LAN-AAH
SAE-6	FXBA-LAN-AAI



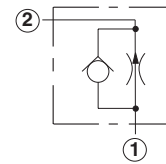
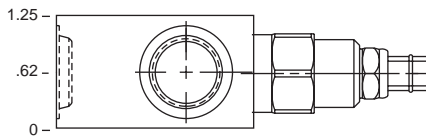
Ports 1 and 2	Assembly Model Code*
1/4" NPTF	FCBB-LAN-AAA
3/8" NPTF	FCBB-LAN-AAB
SAE-4	FCBB-LAN-AAH
SAE-6	FCBB-LAN-AAI

*Add modifier **/S** to order Ductile Iron for pressure rating over 3000 psi.

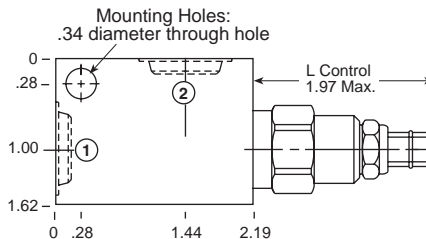
*Add modifier **/S** to order Ductile Iron for pressure rating over 3000 psi.



.1-6.0 GPM Cavity T-13A



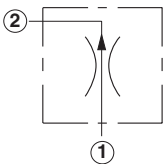
Ports 1 and 2	Assembly Model Code*
1/4" NPTF	FXCA-LAN-GAA
3/8" NPTF	FXCA-LAN-GAB
SAE-4	FXCA-LAN-GAH
SAE-6	FXCA-LAN-GAI
SAE-8	FXCA-LAN-GAJ



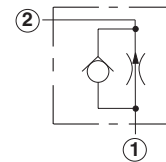
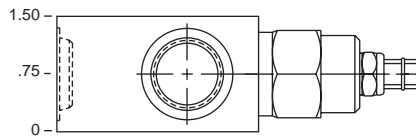
Ports 1 and 2	Assembly Model Code*
1/4" NPTF	FCCB-LAN-GAA
3/8" NPTF	FCCB-LAN-GAB
SAE-4	FCCB-LAN-GAH
SAE-6	FCCB-LAN-GAI
SAE-8	FCCB-LAN-GAJ

*Add modifier **/S** to order Ductile Iron for pressure rating over 3000 psi.

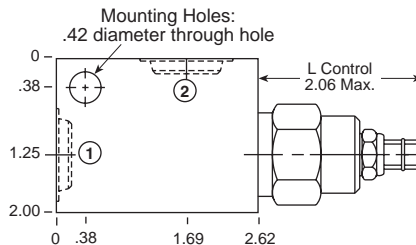
*Add modifier **/S** to order Ductile Iron for pressure rating over 3000 psi.



.1-12.0 GPM Cavity T-5A



Ports 1 and 2	Assembly Model Code*
1/4" NPTF	FXDA-LAN-DAA
3/8" NPTF	FXDA-LAN-DAB
1/2" NPTF	FXDA-LAN-DAC
SAE-4	FXDA-LAN-DAI
SAE-6	FXDA-LAN-DAJ
SAE-8	FXDA-LAN-DAK



Ports 1 and 2	Assembly Model Code*
1/4" NPTF	FCDB-LAN-DAA
3/8" NPTF	FCDB-LAN-DAB
1/2" NPTF	FCDB-LAN-DAC
SAE-4	FCDB-LAN-DAI
SAE-6	FCDB-LAN-DAJ
SAE-8	FCDB-LAN-DAK

*Add modifier **/S** to order Ductile Iron for pressure rating over 3000 psi.

*Add modifier **/S** to order Ductile Iron for pressure rating over 3000 psi.

NOTES: Page 118 for cartridge models FX*A-*** and FC*B-*** shows performance curves, technical tips, and options. See page vii for technical information about line mount bodies including SAE flange pattern specifications. Consult your local Sun Distributor or the Sun Web Site for other port sizes available in the bodies shown above. Model Codes printed in red are Preferred Products and are readily available.

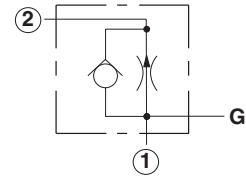
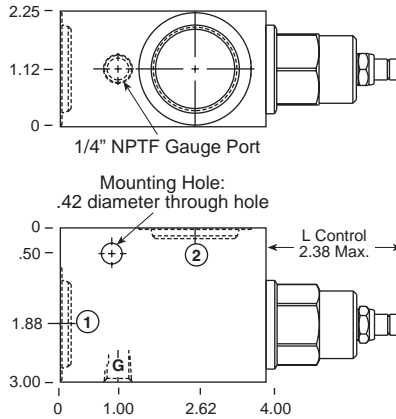
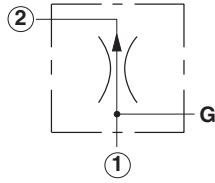
**TWO PORT FLOW CONTROL APPLICATIONS
(90 DEGREE BODIES)**

FIXED ORIFICE

Go to www.sunhydraulics.com for more product information and pricing.

FIXED ORIFICE WITH REVERSE FREE FLOW CHECK

.2-25 GPM Cavity T-16A



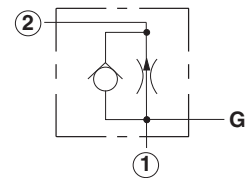
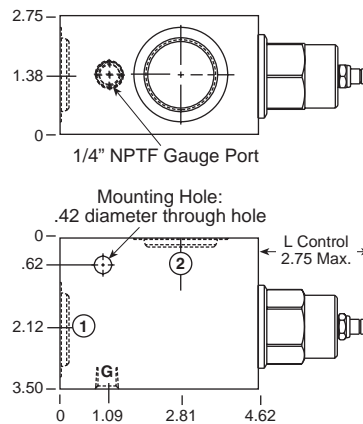
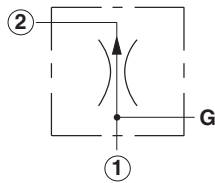
Ports 1 and 2	Assembly Model Code*
3/4" NPTF	FXEA-LAN-IAD
1" NPTF	FXEA-LAN-IAE
1 1/4" NPTF	FXEA-LAN-IAF
SAE-12	FXEA-LAN-IAL
SAE-16	FXEA-LAN-IAM

Ports 1 and 2	Assembly Model Code*
3/4" NPTF	FCEB-LAN-IAD
1" NPTF	FCEB-LAN-IAE
1 1/4" NPTF	FCEB-LAN-IAF
SAE-12	FCEB-LAN-IAL
SAE-16	FCEB-LAN-IAM

*Add modifier /S to order Ductile Iron for pressure rating over 3000 psi.

*Add modifier /S to order Ductile Iron for pressure rating over 3000 psi.

.2-50 GPM Cavity T-18A



Ports 1 and 2	Assembly Model Code*
3/4" NPTF	FXFA-LAN-LAD
1" NPTF	FXFA-LAN-LAE
1 1/4" NPTF	FXFA-LAN-LAF
SAE-12	FXFA-LAN-LAL
SAE-16	FXFA-LAN-LAM

Ports 1 and 2	Assembly Model Code*
3/4" NPTF	FCFB-LAN-LAD
1" NPTF	FCFB-LAN-LAE
1 1/4" NPTF	FCFB-LAN-LAF
SAE-12	FCFB-LAN-LAL
SAE-16	FCFB-LAN-LAM

*Add modifier /S to order Ductile Iron for pressure rating over 3000 psi.

*Add modifier /S to order Ductile Iron for pressure rating over 3000 psi.

NOTES: Page 118 for cartridge models FX*A-*** and FC*B-*** shows performance curves, technical tips, and options. See page vii for technical information about line mount bodies including SAE flange pattern specifications. Consult your local Sun Distributor or the Sun Web Site for other port sizes available in the bodies shown above. Model Codes printed in red are Preferred Products and are readily available.

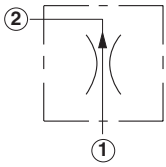
Line Mounted Assemblies

TWO PORT FLOW CONTROL APPLICATIONS (INLINE BODIES)

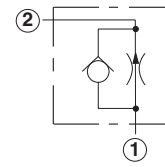
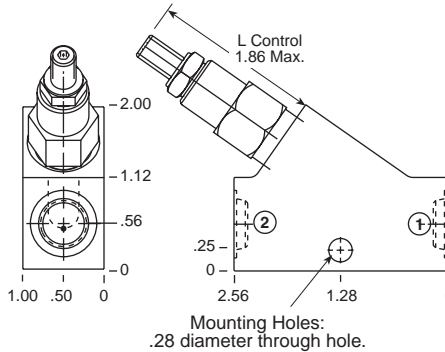
FIXED ORIFICE

Go to www.sunhydraulics.com
for more product information and pricing.

FIXED ORIFICE WITH REVERSE FREE FLOW CHECK



.1-3 GPM Cavity T-162A

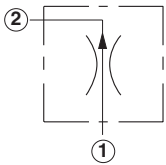


Ports 1 and 2	Assembly Model Code*
1/4" NPTF	FXBA-LAN-ACA
3/8" NPTF	FXBA-LAN-ACB
SAE-4	FXBA-LAN-ACH
SAE-6	FXBA-LAN-ACI

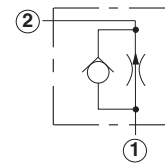
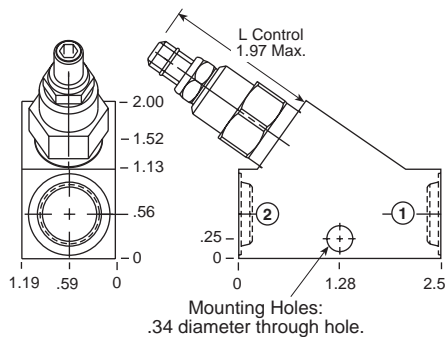
Ports 1 and 2	Assembly Model Code*
1/4" NPTF	FCBB-LAN-ACA
3/8" NPTF	FCBB-LAN-ACB
SAE-4	FCBB-LAN-ACH
SAE-6	FCBB-LAN-ACI

*Add modifier /S to order Ductile Iron for pressure rating over 3000 psi.

*Add modifier /S to order Ductile Iron for pressure rating over 3000 psi.



.1-6.0 GPM Cavity T-13A

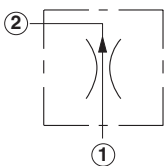


Ports 1 and 2	Assembly Model Code*
1/4" NPTF	FXCA-LAN-GCA
3/8" NPTF	FXCA-LAN-GCB
SAE-4	FXCA-LAN-GCH
SAE-6	FXCA-LAN-GCI
SAE-8	FXCA-LAN-GCJ

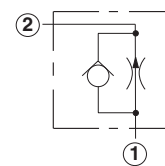
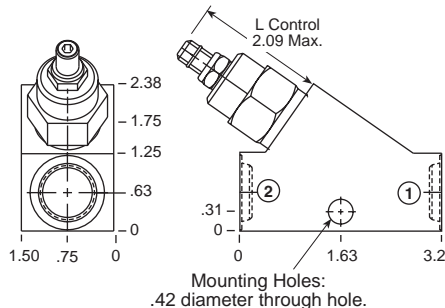
Ports 1 and 2	Assembly Model Code*
1/4" NPTF	FCCB-LAN-GCA
3/8" NPTF	FCCB-LAN-GCB
SAE-4	FCCB-LAN-GCH
SAE-6	FCCB-LAN-GCI
SAE-8	FCCB-LAN-GCJ

*Add modifier /S to order Ductile Iron for pressure rating over 3000 psi.

*Add modifier /S to order Ductile Iron for pressure rating over 3000 psi.



.1-12.0 GPM Cavity T-5A



Ports 1 and 2	Assembly Model Code*
3/8" NPTF	FXDA-LAN-DCB
1/2" NPTF	FXDA-LAN-DCC
SAE-6	FXDA-LAN-DCI
SAE-8	FXDA-LAN-DCJ
SAE-10	FXDA-LAN-DCK

Ports 1 and 2	Assembly Model Code*
3/8" NPTF	FCDB-LAN-DCB
1/2" NPTF	FCDB-LAN-DCC
SAE-6	FCDB-LAN-DCI
SAE-8	FCDB-LAN-DCJ
SAE-10	FCDB-LAN-DCK

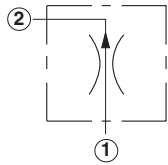
*Add modifier /S to order Ductile Iron for pressure rating over 3000 psi.

*Add modifier /S to order Ductile Iron for pressure rating over 3000 psi.

NOTES: Page 118 for cartridge models FX*A-*** and FC*B-*** shows performance curves, technical tips, and options. See page vii for technical information about line mount bodies including SAE flange pattern specifications. Consult your local Sun Distributor or the Sun Web Site for other port sizes available in the bodies shown above. Model Codes printed in red are Preferred Products and are readily available.

**TWO PORT FLOW CONTROL APPLICATIONS
(INLINE/INLINE 1.50"/2.00" SAE C61 FLANGE PORT BODIES)**

FIXED ORIFICE

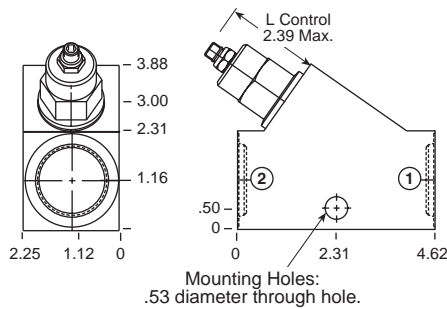


Ports 1 and 2	Assembly Model Code*
3/4" NPTF	FXEA-LAN-ICD
1" NPTF	FXEA-LAN-ICE
1 1/4" NPTF	FXEA-LAN-ICF
SAE-12	FXEA-LAN-ICL
SAE-16	FXEA-LAN-ICM

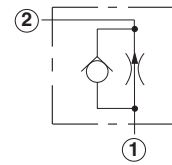
*Add modifier /S to order Ductile Iron for pressure rating over 3000 psi.

Go to www.sunhydraulics.com for more product information and pricing.

.2-25 GPM Cavity T-16A



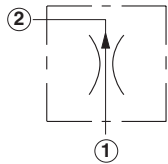
FIXED ORIFICE WITH REVERSE FREE FLOW CHECK



Ports 1 and 2	Assembly Model Code*
3/4" NPTF	FCEB-LAN-ICD
1" NPTF	FCEB-LAN-ICE
1 1/4" NPTF	FCEB-LAN-ICF
SAE-12	FCEB-LAN-ICL
SAE-16	FCEB-LAN-ICM

*Add modifier /S to order Ductile Iron for pressure rating over 3000 psi.

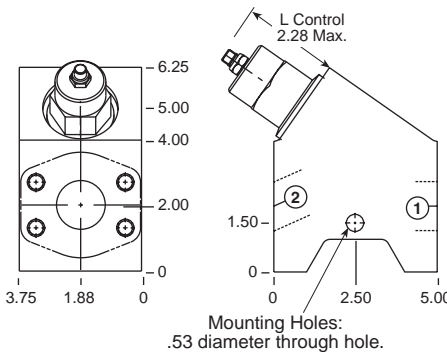
.2-50 GPM Cavity T-18A



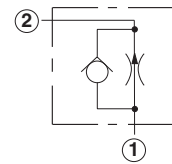
Ports 1 and 2	Assembly Model Code*
1 1/2" SAE C61	FXFA-LAN-ZLS

*Add modifier /S to order Ductile Iron for pressure rating over 3000 psi.

.2-50 GPM Cavity T-18A



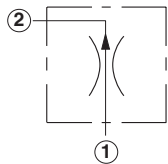
.2-50 GPM Cavity T-18A



Ports 1 and 2	Assembly Model Code*
1 1/2" SAE C61	FCFB-LAN-ZLS

*Add modifier /S to order Ductile Iron for pressure rating over 3000 psi.

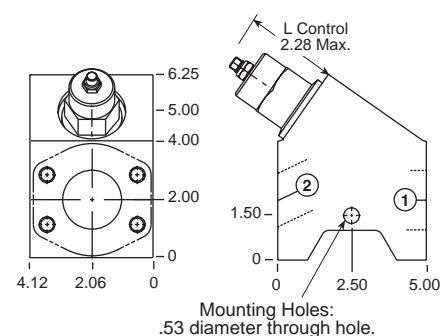
.2-50 GPM Cavity T-18A



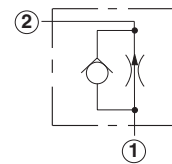
Ports 1 and 2	Assembly Model Code*
2" SAE C61	FXFA-LAN-ZLR

*Add modifier /S to order Ductile Iron for pressure rating over 3000 psi.

.2-50 GPM Cavity T-18A



.2-50 GPM Cavity T-18A



Ports 1 and 2	Assembly Model Code*
2" SAE C61	FCFB-LAN-ZLR

*Add modifier /S to order Ductile Iron for pressure rating over 3000 psi.

NOTES: Page 118 for cartridge models FX*A-*** and FC*B-*** shows performance curves, technical tips, and options. See page vii for technical information about line mount bodies including SAE flange pattern specifications. Consult your local Sun Distributor or the Sun Web Site for other port sizes available in the bodies shown above. **Model Codes printed in red are Preferred Products and are readily available.**

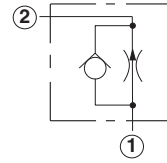
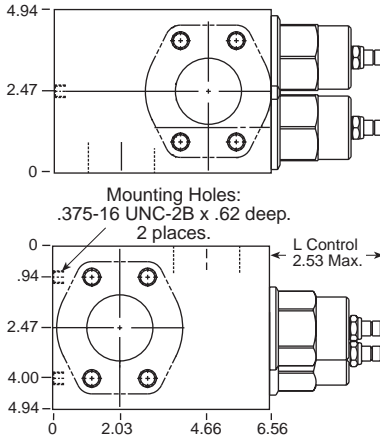
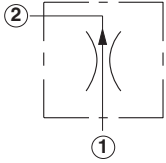
Line Mounted Assemblies

**TWO PORT FLOW CONTROL APPLICATIONS
(2.00" SAE C61/C62 FLANGE PORT BODIES, 2 PORT CAVITY IN PARALLEL)**

FIXED ORIFICE

Go to www.sunhydraulics.com for more product information and pricing.

.2-100 GPM Cavity T-18A

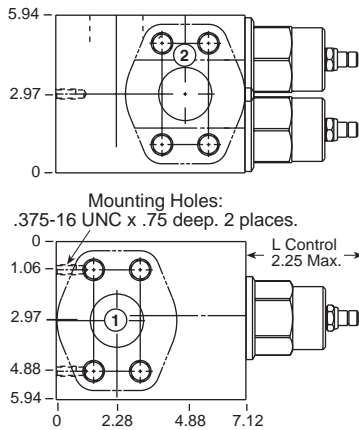
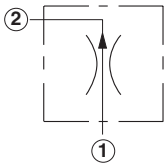


Ports 1 and 2	Assembly Model Code*
2" SAE C61	FXFA-LAN-XZY

Ports 1 and 2	Assembly Model Code*
2" SAE C61	FCFB-LAN-XZY

*Add modifier **/S** to order Ductile Iron for pressure rating over 3000 psi.

.2-100 GPM Cavity T-18A

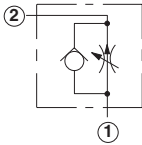
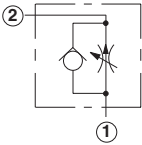
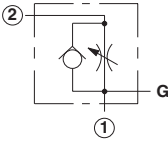
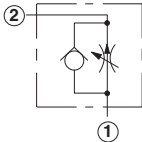


Ports 1 and 2	Assembly Model Code*
2" SAE C62	FXFA-LAN-VTN

*Add modifier **/S** to order Ductile Iron for pressure rating over 3000 psi.

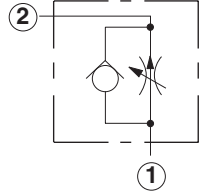
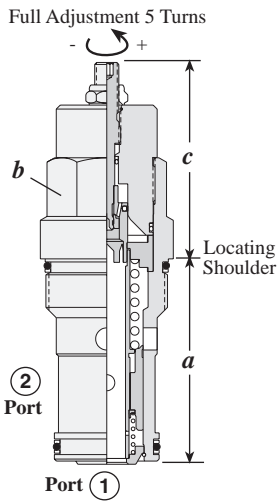
NOTES: Page 118 for cartridge models FX*A-*** and FC*B-*** shows performance curves, technical tips, and options. See page vii for technical information about line mount bodies including SAE flange pattern specifications. Consult your local Sun Distributor or the Sun Web Site for other port sizes available in the bodies shown above.

Fully Adjustable Pressure Compensated Flow Control Assemblies

	<i>Cartridge Type</i>	<i>Page</i>
	Fully Adjustable Pressure Compensated with Free Flow Check	126
<i>Line Mounted Assemblies (Body Type)</i>		
	90 Degree	128
	90 Degree with Gauge Port	129
	Inline Inline/Inline 1.50"/2.00" SAE C61 Flange Port 2.00" SAE C61/C62 Flange Port, 2 Port Cavities	130 131 132

Flow Control Valves

FULLY ADJUSTABLE PRESSURE COMPENSATED WITH FREE FLOW CHECK



Capacity	Typical Cartridge Model Code	Cavity	Cartridge Dimensions					Installation Torque (lb. ft.)
			a	b	c			
					L	H	K	
.1-6 GPM	FDDB - LAN	T - 13A	1.38	7/8"	2.27	2.44	2.31	30/35
.1-12 GPM	FDCB - LAN	T - 5A	1.62	1 1/8"	2.35	2.82	2.73	45/50
.2-25 GPM	FDEA - LAN	T - 16A	2.44	1 1/4"	2.66	3.06	2.91	150/160
.2-50 GPM	FDFA - LAN	T - 18A	3.13	1 5/8"	3.31	3.50	3.47	350/375

OPTION ORDERING INFORMATION

FD ** - ** A **		Seal
Nominal Capacity	Control**	Adjustment Range
BA .1-6 GPM	L Standard Screw	FDDB A .1 - 6 GPM
CB .1-12 GPM	H Calibrated Handknob with Detent Lock	FDCB A .1 - 12 GPM
EA .2-25 GPM	K Handknob	FDEA A .1 - 25 GPM
FA .2-50 GPM		FDFA A .1 - 50 GPM
		N Buna-N V Viton

** See page 244 for information on Control Options

TECHNICAL TIPS / PERFORMANCE CURVES

Flow Control Valves, Fully Adjustable, Pressure Compensated with Free Flow Check

Applications

The fully adjustable pressure compensated flow control (FD** series) is similar in function to the (FC*B) fixed orifice model with check. However, the FD** series offers full adjustment over the entire flow range of the cartridge.

Design Concepts and Features

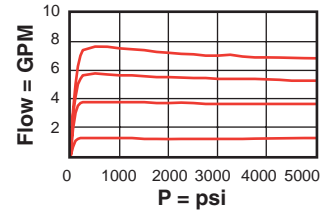
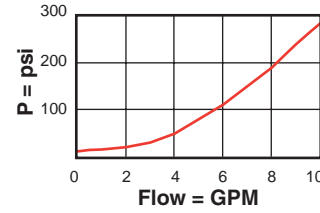
- Sharp edge orifice design to minimize flow variation with viscosity change.
- Five turns of adjustment with low operating effort at high pressure.
- Optional needle ranges to provide different flow capacity. See page 110.
- Leakage at shutoff:
 - FDBA and FDCB 0.08 GPM
 - FDEA and FDFA 0.1 GPM
- Optional adjustment control options are as follows:
 - Standard screw adjustment
 - Handknob with locking ring
 - Calibrated handknob with detent lock

Performance Curves

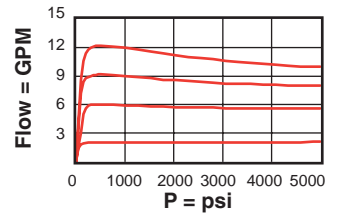
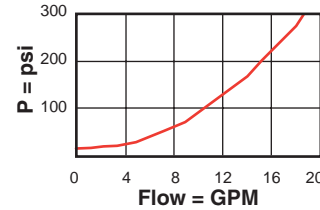
Reverse Free Flow with Needle Closed

Typical Performance

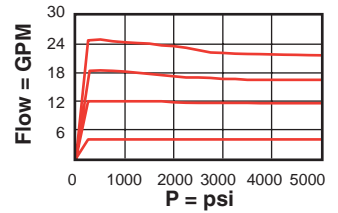
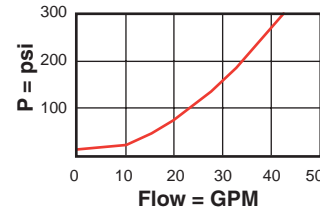
FDBA-LAN



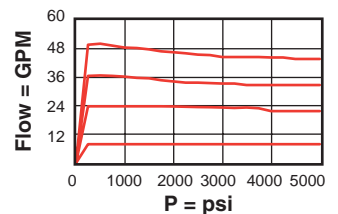
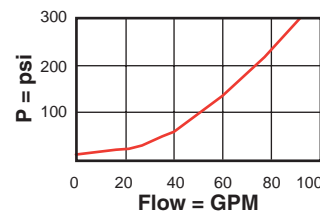
FDCB-LAN



FDEA-LAN



FDFA-LAN



General Application Requirements

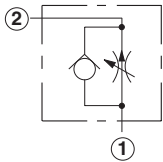
- Operating Temperature Range: Buna-N seals -50° F to 200° F, Viton seals 0° F to 250° F.
- Viscosity Range: 60-3000 SUS.
- Fluid Contamination Level: ISO 4406 18/15 or better; Recommend $\beta_{10} \geq 75$ to achieve ISO 18/15 or better in most systems.
- Factory Pressure Setting for cartridge is established at a 4 GPM flow rate.

Line Mounted Assemblies

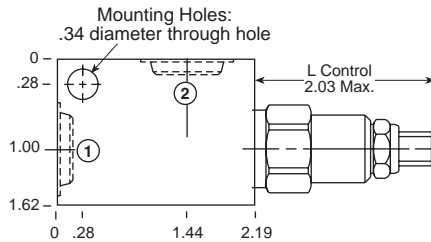
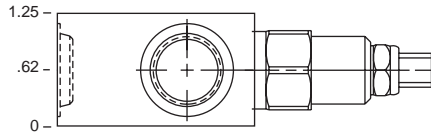
TWO PORT FLOW CONTROL APPLICATIONS (90 DEGREE BODIES)

**FULLY ADJUSTABLE WITH
REVERSE FREE FLOW CHECK**

Go to www.sunhydraulics.com
for more product information and pricing.

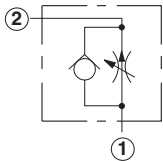


.1-6.0 GPM Cavity T-13A

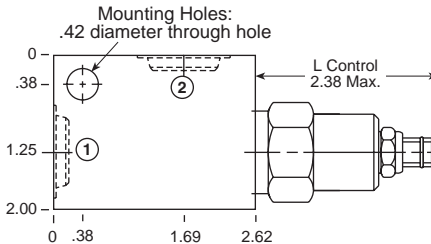
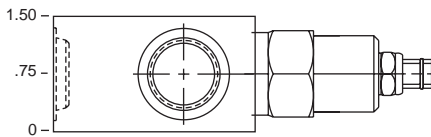


Ports 1 and 2	Assembly Model Code*
1/4" NPTF	FDBA-LAN-GAA
3/8" NPTF	FDBA-LAN-GAB
SAE-4	FDBA-LAN-GAH
SAE-6	FDBA-LAN-GAI
SAE-8	FDBA-LAN-GAJ

*Add modifier /S to order Ductile Iron for pressure rating over 3000 psi.

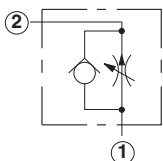


.1-12.0 GPM Cavity T-5A

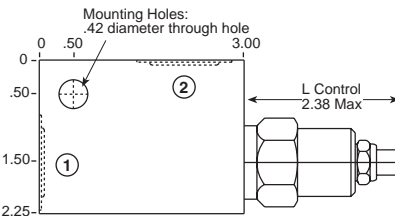
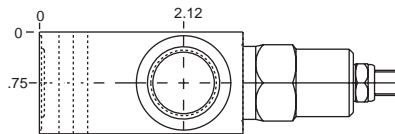


Ports 1 and 2	Assembly Model Code*
1/4" NPTF	FDCB-LAN-DAA
3/8" NPTF	FDCB-LAN-DAB
1/2" NPTF	FDCB-LAN-DAC
SAE-6	FDCB-LAN-DAI
SAE-8	FDCB-LAN-DAJ
SAE-10	FDCB-LAN-DAK

*Add modifier /S to order Ductile Iron for pressure rating over 3000 psi.



.0-12.0 GPM Cavity T-5A



Ports 1 and 2	Assembly Model Code*
3/4 NPTF	FDCB-LAN-DAD

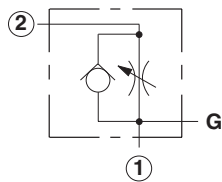
*Add modifier /S to order Ductile Iron for pressure rating over 3000 psi.

NOTES: Page 126 for cartridge model FD**-* shows performance curves, technical tips, and options.
See page vii for technical information about line mount bodies including SAE flange pattern specifications.
Consult your local Sun Distributor or the Sun Web Site for other port sizes available in the bodies shown above.
Model Codes printed in red are Preferred Products and are readily available.

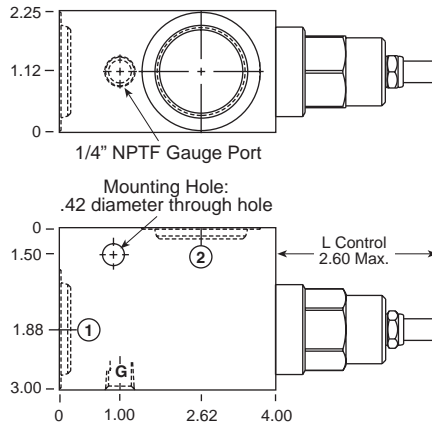
**TWO PORT FLOW CONTROL APPLICATIONS
(90 DEGREE BODIES)**

FULLY ADJUSTABLE WITH REVERSE FREE FLOW CHECK

Go to www.sunhydraulics.com for more product information and pricing.

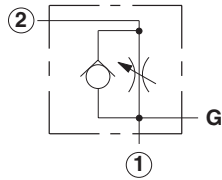


.2-25 GPM Cavity T-16A

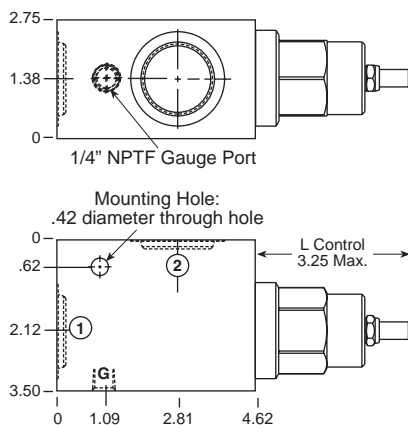


Ports 1 and 2	Assembly Model Code*
3/4" NPTF	FDEA-LAN-IAD
1" NPTF	FDEA-LAN-IAE
1 1/4" NPTF	FDEA-LAN-IAF
SAE-12	FDEA-LAN-IAL
SAE-16	FDEA-LAN-IAM

*Add modifier /S to order Ductile Iron for pressure rating over 3000 psi.



.2-50 GPM Cavity T-18A



Ports 1 and 2	Assembly Model Code*
3/4" NPTF	FDFA-LAN-LAD
1" NPTF	FDFA-LAN-LAE
1 1/4" NPTF	FDFA-LAN-LAF
SAE-12	FDFA-LAN-LAL
SAE-16	FDFA-LAN-LAM

*Add modifier /S to order Ductile Iron for pressure rating over 3000 psi.

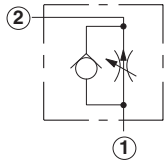
NOTES: Page 126 for cartridge model FD**-* shows performance curves, technical tips, and options.
See page vii for technical information about line mount bodies including SAE flange pattern specifications.
Consult your local Sun Distributor or the Sun Web Site for other port sizes available in the bodies shown above.
Model Codes printed in red are Preferred Products and are readily available.

Line Mounted Assemblies

TWO PORT FLOW CONTROL APPLICATIONS (INLINE BODIES)

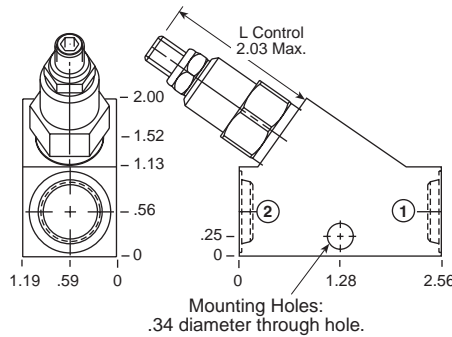
**FULLY ADJUSTABLE WITH
REVERSE FREE FLOW CHECK**

Go to www.sunhydraulics.com
for more product information and pricing.

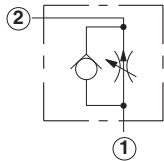


.1-6.0 GPM Cavity T-13A

Ports 1 and 2	Assembly Model Code*
1/4" NPTF	FDBA-LAN-GCA
3/8" NPTF	FDBA-LAN-GCB
SAE-4	FDBA-LAN-GCH
SAE-6	FDBA-LAN-GCI
SAE-8	FDBA-LAN-GCJ

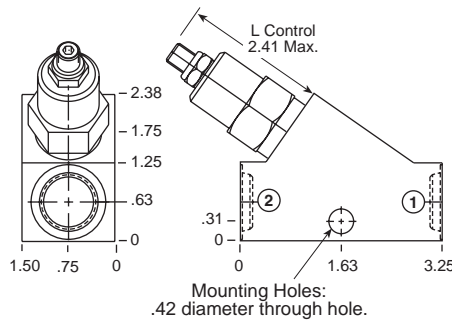


*Add modifier /S to order Ductile Iron for pressure rating over 3000 psi.



.1-12.0 GPM Cavity T-5A

Ports 1 and 2	Assembly Model Code*
3/8" NPTF	FDCB-LAN-DCB
1/2" NPTF	FDCB-LAN-DCC
SAE-6	FDCB-LAN-DCI
SAE-8	FDCB-LAN-DCJ
SAE-10	FDCB-LAN-DCK



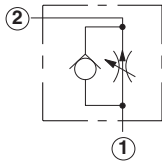
*Add modifier /S to order Ductile Iron for pressure rating over 3000 psi.

NOTES: Page 126 for cartridge model FD**-*** shows performance curves, technical tips, and options.
See page vii for technical information about line mount bodies including SAE flange pattern specifications.
Consult your local Sun Distributor or the Sun Web Site for other port sizes available in the bodies shown above.
Model Codes printed in red are Preferred Products and are readily available.

**TWO PORT FLOW CONTROL APPLICATIONS
(INLINE/INLINE 1.50"/2.00" SAE C61 FLANGE PORT BODIES)**

FULLY ADJUSTABLE WITH REVERSE FREE FLOW CHECK

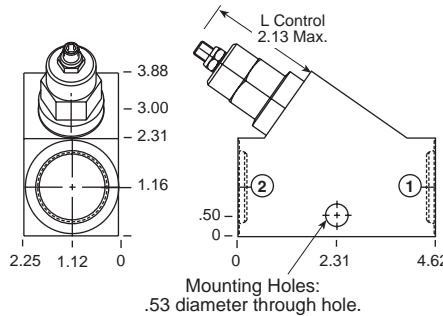
Go to www.sunhydraulics.com for more product information and pricing.



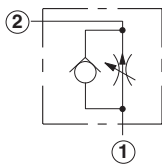
.2-25 GPM

Cavity T-16A

Ports 1 and 2	Assembly Model Code*
3/4" NPTF	FDEA-LAN-ICD
1" NPTF	FDEA-LAN-ICE
1 1/4" NPTF	FDEA-LAN-ICF
SAE-12	FDEA-LAN-ICL
SAE-16	FDEA-LAN-ICM



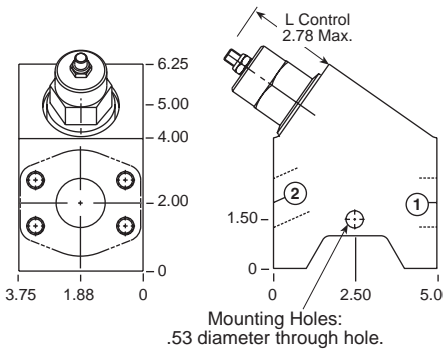
*Add modifier **/S** to order Ductile Iron for pressure rating over 3000 psi.



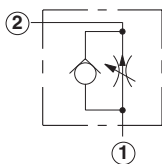
.2-50 GPM

Cavity T-18A

Ports 1 and 2	Assembly Model Code*
1 1/2" SAE C61	FDFA-LAN-ZLS



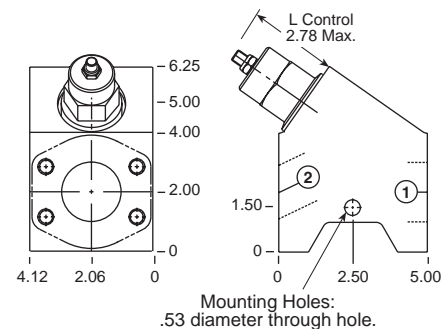
*Add modifier **/S** to order Ductile Iron for pressure rating over 3000 psi.



.2-50 GPM

Cavity T-18A

Ports 1 and 2	Assembly Model Code*
2" SAE C61	FDFA-LAN-ZLR



*Add modifier **/S** to order Ductile Iron for pressure rating over 3000 psi.

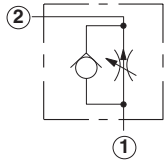
NOTES: Page 126 for cartridge model FD**-*** shows performance curves, technical tips, and options.
See page vii for technical information about line mount bodies including SAE flange pattern specifications.
Consult your local Sun Distributor or the Sun Web Site for other port sizes available in the bodies shown above.
Model Codes printed in red are Preferred Products and are readily available.

Line Mounted Assemblies

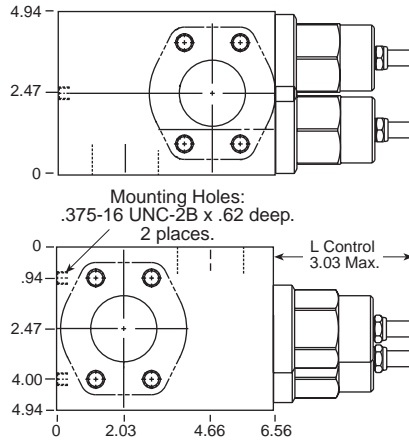
TWO PORT FLOW CONTROL APPLICATIONS (2.00" SAE C61/C62 FLANGE PORT BODIES, 2 CAVITIES)

**FULLY ADJUSTABLE WITH
REVERSE FREE FLOW CHECK**

Go to www.sunhydraulics.com
for more product information and pricing.

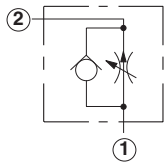


.5-105 GPM Cavity T-18A

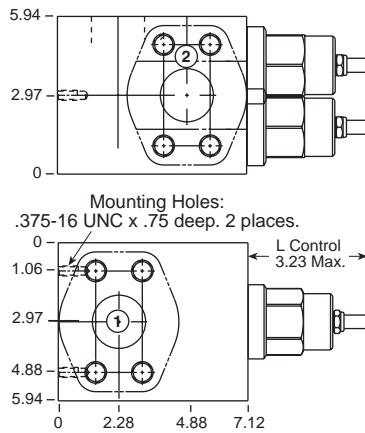


Ports 1 and 2	Assembly Model Code*
2" SAE C61	FDFA-LAN-XZY

*Add modifier **/S** to order Ductile Iron for pressure rating over 3000 psi.



.5-105 GPM Cavity T-18A

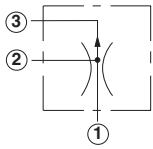
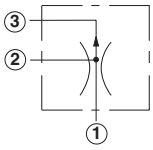
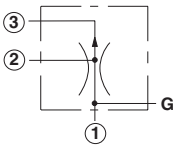
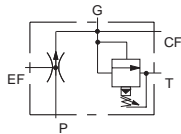


Ports 1 and 2	Assembly Model Code*
2" SAE C62	FDFA-LAN-VTN

*Add modifier **/S** to order Ductile Iron for pressure rating over 3000 psi.

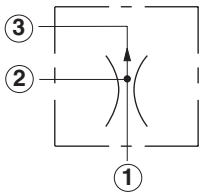
NOTES: Page 126 for cartridge models model FD**-*** shows performance curves, technical tips, and options.
See page vii for technical information about line mount bodies including SAE flange pattern specifications.
Consult your local Sun Distributor or the Sun Web Site for other port sizes available in the bodies shown above.

Fixed Orifice Priority Flow Control Assemblies

	<i>Cartridge Type</i>	<i>Page</i>
	Bypass/Restrictive, Fixed Orifice	134
<i>Line Mounted Assemblies (Body Type)</i>		
	90 Degree High Capacity Port 3	136
	90 Degree High Capacity with Gauge Port	137
	Relief on Controlled Port	138

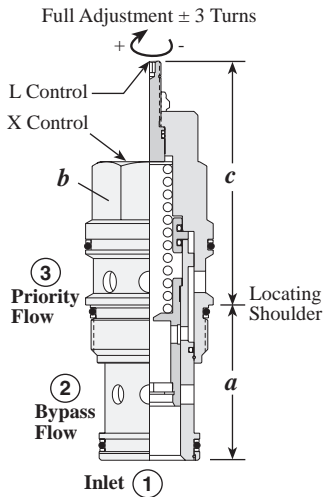
Priority Flow Control Valves

BYPASS / RESTRICTIVE, FIXED ORIFICE



Capacity	Typical Cartridge Model Code	Cavity	Cartridge Dimensions					Installation Torque (lb. ft.)
			a	b	c			
					X	L	K	
.1-3 GPM	FRBA - LAN	T - 163A	1.22	3/4"	1.25	2.55	2.77	25/30
.1-6.0 GPM	FRCA - LAN	T - 11A	1.38	7/8"	1.19	2.50	2.75	30/35
.1-12.0 GPM	FRDA - LAN	T - 2A	1.38	1 1/8"	1.38	2.81	3.06	45/50
.2-25 GPM	FREA - LAN	T - 17A	1.81	1 1/4"	1.81	3.28	3.53	150/160
.2-50 GPM	FRFA - LAN	T - 19A	2.50	1 5/8"	2.75	3.94	4.19	350/375

OPTION ORDERING INFORMATION



FR * A - * A *

<p>Nominal Capacity</p> <p>B .1-3 GPM</p> <p>C .1-6.0 GPM</p> <p>D .1-12.0 GPM</p> <p>E .2-25 GPM</p> <p>F .2-50 GPM</p>	<p>Control**</p> <p>X Non-adjustable Factory set at customer specified flow</p> <p>L Tuning Adjustment ±25% of customer specified flow</p> <p>K Handknob for L control</p>	<p>Adjustment Range</p> <p>A Fixed Orifice</p> <p>N Buna-N</p> <p>V Viton</p>	<p>Seal</p>
--	---	---	--------------------

Customer must specify flow

Maximum Inlet Flow:
 FRBA: 7.5 GPM
 FRCA: 15 GPM
 FRDA: 30 GPM
 FREA: 60 GPM
 FRFA: 120 GPM

Priority Flow ranges:
 FRBA: .1 - 3 GPM
 FRCA: .1 - 6.0 GPM
 FRDA: .1 - 12.0 GPM
 FREA: .2 - 25 GPM
 FRFA: .2 - 50 GPM

** See page 244 for information on Control Options

TECHNICAL TIPS / PERFORMANCE CURVES

Priority Flow Control Valves, Fixed Orifice, Bypass / Restrictive

Applications

These combination priority and bypass flow control valves may be used to establish the flow to the priority or controlled flow circuit, and either bypass the remaining flow to tank at the load induced pressure of the system or use it in a secondary system.

Application Notes

- Valve will not bypass unless priority flow is satisfied.
- Bypass pressure may exceed priority pressure.
- Blocking the controlled flow path will also block the bypass flow path.**

Note factory set point conditions.

Design Concepts and Features

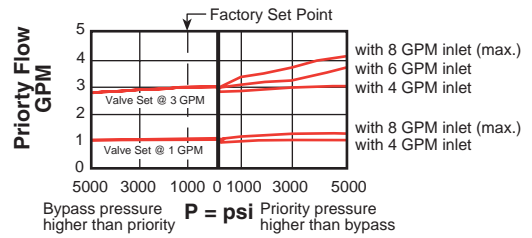
- Customer specified, fixed orifice for priority flow. (Flow setting accuracy $\pm 10\%$.)
- Tunable control option to provide $\pm 25\%$ variation of the customer specified flow at factory preset conditions.

Note: Tunable adjustment range follows performance curve profile.

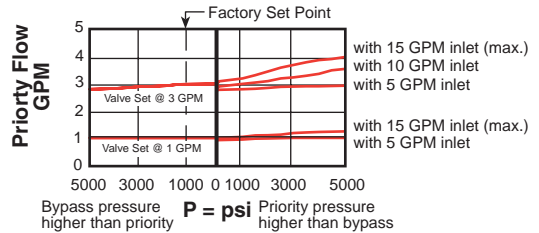
Performance Curves

Typical Performance

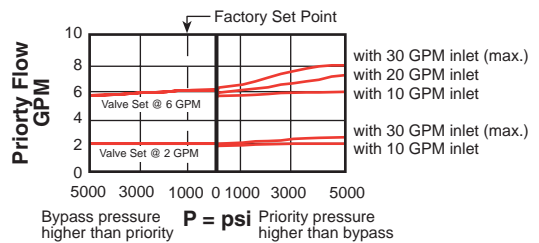
FRBA-LAN



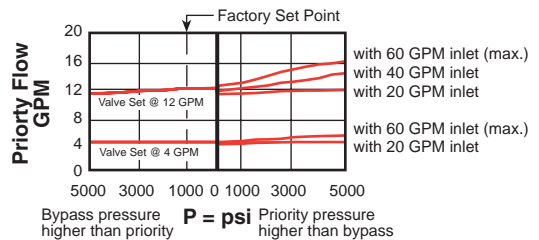
FRCA-LAN



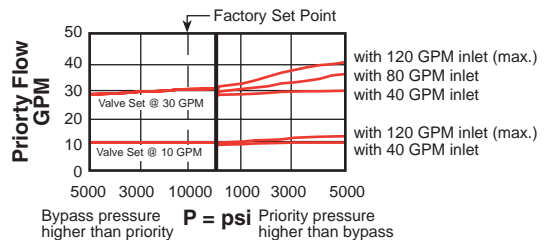
FRDA-LAN



FRFA-LAN



FRFA-LAN



General Application Requirements

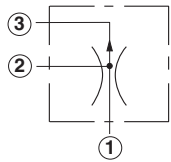
- Operating Temperature Range: Buna-N seals -50°F to 200°F , Viton seals 0°F to 250°F .
- Viscosity Range: 60-3000 SUS.
- Fluid Contamination Level: ISO 4406 18/15 or better; Recommend $\beta_{10} \geq 75$ to achieve ISO 18/15 or better in most systems.

Line Mounted Assemblies

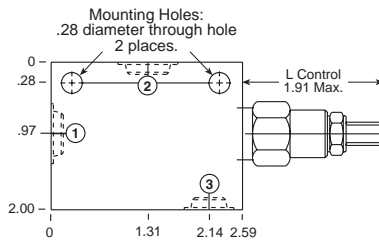
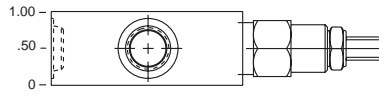
THREE PORT PRIORITY FLOW CONTROL APPLICATIONS
(90 DEGREE HIGH CAPACITY PORT 3 BODIES)

BYPASS / RESTRICTIVE
FIXED ORIFICE

Go to www.sunhydraulics.com
for more product information and pricing.

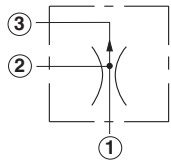


.1-3 GPM Cavity T-163A

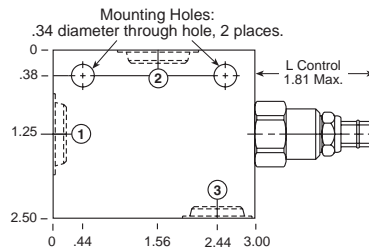
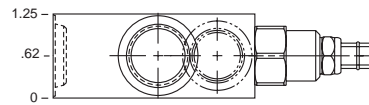


Ports 1 and 2	Port 3	Assembly Model Code*
1/4" NPTF	1/4" NPTF	FRBA-LAN-JCA
3/8" NPTF	1/4" NPTF	FRBA-LAN-JCB
SAE-4	SAE-4	FRBA-LAN-JCH
SAE-6	SAE-4	FRBA-LAN-JCI

*Add modifier /S to order Ductile Iron for pressure rating over 3000 psi.

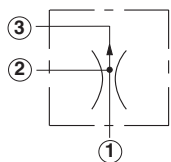


.1-6.0 GPM Cavity T-11A

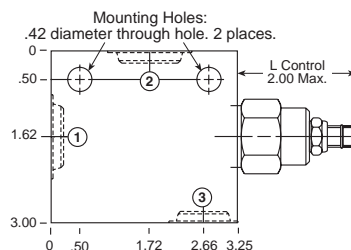
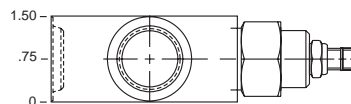


Ports 1 and 2	Port 3	Assembly Model Code*
3/8" NPTF	3/8" NPTF	FRCA-LAN-EAB
1/2" NPTF	3/8" NPTF	FRCA-LAN-EAC
SAE-8	SAE-8	FRCA-LAN-EAJ
SAE-10	SAE-8	FRCA-LAN-EAK

*Add modifier /S to order Ductile Iron for pressure rating over 3000 psi.



.1-12.0 GPM Cavity T-2A



Ports 1 and 2	Port 3	Assembly Model Code*
3/8" NPTF	3/8" NPTF	FRDA-LAN-BAB
1/2" NPTF	1/2" NPTF	FRDA-LAN-BAC
3/4" NPTF	1/2" NPTF	FRDA-LAN-BAD
SAE-8	SAE-8	FRDA-LAN-BAJ
SAE-10	SAE-10	FRDA-LAN-BAK
SAE-12	SAE-10	FRDA-LAN-BAL

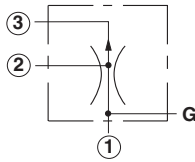
*Add modifier /S to order Ductile Iron for pressure rating over 3000 psi.

NOTES: Page 134 for cartridge model FR*A-*** shows performance curves, technical tips, and options.
See page vii for technical information about line mount bodies including SAE flange pattern specifications.
Consult your local Sun Distributor or the Sun Web Site for other port sizes available in the bodies shown above.
Model Codes printed in red are Preferred Products and are readily available.

THREE PORT PRIORITY FLOW CONTROL APPLICATIONS (90 DEGREE, HIGH CAPACITY PORT 3 BODIES)

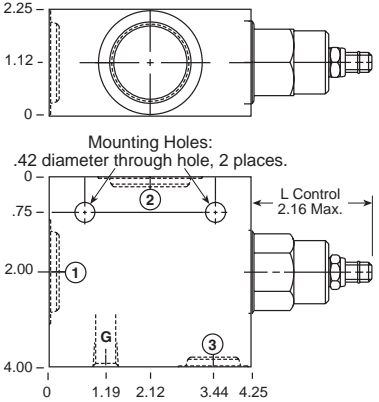
**BYPASS / RESTRICTIVE
FIXED ORIFICE**

Go to www.sunhydraulics.com
for more product information and pricing.



.2-25 GPM Cavity T-17A

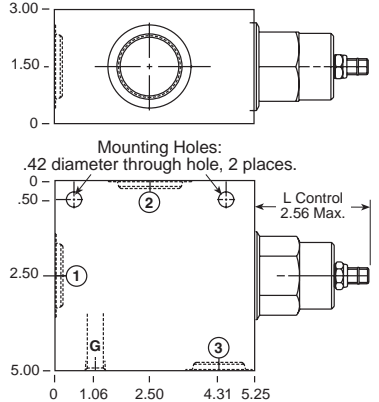
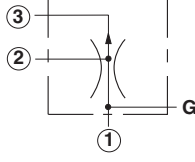
Ports 1 and 2	Port 3	Assembly Model Code*
3/4" NPTF	3/4" NPTF	FREA-LAN-HED
1" NPTF	3/4" NPTF	FREA-LAN-HEE
1 1/4" NPTF	3/4" NPTF	FREA-LAN-HEF
SAE-12	SAE-12	FREA-LAN-HEL
SAE-16	SAE-12	FREA-LAN-HEM



*Add modifier /S to order Ductile Iron for pressure rating over 3000 psi.

.2-50 GPM Cavity T-19A

Ports 1 and 2	Port 3	Assembly Model Code*
1" NPTF	1" NPTF	FRFA-LAN-KEE
1 1/4" NPTF	1" NPTF	FRFA-LAN-KEF
SAE-20	SAE-16	FRFA-LAN-KEN



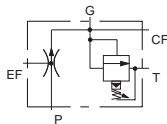
*Add modifier /S to order Ductile Iron for pressure rating over 3000 psi.

NOTES: Page 134 for cartridge model FR*A-*** shows performance curves, technical tips, and options.
See page vii for technical information about line mount bodies including SAE flange pattern specifications.
Consult your local Sun Distributor or the Sun Web Site for other port sizes available in the bodies shown above.
Model Codes printed in red are Preferred Products and are readily available.

Line Mounted Assemblies

THREE PORT PRESSURE-COMPENSATED PRIORITY FLOW CONTROL APPLICATIONS (RELIEF ON CONTROLLED PORT BODIES)

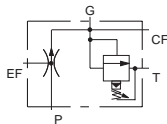
UP TO 6.5 GPM PRIORITY FLOW



Ports (EF) Excess Flow & (P) Pump	Ports (CF) Control Flow & (T) Tank	Assembly Model Code*
1/4" NPTF	1/4" NPTF	YRDR-LAN-LA
3/8" NPTF	3/8" NPTF	YRDR-LAN-LB
1/2" NPTF	3/8" NPTF	YRDR-LAN-LC
SAE-6	SAE-6	YRDR-LAN-LI
SAE-8	SAE-8	YRDR-LAN-LJ
SAE-10	SAE-8	YRDR-LAN-LK

*Add modifier /S to order Ductile Iron for pressure rating over 3000 psi.

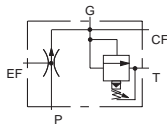
UP TO 12.5 GPM PRIORITY FLOW



Ports (EF) Excess Flow & (P) Pump	Ports (CF) Control Flow & (T) Tank	Assembly Model Code*
1/2" NPTF	1/2" NPTF	YREM-LAN-LC
3/4" NPTF	1/2" NPTF	YREM-LAN-LD
SAE-10	SAE-10	YREM-LAN-LK
SAE-12	SAE-10	YREM-LAN-LL

*Add modifier /S to order Ductile Iron for pressure rating over 3000 psi.

UP TO 25 GPM PRIORITY FLOW

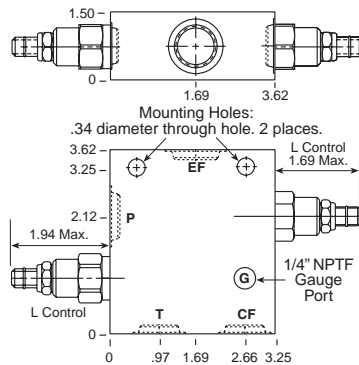


Ports (EF) Excess Flow & (P) Pump	Ports (CF) Control Flow & (T) Tank	Assembly Model Code*
3/4" NPTF	3/4" NPTF	YRFF-LAN-LD
1" NPTF	3/4" NPTF	YRFF-LAN-LE
1 1/4" NPTF	3/4" NPTF	YRFF-LAN-LF
SAE-12	SAE-12	YRFF-LAN-LL
SAE-16	SAE-12	YRFF-LAN-LM

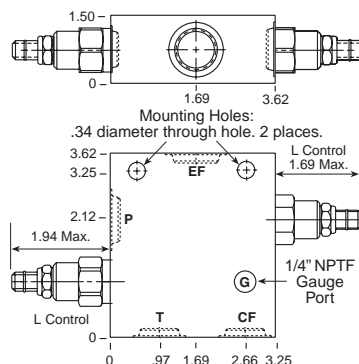
*Add modifier /S to order Ductile Iron for pressure rating over 3000 psi.

Go to www.sunhydraulics.com for more product information and pricing.

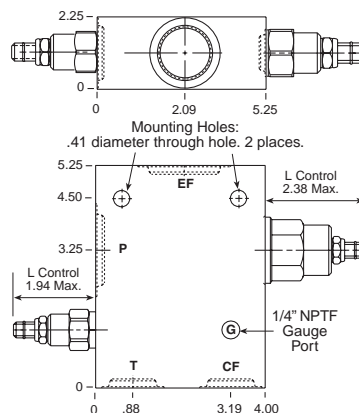
.1-6.0 GPM Cavity T-11A



.1-12.0 GPM Cavity T-2A



.2-25 GPM Cavity T-17A



NOTES: Page 134 for cartridge model FR*A-*** shows performance curves, technical tips, and options. See page vii for technical information about line mount bodies including SAE flange pattern specifications. Consult your local Sun Distributor or the Sun Web Site for other port sizes available in the bodies shown above.

Sandwich Assemblies

	<i>Page</i>
Technical Product Information	140
Studkits	142
Studrod Length Determination Chart	143

Sandwich Assemblies

<i>Body Type</i>	<i>Page</i>	<i>Body Type</i>	<i>Page</i>
<i>ISO 03/CETOP 3 Valves</i>		<i>ISO 07/CETOP 7 Valves</i>	
Relief	145	Relief	183
Relief, Vented	147	Sequence	185
Sequence	148	Reducing	186
Reducing	149	Reducing/Relieving	187
Reducing/Relieving	150	Counterbalance	188
Counterbalance and Vented Counterbalance	151	Pilot-to-Open Check	189
Pilot-to-Open Check	152	Check	190
Check	153	Flow Control	191
Flow Control and Priority Flow Control	154	Circuit Saver	192
Flow Control	155		
Circuit Saver	158		
<i>ISO 05/CETOP 5 Valves</i>		<i>ISO 08/CETOP 8 Valves</i>	
Relief	161	Relief	193
Relief, Vented	163	Sequence	195
Sequence	164	Reducing	196
Reducing	165	Reducing/Relieving	197
Reducing/Relieving	166	Counterbalance	198
Counterbalance	167	Pilot-to-Open Check	199
Pilot-to-Open Check	168	Check	200
Check	169	Flow Control	201
Flow Control	170	Circuit Saver	202
<i>ISO 05 with X and Y Valves</i>			
Relief	173		
Sequence	175		
Reducing	176		
Reducing/Relieving	177		
Counterbalance	178		
Pilot-to-Open Check	179		
Check	180		
Flow Control	181		

Click Here for
MOUNTING and ASSEMBLY of SANDWICH BODIES
Technical Tips

See **Product > Technical Information > Technical Tips for Sun Products**

Click Here for
MOUNTING and ASSEMBLY of SANDWICH BODIES
Technical Tips

See **Product > Technical Information > Technical Tips for Sun Products**

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MOUNTING and ASSEMBLY of SANDWICH BODIES
Technical Tips

See **Product > Technical Information > Technical Tips for Sun Products**

Click Here for
MOUNTING and ASSEMBLY of SANDWICH BODIES
Technical Tips

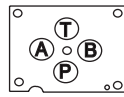
See **Product > Technical Information > Technical Tips for Sun Products**

NOTES

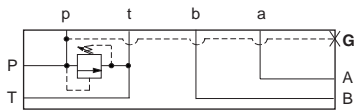
ISO 03 / CETOP 3 RELIEF VALVES
(SIDE PORTED SUBPLATE / REAR PORTED SUBPLATE / SIDE PORTED SUBPLATE WITH P AND T IN BASE)

T-10A Cavity

All subplates shown below are 3.5" wide.

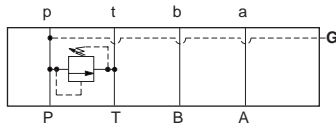


PILOT OPERATED



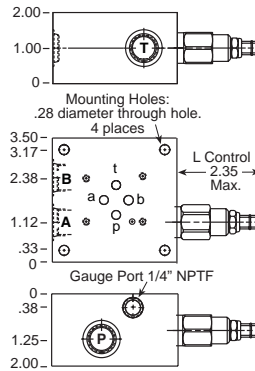
Ports A, B, P, T	Assembly Model Code*
3/8" NPTF	RPEC-LAN-FSB
SAE-8	RPEC-LAN-FSJ

*Add modifier /S to order Ductile Iron for pressure rating over 3000 psi.



Ports A, B, P, T	Assembly Model Code*
3/8" NPTF	RPEC-LAN-FRB
SAE-8	RPEC-LAN-FRJ

*Add modifier /S to order Ductile Iron for pressure rating over 3000 psi.



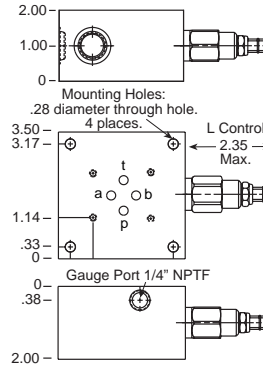
DIRECT ACTING

Function

P to T

Ports A, B, P, T	Assembly Model Code*
3/8" NPTF	RDDA-LAN-FSB
SAE-8	RDDA-LAN-FSJ

*Add modifier /S to order Ductile Iron for pressure rating over 3000 psi.



Function

P to T

Ports A, B, P, T	Assembly Model Code*
3/8" NPTF	RDDA-LAN-FRB
SAE-8	RDDA-LAN-FRJ

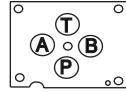
*Add modifier /S to order Ductile Iron for pressure rating over 3000 psi.

NOTES: Page 2 for cartridge models RP*C-*** and RD*A-*** show performance curves, technical tips, and options.
 See page 140 for technical information about sandwich bodies including ISO interface patterns, mounting instructions, studrods, and studkits.
 Go to www.sunhydraulics.com for more product information and pricing.
 Model Codes printed in red are Preferred Products and are readily available.

Sandwich Assemblies

ISO 03 / CETOP 3 RELIEF VALVES

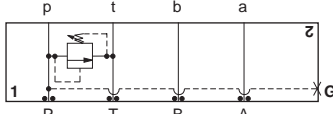
T-10A Cavity



All sandwich bodies shown below are 1.75" wide

PILOT OPERATED

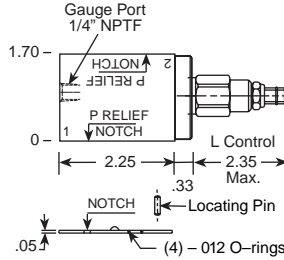
DIRECT ACTING



Assembly Model Code*

RPEC-LAN-FBP

*Add modifier **/S** to order Ductile Iron for pressure rating over 3000 psi.



Function

P to T

Assembly Model Code*

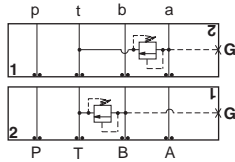
RDDA-LAN-FBP

*Add modifier **/S** to order Ductile Iron for pressure rating over 3000 psi.

Function

A to T (High Capacity)

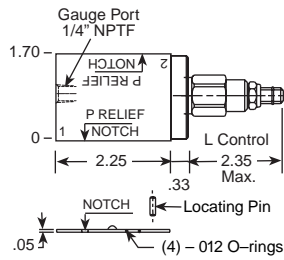
B to T (High Capacity)



Assembly Model Code*

RPEC-LAN-FBA

*Add modifier **/S** to order Ductile Iron for pressure rating over 3000 psi.



Assembly Model Code*

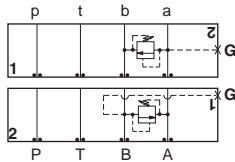
RDDA-LAN-FBA

*Add modifier **/S** to order Ductile Iron for pressure rating over 3000 psi.

Function

A to B (High Capacity)

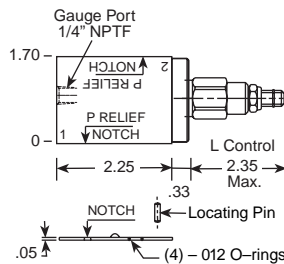
B to A (High Capacity)



Assembly Model Code*

RPEC-LAN-FBC

*Add modifier **/S** to order Ductile Iron for pressure rating over 3000 psi.



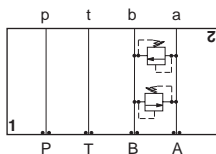
Assembly Model Code*

RDDA-LAN-FBC

*Add modifier **/S** to order Ductile Iron for pressure rating over 3000 psi.

Function

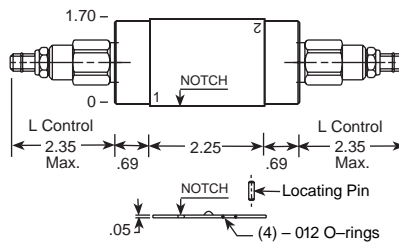
A to B and B to A (High Capacity) (Cross-Port)



Assembly Model Code*

RPEC-LAN-FBY

*Add modifier **/S** to order Ductile Iron for pressure rating over 3000 psi.



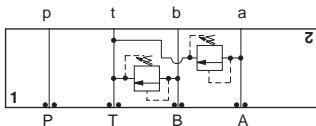
Assembly Model Code*

RDDA-LAN-FBY

*Add modifier **/S** to order Ductile Iron for pressure rating over 3000 psi.

Function

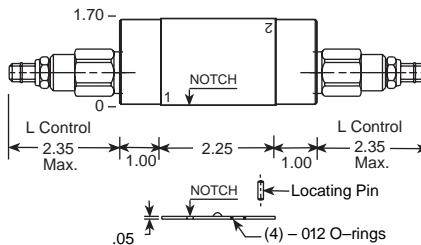
A and B to T (High Capacity)



Assembly Model Code*

RPEC-LAN-FBX

*Add modifier **/S** to order Ductile Iron for pressure rating over 3000 psi.



Assembly Model Code*

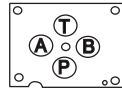
RDDA-LAN-FBX

*Add modifier **/S** to order Ductile Iron for pressure rating over 3000 psi.

NOTES: Page 2 for cartridge models RP*C-*** and RD*A-*** show performance curves, technical tips, and options. See page 140 for technical information about sandwich bodies including ISO interface patterns, mounting instructions, studrods, and studkits. Go to www.sunhydraulics.com for more product information. Model Codes printed in red are Preferred Products and are readily available.

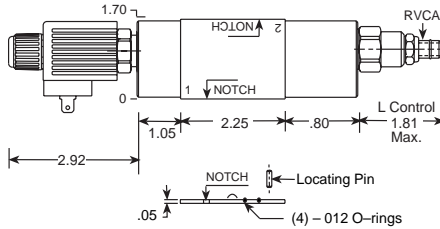
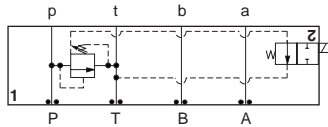
ISO 03 / CETOP 3 RELIEF VALVES, VENTED

T-11A Cavity



All sandwich bodies shown below are 1.75" wide

PILOT OPERATED

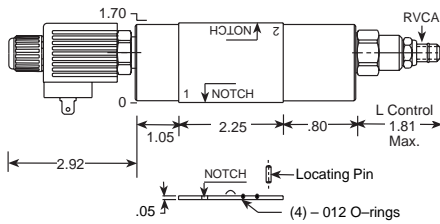
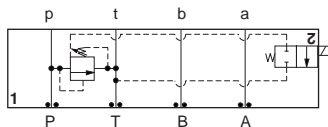


Function
P to T
(Normally Open, Solenoid Vented)

Assembly Model Code*
XRCO-LAN-HA

*Add modifier /S to order Ductile Iron for pressure rating over 3000 psi.

Operating pressure is limited to 5000 psi.
Coil must be selected separately. See page 248.

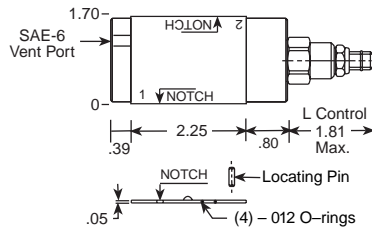
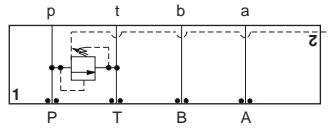


Function
P to T
(Normally Closed, Solenoid Vented)

Assembly Model Code*
XRCO-LAN-CA

*Add modifier /S to order Ductile Iron for pressure rating over 3000 psi.

Operating pressure is limited to 5000 psi.
Coil must be selected separately. See page 248.



Function
P to T (Externally Vented)

Vent Port Assembly Model Code*
SAE-6 **RVCA-LAN-EBC**

*Add modifier /S to order Ductile Iron for pressure rating over 3000 psi.

NOTES: Page 12 for cartridge model RV*A-*** show performance curves, technical tips, and options.

Select Solenoid Connector Option from Page 248.

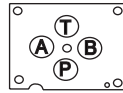
See Page 140 for technical information about sandwich bodies including ISO interface patterns, mounting instructions, studrods, and studkits.

Go to www.sunhydraulics.com for more product information.

Sandwich Assemblies

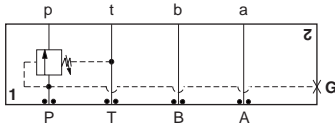
ISO 03 / CETOP 3 SEQUENCE VALVES

T-11A Cavity



All sandwich bodies shown below are 1.75" wide

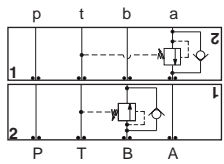
PILOT OPERATED



Assembly Model Code*

RSDC-LAN-EBW/M

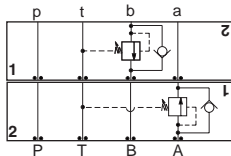
*Add modifier **/S** to order Ductile Iron for pressure rating over 3000 psi.



Assembly Model Code*

RSDC-LAN-EB4

*Add modifier **/S** to order Ductile Iron for pressure rating over 3000 psi.



Assembly Model Code*

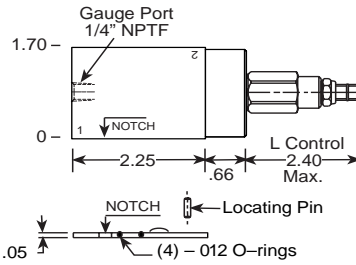
RSDC-LAN-EB5

*Add modifier **/S** to order Ductile Iron for pressure rating over 3000 psi.

DIRECT ACTING

Function

In to **P**



Assembly Model Code*

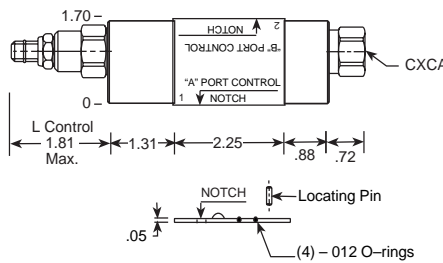
SXCA-LAN-EBW

*Add modifier **/S** to order Ductile Iron for pressure rating over 3000 psi.

Function

In to **A** (Reverse Free Flow Check)

Out of **B** (Reverse Free Flow Check)



Assembly Model Code*

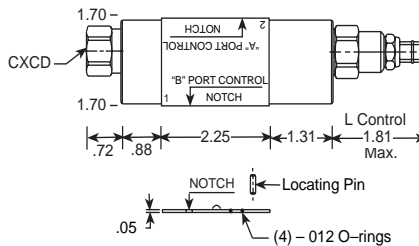
SXCA-LAN-EB4

*Add modifier **/S** to order Ductile Iron for pressure rating over 3000 psi.

Function

In to **B** (Reverse Free Flow Check)

Out of **A** (Reverse Free Flow Check)



Assembly Model Code*

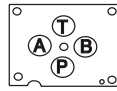
SXCA-LAN-EB5

*Add modifier **/S** to order Ductile Iron for pressure rating over 3000 psi.

NOTES: Pages 20 and 29 for cartridge models RS*C-***, SX*A-*** and SC*A-*** show performance curves, technical tips, and options. See Page 140 for technical information about sandwich bodies including ISO interface patterns, mounting instructions, studrods, and studkits. Go to www.sunhydraulics.com for more product information. Model Codes printed in red are Preferred Products and are readily available.

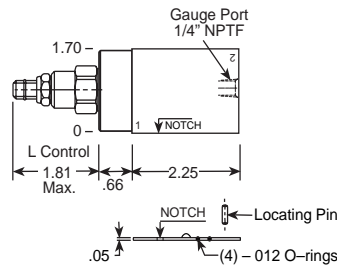
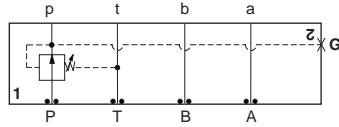
ISO 03 / CETOP 3 REDUCING VALVES

T-11A Cavity



All sandwich bodies shown below are 1.75" wide

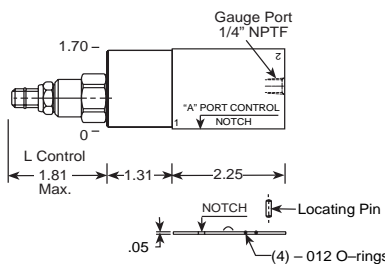
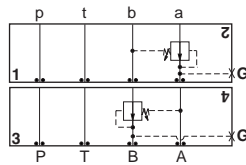
PILOT OPERATED



Function
On P Drained to T

Assembly Model Code*
PBDB-LAN-EBP

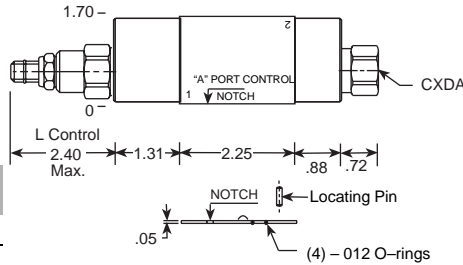
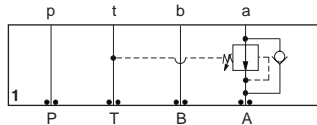
*Add modifier /S to order Ductile Iron for pressure rating over 3000 psi.



Function
On A Drained to B
On B Drained to A

Assembly Model Code*
PBDB-LAN-EBA

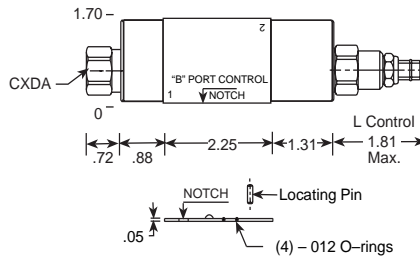
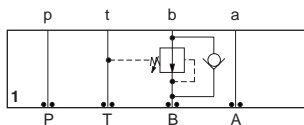
*Add modifier /S to order Ductile Iron for pressure rating over 3000 psi.



Function
On A Drain to T
(Reverse Free Flow Check)

Assembly Model Code*
PBDB-LAN-EB2

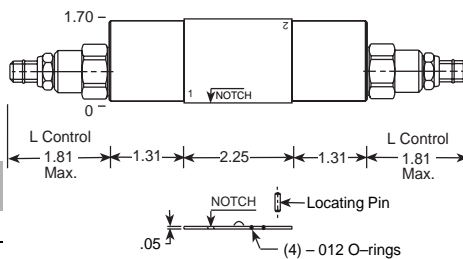
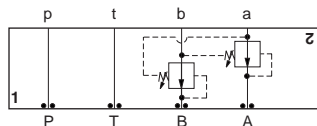
*Add modifier /S to order Ductile Iron for pressure rating over 3000 psi.



Function
On B Drain to T
(Reverse Free Flow Check)

Assembly Model Code*
PBDB-LAN-EB3

*Add modifier /S to order Ductile Iron for pressure rating over 3000 psi.



Function
On A and B
(Drains to Opposite Port)

Assembly Model Code*
PBDB-LAN-EBY

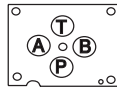
*Add modifier /S to order Ductile Iron for pressure rating over 3000 psi.

NOTES: Page 34 for cartridge model PB*B-*** show performance curves, technical tips, and options.
See Page 140 for technical information about sandwich bodies including ISO interface patterns, mounting instructions, studrods, and studkits.
Go to www.sunhydraulics.com for more product information.
Model Codes printed in red are Preferred Products and are readily available.

Sandwich Assemblies

ISO 03 / CETOP 3 REDUCING / RELIEVING VALVES

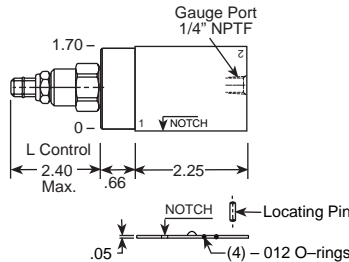
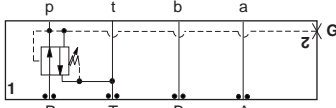
T-11A Cavity



All sandwich bodies shown below are 1.75" wide

PILOT OPERATED

DIRECT ACTING



Function

On P Tank to T, Drained at T

Assembly Model Code*

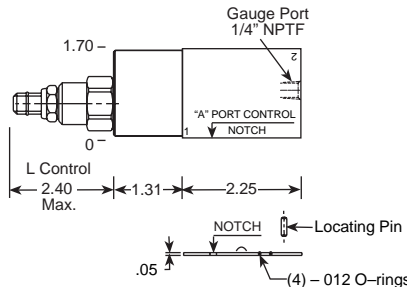
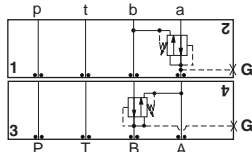
PPDB-LAN-EBP

*Add modifier /S to order Ductile Iron for pressure rating over 3000 psi.

Assembly Model Code*

PRDB-LAN-EBP

*Add modifier /S to order Ductile Iron for pressure rating over 3000 psi.



Function

On A Tank to B

On B Tank to A

Assembly Model Code*

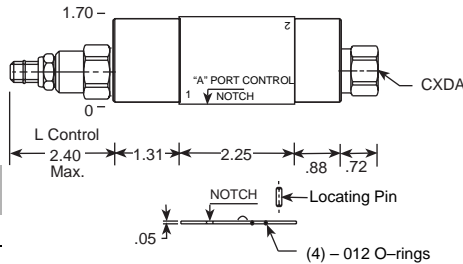
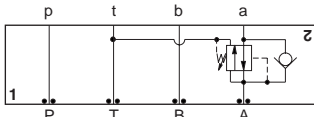
PPDB-LAN-EBA

*Add modifier /S to order Ductile Iron for pressure rating over 3000 psi.

Assembly Model Code*

PRDB-LAN-EBA

*Add modifier /S to order Ductile Iron for pressure rating over 3000 psi.



Function

On A Tank to T
(Reverse Free Flow Check)

Assembly Model Code*

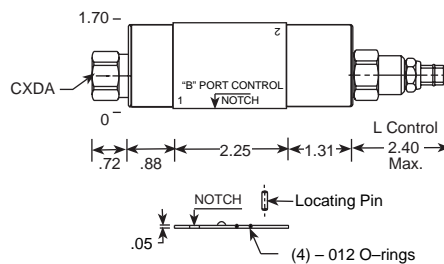
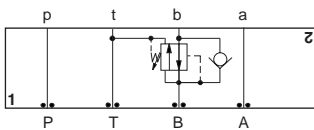
PPDB-LAN-EB2

*Add modifier /S to order Ductile Iron for pressure rating over 3000 psi.

Assembly Model Code*

PRDB-LAN-EB2

*Add modifier /S to order Ductile Iron for pressure rating over 3000 psi.



Function

On B Tank to T, Drained to T
(Reverse Free Flow Check)

Assembly Model Code*

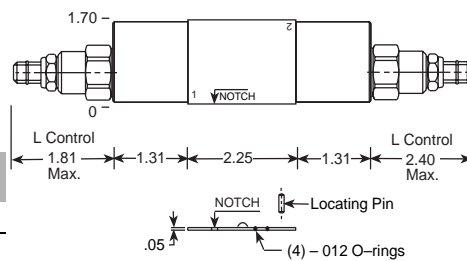
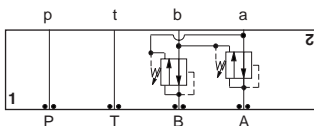
PPDB-LAN-EB3

*Add modifier /S to order Ductile Iron for pressure rating over 3000 psi.

Assembly Model Code*

PRDB-LAN-EB3

*Add modifier /S to order Ductile Iron for pressure rating over 3000 psi.



Function

On A and B Tanks and Drains to Opposite Port

Assembly Model Code*

PPDB-LAN-EBY

*Add modifier /S to order Ductile Iron for pressure rating over 3000 psi.

Assembly Model Code*

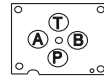
PRDB-LAN-EBY

*Add modifier /S to order Ductile Iron for pressure rating over 3000 psi.

NOTES: Page 42 for cartridge models PP*B-*** and PR*B-*** show performance curves, technical tips, and options.
See Page 140 for technical information about sandwich bodies including ISO interface patterns, mounting instructions, studrods, and studkits.
Go to www.sunhydraulics.com for more product information.
Model Codes printed in red are Preferred Products and are readily available.

ISO 03 / CETOP 3 COUNTERBALANCE / VENTED COUNTERBALANCE VALVES

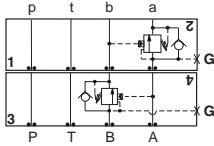
T-11A / T21A Cavity



All sandwich bodies shown below are 1.75" wide

PILOT RATIOS
3:1 and 1.5:1 (CB**) and 3:1 and 1:1 (CW**)

PILOT RATIOS
2.3:1, 4.5:1 and 10:1 (CB**) and 5:1 and 2:1 (CW**)



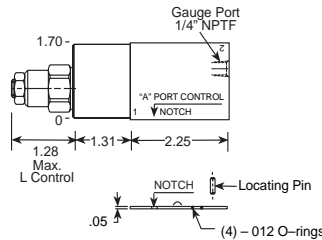
Assembly Model Code*
CBC*-LHN-EBA

*The 4th digit of the Model Code must be entered to specify counterbalance pilot ratio. Add modifier /S to order Ductile Iron for pressure rating over 3000 psi.

STANDARD

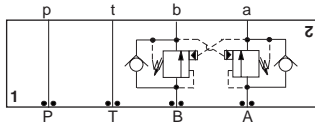
Function

On A Pilot from B
On B Pilot from A



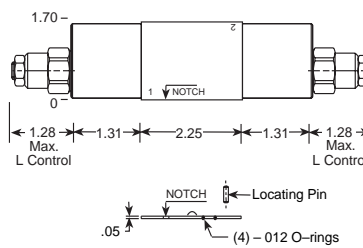
Assembly Model Code*
CBC*-LJN-EBA

*The 4th digit of the Model Code must be entered to specify counterbalance pilot ratio. Add modifier /S to order Ductile Iron for pressure rating over 3000 psi.



Assembly Model Code*
CBC*-LHN-EBY

*The 4th digit of the Model Code must be entered to specify counterbalance pilot ratio. Add modifier /S to order Ductile Iron for pressure rating over 3000 psi.



On A and B (Cross-Piloted)

Assembly Model Code*
CBC*-LJN-EBY

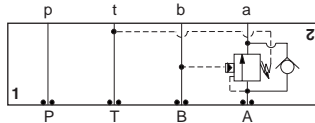
*The 4th digit of the Model Code must be entered to specify counterbalance pilot ratio. Add modifier /S to order Ductile Iron for pressure rating over 3000 psi.

Function

VENTED

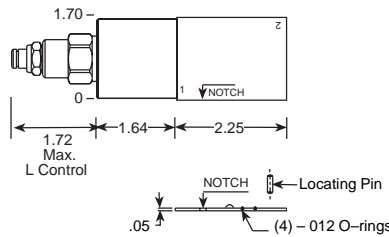
Function

On A Pilot from B, Vent to T



Assembly Model Code*
CWC*-LHN-MBA

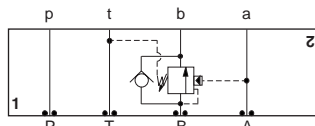
*The 4th digit of the Model Code must be entered to specify counterbalance pilot ratio. Add modifier /S to order Ductile Iron for pressure rating over 3000 psi.



Assembly Model Code*
CWC*-LGN-MBA

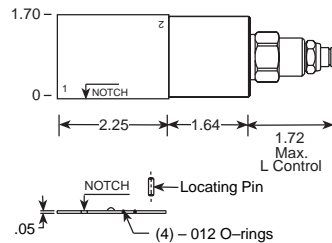
*The 4th digit of the Model Code must be entered to specify counterbalance pilot ratio. Add modifier /S to order Ductile Iron for pressure rating over 3000 psi.

Function



Assembly Model Code*
CWC*-LHN-MBB

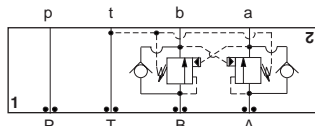
*The 4th digit of the Model Code must be entered to specify counterbalance pilot ratio. Add modifier /S to order Ductile Iron for pressure rating over 3000 psi.



Assembly Model Code*
CWC*-LGN-MBB

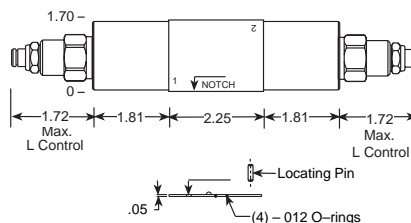
*The 4th digit of the Model Code must be entered to specify counterbalance pilot ratio. Add modifier /S to order Ductile Iron for pressure rating over 3000 psi.

Function



Assembly Model Code*
CWC*-LHN-MBY

*The 4th digit of the Model Code must be entered to specify counterbalance pilot ratio. Add modifier /S to order Ductile Iron for pressure rating over 3000 psi.



On A and B
(Cross-Piloted, vents to T)

Assembly Model Code*
CWC*-LGN-MBY

*The 4th digit of the Model Code must be entered to specify counterbalance pilot ratio. Add modifier /S to order Ductile Iron for pressure rating over 3000 psi.

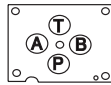
NOTES: Page 50 for cartridge model CB**_*** and page 70 for cartridge model CW**_*** show performance curves, technical tips, and options. See Page 140 for technical information about sandwich bodies including ISO interface patterns, mounting instructions, studrods, and studkits. Go to www.sunhydraulics.com for more product information. Model Codes printed in red are Preferred Products and are readily available.

Sandwich Assemblies

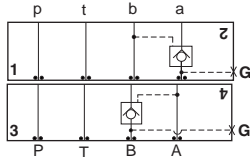
ISO 03 / CETOP 3 PILOT-TO-OPEN CHECK VALVES

T-11A / T-21A Cavity

All sandwich bodies shown below are 1.75" wide



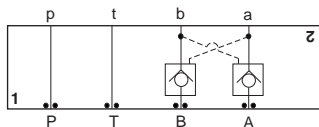
PILOT OPERATED



Assembly Model Code*

CKCB-XCN-EBA

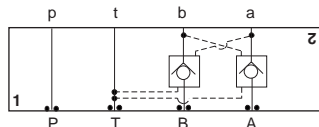
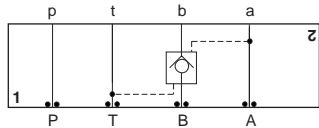
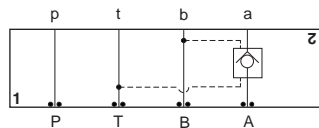
*Add modifier /S to order Ductile Iron for pressure rating over 3000 psi.



Assembly Model Code*

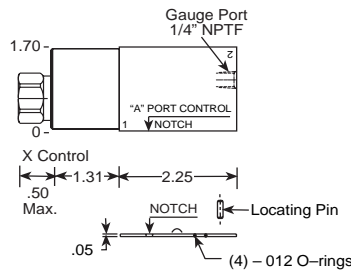
CKCB-XCN-EBY

*Add modifier /S to order Ductile Iron for pressure rating over 3000 psi.



VENTED

STANDARD



Function

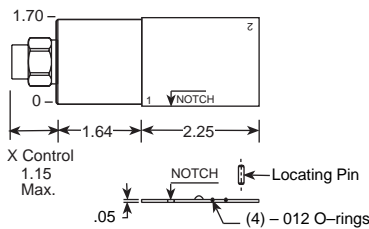
On A Pilot from B

On B Pilot from A

Function

On A and B (Cross-Piloted)

VENTED



Function

On A Pilot from B Vent to T

Assembly Model Code*

CVCV-XCN-MBA

*Add modifier /S to order Ductile Iron for pressure rating over 3000 psi.

Function

On B Pilot from A, Vent to T

Assembly Model Code*

CVCV-XCN-MBB

*Add modifier /S to order Ductile Iron for pressure rating over 3000 psi.

Function

On A and B Cross-Piloted, Vents to T

Assembly Model Code*

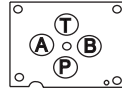
CVCV-XCN-MBY

*Add modifier /S to order Ductile Iron for pressure rating over 3000 psi.

NOTES: Page 78 for cartridge models CK**_*** and page 94 for cartridge model CV*V_*** show performance curves, technical tips, and options. See Page 140 for technical information about sandwich bodies including ISO interface patterns, mounting instructions, studrods, and studkits. Go to www.sunhydraulics.com for more product information. Model Codes printed in red are Preferred Products and are readily available.

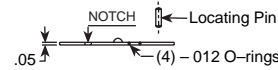
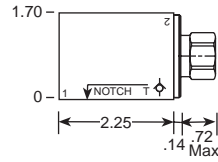
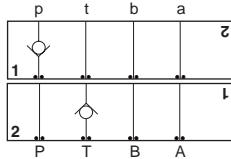
ISO 03 / CETOP 3 CHECK VALVES

T-13A / T-5A Cavity



All sandwich bodies shown below are 1.75" wide

FREE FLOW PORT 1 TO 2



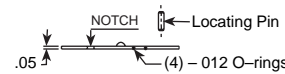
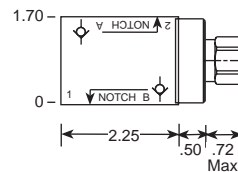
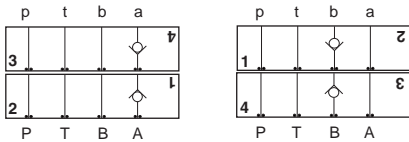
Function

On P
On T

Assembly Model Code*

CXDA-XCN-GDP

*Add modifier /S to order Ductile Iron for pressure rating over 3000 psi.



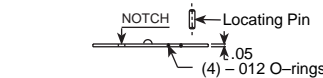
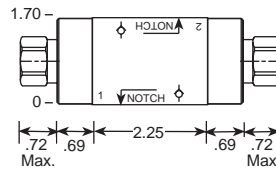
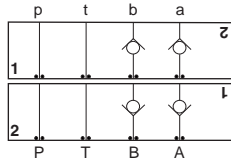
Function

On A Free Flow Into Valve
On A Free Flow Out Valve
On B Free Flow Into Valve
On B Free Flow Out Valve

Assembly Model Code*

CXDA-XCN-GDA

*Add modifier /S to order Ductile Iron for pressure rating over 3000 psi.



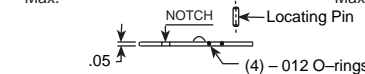
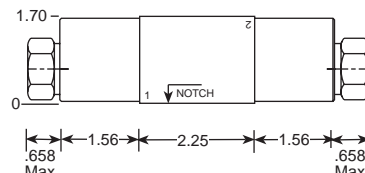
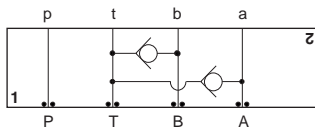
Function

On A and B, Free Flow Out of Valve
On A and B, Free Flow Into Valve

Assembly Model Code*

CXDA-XCN-GDY

*Add modifier /S to order Ductile Iron for pressure rating over 3000 psi.



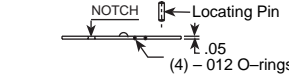
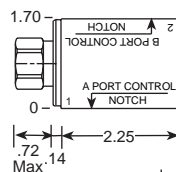
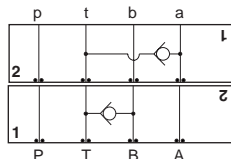
Function

T to A and B (High Capacity)

Assembly Model Code*

CXFA-XAN-GDF

*Add modifier /S to order Ductile Iron for pressure rating over 3000 psi.



Function

T to A
T to B

Assembly Model Code*

CXDA-XAN-GDW

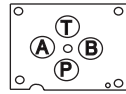
*Add modifier /S to order Ductile Iron for pressure rating over 3000 psi.

NOTES: Page 102 for cartridge models CX*A-*** and CX*D-*** show performance curves, technical tips, and options. See Page 140 for technical information about sandwich bodies including ISO interface patterns, mounting instructions, studrods, and studkits. Go to www.sunhydraulics.com for more product information. Model Codes printed in red are Preferred Products and are readily available.

Sandwich Assemblies

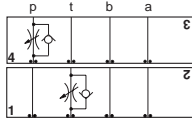
ISO 03 / CETOP 3 FLOW CONTROL / PRIORITY FLOW CONTROL VALVES

T-13A / T-11A Cavity



All sandwich bodies shown below are 1.75" wide

FULLY ADJUSTABLE NEEDLE

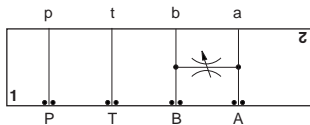


Note: Reverse Checks on FDBA-LAN-GBP Only

Assembly Model Code*

NFCC-LCN-GBP

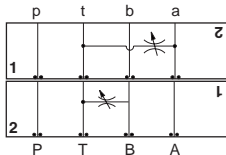
*Add modifier /S to order Ductile Iron for pressure rating over 3000 psi.



Assembly Model Code*

NFCC-LCN-GBS

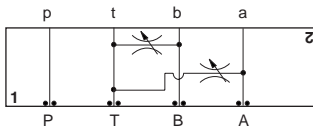
*Add modifier /S to order Ductile Iron for pressure rating over 3000 psi.



Assembly Model Code*

NFCC-LCN-GBW

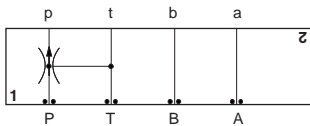
*Add modifier /S to order Ductile Iron for pressure rating over 3000 psi.



Assembly Model Code*

NFCC-LCN-GBX

*Add modifier /S to order Ductile Iron for pressure rating over 3000 psi.



Assembly Model Code*

FRCA-LAN-WBN**

*Add modifier /S to order Ductile Iron for pressure rating over 3000 psi.

**Customer must specify priority flow.

NOTES: Page 110 for cartridge model NF*C-***, page 126 for FD*A-***, and page 134 for FR*A-*** show performance curves, technical tips, and options. See Page 140 for technical information about sandwich bodies including ISO interface patterns, mounting instructions, studrods, and studkits. Go to www.sunhydraulics.com for more product information. Model Codes printed in red are Preferred Products and are readily available.

FULLY ADJUSTABLE NEEDLE PRESSURE COMPENSATED WITH REVERSE FREE FLOW CHECK

Function

Meter-In P

Meter-Out T

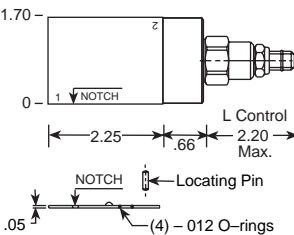
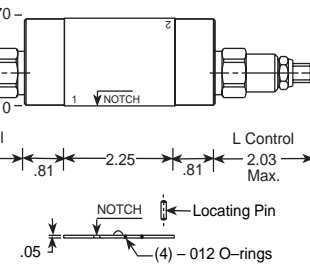
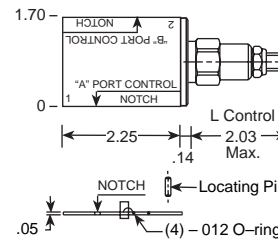
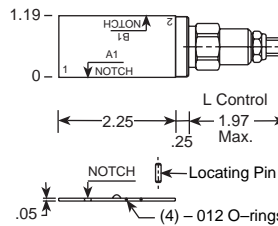
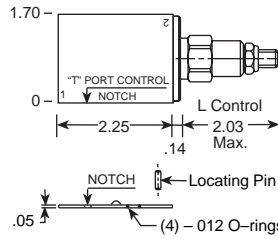
Assembly Model Code*

FDBA-LAN-GBP

*Add modifier /S to order Ductile Iron for pressure rating over 3000 psi.

Function

Bleed-Off A to B and B to A



Function

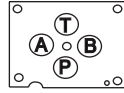
Bleed-Off A and B to T

Function

Priority Flow on P, Bypass to T

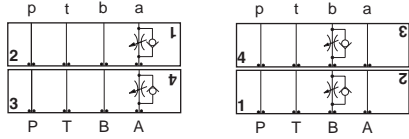
ISO 03 / CETOP 3 FLOW CONTROL VALVES

T-13A Cavity



All sandwich bodies shown below are 1.75" wide

FULLY ADJUSTABLE NEEDLE WITH REVERSE FREE FLOW CHECK



Assembly Model Code*

NCCB-LCN-GBA

*Add modifier /S to order Ductile Iron for pressure rating over 3000 psi.

FULLY ADJUSTABLE, PRESSURE COMPENSATED WITH FREE FLOW CHECK

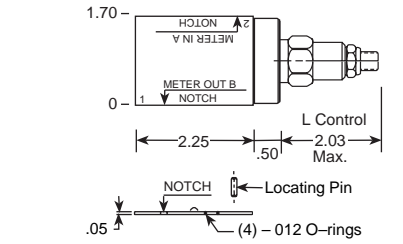
Function

Meter-In A
Meter-Out A
Meter-In B
Meter-Out B

Assembly Model Code*

FDBA-LAN-GBA

*Add modifier /S to order Ductile Iron for pressure rating over 3000 psi.



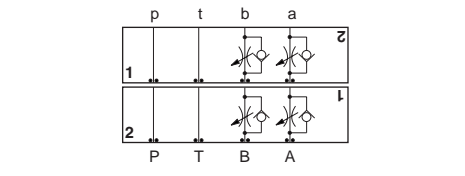
Function

Meter-In A and B
Meter-Out A and B

Assembly Model Code*

FDBA-LAN-GBY

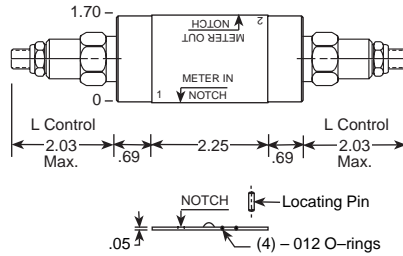
*Add modifier /S to order Ductile Iron for pressure rating over 3000 psi.



Assembly Model Code*

NCCB-LCN-GBY

*Add modifier /S to order Ductile Iron for pressure rating over 3000 psi.



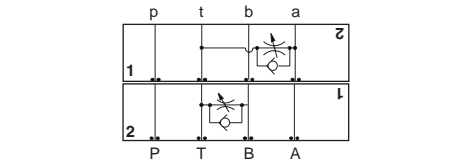
Function

Bleed-Off A to T
Bleed-Off B to T

Assembly Model Code*

FDBA-LAN-GBW

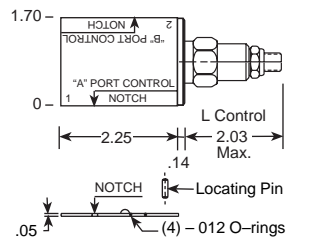
*Add modifier /S to order Ductile Iron for pressure rating over 3000 psi.



Assembly Model Code*

NCCB-LAN-GBW

*Add modifier /S to order Ductile Iron for pressure rating over 3000 psi.



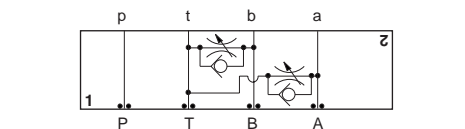
Function

Bleed-Off A and B to T

Assembly Model Code*

FDBA-LAN-GBX

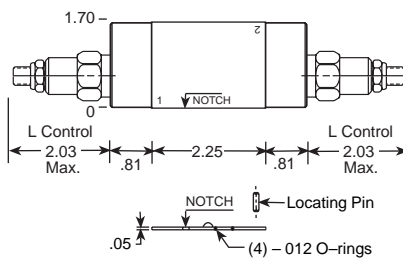
*Add modifier /S to order Ductile Iron for pressure rating over 3000 psi.



Assembly Model Code*

NCCB-LAN-GBX

*Add modifier /S to order Ductile Iron for pressure rating over 3000 psi.

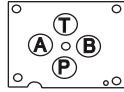


NOTES: Page 110 for cartridge model NC*B-*** and page 126 for FD*A-*** show performance curves, technical tips, and options. See Page 140 for technical information about sandwich bodies including ISO interface patterns, mounting instructions, studrods, and studkits. Go to www.sunhydraulics.com for more product information. Model Codes printed in red are Preferred Products and are readily available.

Sandwich Assemblies

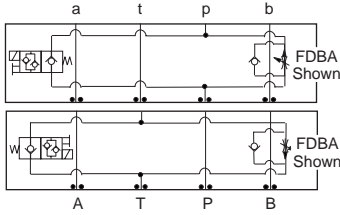
**ISO 03 / CETOP 3 FLOW CONTROL VALVES
(RAPID ADVANCE - FINE FEED)**

T-13A Cavity



All sandwich bodies shown below are 1.75" wide

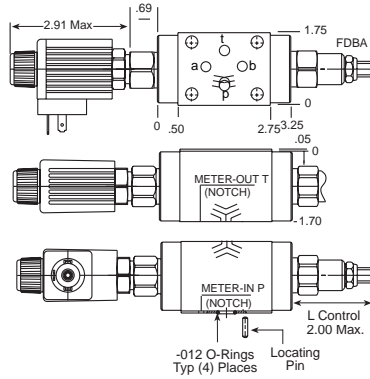
FULLY ADJUSTABLE, PRESSURE COMPENSATED WITH FREE FLOW CHECK



Assembly Model Code*

X2CD-LAN-CA

*Add modifier /S to order Ductile Iron for pressure rating over 3000 psi.



Coil must be selected separately. See page 248.

Function

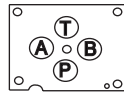
Meter-In **P**, Solenoid Normally Closed

Meter-Out **T**, Solenoid Normally Closed

NOTES: Page 126 for cartridge models FD*A-*** show performance curves, technical tips, and options. See Page 140 for technical information about sandwich bodies including ISO interface patterns, mounting instructions, studrods, and studkits. Go to www.sunhydraulics.com for more product information and pricing.

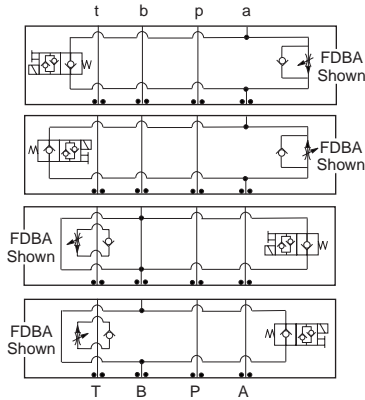
**ISO 03 / CETOP 3 FLOW CONTROL VALVES
(RAPID ADVANCE - FINE FEED)**

T-13A Cavity



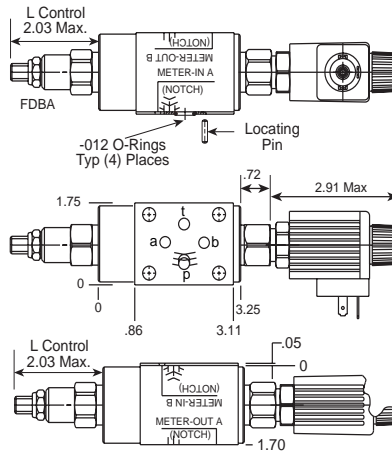
All sandwich bodies shown below are 1.75" wide

FULLY ADJUSTABLE, PRESSURE COMPENSATED WITH FREE FLOW CHECK



Assembly Model Code*
X4CD-LAN-CA

*Add modifier /S to order Ductile Iron for pressure rating over 3000 psi.



Coil must be selected separately. See page 248.

Function

- Meter-In **A**, Solenoid Normally Closed
- Meter-Out **A**, Solenoid Normally Closed
- Meter-In **B**, Solenoid Normally Closed
- Meter-Out **B**, Solenoid Normally Closed

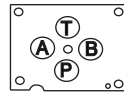
NOTES: Page 110 for cartridge models NF*C-*** and NC*B-*** show performance curves, technical tips, and options. See Page 140 for technical information about sandwich bodies including ISO interface patterns, mounting instructions, studrods, and studkits. Go to www.sunhydraulics.com for more product information and pricing.

Sandwich Assemblies

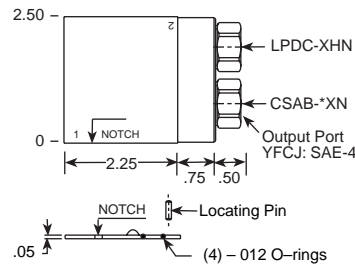
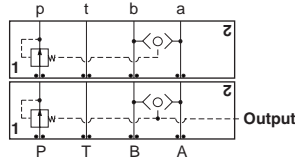
ISO 03 / CETOP 3 CIRCUIT SAVERS

(PRESSURE COMPENSATOR / REGENERATIVE / LOAD SENSING / PILOT CHOKE PACK)

T-11A / T-13A Cavity



All sandwich bodies shown below are 1.75" wide



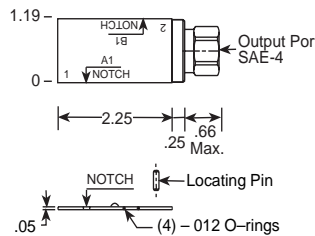
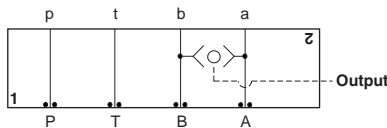
Function

YFCG: Pressure Compensator (Restrictive), 200 psi

YFCJ: Pressure Compensator (Restrictive), 200 psi with external Load-Sensing Port

External Shuttle Port	Assembly Model Code*
None	YFCG-XHN-AA
SAE-4	YFCJ-XHN-AA

*Add modifier /S to order Ductile Iron for pressure rating over 3000 psi.



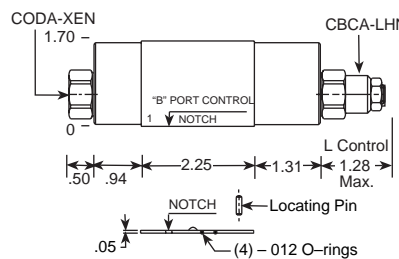
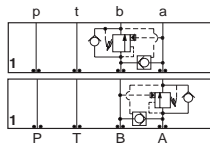
Function

Shuttle A and B (Output External)

Assembly Model Code*

CSAA-BXN-GBS

*Add modifier /S to order Ductile Iron for pressure rating over 3000 psi.



Function

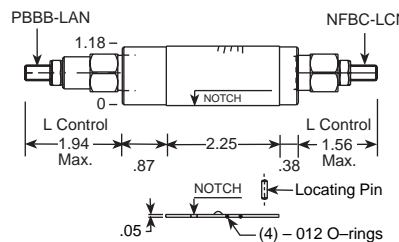
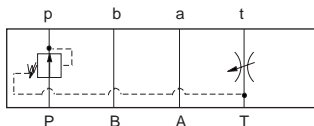
B to A Pressure Sensing Regenerative Circuit

A to B Pressure Sensing Regenerative Circuit

Assembly Model Code*

YDCA-LHN-AA

*Add modifier /S to order Ductile Iron for pressure rating over 3000 psi.



Function

Pilot Choke Pack

(Used typically to control main stage shift time on pilot operated ISO/CETOP directional valves.)

Assembly Model Code*

YNAA-LDN-AA

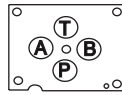
*Add modifier /S to order Ductile Iron for pressure rating over 3000 psi.

NOTES: See Page 140 for technical information about sandwich bodies including ISO interface patterns, mounting instructions, studrods, and studkits.

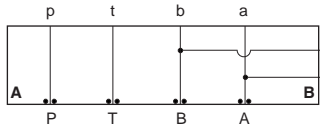
Go to www.sunhydraulics.com for more product information.

Model Codes printed in red are Preferred Products and are readily available.

**ISO 03 / CETOP 3 CIRCUIT SAVERS
(TAP IN MANIFOLD / ADAPTOR PLATE / COVER PLATE)**

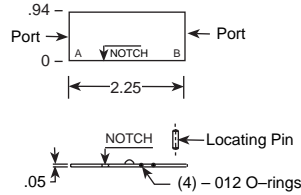


All sandwich bodies shown below are 1.75" wide



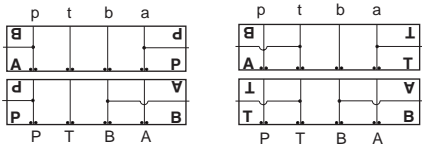
Ports A, B	Assembly Model Code*
1/4" NPTF	ZWV
SAE-4	ZUO

*Add modifier **/S** to order Ductile Iron for pressure rating over 3000 psi.



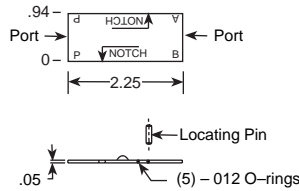
Function

A and B Tap in Manifold



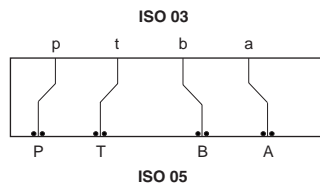
External Port	Assembly Model Code*
1/4" NPTF	ZWV
SAE-4	ZPT

*Add modifier **/S** to order Ductile Iron for pressure rating over 3000 psi.



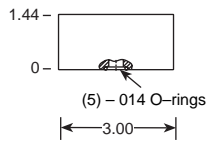
Function

P and A Tap in Manifold
P and B Tap in Manifold
T and A Tap in Manifold
T and B Tap in Manifold



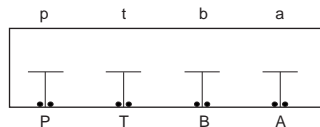
Assembly Model Code*
ZVT

*Add modifier **/S** to order Ductile Iron for pressure rating over 3000 psi.



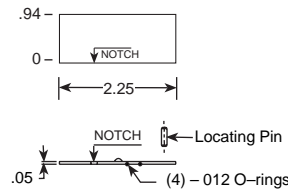
Function

Adaptor from ISO 05 to ISO 03.



Assembly Model Code*
ZJR

*Add modifier **/S** to order Ductile Iron for pressure rating over 3000 psi.



Function

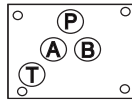
Cover Plate with All Ports Blocked

NOTE: See Page 140 for technical information about sandwich bodies including ISO interface patterns, mounting instructions, studrods, and studkits. Go to www.sunhydraulics.com for more product information. Model Codes printed in red are Preferred Products and are readily available.

NOTES

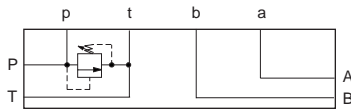
**ISO 05 / CETOP 5 RELIEF VALVES
(SIDE PORTED SUBPLATE / REAR PORTED SUBPLATE / SIDE PORTED SUBPLATE WITH GASKET MOUNTED TANK PORT)**

T-10A Cavity



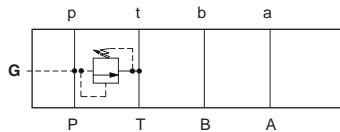
All subplates shown below are 4.5" wide

PILOT OPERATED



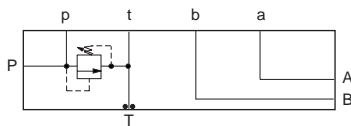
Ports A, B, P, T	Assembly Model Code*
1/2" NPTF	RPEC-LAN-FSC
SAE-10	RPEC-LAN-FSK

*Add modifier /S to order Ductile Iron for pressure rating over 3000 psi.



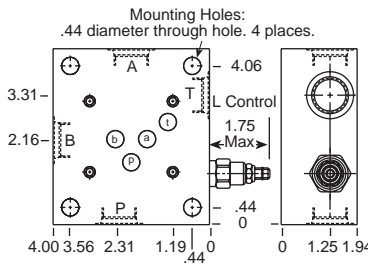
Ports A, B, P, T	Assembly Model Code*
1/2" NPTF	RPEC-LAN-FRC
SAE-10	RPEC-LAN-FRK

*Add modifier /S to order Ductile Iron for pressure rating over 3000 psi.



Ports A, B, P, T	Assembly Model Code*
1/2" NPTF	RPEC-LAN-FTC
SAE-10	RPEC-LAN-FTK

*Add modifier /S to order Ductile Iron for pressure rating over 3000 psi.



DIRECT ACTING

Function

P to T

Ports A, B, P, T	Assembly Model Code*
1/2" NPTF	RDDA-LAN-FSC
SAE-10	RDDA-LAN-FSK

*Add modifier /S to order Ductile Iron for pressure rating over 3000 psi.

Function

P to T

Ports A, B, P, T	Assembly Model Code*
1/2" NPTF	RDDA-LAN-FRC
SAE-10	RDDA-LAN-FRK

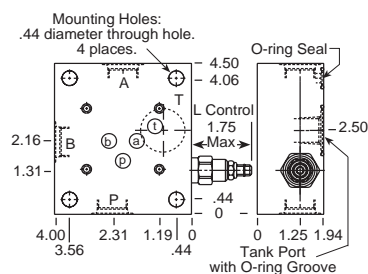
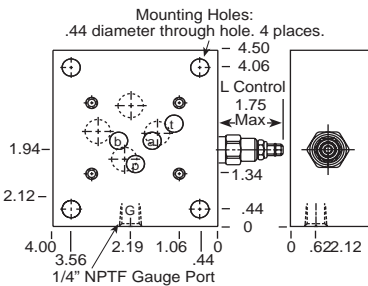
*Add modifier /S to order Ductile Iron for pressure rating over 3000 psi.

Function

P to T

Ports A, B, P, T	Assembly Model Code*
1/2" NPTF	RDDA-LAN-FTC
SAE-10	RDDA-LAN-FTK

*Add modifier /S to order Ductile Iron for pressure rating over 3000 psi.

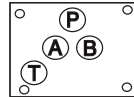


NOTES: Page 2 for cartridge models RP*C-*** and RD*A-*** show performance curves, technical tips, and options. See page 140 for technical information about sandwich bodies including ISO interface patterns, mounting instructions, studrods, and studkits. Go to www.sunhydraulics.com for more product information and pricing. Model Codes printed in red are Preferred Products and are readily available.

Sandwich Assemblies

ISO 05 / CETOP 5 RELIEF VALVES

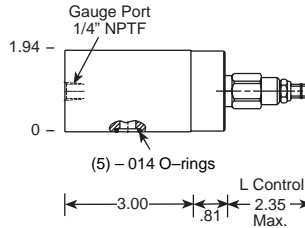
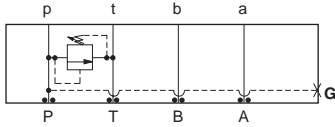
T-10A Cavity



All sandwich bodies shown below are 2.50" wide

PILOT OPERATED

DIRECT ACTING



Function

P to T

Assembly Model Code*

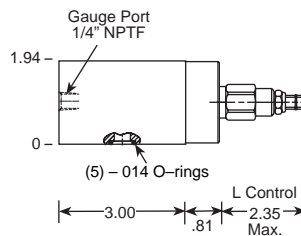
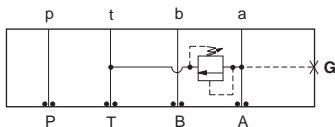
RPEC-LAN-CBE

*Add modifier /S to order Ductile Iron for pressure rating over 3000 psi.

Assembly Model Code*

RDDA-LAN-CBE

*Add modifier /S to order Ductile Iron for pressure rating over 3000 psi.



Function

A to T

Assembly Model Code*

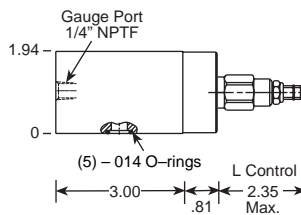
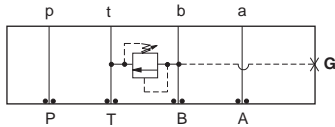
RPEC-LAN-CBF

*Add modifier /S to order Ductile Iron for pressure rating over 3000 psi.

Assembly Model Code*

RDDA-LAN-CBF

*Add modifier /S to order Ductile Iron for pressure rating over 3000 psi.



Function

B to T

Assembly Model Code*

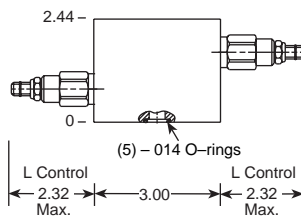
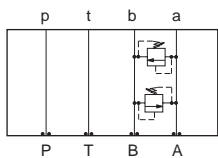
RPEC-LAN-CBG

*Add modifier /S to order Ductile Iron for pressure rating over 3000 psi.

Assembly Model Code*

RDDA-LAN-CBG

*Add modifier /S to order Ductile Iron for pressure rating over 3000 psi.



Function

**A to B and B to A
(Cross-port)**

Assembly Model Code*

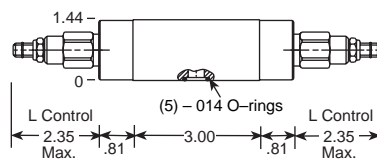
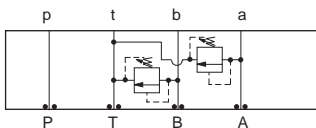
RPEC-LAN-CBI

*Add modifier /S to order Ductile Iron for pressure rating over 3000 psi.

Assembly Model Code*

RDDA-LAN-CBI

*Add modifier /S to order Ductile Iron for pressure rating over 3000 psi.



Function

A and B to T

Assembly Model Code*

RPEC-LAN-CBD

*Add modifier /S to order Ductile Iron for pressure rating over 3000 psi.

Assembly Model Code*

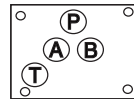
RDDA-LAN-CBD

*Add modifier /S to order Ductile Iron for pressure rating over 3000 psi.

NOTES: Page 2 for cartridge models RP*C-*** and RD*A-*** show performance curves, technical tips, and options. See page 140 for technical information about sandwich bodies including ISO interface patterns, mounting instructions, studrods, and studkits. Go to www.sunhydraulics.com for more product information. Model Codes printed in red are Preferred Products and are readily available.

ISO 05 / CETOP 5 RELIEF VALVES

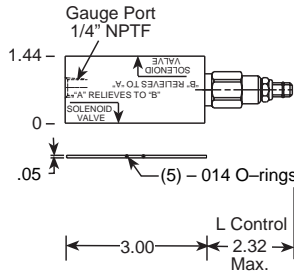
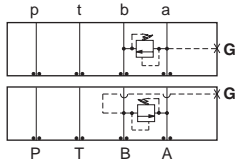
T-10A Cavity/T-2A Cavity



All sandwich bodies shown below are 2.50" wide

PILOT OPERATED

DIRECT ACTING



Function

A to B

B to A

Assembly Model Code*

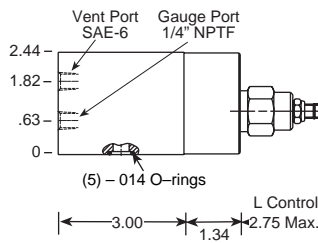
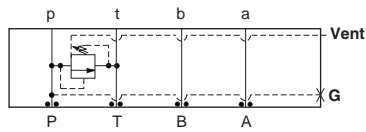
RPEC-LAN-CBH

*Add modifier /S to order Ductile Iron for pressure rating over 3000 psi.

Assembly Model Code*

RDDA-LAN-CBH

*Add modifier /S to order Ductile Iron for pressure rating over 3000 psi.



Function

P to T (Externally Vented)

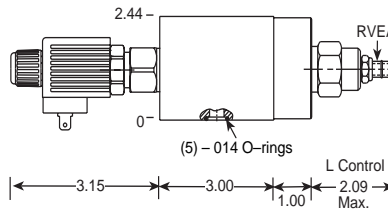
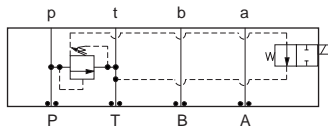
Vent Port

Assembly Model Code*

SAE-6

RVEA-LAN-BBC

*Add modifier /S to order Ductile Iron for pressure rating over 3000 psi.



Function

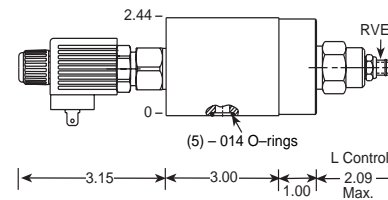
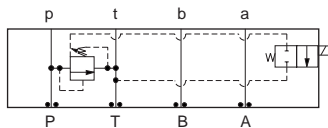
P to T (Normally Open, Solenoid Vented)

Assembly Model Code*

XRED-LAN-HA

*Add modifier /S to order Ductile Iron for pressure rating over 3000 psi.

Coil must be selected separately. See page 248.



Function

P to T (Normally Closed, Solenoid Vented)

Assembly Model Code*

XRED-LAN-CA

*Add modifier /S to order Ductile Iron for pressure rating over 3000 psi.

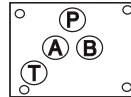
Coil must be selected separately. See page 248.

NOTES: Page 2 for cartridge models RP*C-***, RD*A-*** and page 12 for cartridge model RV*A-*** show performance curves, technical tips, and options. See page 140 for technical information about sandwich bodies including ISO interface patterns, mounting instructions, studrods, and studkits. Go to www.sunhydraulics.com for more product information.

Sandwich Assemblies

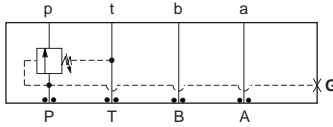
ISO 05 / CETOP 5 SEQUENCE VALVES

T-2A Cavity



All sandwich bodies shown below are 2.50" wide

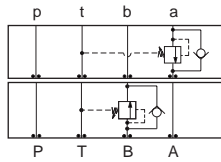
PILOT OPERATED



Assembly Model Code*

RSFC-LAN-BBW

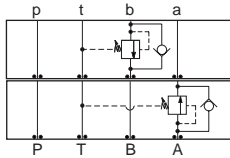
*Add modifier **/S** to order Ductile Iron for pressure rating over 3000 psi.



Assembly Model Code*

RSFC-LAN-BB4

*Add modifier **/S** to order Ductile Iron for pressure rating over 3000 psi.



Assembly Model Code*

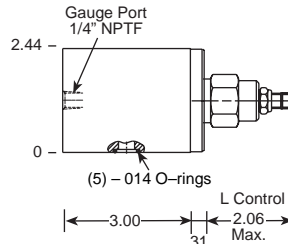
RSFC-LAN-BB5

*Add modifier **/S** to order Ductile Iron for pressure rating over 3000 psi.

DIRECT ACTING

Function

In to **P**



Assembly Model Code*

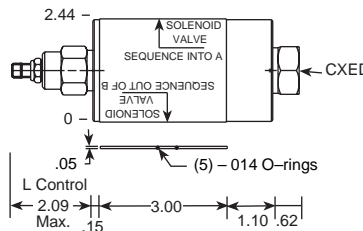
SXEA-LAN-BBW

*Add modifier **/S** to order Ductile Iron for pressure rating over 3000 psi.

Function

Into **A** (Reverse Free Flow Check)

Out of **B** (Reverse Free Flow Check)



Assembly Model Code*

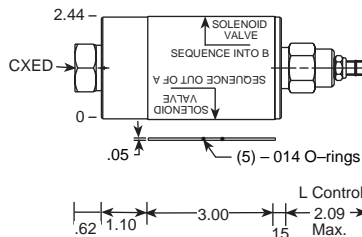
SXEA-LAN-BB4

*Add modifier **/S** to order Ductile Iron for pressure rating over 3000 psi.

Function

Into **B** (Reverse Free Flow Check)

Out of **A** (Reverse Free Flow Check)



Assembly Model Code*

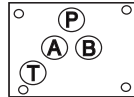
SXEA-LAN-BB5

*Add modifier **/S** to order Ductile Iron for pressure rating over 3000 psi.

NOTES: Page 20 for cartridge model RS*C-*** and SX*A-*** and page 102 for CX*D-*** show performance curves, technical tips, and options. See page 140 for technical information about sandwich bodies including ISO interface patterns, mounting instructions, studrods, and studkits. Go to www.sunhydraulics.com for more product information. Model Codes printed in red are Preferred Products and are readily available.

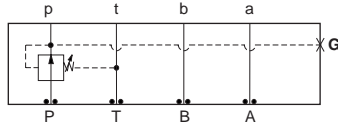
ISO 05 / CETOP 5 REDUCING VALVES

T-2A Cavity



All sandwich bodies shown below are 2.50" wide

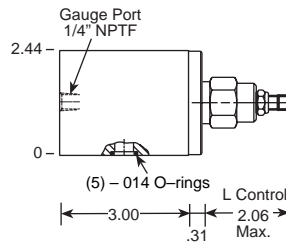
PILOT OPERATED



Assembly Model Code*

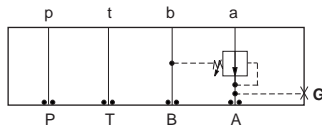
PBFB-LAN-BBP

*Add modifier /S to order Ductile Iron for pressure rating over 3000 psi.



Function

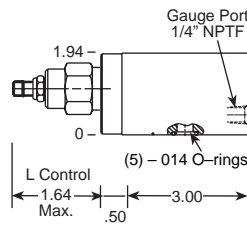
On P Drained to T



Assembly Model Code*

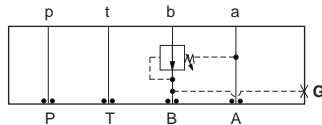
PBFB-LAN-BBA

*Add modifier /S to order Ductile Iron for pressure rating over 3000 psi.



Function

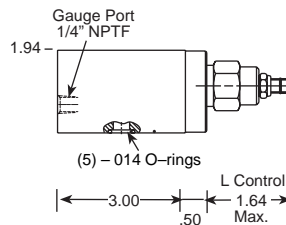
On A Drained to B



Assembly Model Code*

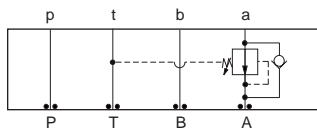
PBFB-LAN-BBB

*Add modifier /S to order Ductile Iron for pressure rating over 3000 psi.



Function

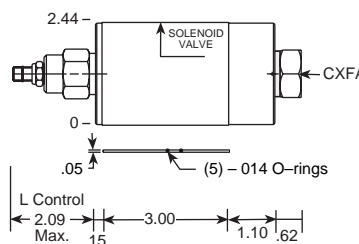
On B Drained to A



Assembly Model Code*

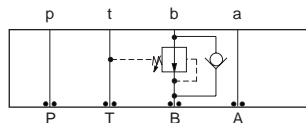
PBFB-LAN-BB2

*Add modifier /S to order Ductile Iron for pressure rating over 3000 psi.



Function

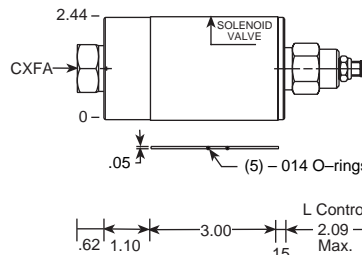
On A Drain to T
(Reverse Free Flow Check)



Assembly Model Code*

PBFB-LAN-BB3

*Add modifier /S to order Ductile Iron for pressure rating over 3000 psi.



Function

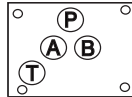
On B Drain to T
(Reverse Free Flow Check)

NOTES: Page 34 for cartridge model PB*B-*** and page 102 for cartridge model CX*A-*** show performance curves, technical tips, and options. See page 140 for technical information about sandwich bodies including ISO interface patterns, mounting instructions, studrods, and studkits. Go to www.sunhydraulics.com for more product information. Model Codes printed in red are Preferred Products and are readily available.

Sandwich Assemblies

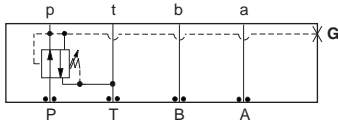
ISO 05 / CETOP 5 REDUCING / RELIEVING VALVES

T-2A Cavity



All sandwich bodies shown below are 2.50" wide

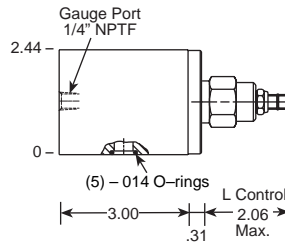
PILOT OPERATED



Assembly Model Code*

PPFB-LAN-BBP

*Add modifier /S to order Ductile Iron for pressure rating over 3000 psi.



DIRECT ACTING

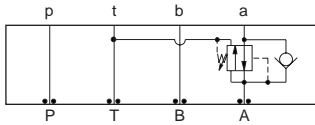
Function

On P, Tank to T

Assembly Model Code*

PRFB-LAN-BBP

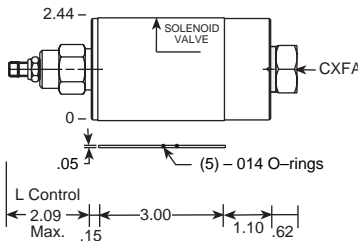
*Add modifier /S to order Ductile Iron for pressure rating over 3000 psi.



Assembly Model Code*

PPFB-LAN-BB2

*Add modifier /S to order Ductile Iron for pressure rating over 3000 psi.



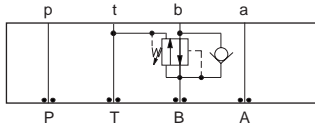
Function

On A, Tank to T
(Reverse Free Flow Check)

Assembly Model Code*

PRFB-LAN-BB2

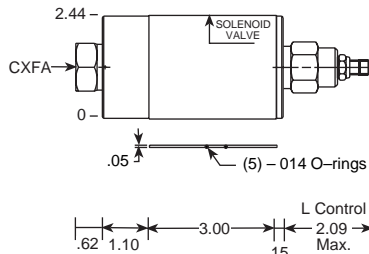
*Add modifier /S to order Ductile Iron for pressure rating over 3000 psi.



Assembly Model Code*

PPFB-LAN-BB3

*Add modifier /S to order Ductile Iron for pressure rating over 3000 psi.



Function

On B, Tank to T
(Reverse Free Flow Check)

Assembly Model Code*

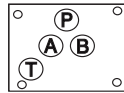
PRFB-LAN-BB3

*Add modifier /S to order Ductile Iron for pressure rating over 3000 psi.

NOTES: Page 42 for cartridge models PP*B-*** and PR*B-*** show performance curves, technical tips, and options. See page 140 for technical information about sandwich bodies including ISO interface patterns, mounting instructions, studrods, and studkits. Go to www.sunhydraulics.com for more product information. Model Codes printed in red are Preferred Products and are readily available.

ISO 05 / CETOP 5 COUNTERBALANCE VALVES

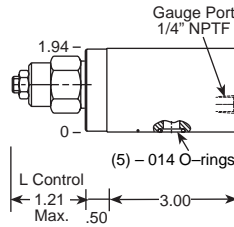
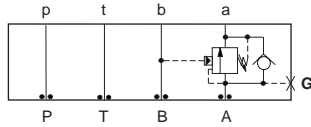
T-2A Cavity



All sandwich bodies shown below are 2.50" wide

PILOT RATIOS
3:1 (CBEA), 1.5:1 (CBEB), 2:1 (CBEY)

PILOT RATIOS
2.3:1 (CBEL), 4.5:1 (CBEG), 10:1 (CBEH)



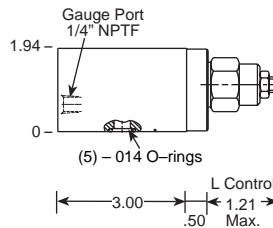
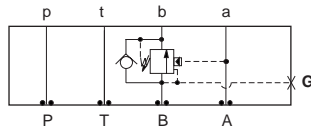
Function
On A, Pilot from B

Assembly Model Code*
CBE*-LHN-BBA

Assembly Model Code*
CBE*-LJN-BBA

*The 4th digit of the Model Code must be entered to specify counterbalance pilot ratio. Add modifier /S to order Ductile Iron for pressure rating over 3000 psi.

*The 4th digit of the Model Code must be entered to specify counterbalance pilot ratio. Add modifier /S to order Ductile Iron for pressure rating over 3000 psi.



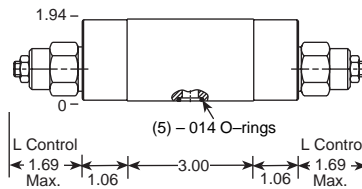
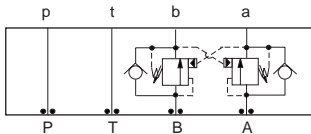
Function
On B, Pilot from A

Assembly Model Code*
CBE*-LHN-BBB

Assembly Model Code*
CBE*-LJN-BBB

*The 4th digit of the Model Code must be entered to specify counterbalance pilot ratio. Add modifier /S to order Ductile Iron for pressure rating over 3000 psi.

*The 4th digit of the Model Code must be entered to specify counterbalance pilot ratio. Add modifier /S to order Ductile Iron for pressure rating over 3000 psi.



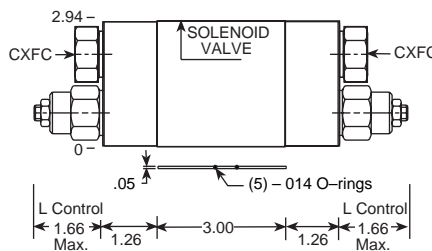
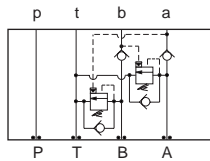
Function
On A and B (Cross-Piloted)

Assembly Model Code*
CBE*-LHN-BBY

Assembly Model Code*
CBE*-LJN-BBY

*The 4th digit of the Model Code must be entered to specify counterbalance pilot ratio. Add modifier /S to order Ductile Iron for pressure rating over 3000 psi.

*The 4th digit of the Model Code must be entered to specify counterbalance pilot ratio. Add modifier /S to order Ductile Iron for pressure rating over 3000 psi.



Function
Cushion Lock Circuit
On A and B

Assembly Model Code*
CBE*-LHN-BB8

Assembly Model Code*
CBE*-LJN-BB8

*The 4th digit of the Model Code must be entered to specify counterbalance pilot ratio. Add modifier /S to order Ductile Iron for pressure rating over 3000 psi.

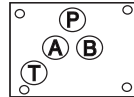
*The 4th digit of the Model Code must be entered to specify counterbalance pilot ratio. Add modifier /S to order Ductile Iron for pressure rating over 3000 psi.

NOTES: Page 50 for cartridge model CB**.* show performance curves, technical tips, and options.
See page 140 for technical information about sandwich bodies including ISO interface patterns, mounting instructions, studrods, and studkits.
Go to www.sunhydraulics.com for more product information.
Model Codes printed in red are Preferred Products and are readily available.

Sandwich Assemblies

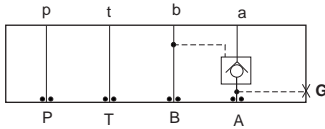
ISO 05 / CETOP 5 PILOT-TO-OPEN CHECK VALVES

T-2A Cavity



All sandwich bodies shown below are 2.50" wide

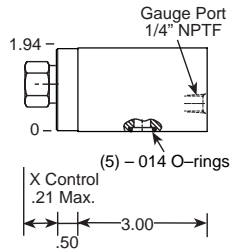
PILOT OPERATED



Assembly
Model Code*

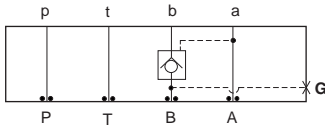
CKEB-XCN-BBA

*Add modifier **/S** to order Ductile Iron for pressure rating over 3000 psi.



Function

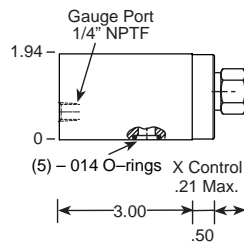
On A, Pilot from B



Assembly
Model Code*

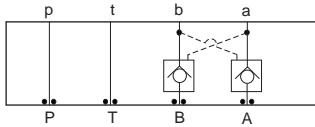
CKEB-XCN-BBB

*Add modifier **/S** to order Ductile Iron for pressure rating over 3000 psi.



Function

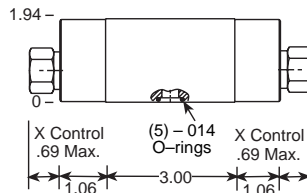
On B, Pilot from A



Assembly
Model Code*

CKEB-XCN-BBY

*Add modifier **/S** to order Ductile Iron for pressure rating over 3000 psi.



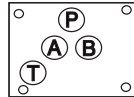
Function

On A and B (Cross-piloted)

NOTES: Page 78 for cartridge model CK**-*** show performance curves, technical tips, and options.
See page 140 for technical information about sandwich bodies including ISO interface patterns, mounting instructions, studrods, and studkits.
Go to www.sunhydraulics.com for more product information.
Model Codes printed in red are Preferred Products and are readily available.

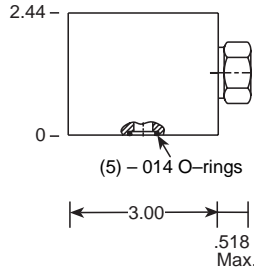
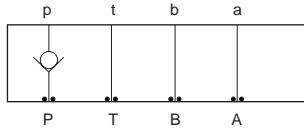
ISO 05 / CETOP 5 CHECK VALVES

T-5A Cavity



All sandwich bodies shown below are 2.50" wide

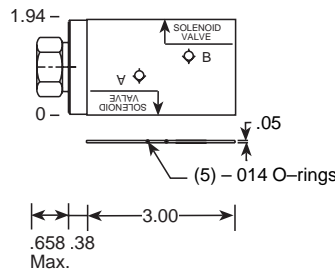
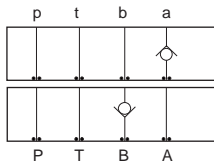
FREE FLOW
PORT 1 TO 2



Function
On P

Assembly
Model Code*
CXFA-XCN-DBP

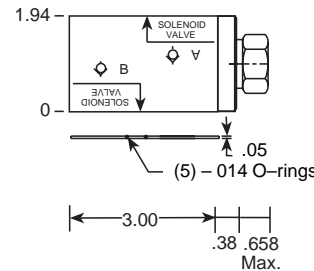
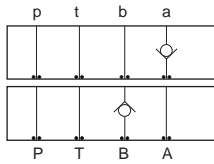
*Add modifier /S to order Ductile Iron for pressure rating over 3000 psi.



Function
On A, Free Flow Out of Valve
On B, Free Flow Into Valve

Assembly
Model Code*
CXFA-XCN-DBK

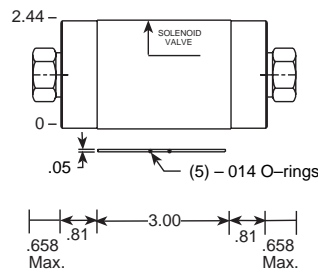
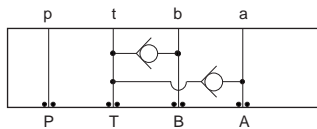
*Add modifier /S to order Ductile Iron for pressure rating over 3000 psi.



Function
On A, Free Flow Into Valve
On B, Free Flow Out of Valve

Assembly
Model Code*
CXFA-XCN-DBJ

*Add modifier /S to order Ductile Iron for pressure rating over 3000 psi.



Function
T to A and B

Assembly
Model Code*
CXFA-XAN-DBW

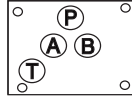
*Add modifier /S to order Ductile Iron for pressure rating over 3000 psi.

NOTES: Page 102 for cartridge models CX*A-*** and CX*D-*** show performance curves, technical tips, and options. See page 140 for technical information about sandwich bodies including ISO interface patterns, mounting instructions, studrods, and studkits. Go to www.sunhydraulics.com for more product information. Model Codes printed in red are Preferred Products and are readily available.

Sandwich Assemblies

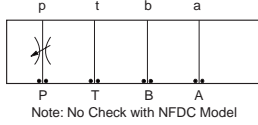
ISO 05 / CETOP 5 FLOW CONTROL VALVES

T-5A Cavity



All sandwich bodies shown below are 2.50" wide

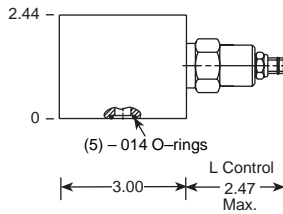
FULLY ADJUSTABLE NEEDLE WITH REVERSE FREE FLOW CHECK



Assembly Model Code*

NFDC-LAN-DBP

*Add modifier /S to order Ductile Iron for pressure rating over 3000 psi.



FULLY ADJUSTABLE PRESSURE COMPENSATED WITH FREE FLOW CHECK

Function

Meter-In P

Assembly Model Code*

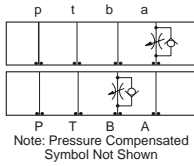
FDCB-LAN-DBP

*Add modifier /S to order Ductile Iron for pressure rating over 3000 psi.

Function

Meter-Out A

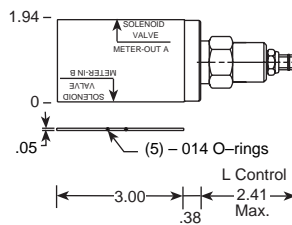
Meter-In B



Assembly Model Code*

NCEB-LAN-DBA

*Add modifier /S to order Ductile Iron for pressure rating over 3000 psi.



Assembly Model Code*

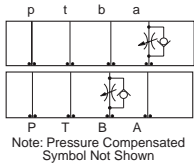
FDCB-LAN-DBA

*Add modifier /S to order Ductile Iron for pressure rating over 3000 psi.

Function

Meter-In A

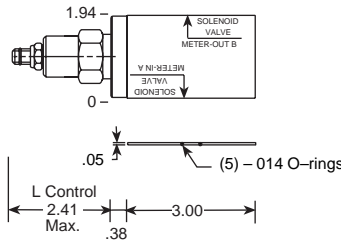
Meter-Out B



Assembly Model Code*

NCEB-LAN-DBB

*Add modifier /S to order Ductile Iron for pressure rating over 3000 psi.



Assembly Model Code*

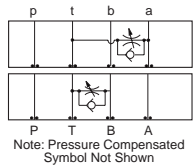
FDCB-LAN-DBB

*Add modifier /S to order Ductile Iron for pressure rating over 3000 psi.

Function

Bleed-Off A to T

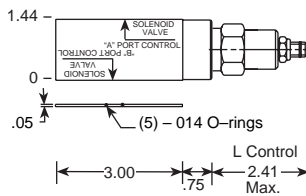
Bleed-Off B to T



Assembly Model Code*

NCEB-LAN-DBC

*Add modifier /S to order Ductile Iron for pressure rating over 3000 psi.



Assembly Model Code*

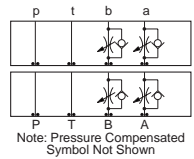
FDCB-LAN-DBC

*Add modifier /S to order Ductile Iron for pressure rating over 3000 psi.

Function

Meter-In A and B

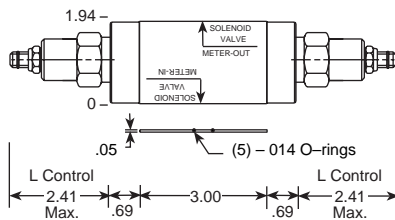
Meter-Out A and B



Assembly Model Code*

NCEB-LAN-DBY

*Add modifier /S to order Ductile Iron for pressure rating over 3000 psi.



Assembly Model Code*

FDCB-LAN-DBY

*Add modifier /S to order Ductile Iron for pressure rating over 3000 psi.

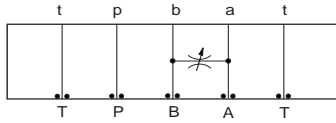
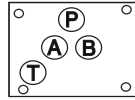
NOTES: Page 110 for cartridge models NF*C-*** and NC*B-***, and page 126 for FD*B*** show performance curves, technical tips, and options. See page 140 for technical information about sandwich bodies including ISO interface patterns, mounting instructions, studrods, and studkits. Go to www.sunhydraulics.com for more product information. Model Codes printed in red are Preferred Products and are readily available.

ISO 05 / CETOP 5 FLOW CONTROL VALVES

T-13A Cavity

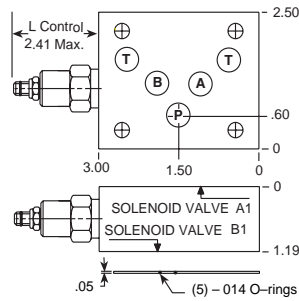
All sandwich bodies shown below are 2.50" wide

FULLY ADJUSTABLE NEEDLE



Assembly Model Code*
NFCC-LCN-DBS

*Add modifier **/S** to order Ductile Iron for pressure rating over 3000 psi.



Function

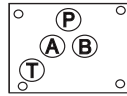
Meter A to B
Meter B to A

NOTES: Page 110 for cartridge models NF*C-*** show performance curves, technical tips, and options.
See page 140 for technical information about sandwich bodies including ISO interface patterns, mounting instructions, studrods, and studkits.
Go to www.sunhydraulics.com for more product information.

Sandwich Assemblies

**ISO 05 / CETOP 5 FLOW CONTROL VALVES
(RAPID ADVANCE AND FEED ASSEMBLIES)**

T-5A Cavity



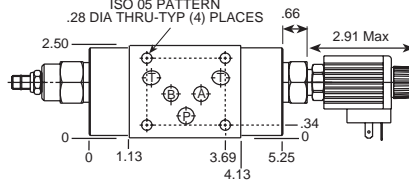
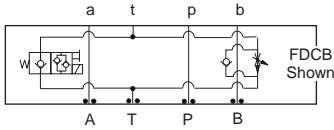
All sandwich bodies shown below are 2.50" wide

**FIXED ORIFICE TUNABLE,
PRESSURE COMPENSATED**

**FULLY ADJUSTABLE, PRESSURE
COMPENSATED WITH FREE FLOW CHECK**

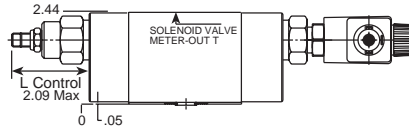
Function

Meter-Out **T**, Solenoid Normally Closed



Assembly
Model Code*
X3DD-LAN-CA

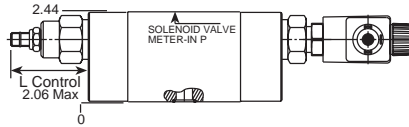
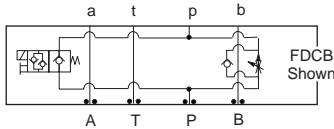
*Add modifier **/S** to order Ductile Iron for pressure rating over 3000 psi.



Coil must be selected separately. See page 248.

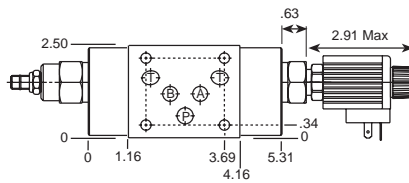
Function

Meter in **P**, Solenoid Normally Closed



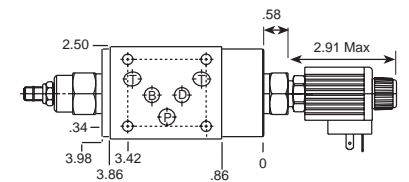
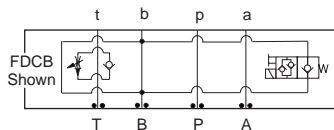
Assembly
Model Code*
X2DD-LAN-CA

*Add modifier **/S** to order Ductile Iron for pressure rating over 3000 psi.



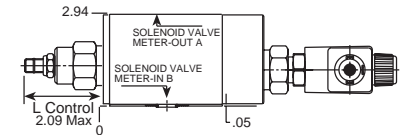
Function

Meter-Out **A**, Solenoid Normally Closed
Meter-In **B**, Solenoid Normally Closed



Assembly
Model Code*
X6DD-LAN-CA

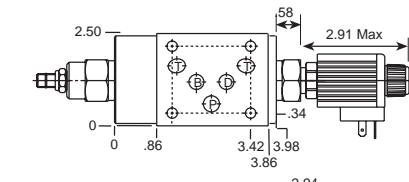
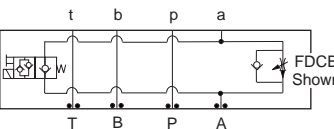
*Add modifier **/S** to order Ductile Iron for pressure rating over 3000 psi.



Coil must be selected separately. See page 248.

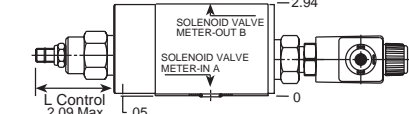
Function

Meter-In **A**, Solenoid Normally Closed
Meter-Out **B**, Solenoid Normally Closed



Assembly
Model Code*
X4DD-LAN-CA

*Add modifier **/S** to order Ductile Iron for pressure rating over 3000 psi.

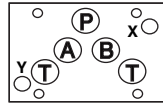


Coil must be selected separately. See page 248.

NOTES: Page 110 for cartridge models NF*C-*** and NC*B-*** show performance curves, technical tips, and options.
See page 140 for technical information about sandwich bodies including ISO interface patterns, mounting instructions, studrods, and studkits.
Go to www.sunhydraulics.com for more product information.

**ISO 05 / CETOP 5 WITH X AND Y RELIEF VALVES
(SIDE PORTED SUBPLATE)**

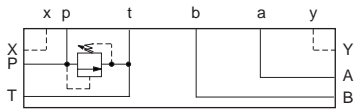
T-10A Cavity



All subplates shown below are 4.5" wide

PILOT OPERATED

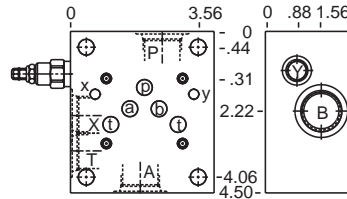
DIRECT ACTING



ISO5/CETOP VERSION

Function

P to T



Order Retainer and Seal Kits separately. (See page 141)

Ports A, B, P, T	Ports X, Y	Assembly Model Code*
1/2" NPTF	1/4" NPTF	RDDA-LAN-ZHP
3/4" NPTF	1/4" NPTF	RDDA-LAN-ZHQ
SAE-10	SAE-6	RDDA-LAN-ZHR
SAE-12	SAE-6	RDDA-LAN-ZHS

*Add modifier /S to order Ductile Iron for pressure rating over 3000 psi.

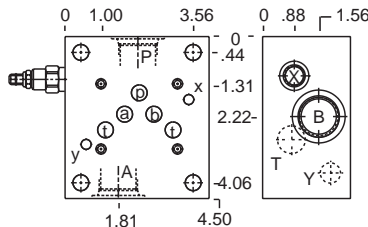
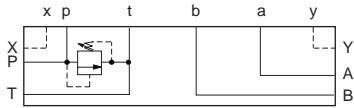
Ports A, B, P, T	Ports X, Y	Assembly Model Code*
1/2" NPTF	1/4" NPTF	RPEC-LAN-ZHP
3/4" NPTF	1/4" NPTF	RPEC-LAN-ZHQ
SAE-10	SAE-6	RPEC-LAN-ZHR
SAE-12	SAE-6	RPEC-LAN-ZHS

*Add modifier /S to order Ductile Iron for pressure rating over 3000 psi.

U.S. D05H VERSION

Function

P to T



Order Retainer and Seal Kits separately. (See page 141)

Ports A, B, P, T	Ports X, Y	Assembly Model Code*
1/2" NPTF	1/4" NPTF	RDDA-LAN-ZHH
3/4" NPTF	1/4" NPTF	RDDA-LAN-ZHJ
SAE-10	SAE-6	RDDA-LAN-ZHK
SAE-12	SAE-6	RDDA-LAN-ZHL

*Add modifier /S to order Ductile Iron for pressure rating over 3000 psi.

Ports A, B, P, T	Ports X, Y	Assembly Model Code*
1/2" NPTF	1/4" NPTF	RPEC-LAN-ZHH
3/4" NPTF	1/4" NPTF	RPEC-LAN-ZHJ
SAE-10	SAE-6	RPEC-LAN-ZHK
SAE-12	SAE-6	RPEC-LAN-ZHL

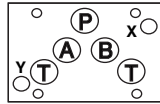
*Add modifier /S to order Ductile Iron for pressure rating over 3000 psi.

NOTES: Page 2 for cartridge models RP*C-*** and RD*A-*** show performance curves, technical tips, and options. See page 140 for technical information about sandwich bodies including ISO interface patterns, mounting instructions, studrods, and studkits. Sun ISO 05 X, Y, sandwich bodies are furnished with pilot and drain connections. Seal plates are NOT supplied with these bodies, due to the differences in the European and U.S. seal plates. To order seal plates separately see page 141-142.

Go to www.sunhydraulics.com for more product information and pricing.

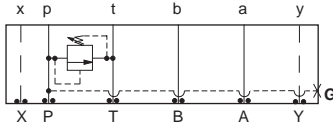
ISO 05 / CETOP 5 WITH X AND Y RELIEF VALVES

T-3A / T-10A Cavities



All sandwich bodies shown below are 2.50" wide

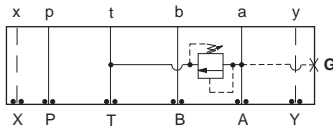
PILOT OPERATED



Assembly Model Code*

RPGC-LAN-CJP

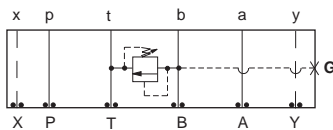
*Add modifier /S to order Ductile Iron for pressure rating over 3000 psi.



Assembly Model Code*

RPGC-LAN-CJA

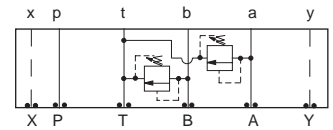
*Add modifier /S to order Ductile Iron for pressure rating over 3000 psi.



Assembly Model Code*

RPGC-LAN-CJB

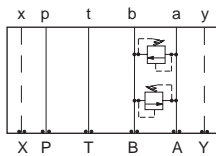
*Add modifier /S to order Ductile Iron for pressure rating over 3000 psi.



Assembly Model Code*

RPGC-LAN-CJX

*Add modifier /S to order Ductile Iron for pressure rating over 3000 psi.



Assembly Model Code*

RPEC-LAN-CJY

*Add modifier /S to order Ductile Iron for pressure rating over 3000 psi.

DIRECT ACTING

Function

P to T (High Capacity)

Assembly Model Code*

RDFA-LAN-CJP

*Add modifier /S to order Ductile Iron for pressure rating over 3000 psi.

Function

A to T (High Capacity)

Assembly Model Code*

RDFA-LAN-CJA

*Add modifier /S to order Ductile Iron for pressure rating over 3000 psi.

Function

B to T (High Capacity)

Assembly Model Code*

RDFA-LAN-CJB

*Add modifier /S to order Ductile Iron for pressure rating over 3000 psi.

Function

A and B to T (High Capacity)

Assembly Model Code*

RDFA-LAN-CJX

*Add modifier /S to order Ductile Iron for pressure rating over 3000 psi.

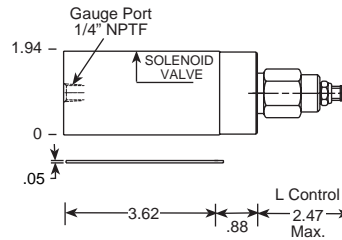
Function

A to B and B to A
(Cross-port)

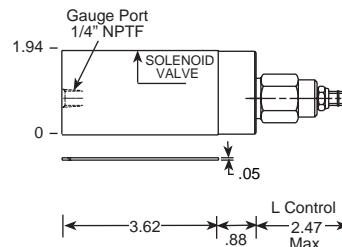
Assembly Model Code*

RDDA-LAN-CJY

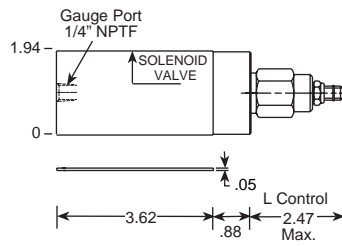
*Add modifier /S to order Ductile Iron for pressure rating over 3000 psi.



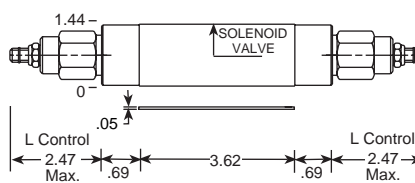
Order Retainer and Seal Kits separately. (See page 141)



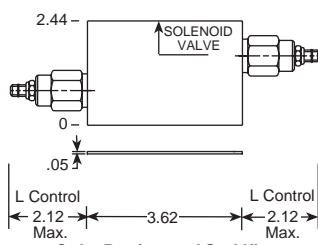
Order Retainer and Seal Kits separately. (See page 141)



Order Retainer and Seal Kits separately. (See page 141)



Order Retainer and Seal Kits separately. (See page 141)



Order Retainer and Seal Kits separately. (See page 141)

NOTES: Page 2 for cartridge models RP*C-*** and RD*A-*** show performance curves, technical tips, and options.

See page 140 for technical information about sandwich bodies including ISO interface patterns, mounting instructions, studrods, and studkits.

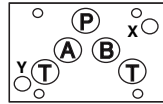
Sun ISO 05 X, Y, sandwich bodies are furnished with pilot and drain connections. Seal plates are NOT supplied with these bodies, due to the differences in the European and U.S. seal plates. To order seal plates separately see page 141-142.

Go to www.sunhydraulics.com for more product information.

Model Codes printed in red are Preferred Products and are readily available.

ISO 05 / CETOP 5 WITH X AND Y SEQUENCE VALVES

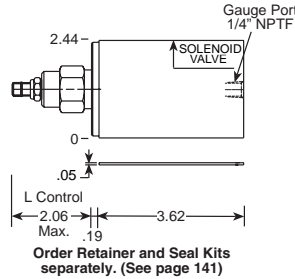
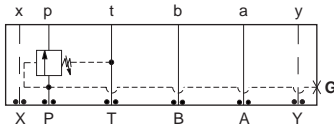
T-2A Cavity



All sandwich bodies shown below are 2.50" wide

PILOT OPERATED

DIRECT ACTING



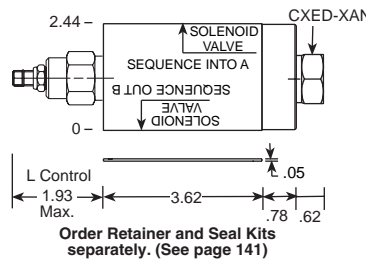
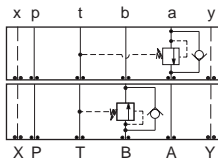
Function
In to P

Assembly Model Code*
RSFC-LAN-BJW

Assembly Model Code*
SXEA-LAN-BJW

*Add modifier /S to order Ductile Iron for pressure rating over 3000 psi.

*Add modifier /S to order Ductile Iron for pressure rating over 3000 psi.



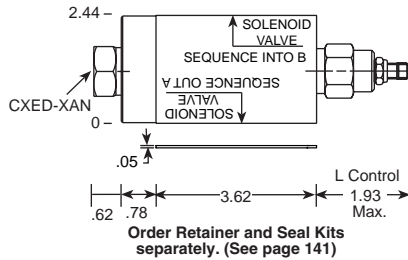
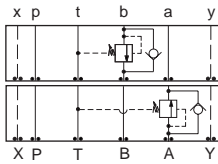
Function
In to A (Reverse Free Flow Check)
Out of B (Reverse Free Flow Check)

Assembly Model Code*
RSFC-LAN-BJ4

Assembly Model Code*
SXEA-LAN-BJ4

*Add modifier /S to order Ductile Iron for pressure rating over 3000 psi.

*Add modifier /S to order Ductile Iron for pressure rating over 3000 psi.



Function
In to B (Reverse Free Flow Check)
Out of A (Reverse Free Flow Check)

Assembly Model Code*
RSFC-LAN-BJ5

Assembly Model Code*
SXEA-LAN-BJ5

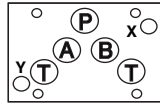
*Add modifier /S to order Ductile Iron for pressure rating over 3000 psi.

*Add modifier /S to order Ductile Iron for pressure rating over 3000 psi.

NOTES: Page 20 for cartridge models RS*C-*** and SX*A-*** show performance curves, technical tips, and options. See page 140 for technical information about sandwich bodies including ISO interface patterns, mounting instructions, studrods, and studkits. Sun ISO 05 X, Y, sandwich bodies are furnished with pilot and drain connections. Seal plates are NOT supplied with these bodies, due to the differences in the European and U.S. seal plates. To order seal plates separately see page 141-142. Go to www.sunhydraulics.com for more product information.

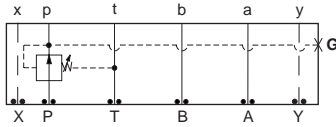
ISO 05 / CETOP 5 WITH X AND Y REDUCING VALVES

T-2A Cavity



All sandwich bodies shown below are 2.50" wide

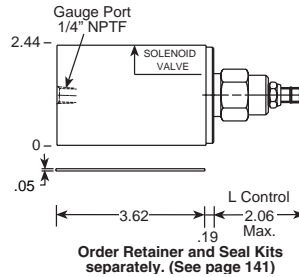
PILOT OPERATED



Assembly Model Code*

PBFB-LAN-BJP

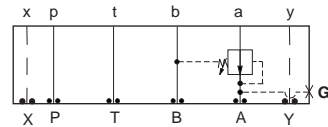
*Add modifier /S to order Ductile Iron for pressure rating over 3000 psi.



Order Retainer and Seal Kits separately. (See page 141)

Function

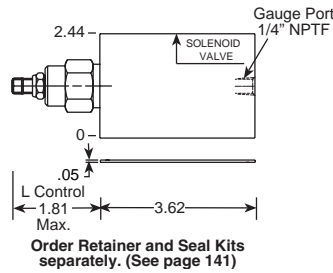
On P Drained to T



Assembly Model Code*

PBFB-LAN-BJA

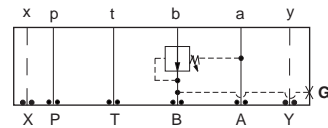
*Add modifier /S to order Ductile Iron for pressure rating over 3000 psi.



Order Retainer and Seal Kits separately. (See page 141)

Function

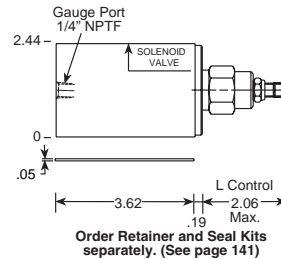
On A Drained to B



Assembly Model Code*

PBFB-LAN-BJB

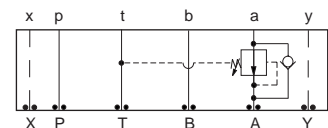
*Add modifier /S to order Ductile Iron for pressure rating over 3000 psi.



Order Retainer and Seal Kits separately. (See page 141)

Function

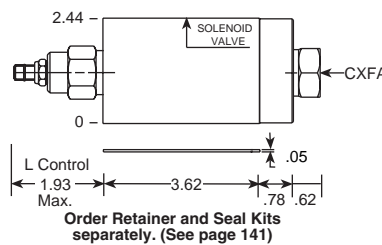
On B Drained to A



Assembly Model Code*

PBFB-LAN-BJ2

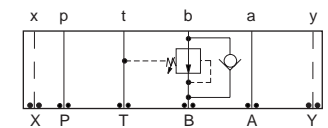
*Add modifier /S to order Ductile Iron for pressure rating over 3000 psi.



Order Retainer and Seal Kits separately. (See page 141)

Function

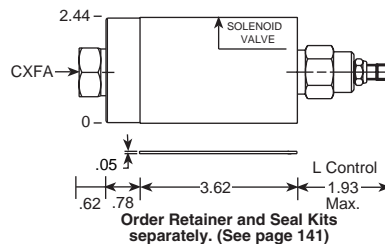
On A Drain to T
(Reverse Free Flow Check)



Assembly Model Code*

PBFB-LAN-BJ3

*Add modifier /S to order Ductile Iron for pressure rating over 3000 psi.



Order Retainer and Seal Kits separately. (See page 141)

Function

On B Drain to T
(Reverse Free Flow Check)

NOTES: Page 34 for cartridge models PB*B-*** and page 102 for CX*A-*** show performance curves, technical tips, and options.

See page 140 for technical information about sandwich bodies including ISO interface patterns, mounting instructions, studrods, and studkits.

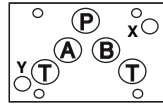
Sun ISO 05 X, Y, sandwich bodies are furnished with pilot and drain connections. Seal plates are NOT supplied with these bodies, due to the differences in the European and U.S. seal plates. To order seal plates separately see page 141-142

Go to www.sunhydraulics.com for more product information.

Model Codes printed in red are Preferred Products and are readily available.

ISO 05 / CETOP 5 WITH X AND Y REDUCING / RELIEVING VALVES

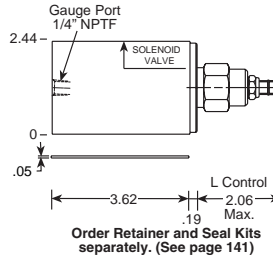
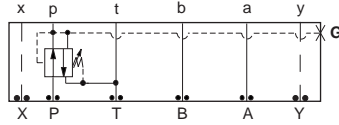
T-2A Cavity



All sandwich bodies shown below are 2.50" wide

PILOT OPERATED

DIRECT ACTING



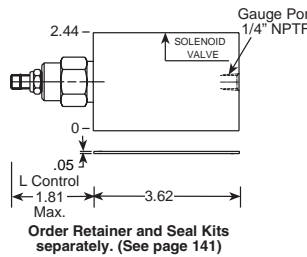
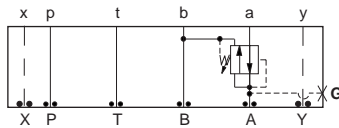
Function
On P Tank to T Drained to T

Assembly Model Code*
PPFB-LAN-BJP

Assembly Model Code*
PRFB-LAN-BJP

*Add modifier /S to order Ductile Iron for pressure rating over 3000 psi.

*Add modifier /S to order Ductile Iron for pressure rating over 3000 psi.



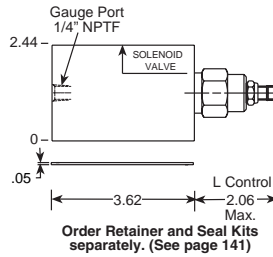
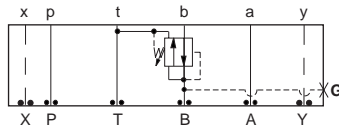
Function
On A Tank to B

Assembly Model Code*
PPFB-LAN-BJA

Assembly Model Code*
PRFB-LAN-BJA

*Add modifier /S to order Ductile Iron for pressure rating over 3000 psi.

*Add modifier /S to order Ductile Iron for pressure rating over 3000 psi.



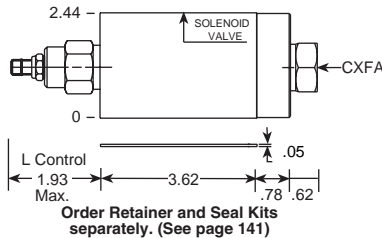
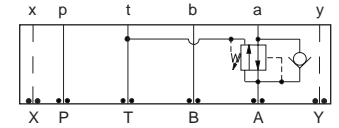
Function
On B Tank to A

Assembly Model Code*
PPFB-LAN-BJB

Assembly Model Code*
PRFB-LAN-BJB

*Add modifier /S to order Ductile Iron for pressure rating over 3000 psi.

*Add modifier /S to order Ductile Iron for pressure rating over 3000 psi.



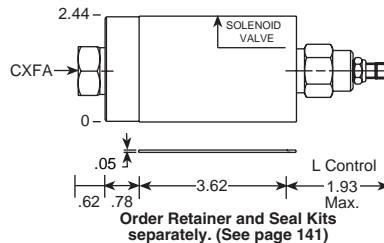
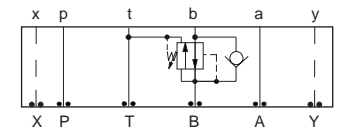
Function
On A Tank to T
(Reverse Free Flow Check)

Assembly Model Code*
PPFB-LAN-BJ2

Assembly Model Code*
PRFB-LAN-BJ2

*Add modifier /S to order Ductile Iron for pressure rating over 3000 psi.

*Add modifier /S to order Ductile Iron for pressure rating over 3000 psi.



Function
On B Tank to T
(Reverse Free Flow Check)

Assembly Model Code*
PPFB-LAN-BJ3

Assembly Model Code*
PRFB-LAN-BJ3

*Add modifier /S to order Ductile Iron for pressure rating over 3000 psi.

*Add modifier /S to order Ductile Iron for pressure rating over 3000 psi.

NOTES: Page 34 for cartridge models PPFB-*** and PRFB-***, and page 102 for C*FA-*** show performance curves, technical tips, and options. See page 140 for technical information about sandwich bodies including ISO interface patterns, mounting instructions, studrods, and studkits.

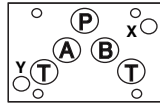
Sun ISO 05 X, Y, sandwich bodies are furnished with pilot and drain connections. Seal plates are NOT supplied with these bodies, due to the differences in the European and U.S. seal plates. To order seal plates separately see page 141-142.

Go to www.sunhydraulics.com for more product information.

Model Codes printed in red are Preferred Products and are readily available.

ISO 05 / CETOP 5 WITH X AND Y COUNTERBALANCE VALVES

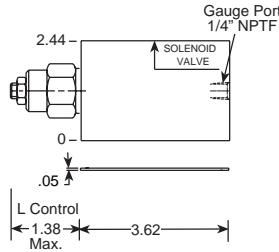
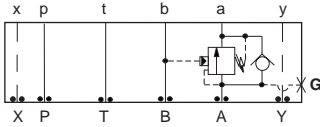
T-2A Cavity



All sandwich bodies shown below are 2.50" wide

PILOT RATIOS
3:1, 1.5:1 and 2:1

PILOT RATIOS
2.3:1, 4.5:1 and 10:1



Function

On A Pilot from B

Assembly Model Code*

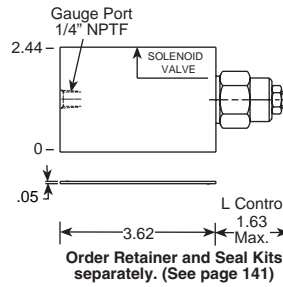
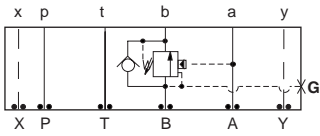
CBE*-LHN-BJA

*The 4th digit of the Model Code must be entered to specify counterbalance pilot ratio. Add modifier /S to order Ductile Iron for pressure rating over 3000 psi.

Assembly Model Code*

CBE*-LJN-BJA

*Add modifier /S to order Ductile Iron for pressure rating over 3000 psi.



Function

On B Pilot from A

Assembly Model Code*

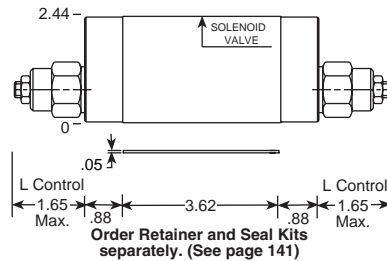
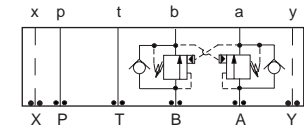
CBE*-LHN-BJB

*The 4th digit of the Model Code must be entered to specify counterbalance pilot ratio. Add modifier /S to order Ductile Iron for pressure rating over 3000 psi.

Assembly Model Code*

CBE*-LJN-BJB

*Add modifier /S to order Ductile Iron for pressure rating over 3000 psi.



Function

On A and B (Cross-Piloted)

Assembly Model Code*

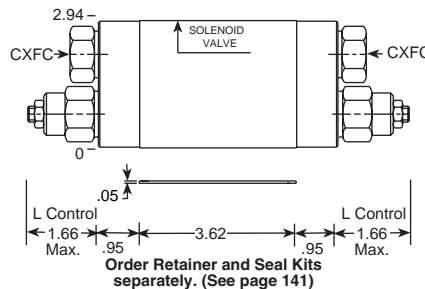
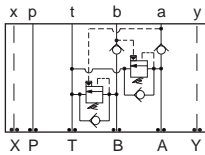
CBE*-LHN-BJY

*The 4th digit of the Model Code must be entered to specify counterbalance pilot ratio. Add modifier /S to order Ductile Iron for pressure rating over 3000 psi.

Assembly Model Code*

CBE*-LJN-BJY

*Add modifier /S to order Ductile Iron for pressure rating over 3000 psi.



Function

Cushion Lock Circuit
On A and B

Assembly Model Code*

CBE*-LHN-BJ8

*The 4th digit of the Model Code must be entered to specify counterbalance pilot ratio. Add modifier /S to order Ductile Iron for pressure rating over 3000 psi.

Assembly Model Code*

CBE*-LJN-BJ8

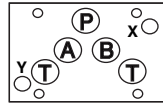
*Add modifier /S to order Ductile Iron for pressure rating over 3000 psi.

NOTES: Page 50 for cartridge model CBE*-*** show performance curves, technical tips, and options. See page 140 for technical information about sandwich bodies including ISO interface patterns, mounting instructions, studrods, and studkits. Sun ISO 05 X, Y, sandwich bodies are furnished with pilot and drain connections. Seal plates are NOT supplied with these bodies, due to the differences in the European and U.S. seal plates. To order seal plates separately see page 141-142. Go to www.sunhydraulics.com for more product information. Model Codes printed in red are Preferred Products and are readily available.

ISO 05 / CETOP 5 WITH X AND Y PILOT-TO-OPEN CHECK VALVES

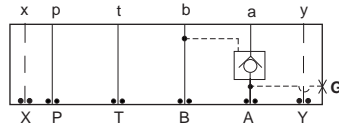
ISO 05/CETOP 5
with X and Y U.S.

T-2A Cavity



All sandwich bodies shown below are 2.50" wide

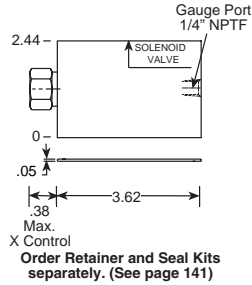
PILOT OPERATED



Assembly Model Code*

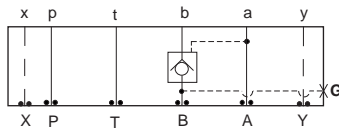
CKEB-XCN-BJA

*Add modifier /S to order Ductile Iron for pressure rating over 3000 psi.



Function

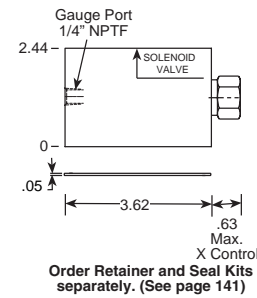
On A Pilot from B



Assembly Model Code*

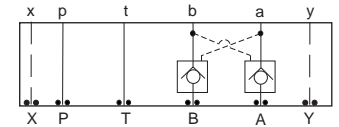
CKEB-XCN-BJB

*Add modifier /S to order Ductile Iron for pressure rating over 3000 psi.



Function

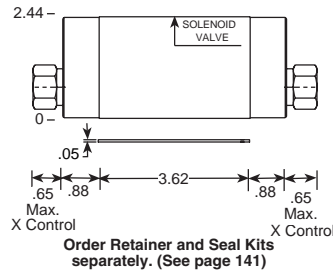
On B Pilot from A



Assembly Model Code*

CKEB-XCN-BJY

*Add modifier /S to order Ductile Iron for pressure rating over 3000 psi.



Function

On A and B (Cross-Piloted)

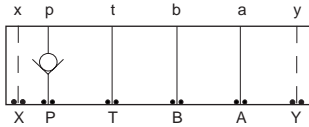
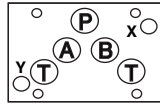
NOTES: Page 78 for cartridge models CK**_*** show performance curves, technical tips, and options.
See page 140 for technical information about sandwich bodies including ISO interface patterns, mounting instructions, studrods, and studkits.
Sun ISO 05 X, Y, sandwich bodies are furnished with pilot and drain connections. Seal plates are NOT supplied with these bodies, due to the differences in the European and U.S. seal plates. To order seal plates separately see page 141-142.
Go to www.sunhydraulics.com for more product information.
Model Codes printed in red are Preferred Products and are readily available.

ISO 05 / CETOP 5 WITH X AND Y CHECK VALVES

T-5A Cavity

All sandwich bodies shown below are 2.50" wide

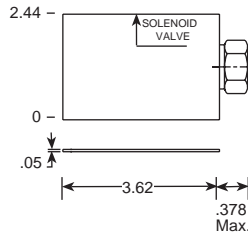
CHECK VALVES



Assembly Model Code*

CXFA-XCN-DJP

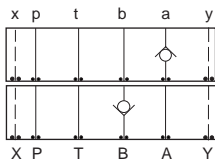
*Add modifier /S to order Ductile Iron for pressure rating over 3000 psi.



Order Retainer and Seal Kits separately. (See page 141)

Function

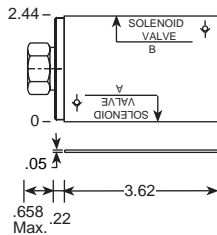
On P



Assembly Model Code*

CXFA-XCN-DJK

*Add modifier /S to order Ductile Iron for pressure rating over 3000 psi.

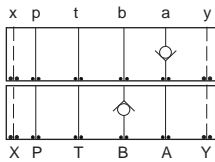


Order Retainer and Seal Kits separately. (See page 141)

Function

On A Free Flow Out of Valve

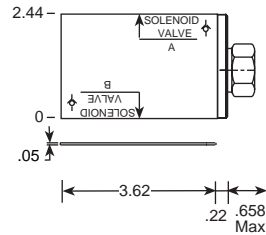
On B Free Flow Into Valve



Assembly Model Code*

CXFA-XCN-DJJ

*Add modifier /S to order Ductile Iron for pressure rating over 3000 psi.

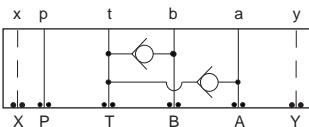


Order Retainer and Seal Kits separately. (See page 141)

Function

On A Free Flow Into Valve

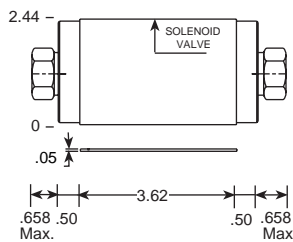
On B Free Flow Out of Valve



Assembly Model Code*

CXFA-XAN-DJW

*Add modifier /S to order Ductile Iron for pressure rating over 3000 psi.



Order Retainer and Seal Kits separately. (See page 141)

Function

T to A and B

NOTES: Page 102 for cartridge models CX*A-*** show performance curves, technical tips, and options.

See page 140 for technical information about sandwich bodies including ISO interface patterns, mounting instructions, studrods, and studkits.

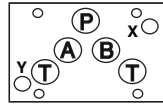
Sun ISO 05 X, Y, sandwich bodies are furnished with pilot and drain connections. Seal plates are NOT supplied with these bodies, due to the differences in the European and U.S. seal plates. To order seal plates separately see page 141-142.

Go to www.sunhydraulics.com for more product information.

Model Codes printed in red are Preferred Products and are readily available.

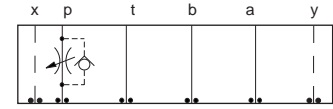
ISO 05 / CETOP 5 WITH X AND Y FLOW CONTROL VALVES

T-5A Cavity



All sandwich bodies shown below are 2.50" wide

FULLY ADJUSTABLE NEEDLE



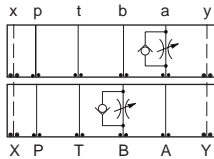
Note: Free Flow Check with Model FDCB Only

Assembly Model Code*

NFDC-LAN-DJP

*Add modifier /S to order Ductile Iron for pressure rating over 3000 psi.

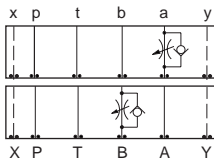
FULLY ADJUSTABLE NEEDLE WITH FREE FLOW CHECK



Assembly Model Code*

NCEB-LCN-DJA

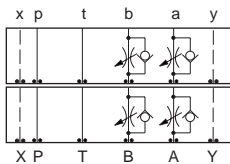
*Add modifier /S to order Ductile Iron for pressure rating over 3000 psi.



Assembly Model Code*

NCEB-LCN-DJB

*Add modifier /S to order Ductile Iron for pressure rating over 3000 psi.

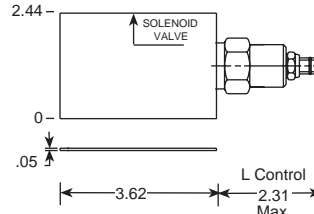


Assembly Model Code*

NCEB-LCN-DJY

*Add modifier /S to order Ductile Iron for pressure rating over 3000 psi.

FULLY ADJUSTABLE PRESSURE COMPENSATED WITH FREE FLOW CHECK



Order Retainer and Seal Kits separately. (See page 141)

Function

Meter-In P

Assembly Model Code*

FDCB-LAN-DJP

*Add modifier /S to order Ductile Iron for pressure rating over 3000 psi.

Function

Meter-Out A

Meter-In B

Assembly Model Code*

FDCB-LAN-DJA

*Add modifier /S to order Ductile Iron for pressure rating over 3000 psi.

Function

Meter-In A

Meter-Out B

Assembly Model Code*

FDCB-LAN-DJB

*Add modifier /S to order Ductile Iron for pressure rating over 3000 psi.

Function

Meter-In A and B

Meter-Out A and B

Assembly Model Code*

FDCB-LAN-DJY

*Add modifier /S to order Ductile Iron for pressure rating over 3000 psi.

NOTES: Page 110 for cartridge models NF*C-*** and NC*B-***, and page 126 for FD**.* show performance curves, technical tips, and options. See page 140 for technical information about sandwich bodies including ISO interface patterns, mounting instructions, studrods, and studkits.

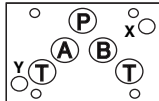
Sun ISO 05 X, Y, sandwich bodies are furnished with pilot and drain connections. Seal plates are NOT supplied with these bodies, due to the differences in the European and U.S. seal plates. To order seal plates separately see page 141-142.

Go to www.sunhydraulics.com for more product information.

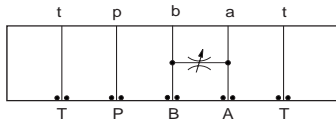
Model Codes printed in red are Preferred Products and are readily available.

ISO 05 / CETOP 5 WITH X AND Y FLOW CONTROL VALVES

T-13A Cavity

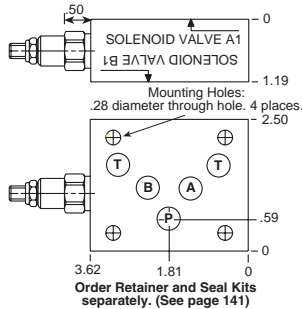


FULLY ADJUSTABLE NEEDLE



Assembly Model Code*
NFCC-LCN-DJS

*Add modifier /S to order Ductile Iron for pressure rating over 3000 psi.

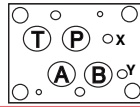


Function
Meter A to B and B to A

NOTES: Page 110 for cartridge model NF*C-*** show performance curves, technical tips, and options.
See page 140 for technical information about sandwich bodies including ISO interface patterns, mounting instructions, studrods, and studkits.
Sun ISO 05 X, Y, sandwich bodies are furnished with pilot and drain connections. Seal plates are NOT supplied with these bodies, due to the differences in the European and U.S. seal plates. To order seal plates separately see page 141-142.
Go to www.sunhydraulics.com for more product information.

**ISO 07 / CETOP 7 RELIEF VALVES
(SIDE PORTED SUBPLATE / SIDE PORTED SUBPLATE WITH GASKET MOUNTED TANK PORT)**

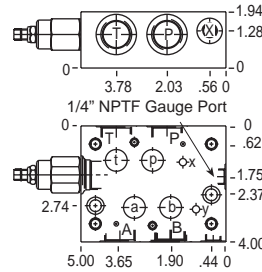
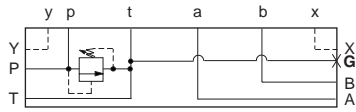
T-3A Cavity



All subplates shown below are 5.0" wide

PILOT OPERATED

DIRECT ACTING



Function

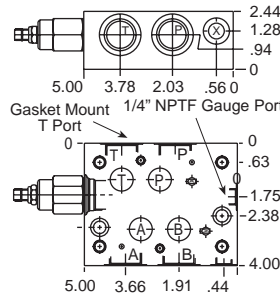
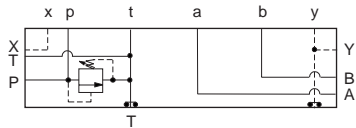
P to T

Ports A, B, P, T	Ports X, Y	Assembly Model Code*
3/4" NPTF	1/4" NPTF	RPGC-LAN-ZLW
SAE-12	SAE-6	RPGC-LAN-ZLX

*Add modifier /S to order Ductile Iron for pressure rating over 3000 psi.

Ports A, B, P, T	Ports X, Y	Assembly Model Code*
3/4" NPTF	1/4" NPTF	RDFA-LAN-ZLW
SAE-12	SAE-6	RDFA-LAN-ZLX

*Add modifier /S to order Ductile Iron for pressure rating over 3000 psi.



Function

P to T

Ports A, B, P, T	Ports X, Y	Assembly Model Code*
3/4" NPTF	1/4" NPTF	RPGC-LAN-VTE
SAE-12	SAE-6	RPGC-LAN-VTF

*Add modifier /S to order Ductile Iron for pressure rating over 3000 psi.

Ports A, B, P, T	Ports X, Y	Assembly Model Code*
3/4" NPTF	1/4" NPTF	RDFA-LAN-VTE
SAE-12	SAE-6	RDFA-LAN-ZLF

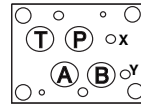
*Add modifier /S to order Ductile Iron for pressure rating over 3000 psi.

NOTES: Page 2 for cartridge models RP*C-*** and RD*A-*** show performance curves, technical tips, and options.
See page 140 for technical information about sandwich bodies including ISO interface patterns, mounting instructions, studrods, and studkits.
Go to www.sunhydraulics.com for more product information and pricing.
Model Codes printed in red are Preferred Products and are readily available.

Sandwich Assemblies

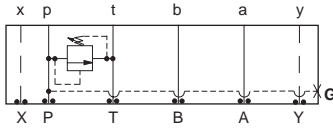
ISO 07 / CETOP 7 RELIEF VALVES

T-3A / T-10A Cavities



All sandwich bodies shown below are 3.50" wide

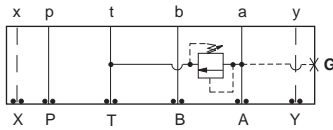
PILOT OPERATED



Assembly Model Code*

RPGC-LAN-CKP

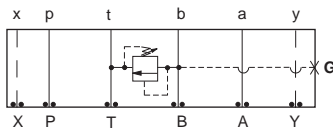
*Add modifier /S to order Ductile Iron for pressure rating over 3000 psi.



Assembly Model Code*

RPGC-LAN-CKA

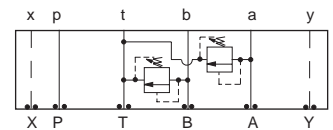
*Add modifier /S to order Ductile Iron for pressure rating over 3000 psi.



Assembly Model Code*

RPGC-LAN-CKB

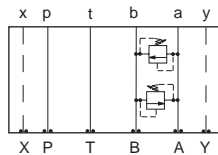
*Add modifier /S to order Ductile Iron for pressure rating over 3000 psi.



Assembly Model Code*

RPGC-LAN-CKX

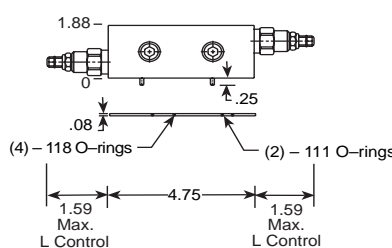
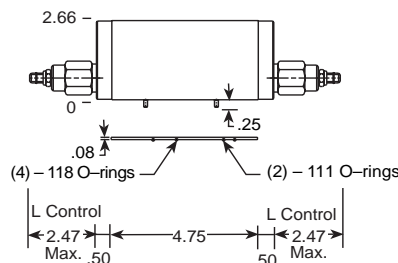
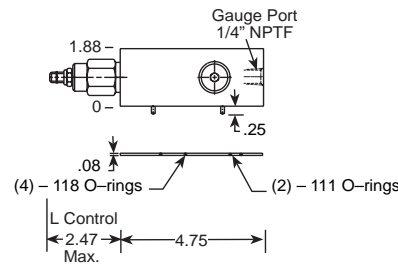
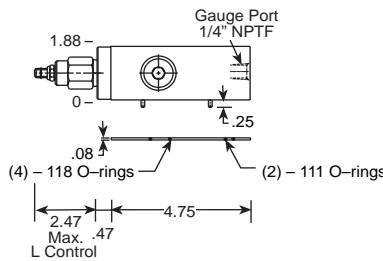
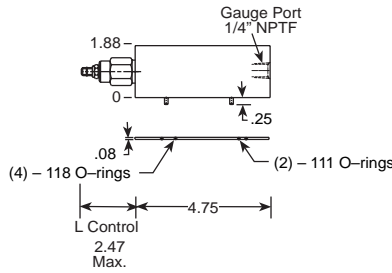
*Add modifier /S to order Ductile Iron for pressure rating over 3000 psi.



Assembly Model Code*

RPEC-LAN-CKY

*Add modifier /S to order Ductile Iron for pressure rating over 3000 psi.



DIRECT ACTING

Function

P to T

Assembly Model Code*

RDFA-LAN-CKP

*Add modifier /S to order Ductile Iron for pressure rating over 3000 psi.

Function

A to T

Assembly Model Code*

RDFA-LAN-CKA

*Add modifier /S to order Ductile Iron for pressure rating over 3000 psi.

Function

B to T

Assembly Model Code*

RDFA-LAN-CKB

*Add modifier /S to order Ductile Iron for pressure rating over 3000 psi.

Function

A and B to T (High Capacity)

Assembly Model Code*

RDFA-LAN-CKX

*Add modifier /S to order Ductile Iron for pressure rating over 3000 psi.

Function

A to B and B to A (Cross-port)

Assembly Model Code*

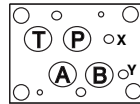
RDDA-LAN-CKY

*Add modifier /S to order Ductile Iron for pressure rating over 3000 psi.

NOTES: Page 2 for cartridge models RP*C-*** and RD*A-*** show performance curves, technical tips, and options. See page 140 for technical information about sandwich bodies including ISO interface patterns, mounting instructions, studrods, and studkits. Go to www.sunhydraulics.com for more product information. Model Codes printed in red are Preferred Products and are readily available.

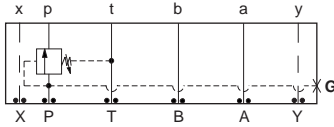
ISO 07 / CETOP 7 SEQUENCE VALVES

T-17A Cavity



All sandwich bodies shown below are 3.50" wide

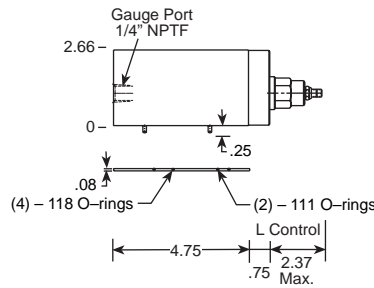
PILOT OPERATED



Assembly Model Code*

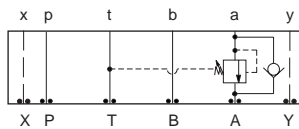
RSHC-LAN-BKW

*Add modifier /S to order Ductile Iron for pressure rating over 3000 psi.



Function

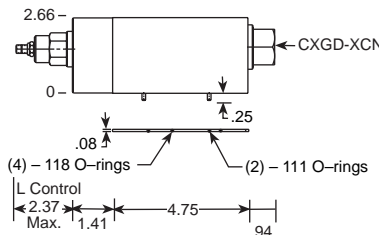
In to P



Assembly Model Code*

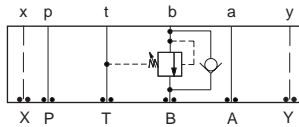
RSHC-LAN-BK4

*Add modifier /S to order Ductile Iron for pressure rating over 3000 psi.



Function

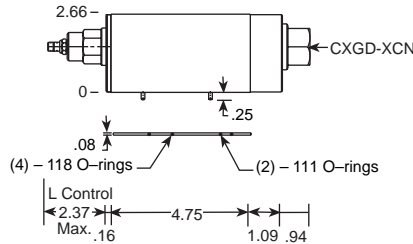
In to A (Reverse Free Flow Check)



Assembly Model Code*

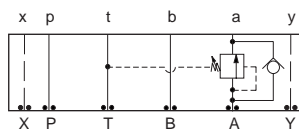
RSHC-LAN-BK5

*Add modifier /S to order Ductile Iron for pressure rating over 3000 psi.



Function

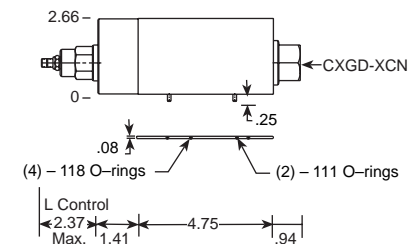
In to B (Reverse Free Flow Check)



Assembly Model Code*

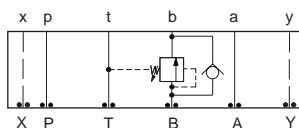
RSHC-LAN-BK6

*Add modifier /S to order Ductile Iron for pressure rating over 3000 psi.



Function

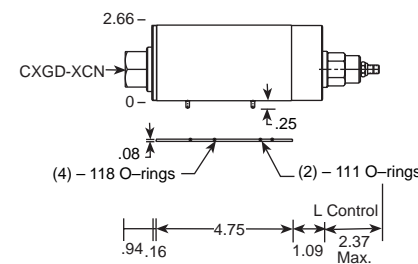
Out of A (Reverse Free Flow Check)



Assembly Model Code*

RSHC-LAN-BK7

*Add modifier /S to order Ductile Iron for pressure rating over 3000 psi.



Function

Out of B (Reverse Free Flow Check)

NOTES: Page 20 for cartridge model RS*C-*** show performance curves, technical tips, and options.

See page 140 for technical information about sandwich bodies including ISO interface patterns, mounting instructions, studrods, and studkits.

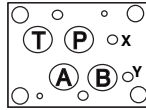
Go to www.sunhydraulics.com for more product information.

Model Codes printed in red are Preferred Products and are readily available.

Sandwich Assemblies

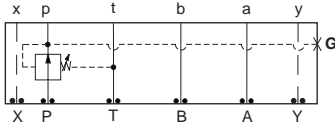
ISO 07 / CETOP 7 REDUCING VALVES

T-17A Cavity



All sandwich bodies shown below are 3.50" wide

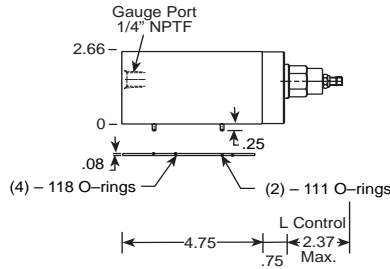
PILOT OPERATED



Assembly Model Code*

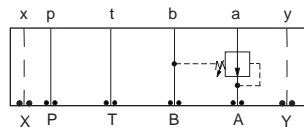
PBHB-LAN-BKP

*Add modifier /S to order Ductile Iron for pressure rating over 3000 psi.



Function

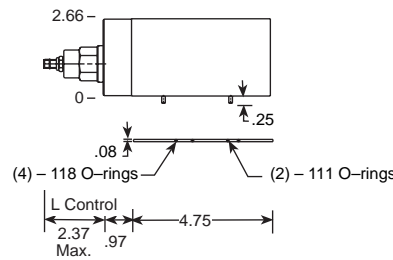
On P Drained to T



Assembly Model Code*

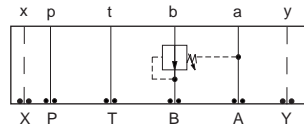
PBHB-LAN-BKA

*Add modifier /S to order Ductile Iron for pressure rating over 3000 psi.



Function

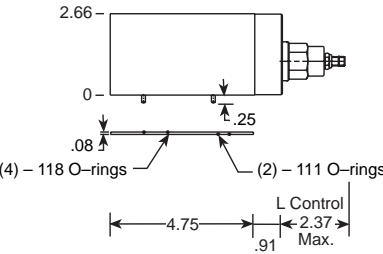
On A Drained to B



Assembly Model Code*

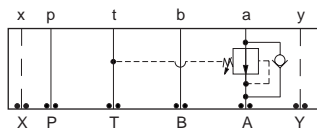
PBHB-LAN-BKB

*Add modifier /S to order Ductile Iron for pressure rating over 3000 psi.



Function

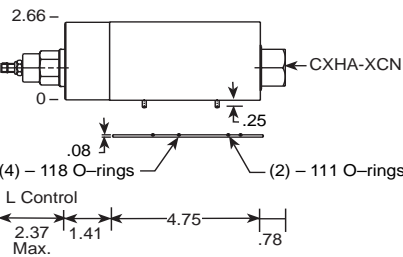
On B Drained to A



Assembly Model Code*

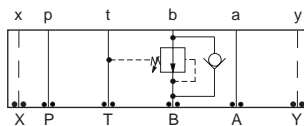
PBHB-LAN-BK2

*Add modifier /S to order Ductile Iron for pressure rating over 3000 psi.



Function

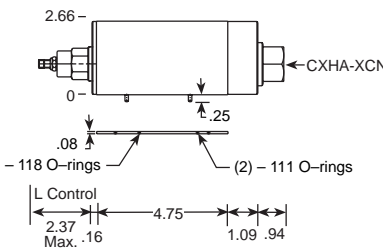
On A Drain to T
(Reverse Free Flow Check)



Assembly Model Code*

PBHB-LAN-BKJ

*Add modifier /S to order Ductile Iron for pressure rating over 3000 psi.



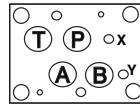
Function

On B Drain to T
(Reverse Free Flow Check)

NOTES: Page 34 for cartridge model PB*B-*** and page 102 for CX*A-*** shows performance curves, technical tips, and options. See page 140 for technical information about sandwich bodies including ISO interface patterns, mounting instructions, studrods, and studkits. Go to www.sunhydraulics.com for more product information. Model Codes printed in red are Preferred Products and are readily available.

ISO 07 / CETOP 7 REDUCING / RELIEVING VALVES

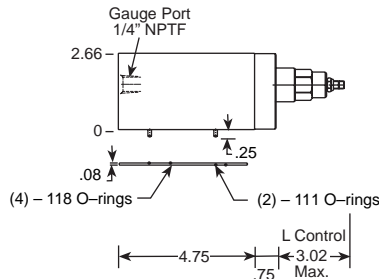
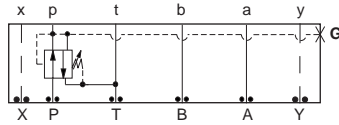
T-17A Cavity



All sandwich bodies shown below are 3.50" wide

PILOT OPERATED

DIRECT ACTING



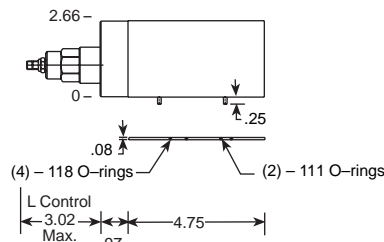
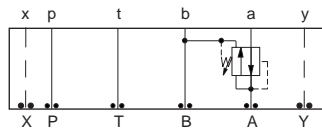
Function
On P Tank to T Drained to T

Assembly Model Code*
PPHB-LAN-BKP

Assembly Model Code*
PRHB-LAN-BKP

*Add modifier /S to order Ductile Iron for pressure rating over 3000 psi.

*Add modifier /S to order Ductile Iron for pressure rating over 3000 psi.



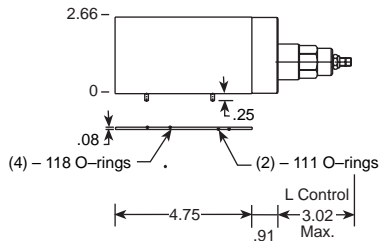
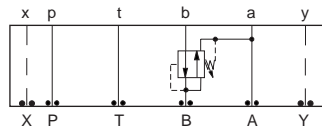
Function
On A Tank to B Drained to B

Assembly Model Code*
PPHB-LAN-BKA

Assembly Model Code*
PRHB-LAN-BKA

*Add modifier /S to order Ductile Iron for pressure rating over 3000 psi.

*Add modifier /S to order Ductile Iron for pressure rating over 3000 psi.



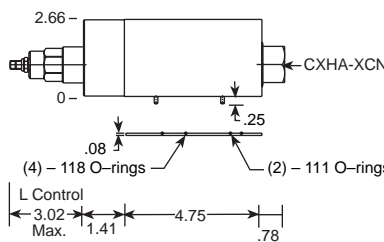
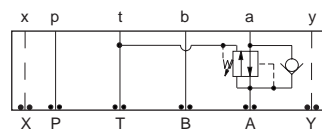
Function
On B Tank to A Drained to A

Assembly Model Code*
PPHB-LAN-BKB

Assembly Model Code*
PRHB-LAN-BKB

*Add modifier /S to order Ductile Iron for pressure rating over 3000 psi.

*Add modifier /S to order Ductile Iron for pressure rating over 3000 psi.



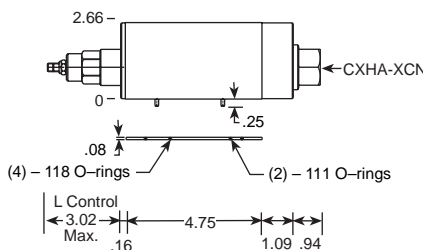
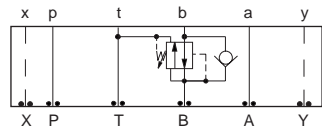
Function
On A Tank to T Drained to T (Reverse Free Flow Check)

Assembly Model Code*
PPHB-LAN-BK2

Assembly Model Code*
PRHB-LAN-BK2

*Add modifier /S to order Ductile Iron for pressure rating over 3000 psi.

*Add modifier /S to order Ductile Iron for pressure rating over 3000 psi.



Function
On B Tank to T Drained to T (Reverse Free Flow Check)

Assembly Model Code*
PPHB-LAN-BKJ

Assembly Model Code*
PRHB-LAN-BKJ

*Add modifier /S to order Ductile Iron for pressure rating over 3000 psi.

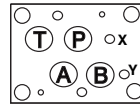
*Add modifier /S to order Ductile Iron for pressure rating over 3000 psi.

NOTES: Page 42 for cartridge models PP*B-*** and PR*B-***, and page 102 for CX*A-*** show performance curves, technical tips, and options. See page 140 for technical information about sandwich bodies including ISO interface patterns, mounting instructions, studrods, and studkits. Go to www.sunhydraulics.com for more product information. Model Codes printed in red are Preferred Products and are readily available.

Sandwich Assemblies

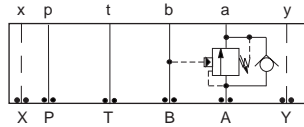
ISO 07 / CETOP 7 COUNTERBALANCE VALVES

T-17A Cavity



All sandwich bodies shown below are 3.50" wide

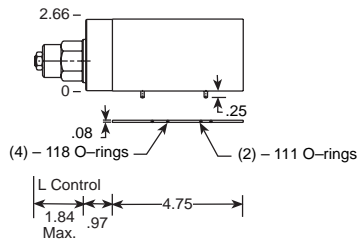
PILOT RATIOS
3:1, 2:1 and 1.5:1



Assembly Model Code*

CBG*-LHN-BKA

*Add modifier /S to order Ductile Iron for pressure rating over 3000 psi.



PILOT RATIOS
2.3:1, 4.5:1 and 10:1

Function

On A Pilot from B

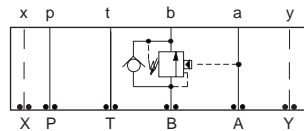
Assembly Model Code*

CBG*-LJN-BKA

*Add modifier /S to order Ductile Iron for pressure rating over 3000 psi.

Function

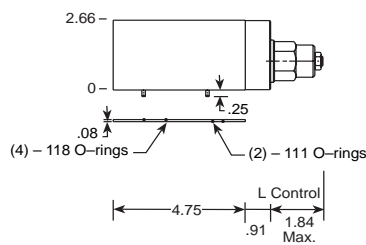
On B Pilot from A



Assembly Model Code*

CBG*-LHN-BKB

*Add modifier /S to order Ductile Iron for pressure rating over 3000 psi.



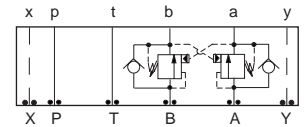
Assembly Model Code*

CBG*-LJN-BKB

*Add modifier /S to order Ductile Iron for pressure rating over 3000 psi.

Function

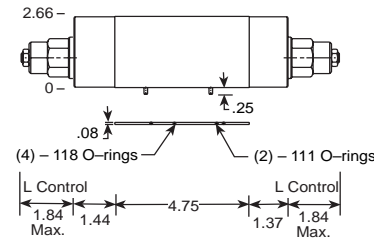
On A and B (Cross-piloted)



Assembly Model Code*

CBG*-LHN-BKY

*Add modifier /S to order Ductile Iron for pressure rating over 3000 psi.



Assembly Model Code*

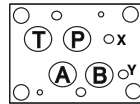
CBG*-LJN-BKY

*Add modifier /S to order Ductile Iron for pressure rating over 3000 psi.

NOTES: Page 50 for cartridge model CB**.* show performance curves, technical tips, and options.
See page 140 for technical information about sandwich bodies including ISO interface patterns, mounting instructions, studrods, and studkits.
Go to www.sunhydraulics.com for more product information.
Model Codes printed in red are Preferred Products and are readily available.

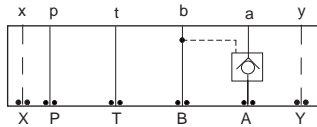
ISO 07 / CETOP 7 PILOT-TO-OPEN CHECK VALVES

T-17A Cavity



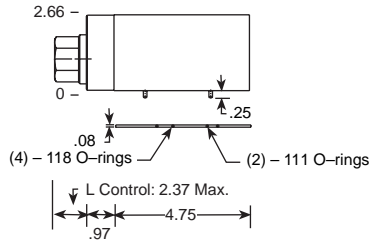
All sandwich bodies shown below are 3.50" wide

PILOT OPERATED

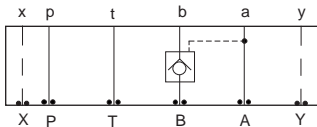


Assembly Model Code*
CKGB-XCN-BKA

*Add modifier /S to order Ductile Iron for pressure rating over 3000 psi.

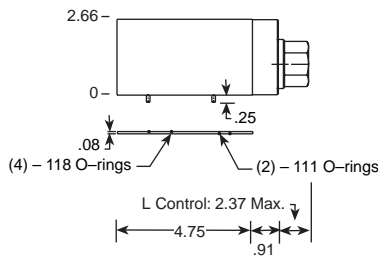


Function
On A Pilot from B

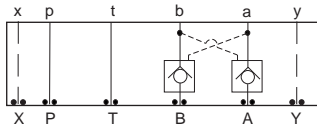


Assembly Model Code*
CKGB-XCN-BKB

*Add modifier /S to order Ductile Iron for pressure rating over 3000 psi.

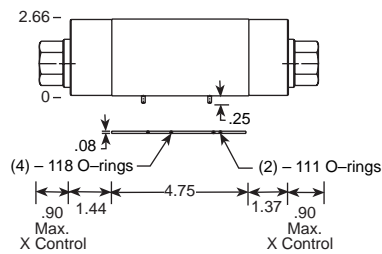


Function
On B Pilot from A



Assembly Model Code*
CKGB-XCN-BKY

*Add modifier /S to order Ductile Iron for pressure rating over 3000 psi.



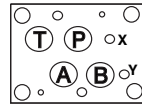
Function
On A and B (Cross-piloted)

NOTES: Page 78 for cartridge model CK**.* show performance curves, technical tips, and options.
See page 140 for technical information about sandwich bodies including ISO interface patterns, mounting instructions, studrods, and studkits.
Go to www.sunhydraulics.com for more product information.
Model Codes printed in red are Preferred Products and are readily available.

Sandwich Assemblies

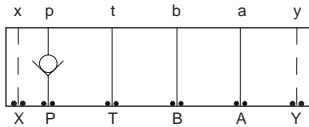
ISO 07 / CETOP 7 CHECK VALVES

T-5A/T-16A Cavity



All sandwich bodies shown below are 3.50" wide

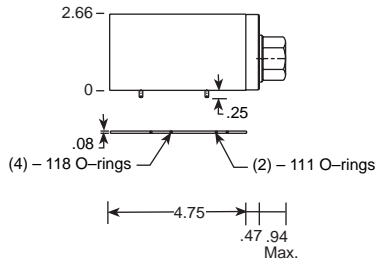
CHECK VALVE



Assembly Model Code*

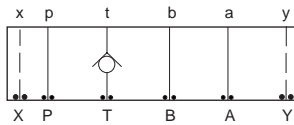
CXHA-XCN-DKP

*Add modifier **/S** to order Ductile Iron for pressure rating over 3000 psi.



Function

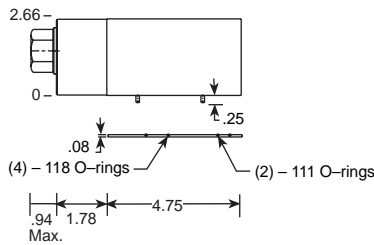
On **P**



Assembly Model Code*

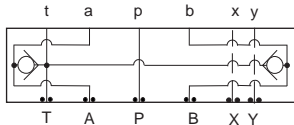
CXHA-XCN-DKT

*Add modifier **/S** to order Ductile Iron for pressure rating over 3000 psi.



Function

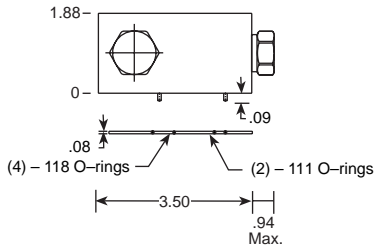
On **T** Free Flow Out of Valve



Assembly Model Code*

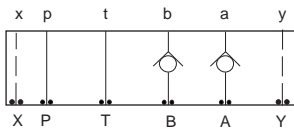
CXFA-XAN-DKX

*Add modifier **/S** to order Ductile Iron for pressure rating over 3000 psi.



Function

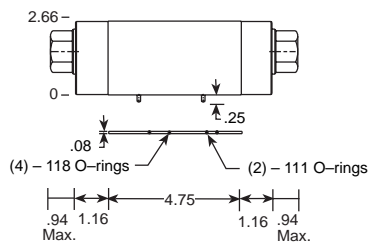
T to **A** and **B**



Assembly Model Code*

CXHA-XCN-DKZ

*Add modifier **/S** to order Ductile Iron for pressure rating over 3000 psi.



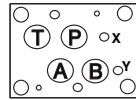
Function

On **A** and **B**, Free Flow Out of Valve

NOTES: Page 102 for cartridge models CX*A-*** show performance curves, technical tips, and options. See page 140 for technical information about sandwich bodies including ISO interface patterns, mounting instructions, studrods, and studkits. Go to www.sunhydraulics.com for more product information. Model Codes printed in red are Preferred Products and are readily available.

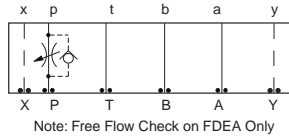
ISO 07 / CETOP 7 FLOW CONTROL VALVES

T-16A Cavity



All sandwich bodies shown below are 3.50" wide

FULLY ADJUSTABLE NEEDLE

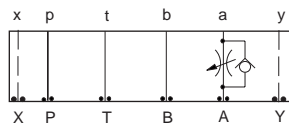


Note: Free Flow Check on FDEA Only

Assembly Model Code*
NFEC-LEN-DKP

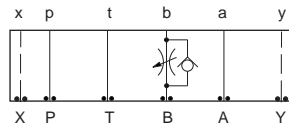
*Add modifier /S to order Ductile Iron for pressure rating over 3000 psi.

FULLY ADJUSTABLE NEEDLE WITH FREE FLOW CHECK



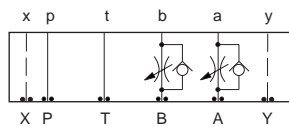
Assembly Model Code*
NCFB-L*N-DKA

*Add modifier /S to order Ductile Iron for pressure rating over 3000 psi.



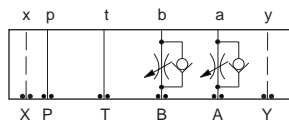
Assembly Model Code*
NCFB-L*N-DKB

*Add modifier /S to order Ductile Iron for pressure rating over 3000 psi.



Assembly Model Code*
NCFB-L*N-DKY

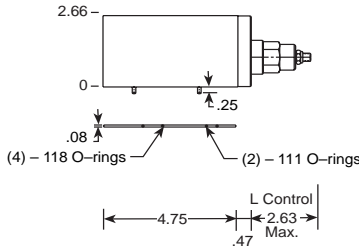
*Add modifier /S to order Ductile Iron for pressure rating over 3000 psi.



Assembly Model Code*
NCFB-L*N-DKZ

*Add modifier /S to order Ductile Iron for pressure rating over 3000 psi.

FULLY ADJUSTABLE PRESSURE COMPENSATED WITH FREE FLOW CHECK



Function

Meter-In P

Assembly Model Code*
FDEA-LAN-DKP

*Add modifier /S to order Ductile Iron for pressure rating over 3000 psi.

Function

Meter-Out A

Assembly Model Code*
FDEA-LAN-DKA

*Add modifier /S to order Ductile Iron for pressure rating over 3000 psi.

Function

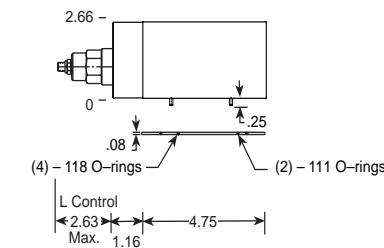
Meter-Out B

Assembly Model Code*
FDEA-LAN-DKB

*Add modifier /S to order Ductile Iron for pressure rating over 3000 psi.

Function

Meter-Out A and B

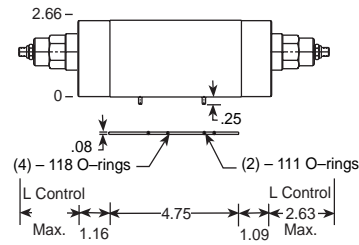
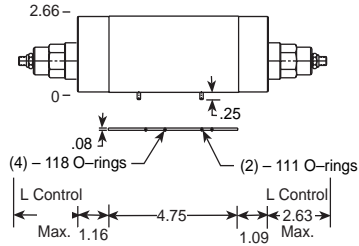
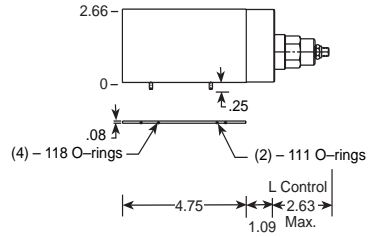


Assembly Model Code*
FDEA-LAN-DKY

*Add modifier /S to order Ductile Iron for pressure rating over 3000 psi.

Function

Meter-In A and B



Assembly Model Code*
FDEA-LAN-DKZ

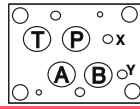
*Add modifier /S to order Ductile Iron for pressure rating over 3000 psi.

NOTES: Page 110 for cartridge models NF*C-*** and NC*B-***, and page 126 for FD*A show performance curves, technical tips, and options. See page 140 for technical information about sandwich bodies including ISO interface patterns, mounting instructions, studrods, and studkits. Go to www.sunhydraulics.com for more product information. Model Codes printed in red are Preferred Products and are readily available.

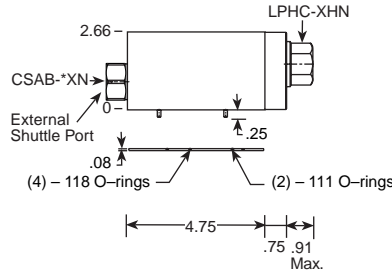
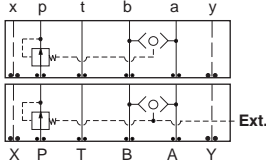
Sandwich Assemblies

**ISO 07 / CETOP 7 CIRCUIT SAVER VALVES
(PRESSURE COMPENSATOR / REGENERATIVE)**

T-13A Cavity/T-17A Cavity



All sandwich bodies shown below are 3.50" wide



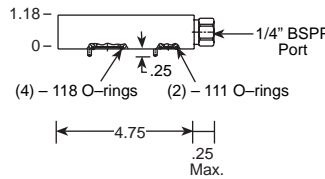
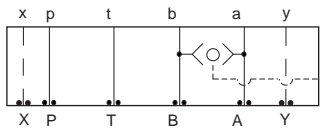
Function

YFFE: Pressure Compensator (Restrictive)

YFFF: With Load Sensing Pressure Compensator (Restrictive)

External Shuttle Port	Assembly Model Code*
None	YFFE-XHN-AB
SAE-4	YFFF-XHN-AB

*Add modifier /S to order Ductile Iron for pressure rating over 3000 psi.



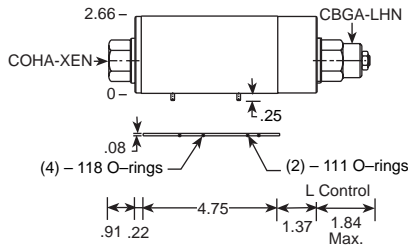
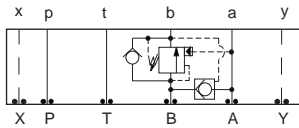
Function

Shuttle A and B (Output External)

Assembly Model Code*

CSAA-BXN-DKS

*Add modifier /S to order Ductile Iron for pressure rating over 3000 psi.



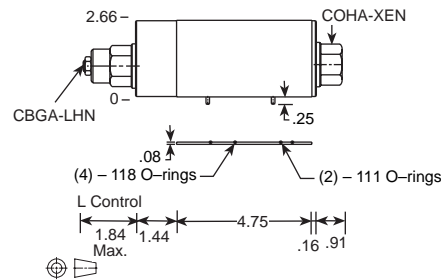
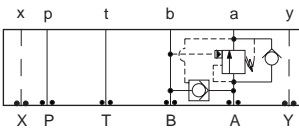
Function

B to A Regenerative

Assembly Model Code*

YDFG-LHN-AB

*Add modifier /S to order Ductile Iron for pressure rating over 3000 psi.



Function

A to B Regenerative

Assembly Model Code*

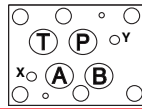
YDFE-LHN-AB

*Add modifier /S to order Ductile Iron for pressure rating over 3000 psi.

NOTES: Page 50 for cartridge model CB*A-*** shows performance curves, technical tips, and options.
See page 140 for technical information about sandwich bodies including ISO interface patterns, mounting instructions, studrods, and studkits.
Go to www.sunhydraulics.com for more product information.

ISO 08 / CETOP 8 RELIEF VALVES
(SIDE PORTED SUBPLATE / REAR PORTED SUBPLATE / SIDE PORTED SUBPLATE WITH GASKET MOUNTED TANK PORT)

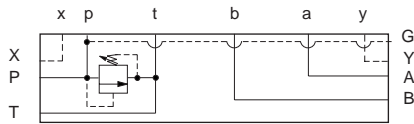
T-3A Cavity



All subplates shown below are 5.94" wide

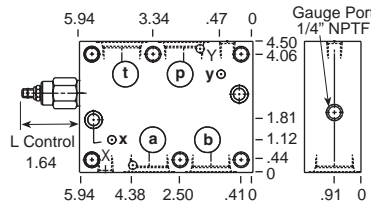
PILOT OPERATED

DIRECT ACTING



Ports A, B, P, T	Ports X, Y	Assembly Model Code*
1" NPTF	1/4" NPTF	RPGC-LAN-CSE
SAE-16	SAE-6	RPGC-LAN-CSM

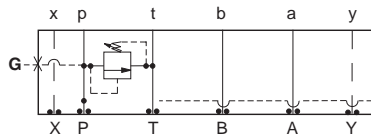
*Add modifier /S to order Ductile Iron for pressure rating over 3000 psi.



Function
P to T (Side Ports)

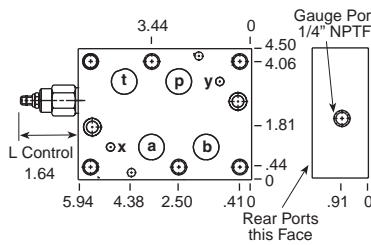
Ports A, B, P, T	Ports X, Y	Assembly Model Code*
1" NPTF	1/4" NPTF	RDFA-LAN-CSE
SAE-16	SAE-6	RDFA-LAN-CSM

*Add modifier /S to order Ductile Iron for pressure rating over 3000 psi.



Ports A, B, P, T	Ports X, Y	Assembly Model Code*
1" NPTF	1/4" NPTF	RPGC-LAN-CRE
SAE-16	SAE-6	RPGC-LAN-CRM

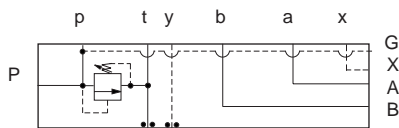
*Add modifier /S to order Ductile Iron for pressure rating over 3000 psi.



Function
P to T (Rear Ports)

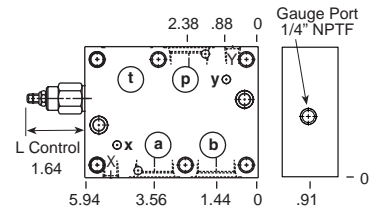
Ports A, B, P, T	Ports X, Y	Assembly Model Code*
1" NPTF	1/4" NPTF	RDFA-LAN-CRE
SAE-16	SAE-6	RDFA-LAN-CRM

*Add modifier /S to order Ductile Iron for pressure rating over 3000 psi.



Ports A, B, P, T	Ports X, Y	Assembly Model Code*
1" NPTF	1/4" NPTF	RPGC-LAN-CTE
SAE-16 (T) 1" NPTF	SAE-6	RPGC-LAN-CTM

*Add modifier /S to order Ductile Iron for pressure rating over 3000 psi.



Function
P to T (Gasket Mounted T and Y Port, Other Ports on Side)

Ports A, B, P, T	Ports X, Y	Assembly Model Code*
1" NPTF	1/4" NPTF	RDFA-LAN-CTE
SAE-16 (T) 1" NPTF	SAE-6	RDFA-LAN-CTM

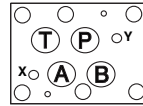
*Add modifier /S to order Ductile Iron for pressure rating over 3000 psi.

NOTES: Page 2 for cartridge models RP*C-*** and RD*A-*** show performance curves, technical tips, and options. See page 140 for technical information about sandwich bodies including ISO interface patterns, mounting instructions, studrods, and studkits. Go to www.sunhydraulics.com for more product information and pricing. Model Codes printed in red are Preferred Products and are readily available.

Sandwich Assemblies

ISO 08 / CETOP 8 RELIEF VALVES

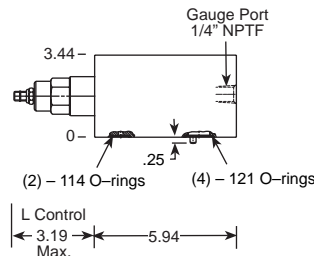
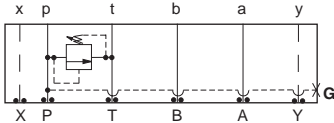
T-16A Cavity



All sandwich bodies shown below are 4.50" wide

PILOT OPERATED

DIRECT ACTING



Function

P to T (High Capacity)

Assembly Model Code*

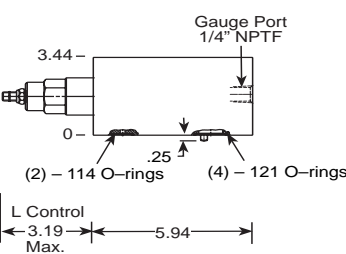
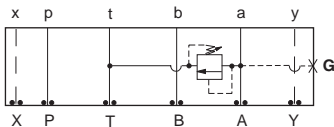
RPIC-LAN-CDO

*Add modifier /S to order Ductile Iron for pressure rating over 3000 psi.

Assembly Model Code*

RDHA-LAN-CDO

*Add modifier /S to order Ductile Iron for pressure rating over 3000 psi.



Function

A to T (High Capacity)

Assembly Model Code*

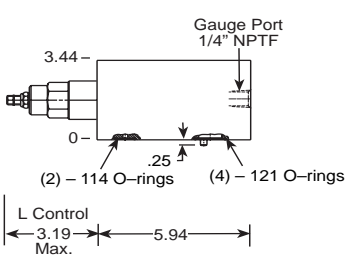
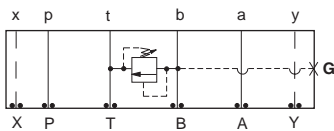
RPIC-LAN-CDC

*Add modifier /S to order Ductile Iron for pressure rating over 3000 psi.

Assembly Model Code*

RDHA-LAN-CDC

*Add modifier /S to order Ductile Iron for pressure rating over 3000 psi.



Function

B to T (High Capacity)

Assembly Model Code*

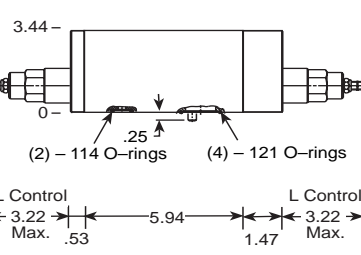
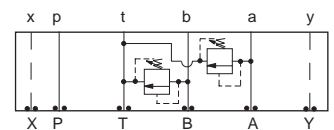
RPIC-LAN-CDD

*Add modifier /S to order Ductile Iron for pressure rating over 3000 psi.

Assembly Model Code*

RDHA-LAN-CDD

*Add modifier /S to order Ductile Iron for pressure rating over 3000 psi.



Function

A and B to T (High Capacity)

Assembly Model Code*

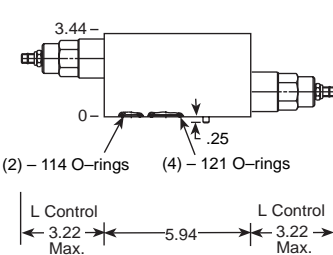
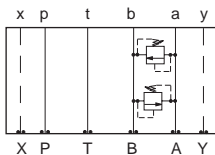
RPIC-LAN-CDZ

*Add modifier /S to order Ductile Iron for pressure rating over 3000 psi.

Assembly Model Code*

RDHA-LAN-CDZ

*Add modifier /S to order Ductile Iron for pressure rating over 3000 psi.



Function

A to B and B to A (High Capacity) (Cross-port)

Assembly Model Code*

RPIC-LAN-CDW

*Add modifier /S to order Ductile Iron for pressure rating over 3000 psi.

Assembly Model Code*

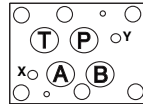
RDHA-LAN-CDW

*Add modifier /S to order Ductile Iron for pressure rating over 3000 psi.

NOTES: Page 2 for cartridge models RP*C-*** and RD*A-*** show performance curves, technical tips, and options. See page 140 for technical information about sandwich bodies including ISO interface patterns, mounting instructions, studrods, and studkits. Go to www.sunhydraulics.com for more product information. Model Codes printed in red are Preferred Products and are readily available.

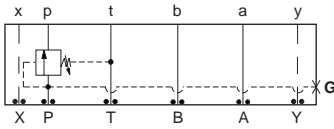
ISO 08 / CETOP 8 SEQUENCE VALVES

T-17A Cavity



All sandwich bodies shown below are 4.50" wide

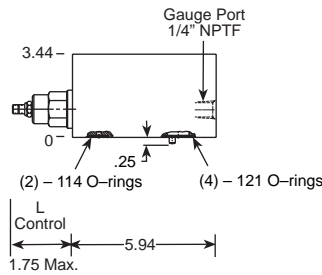
PILOT OPERATED



Assembly Model Code*

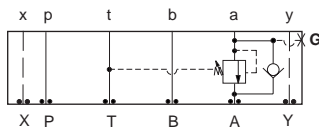
RSHC-LAN-HBW

*Add modifier /S to order Ductile Iron for pressure rating over 3000 psi.



Function

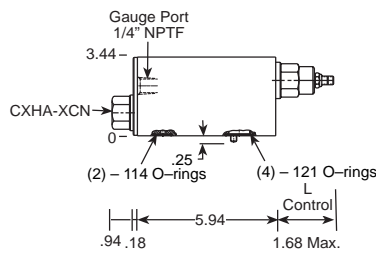
In to **P**



Assembly Model Code*

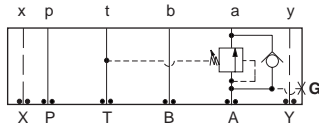
RSHC-LAN-HB4

*Add modifier /S to order Ductile Iron for pressure rating over 3000 psi.



Function

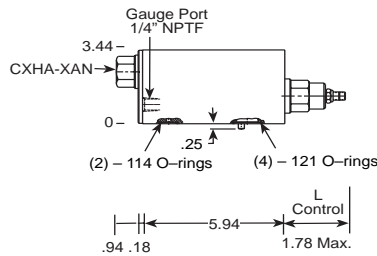
In to **A** (Reverse Free Flow Check)



Assembly Model Code*

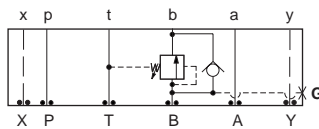
RSHC-LAN-HB6

*Add modifier /S to order Ductile Iron for pressure rating over 3000 psi.



Function

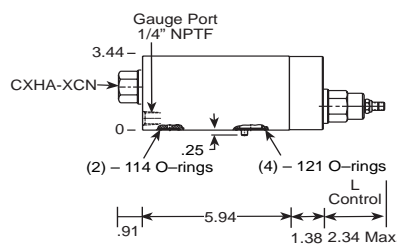
Out of **A** (Reverse Free Flow Check)



Assembly Model Code*

RSHC-LAN-HB7

*Add modifier /S to order Ductile Iron for pressure rating over 3000 psi.



Function

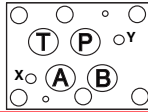
Out of **B** (Reverse Free Flow Check)

NOTES: Pages 20 for cartridge models RS*C-*** and page 102 for CX*A-*** show performance curves, technical tips, and options. See page 140 for technical information about sandwich bodies including ISO interface patterns, mounting instructions, studrods, and studkits. Go to www.sunhydraulics.com for more product information. Model Codes printed in red are Preferred Products and are readily available.

Sandwich Assemblies

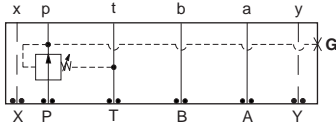
ISO 08 / CETOP 8 REDUCING VALVES

T-19A Cavity/T-17A Cavity



All sandwich bodies shown below are 4.50" wide

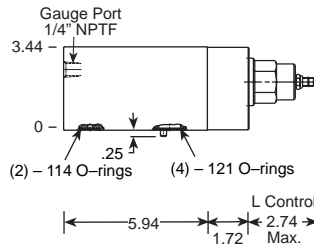
PILOT OPERATED



Assembly Model Code*

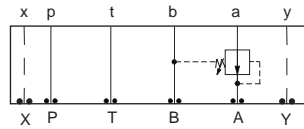
PBJB-LAN-HBO

*Add modifier /S to order Ductile Iron for pressure rating over 3000 psi.



Function

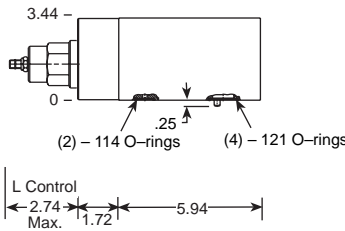
On P Drained to T (High Capacity)



Assembly Model Code*

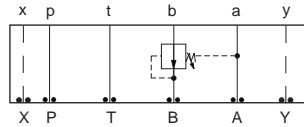
PBJB-LAN-HBA

*Add modifier /S to order Ductile Iron for pressure rating over 3000 psi.



Function

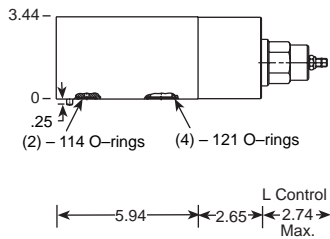
On A Drained to B (High Capacity)



Assembly Model Code*

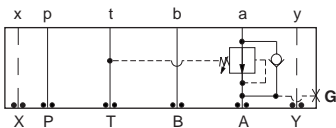
PBJB-LAN-HBB

*Add modifier /S to order Ductile Iron for pressure rating over 3000 psi.



Function

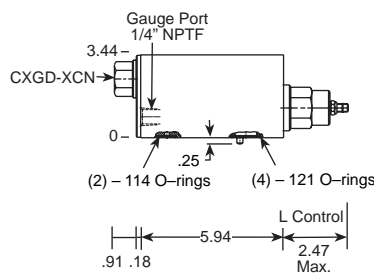
On B Drained to A (High Capacity)



Assembly Model Code*

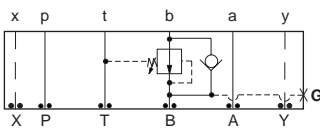
PBHB-LAN-HBK

*Add modifier /S to order Ductile Iron for pressure rating over 3000 psi.



Function

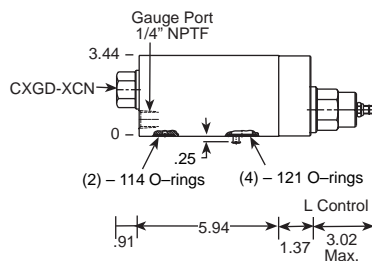
On A Drain to T (Reverse Free Flow Check)



Assembly Model Code*

PBHB-LAN-HBJ

*Add modifier /S to order Ductile Iron for pressure rating over 3000 psi.



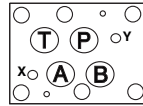
Function

On B Drain to T (Reverse Free Flow Check)

NOTES: Page 34 for cartridge model PBJB-*** and page 102 for CX*D-*** show performance curves, technical tips, and options. See page 140 for technical information about sandwich bodies including ISO interface patterns, mounting instructions, studrods, and studkits. Go to www.sunhydraulics.com for more product information. Model Codes printed in red are Preferred Products and are readily available.

ISO 08 / CETOP 8 REDUCING / RELIEF VALVES

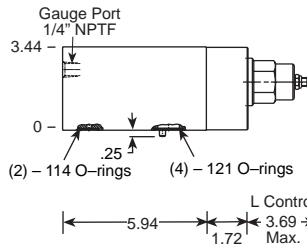
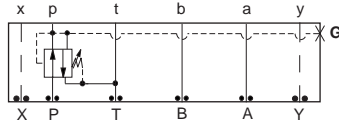
T-19A Cavity/T-17A Cavity



All sandwich bodies shown below are 4.50" wide

PILOT OPERATED

DIRECT ACTING



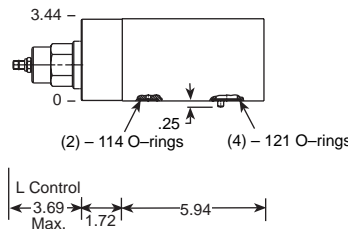
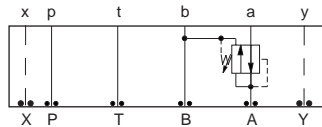
Function
On P Tank to T Drained to T (High Capacity)

Assembly Model Code*
PPJB-LAN-HBO

Assembly Model Code*
PRJB-LAN-HBO

*Add modifier /S to order Ductile Iron for pressure rating over 3000 psi.

*Add modifier /S to order Ductile Iron for pressure rating over 3000 psi.



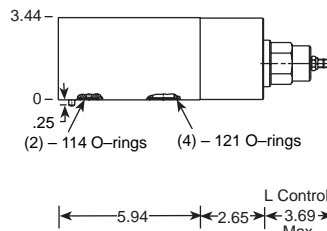
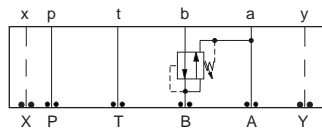
Function
On A Tank to B Drained to B (High Capacity)

Assembly Model Code*
PPJB-LAN-HBA

Assembly Model Code*
PRJB-LAN-HBA

*Add modifier /S to order Ductile Iron for pressure rating over 3000 psi.

*Add modifier /S to order Ductile Iron for pressure rating over 3000 psi.



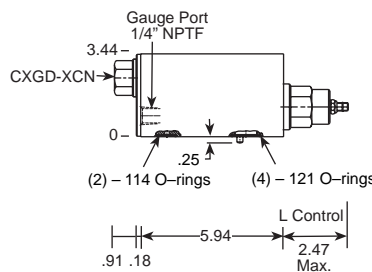
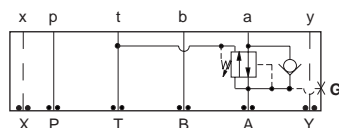
Function
On B Tank to A Drained to A (High Capacity)

Assembly Model Code*
PPJB-LAN-HBB

Assembly Model Code*
PRJB-LAN-HBB

*Add modifier /S to order Ductile Iron for pressure rating over 3000 psi.

*Add modifier /S to order Ductile Iron for pressure rating over 3000 psi.



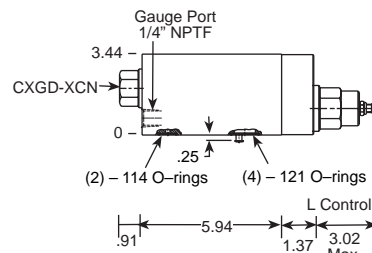
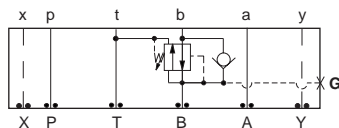
Function
On A Tank to T Drained to T (Reverse Free Flow Check)

Assembly Model Code*
PPHB-LAN-HBK

Assembly Model Code*
PRHB-LAN-HBK

*Add modifier /S to order Ductile Iron for pressure rating over 3000 psi.

*Add modifier /S to order Ductile Iron for pressure rating over 3000 psi.



Function
On B Tank to T Drained to T (Reverse Free Flow Check)

Assembly Model Code*
PPHB-LAN-HBJ

Assembly Model Code*
PRHB-LAN-HBJ

*Add modifier /S to order Ductile Iron for pressure rating over 3000 psi.

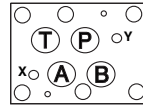
*Add modifier /S to order Ductile Iron for pressure rating over 3000 psi.

NOTES: Page 42 for cartridge model PP*B-*** and PR*B-***, and page 102 for CX*D-*** shows performance curves, technical tips, and options. See page 140 for technical information about sandwich bodies including ISO interface patterns, mounting instructions, studrods, and studkits. Go to www.sunhydraulics.com for more product information. Model Codes printed in red are Preferred Products and are readily available.

Sandwich Assemblies

ISO 08 / CETOP 8 COUNTERBALANCE VALVES

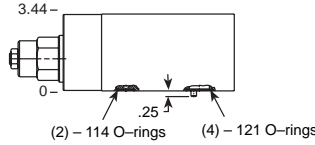
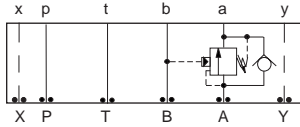
T-19A Cavity



All sandwich bodies shown below are 4.50" wide

PILOT RATIOS
3:1, 1.5:1 and 2:1

PILOT RATIOS
2.3:1, 4.5:1 and 10:1



Function

On **A** Pilot from **B** (High Capacity)

Assembly Model Code*

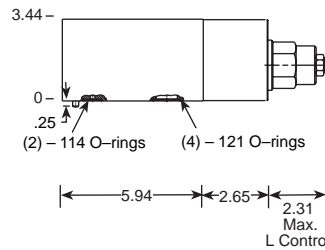
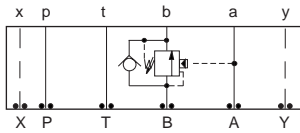
CBI*-LHN-HBA

*Add modifier **/S** to order Ductile Iron for pressure rating over 3000 psi.

Assembly Model Code*

CBI*-LJN-HBA

*Add modifier **/S** to order Ductile Iron for pressure rating over 3000 psi.



Function

On **B** Pilot from **A** (High Capacity)

Assembly Model Code*

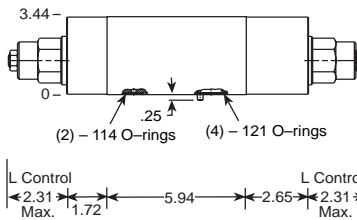
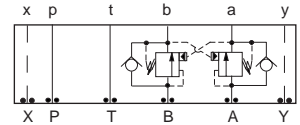
CBI*-LHN-HBB

*Add modifier **/S** to order Ductile Iron for pressure rating over 3000 psi.

Assembly Model Code*

CBI*-LJN-HBB

*Add modifier **/S** to order Ductile Iron for pressure rating over 3000 psi.



Function

On **A** and **B**
(Cross-Piloted) (High Capacity)

Assembly Model Code*

CBI*-LHN-HBY

*Add modifier **/S** to order Ductile Iron for pressure rating over 3000 psi.

Assembly Model Code*

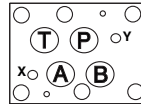
CBI*-LJN-HBY

*Add modifier **/S** to order Ductile Iron for pressure rating over 3000 psi.

NOTES: Page 50 for cartridge model CB**-* show performance curves, technical tips, and options.
See page 140 for technical information about sandwich bodies including ISO interface patterns, mounting instructions, studrods, and studkits.
Go to www.sunhydraulics.com for more product information.
Model Codes printed in red are Preferred Products and are readily available.

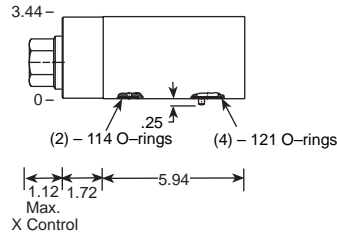
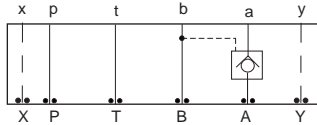
ISO 08 / CETOP 8 PILOT-TO-OPEN CHECK VALVES

T-19A Cavity



All sandwich bodies shown below are 4.50" wide

PILOT OPERATED

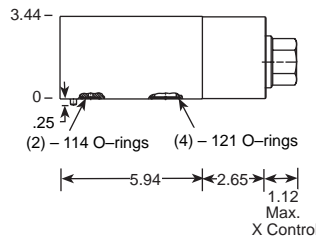
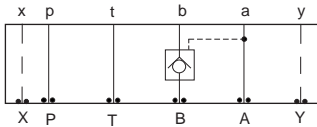


Function

On A Pilot from B (High Capacity)

Assembly Model Code*
CKIB-XCN-HBA

*Add modifier /S to order Ductile Iron for pressure rating over 3000 psi.

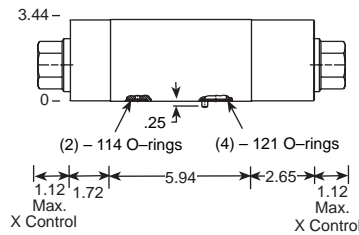
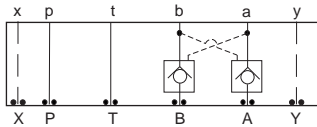


Function

On B Pilot from A (High Capacity)

Assembly Model Code*
CKIB-XCN-HBB

*Add modifier /S to order Ductile Iron for pressure rating over 3000 psi.



Function

On A and B
Cross-Piloted (High Capacity)

Assembly Model Code*
CKIB-XCN-HBY

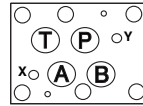
*Add modifier /S to order Ductile Iron for pressure rating over 3000 psi.

NOTES: Page 78 for cartridge model CK**_*** show performance curves, technical tips, and options.
See page 140 for technical information about sandwich bodies including ISO interface patterns, mounting instructions, studrods, and studkits.
Go to www.sunhydraulics.com for more product information.
Model Codes printed in red are Preferred Products and are readily available.

Sandwich Assemblies

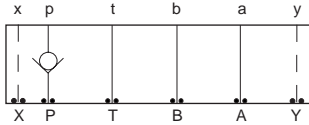
ISO 08 / CETOP 8 CHECK VALVES

T-18A Cavity/T-16A Cavity



All sandwich bodies shown below are 4.50" wide

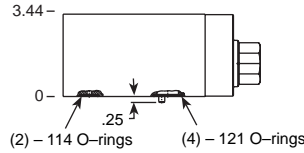
CHECK VALVE



Assembly Model Code*

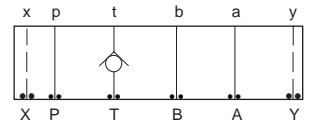
CXJA-XCN-IBO

*Add modifier /S to order Ductile Iron for pressure rating over 3000 psi.



Function

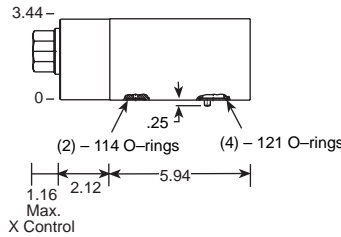
On **P** (High Capacity)



Assembly Model Code*

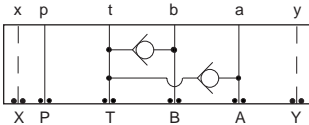
CXJA-XCN-IBV

*Add modifier /S to order Ductile Iron for pressure rating over 3000 psi.



Function

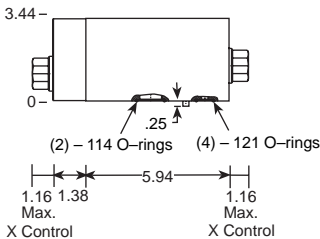
On **T** (High Capacity)



Assembly Model Code*

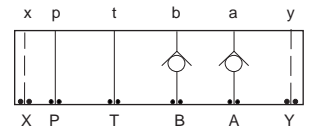
CXHA-XAN-CDV

*Add modifier /S to order Ductile Iron for pressure rating over 3000 psi.



Function

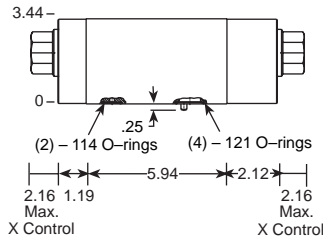
T to A and B



Assembly Model Code*

CXJA-XCN-IBZ

*Add modifier /S to order Ductile Iron for pressure rating over 3000 psi.



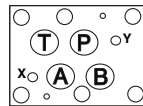
Function

On **A and B** Free Flow Out of Valve (High Capacity)

NOTES: Page 102 for cartridge model CX*A-*** shows performance curves, technical tips, and options. See page 140 for technical information about sandwich bodies including ISO interface patterns, mounting instructions, studrods, and studkits. Go to www.sunhydraulics.com for more product information. Model Codes printed in red are Preferred Products and are readily available.

ISO 08 / CETOP 8 FLOW CONTROL VALVES

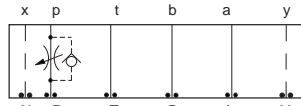
T-18A Cavity



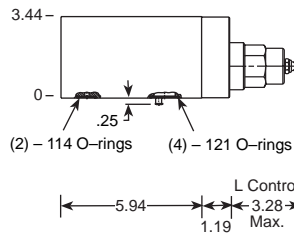
All sandwich bodies shown below are 4.50" wide

FULLY ADJUSTABLE NEEDLE

FULLY ADJUSTABLE PRESSURE COMPENSATED WITH FREE FLOW CHECK



Note: Free Flow Check on FDFA Only



Function
Meter-In P (High Capacity)

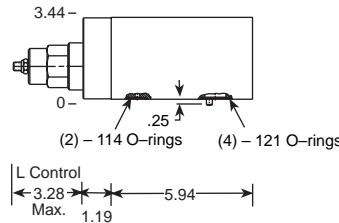
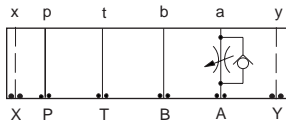
Assembly Model Code*
NFFC-LGN-IBO

Assembly Model Code*
FDFA-LAN-IBO

*Add modifier /S to order Ductile Iron for pressure rating over 3000 psi.

*Add modifier /S to order Ductile Iron for pressure rating over 3000 psi.

FULLY ADJUSTABLE NEEDLE WITH FREE FLOW CHECK



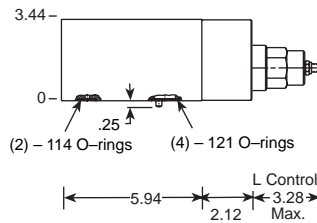
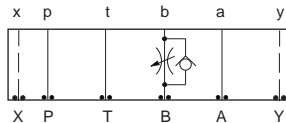
Function
Meter-Out A (High Capacity)

Assembly Model Code*
NCGB-LCN-IBE

Assembly Model Code*
FDFA-LAN-IBE

*Add modifier /S to order Ductile Iron for pressure rating over 3000 psi.

*Add modifier /S to order Ductile Iron for pressure rating over 3000 psi.



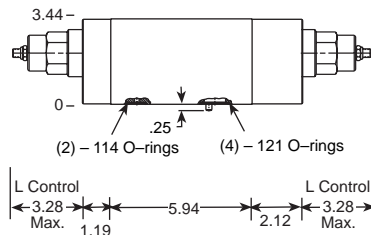
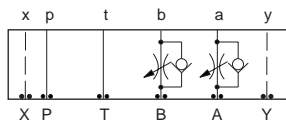
Function
Meter-Out B (High Capacity)

Assembly Model Code*
NCGB-LCN-IBF

Assembly Model Code*
FDFA-LAN-IBF

*Add modifier /S to order Ductile Iron for pressure rating over 3000 psi.

*Add modifier /S to order Ductile Iron for pressure rating over 3000 psi.



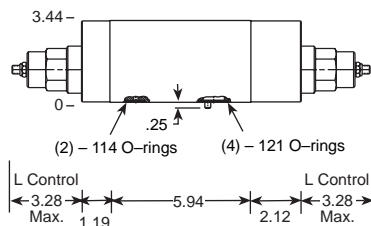
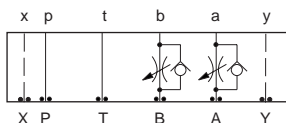
Function
Meter-In A and B (High Capacity)

Assembly Model Code*
NCGB-LCN-IBZ

Assembly Model Code*
FDFA-LAN-IBZ

*Add modifier /S to order Ductile Iron for pressure rating over 3000 psi.

*Add modifier /S to order Ductile Iron for pressure rating over 3000 psi.



Function
Meter-Out A and B (High Capacity)

Assembly Model Code*
NCGB-LCN-IBY

Assembly Model Code*
FDFA-LAN-IBY

*Add modifier /S to order Ductile Iron for pressure rating over 3000 psi.

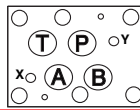
*Add modifier /S to order Ductile Iron for pressure rating over 3000 psi.

NOTES: Page 110 for cartridge model NC*B-*** and page 126 for FD*A-*** show performance curves, technical tips, and options. See page 140 for technical information about sandwich bodies including ISO interface patterns, mounting instructions, studrods, and studkits. Go to www.sunhydraulics.com for more product information. Model Codes printed in red are Preferred Products and are readily available.

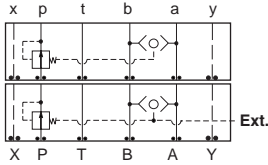
Sandwich Assemblies

**ISO 08 / CETOP 8 CIRCUIT SAVER VALVES
(PRESSURE COMPENSATOR / LOAD SENSING / REGENERATIVE)**

T-13A Cavity/T-19A Cavity

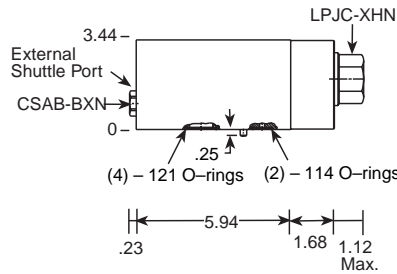


All sandwich bodies shown below are 4.50" wide



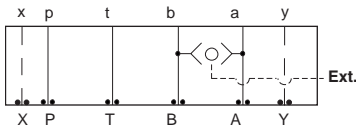
External Shuttle Port	Assembly Model Code*
None	YFIA-XHN-CA
SAE-4	YFIB-XHN-CA

*Add modifier /S to order Ductile Iron for pressure rating on YFIB over 3000 psi. Add /S for YFIA.



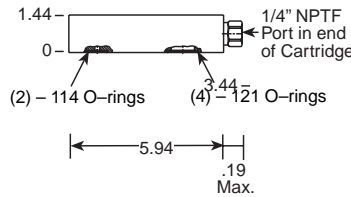
Function

- YFIA: Pressure Compensator (Restrictive)
- YFIB: Pressure Compensator (Restrictive) with External Port



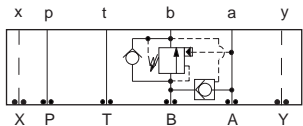
Assembly Model Code*
CSAA-BXN-IBS

*Add modifier /S to order Ductile Iron for pressure rating over 3000 psi.



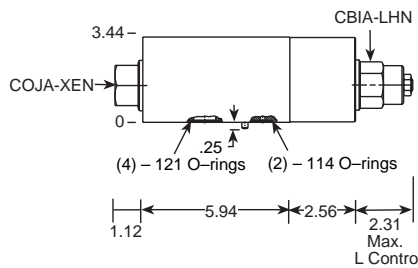
Function

- Shuttle A and B (Output External)



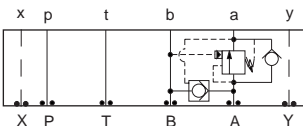
Assembly Model Code*
YDGF-LHN-CA

*Add modifier /S to order Ductile Iron for pressure rating over 3000 psi.



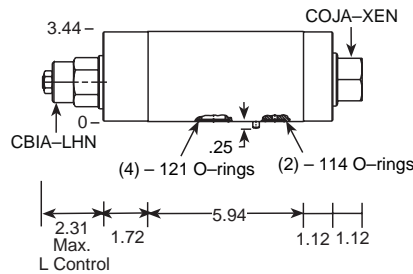
Function

- B to A Regenerative (High Capacity)



Assembly Model Code*
YDGE-LHN-CA

*Add modifier /S to order Ductile Iron for pressure rating over 3000 psi.



Function

- A to B Regenerative (High Capacity)

NOTES: Page 50 for cartridge model CB*A-*** shows performance curves, technical tips, and options. See page 140 for technical information about sandwich bodies including ISO interface patterns, mounting instructions, studrods, and studkits. Go to www.sunhydraulics.com for more product information.

Standard Assemblies

<i>Assembly Type</i>	<i>Page</i>
CUSHION LOCK VALVES	
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<i>Hot Oil Shuttle and Relief Applications</i>	
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2.00" SAE Flange Port	217
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1.50"/2.00" SAE Flange Port	221
LINE MOUNTED REGENERATIVE ASSEMBLIES	
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<i>Char-Lynn S Series Motors</i>	
Single/Dual Cross-port Relief and Single Counterbalance Applications	229
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Single/Dual Counterbalance Applications (Shuttles)	239
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Single/Dual Cross-port Relief and Single Counterbalance Applications	241
Single/Dual Counterbalance Applications (Shuttles)	242

TECHNICAL PRODUCT INFORMATION

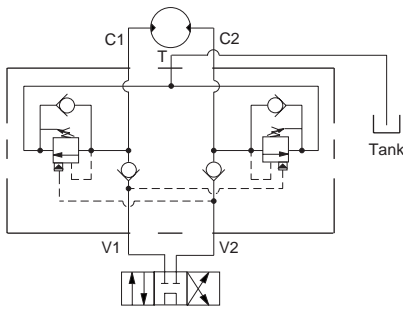
CUSHION LOCK VALVES

Applications

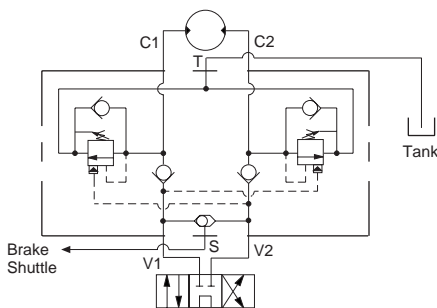
The cushion lock circuit is used to control the acceleration, and deceleration of reciprocating or rotary reversing circuits. Most slewing type circuits have inertia loads and it is important that there is a facility to ensure that during operation there is good control of the motion. The cushion lock provides this type of control using counterbalance valves as both a relief for acceleration and providing a braking resistance during deceleration.

Sun offers four basic types of cushion lock valves:

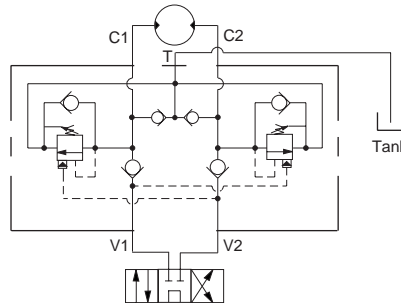
1. The basic dual counterbalance valve assembly with the check valves in supply lines and separate tank return line.



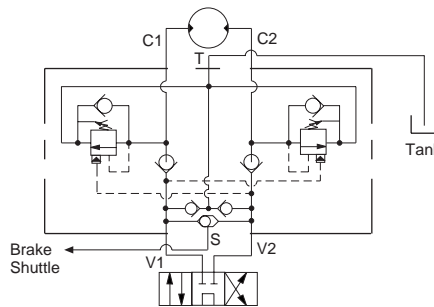
2. The basic assembly as above but with a shuttle valve to release a spring-applied mechanical brake.



3. The assembly that incorporates the same features as version 1. but with additional anti-cavitation check valves from the external tank line to the service lines.



4. The assembly as in version 3. but with a shuttle valve to release a spring-applied mechanical brake.



Design Concepts and Features

The use of counterbalance valves provides smooth control of the motion because the valves are modulating load control valves.

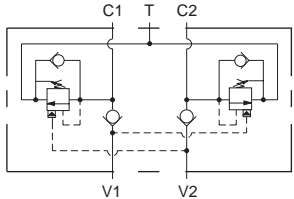
The valves are also seated so provide good load locking capability, although on most motor applications a mechanical brake supplements this because there is always leakage across the motor.

A wide range of pilot ratios and pressure ratings are available for the counterbalance valves to enable the most suitable valves to be selected for the application.

The check valves used for anti-cavitation have low cracking pressure of 5 psi to create the least resistance. The valves are also available in ISO sandwiches or could be made in custom manifolds to suit a particular application.

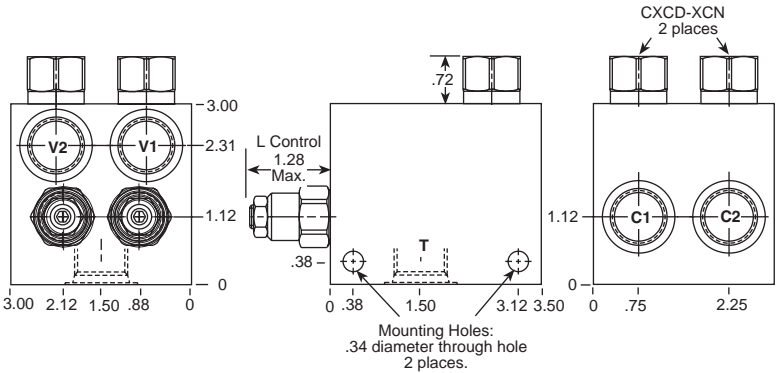
**DUAL LOAD CONTROL APPLICATIONS
(TWO CAVITY WITH CHECKS)**

**PILOT RATIOS
1.5:1, 2:1, 2.3:1, 3:1, 4.5:1, 10:1**



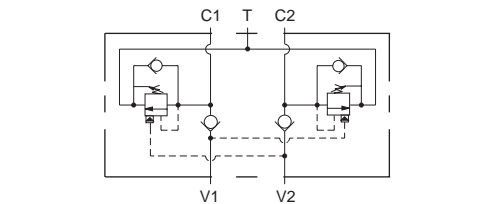
0-15 GPM Cavity T-11A

Ports C1, C2 V1, V2	Port T	Assembly Model Code*
3/8" NPTF	1/2" NPTF	CBC*-L*N-EMB
1/2" NPTF	1/2" NPTF	CBC*-L*N-EMC
SAE-8	SAE-10	CBC*-L*N-EMJ
SAE-10	SAE-10	CBC*-L*N-EMK

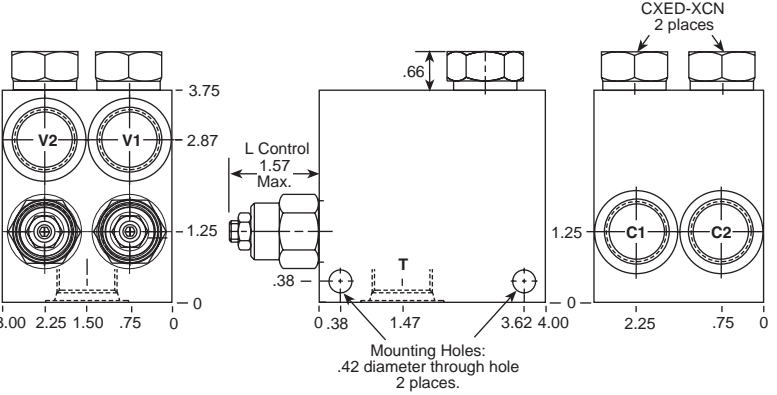


*Add modifier /S to order Ductile Iron for pressure rating over 3000 psi.

0-30 GPM Cavity T-2A



Ports C1, C2 V1, V2	Port T	Assembly Model Code*
1/2" NPTF	3/4" NPTF	CBE*-L*N-BMC
3/4" NPTF	3/4" NPTF	CBE*-L*N-BMD
SAE-10	SAE-12	CBE*-L*N-BMK
SAE-12	SAE-12	CBE*-L*N-BML



*Add modifier /S to order Ductile Iron for pressure rating over 3000 psi.

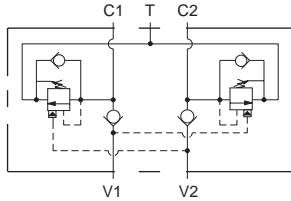
NOTES: Page 50 for cartridge model CB**-* and page 102 for CX*D-* shows performance curves, technical tips, and options. See page vii for technical information about line mount bodies including SAE flange pattern specifications. Consult your local Sun Distributor or the Sun Web Site for other port sizes available in the bodies shown above. Go to www.sunhydraulics.com for more product information and pricing.



Standard Assemblies: Cushion Lock Valves

DUAL LOAD CONTROL APPLICATIONS (TWO CAVITY WITH CHECKS)

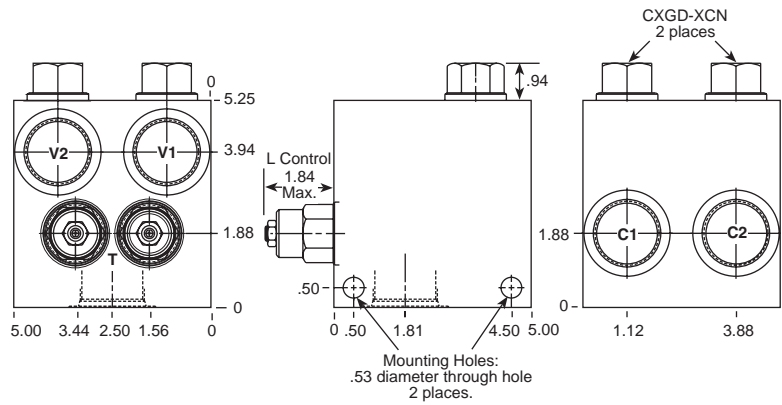
PILOT RATIOS
1.5:1, 2:1, 2.3:1, 3:1, 4.5:1, 10:1



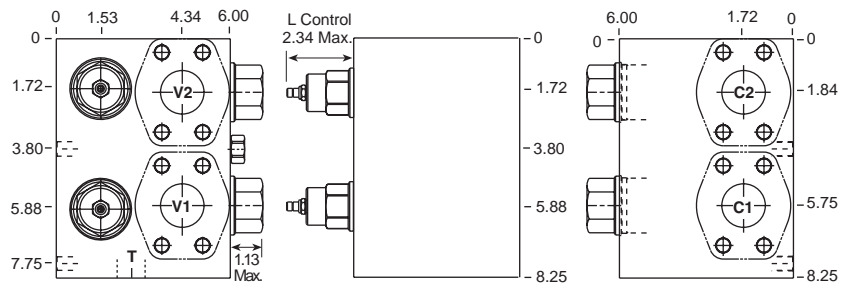
Ports C1, C2 V1, V2	Port T	Assembly Model Code*
1" NPTF	1 1/4" NPTF	CBG*-L*N-HME
1 1/4" NPTF	1 1/4" NPTF	CBG*-L*N-HMF
SAE-16	SAE-20	CBG*-L*N-HMM
SAE-20	SAE-20	CBG*-L*N-HMN

*Add modifier /S to order Ductile Iron for pressure rating over 3000 psi.

0-60 GPM Cavity T-17A



0-120 GPM Cavity T-19A



Model Code	Pilot Ratio
YCJD-L*N-AR	3:1
YCJD-L*N-GR	4.5:1
YCJD-L*N-HR	10:1

*Add modifier /S to order Ductile Iron for pressure rating over 3000 psi.

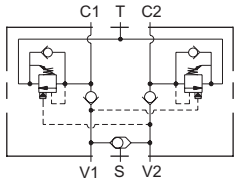
NOTES: Page 50 for cartridge model CB**-* and page 102 for CX*D-* shows performance curves, technical tips, and options. See page vii for technical information about line mount bodies including SAE flange pattern specifications. Consult your local Sun Distributor or the Sun Web Site for other port sizes available in the bodies shown above. Go to www.sunhydraulics.com for more product information and pricing.

Standard Assemblies: Cushion Lock Valves

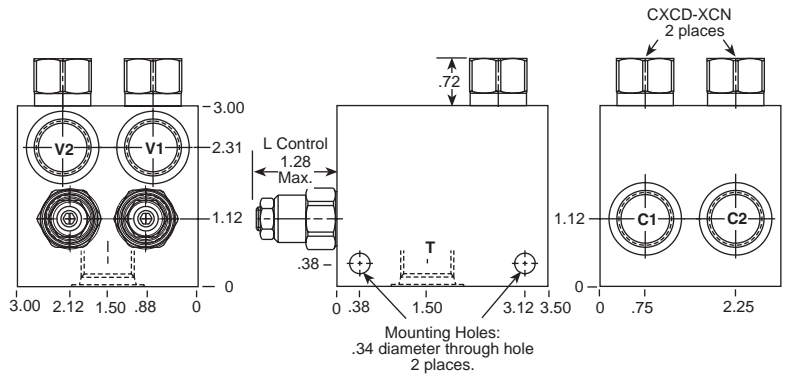
**DUAL LOAD CONTROL APPLICATIONS
(TWO CAVITY WITH CHECKS AND SHUTTLE)**

PILOT RATIOS
1.5:1, 2:1, 2.3:1, 3:1, 4.5:1, 10:1

0-15 GPM Cavity T-11A

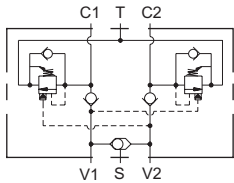


Ports C1, C2 V1, V2	Port T	Port S	Assembly Model Code*
3/8" NPTF	1/2" NPTF	1/4" NPTF	CBC*-L*N-ENB
1/2" NPTF	1/2" NPTF	1/4" NPTF	CBC*-L*N-ENC
SAE-8	SAE-10	SAE-4	CBC*-L*N-ENJ
SAE-10	SAE-10	SAE-4	CBC*-L*N-ENK

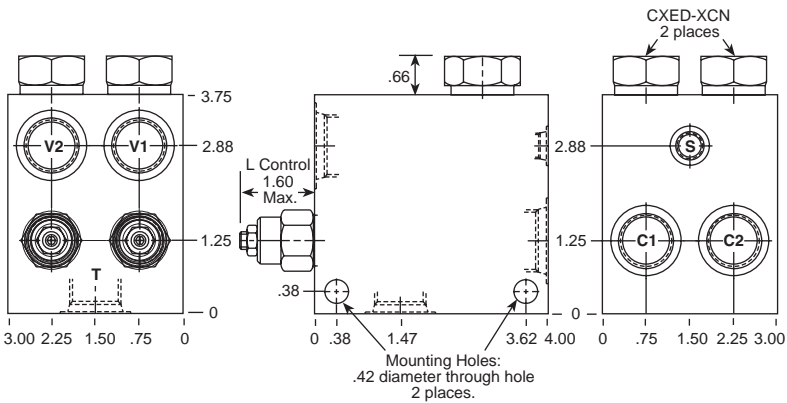


*Add modifier /S to order Ductile Iron for pressure rating over 3000 psi.

0-30 GPM Cavity T-2A



Ports C1, C2 V1, V2	Port T	Port S	Assembly Model Code*
1/2" NPTF	3/4" NPTF	1/4" NPTF	CBE*-L*N-BNC
3/4" NPTF	3/4" NPTF	1/4" NPTF	CBE*-L*N-BND
SAE-10	SAE-12	SAE-4	CBE*-L*N-BNK
SAE-12	SAE-12	SAE-4	CBE*-L*N-BNL



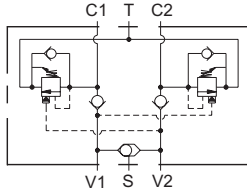
*Add modifier /S to order Ductile Iron for pressure rating over 3000 psi.

NOTES: Page 50 for cartridge model CB**-* and page 102 for CX*D-* shows performance curves, technical tips, and options. See page vii for technical information about line mount bodies including SAE flange pattern specifications. Consult your local Sun Distributor or the Sun Web Site for other port sizes available in the bodies shown above. Go to www.sunhydraulics.com for more product information and pricing.

Standard Assemblies: Cushion Lock Valves

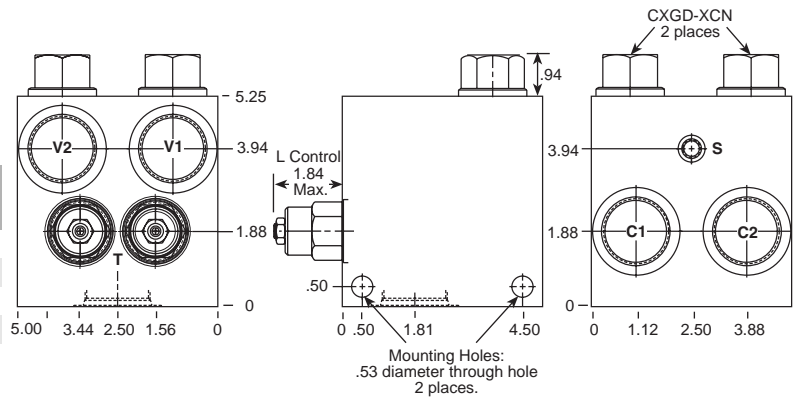
DUAL LOAD CONTROL APPLICATIONS (TWO CAVITY WITH CHECKS WITH SHUTTLE)

PILOT RATIOS
1.5:1, 2:1, 2.3:1, 3:1, 4.5:1, 10:1



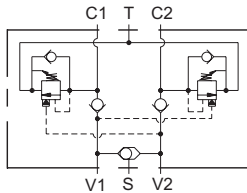
Ports C1, C2 V1, V2	Port T	Port S	Assembly Model Code*
1" NPTF	1 1/4" NPTF	1/4" NPTF	CBC*-L*N-HNE
1 1/4" NPTF	1 1/4" NPTF	1/4" NPTF	CBC*-L*N-HNF
SAE-16	SAE-20	SAE-4	CBC*-L*N-HNM
SAE-20	SAE-20	SAE-4	CBC*-L*N-HNN

0-60 GPM Cavity T-17A

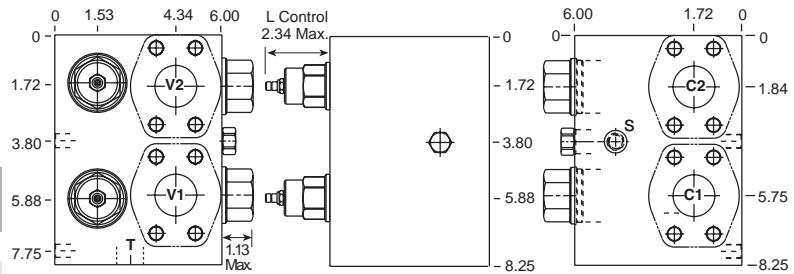


*Add modifier **/S** to order Ductile Iron for pressure rating over 3000 psi.

0-120 GPM Cavity T-19A



Ports C1, C2 V1, V2	Port T	Port S	Assembly Model Code*
1 1/2" SAE C61	1 3/8" NPTF	1/4" NPTF	YCJH-L*N-AR
1 1/2" SAE C61	1 3/8" NPTF	1/4" NPTF	YCJH-L*N-GR
1 1/2" SAE C61	1 3/8" NPTF	SAE-4	YCJH-L*N-HR



Model Code	Pilot Ratio
YCJH-L*N-AR	3:1
YCJH-L*N-GR	4.5:1
YCJH-L*N-HR	10:1

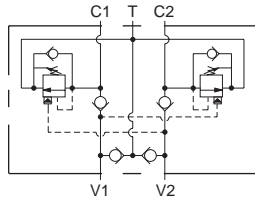
*Add modifier **/S** to order Ductile Iron for pressure rating over 3000 psi.

NOTES: Page 50 for cartridge model CB**-* and page 102 for CX*D-* shows performance curves, technical tips, and options. See page vii for technical information about line mount bodies including SAE flange pattern specifications. Consult your local Sun Distributor or the Sun Web Site for other port sizes available in the bodies shown above. Go to www.sunhydraulics.com for more product information and pricing.

Standard Assemblies: Cushion Lock Valves

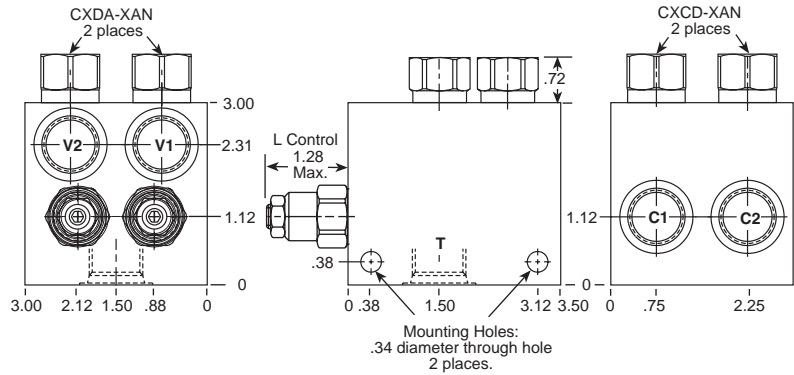
**DUAL LOAD CONTROL APPLICATIONS
(TWO CAVITY WITH ANTI-CAVITATION CHECKS)**

**PILOT RATIOS
1.5:1, 2:1, 2.3:1, 3:1, 4.5:1, 10:1**



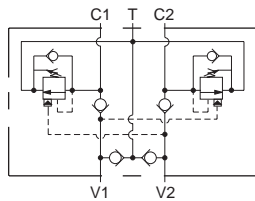
Ports C1, C2 V1, V2	Port T	Assembly Model Code*
3/8" NPTF	1/2" NPTF	CBC*-L*N-EPB
1/2" NPTF	1/2" NPTF	CBC*-L*N-EPC
SAE-8	SAE-10	CBC*-L*N-EPJ
SAE-10	SAE-10	CBC*-L*N-EPK

0-15 GPM Cavity T-11A

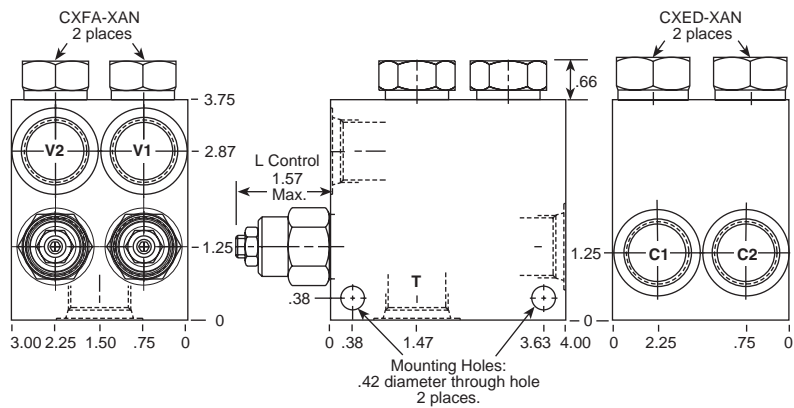


*Add modifier /S to order Ductile Iron for pressure rating over 3000 psi.

0-30 GPM Cavity T-2A



Ports C1, C2 V1, V2	Port T	Assembly Model Code*
1/2" NPTF	1/2" NPTF	CBE*-L*N-BPC
3/4" NPTF	3/4" NPTF	CBE*-L*N-BPD
SAE-10	SAE-12	CBE*-L*N-BPK
SAE-12	SAE-12	CBE*-L*N-BPL



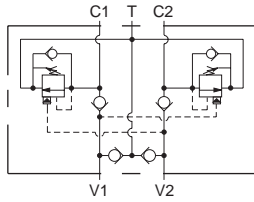
*Add modifier /S to order Ductile Iron for pressure rating over 3000 psi.

NOTES: Page 50 for cartridge model CB**-* and page 102 for CX*D-* shows performance curves, technical tips, and options. See page vii for technical information about line mount bodies including SAE flange pattern specifications. Consult your local Sun Distributor or the Sun Web Site for other port sizes available in the bodies shown above. Go to www.sunhydraulics.com for more product information and pricing.

Standard Assemblies: Cushion Lock Valves

DUAL LOAD CONTROL APPLICATIONS
(TWO CAVITY WITH ANTI-CAVITATION CHECKS)

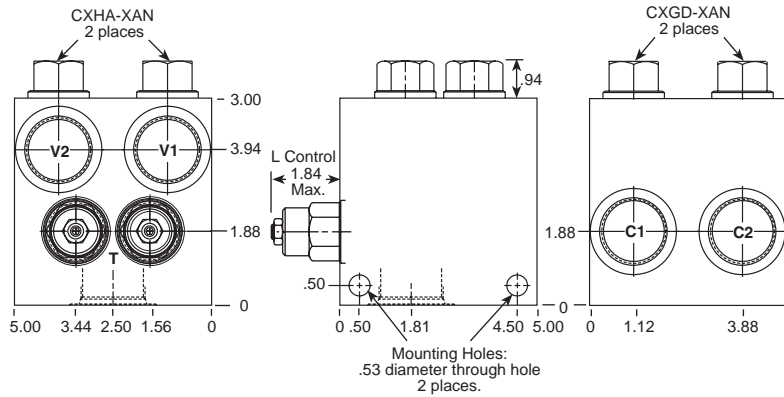
PILOT RATIOS
1.5:1, 2:1, 2.3:1, 3:1, 4.5:1, 10:1



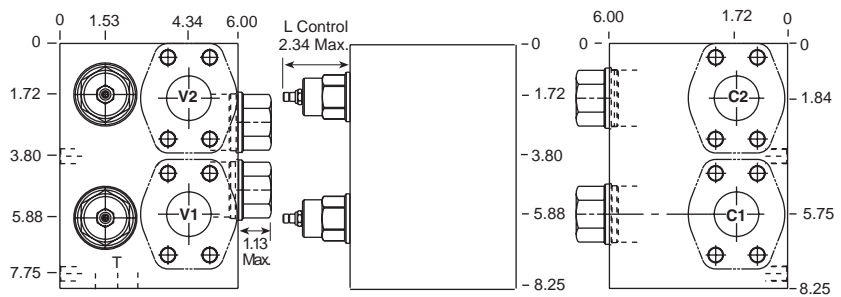
Ports C1, C2 V1, V2	Port T	Assembly Model Code*
1" NPTF	1 1/4" NPTF	CBG*-L*N-HPE
1 1/4" NPTF	1 1/4" NPTF	CBG*-L*N-HPF
SAE-16	SAE-20	CBG*-L*N-HPM
SAE-20	SAE-20	CBG*-L*N-HPN

*Add modifier /S to order Ductile Iron for pressure rating over 3000 psi.

0-60 GPM Cavity T-17A



0-120 GPM Cavity T-19A



Model Code	Pilot Ratio
YCJE-L*N-AR	3:1
YCJE-L*N-GR	4.5:1
YCJE-L*N-HR	10:1

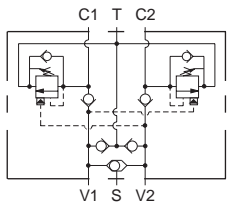
*Add modifier /S to order Ductile Iron for pressure rating over 3000 psi.

NOTES: Page 50 for cartridge model CB**.* and page 102 for CX*D.* shows performance curves, technical tips, and options. See page vii for technical information about line mount bodies including SAE flange pattern specifications. Consult your local Sun Distributor or the Sun Web Site for other port sizes available in the bodies shown above. Go to www.sunhydraulics.com for more product information and pricing.

Standard Assemblies: Cushion Lock Valves

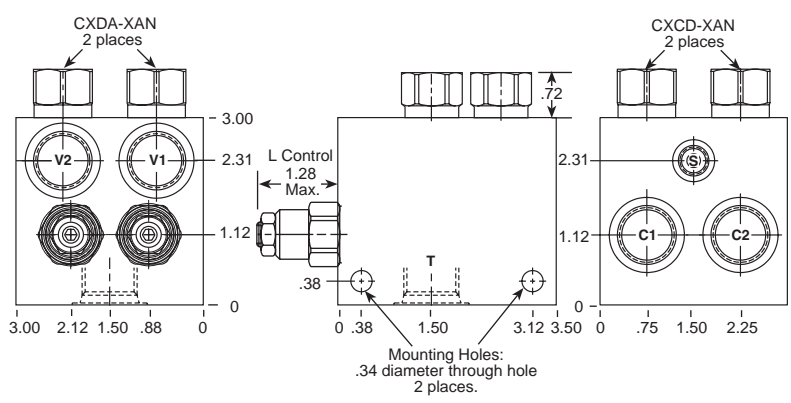
**DUAL LOAD CONTROL APPLICATIONS
(TWO CAVITY WITH ANTI-CAVITATION CHECKS AND SHUTTLE)**

PILOT RATIOS
1.5:1, 2:1, 2.3:1, 3:1, 4.5:1, 10:1

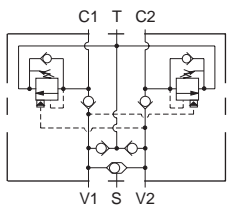


Ports C1, C2 V1, V2	Port T	Port S	Assembly Model Code*
3/8" NPTF	1/2" NPTF	1/4" NPTF	CBC*-L*N-EQB
1/2" NPTF	1/2" NPTF	1/4" NPTF	CBC*-L*N-EQC
SAE-8	SAE-10	SAE-4	CBC*-L*N-EQJ
SAE-10	SAE-10	SAE-4	CBC*-L*N-EQK

0-15 GPM Cavity T-11A

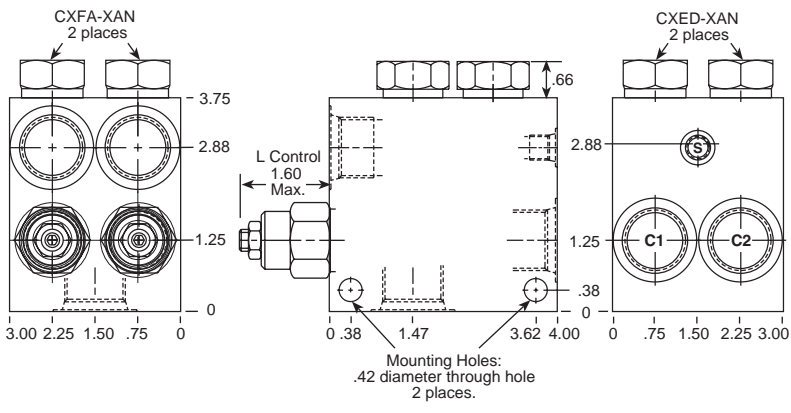


*Add modifier /S to order Ductile Iron for pressure rating over 3000 psi.



Ports C1, C2 V1, V2	Port T	Port S	Assembly Model Code*
1/2" NPTF	3/4" NPTF	1/4" NPTF	CBE*-L*N-BQC
3/4" NPTF	3/4" NPTF	1/4" NPTF	CBE*-L*N-BQD
SAE-10	SAE-12	SAE-4	CBE*-L*N-BQK
SAE-12	SAE-12	SAE-4	CBE*-L*N-BQL

0-30 GPM Cavity T-2A



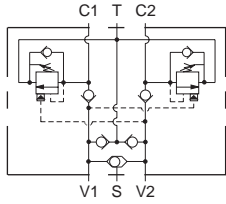
*Add modifier /S to order Ductile Iron for pressure rating over 3000 psi.

NOTES: Page 50 for cartridge model CB**.* and page 102 for CX*D.* shows performance curves, technical tips, and options. See page vii for technical information about line mount bodies including SAE flange pattern specifications. Consult the Sun Factory for other port sizes available in the bodies shown above. Go to www.sunhydraulics.com for more product information and pricing.

Standard Assemblies: Cushion Lock Valves

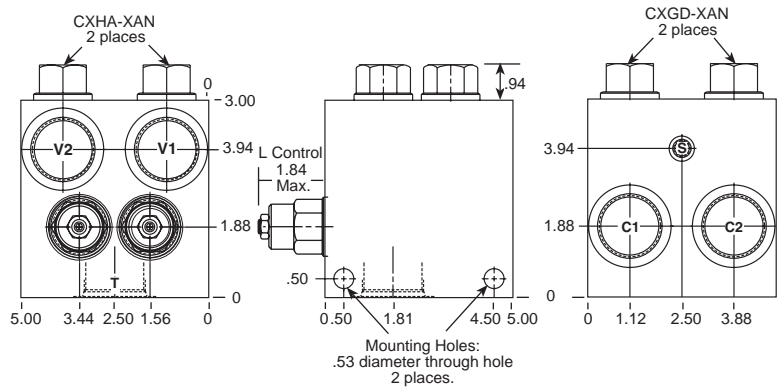
DUAL LOAD CONTROL APPLICATIONS (TWO CAVITY WITH ANTI-CAVITATION CHECKS AND SHUTTLE)

PILOT RATIOS
1.5:1, 2:1, 2.3:1, 3:1, 4.5:1, 10:1



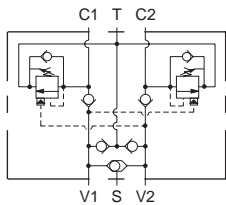
Ports C1, C2 V1, V2	Port T	Port S	Assembly Model Code*
1" NPTF	1 1/4" NPTF	1/4" NPTF	CBG*-L*N-HQE
1 1/4" NPTF	1 1/4" NPTF	1/4" NPTF	CBG*-L*N-HQF
SAE-16	SAE-20	SAE-4	CBG*-L*N-HQM
SAE-20	SAE-20	SAE-4	CBG*-L*N-HQN

0-60 GPM Cavity T-17A

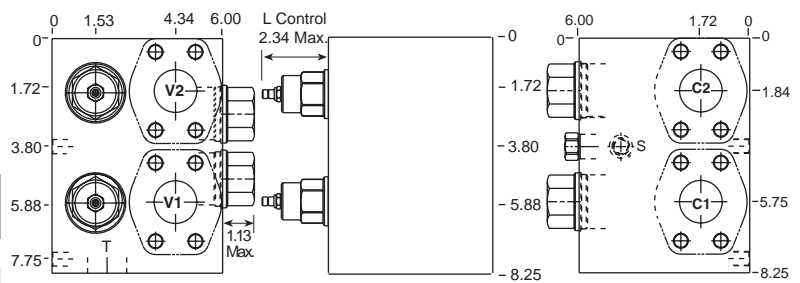


*Add modifier **/S** to order Ductile Iron for pressure rating over 3000 psi.

0-120 GPM Cavity T-19A



Ports C1, C2 V1, V2	Port T	Port S	Assembly Model Code*
1 1/2" SAE C61	1 3/8" NPTF	1/4" NPTF	YCJG-L*N-AR
1 1/2" SAE C61	1 3/8" NPTF	1/4" NPTF	YCJG-L*N-GR
1 1/2" SAE C61	1 3/8" NPTF	SAE-4	YCJG-L*N-HR



Model Code	Pilot Ratio
YCJG-L*N-AR	3:1
YCJG-L*N-GR	4.5:1
YCJG-L*N-HR	10:1

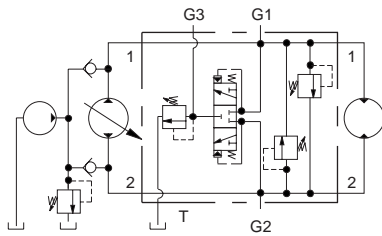
*Add modifier **/S** to order Ductile Iron for pressure rating over 3000 psi.

NOTES: Page 50 for cartridge model CB**.* and page 102 for CX*D.* shows performance curves, technical tips, and options. See page vii for technical information about line mount bodies including SAE flange pattern specifications. Consult your local Sun Distributor or the Sun Web Site for other port sizes available in the bodies shown above. Go to www.sunhydraulics.com for more product information and pricing.

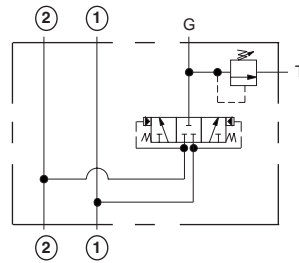
TECHNICAL PRODUCT INFORMATION
HYDROSTATIC TRANSMISSION VALVES AND HOT OIL SHUTTLES

Applications

In all closed loop hydrostatic transmission circuits it is necessary to remove and replace some of the oil from the circuit to provide cooling and filtration. The normal rule of thumb is to continuously take out 10-15% of the pump flow. This is achieved using a hot oil shuttle valve with low-pressure relief.



The hot oil shuttle valve senses pressure from the high-pressure side and opens to bleed off oil from the return low-pressure side of the circuit. A low-pressure charge pump into the inlet of the transmission pump makes up this oil.



The oil passed through the hot oil shuttle valve goes across a low-pressure relief valve set at a slightly lower pressure than the charge pump. This oil is taken through an offline filtration and cooling unit before being returned to the oil reservoir. Often this oil is also passed through the casing drain of the transmission motor to help keep the motor cool.

The other main requirement for close loop circuits is cross line relief valves to provide protection from over pressurization to the pump and motor.

Design Concepts and Features

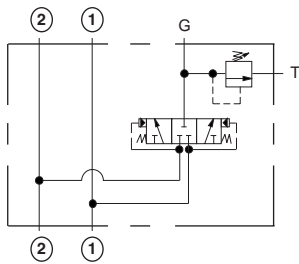
Sun offers a complete range of hot oil shuttle valves and hydrostatic transmission valves incorporating four through ports for easy installation into the circuit. The use of cartridge valves in these packages means an elimination of pipe work and provides easy maintenance. In the event of a problem, it simply means replacing a cartridge rather than the complete valve assembly. This reduces cost and eliminates down time. The cross line relief valves used are fast acting with limited overshoot to provide excellent protection from over pressurization.

Sun can provide packages to handle transmission flows from 10 GPM right up to 240 GPM and pressures up to 5000 psi. As well as the standard packages shown in the catalogue, Sun can also design a custom package to suit the exact requirement for a customer's application.

Standard Assemblies: Hydrostatic Transmission Valves and Hot Oil Shuttles

HOT OIL SHUTTLE AND RELIEF APPLICATIONS (INLINE / 1.00" SAE FLANGE PORT BODIES)

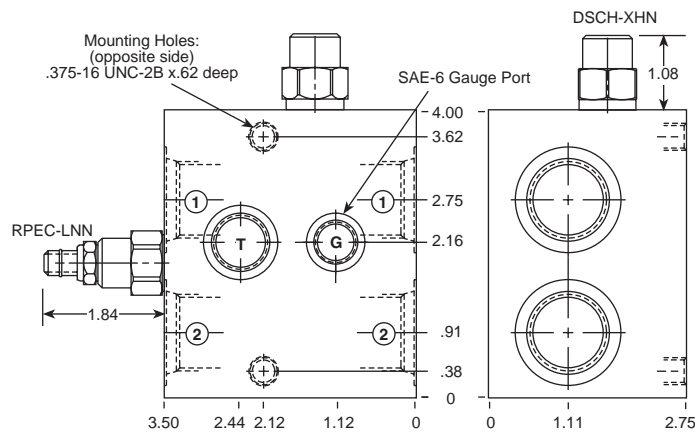
PILOT OPERATED



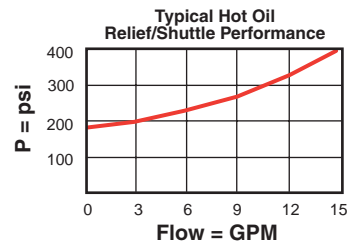
Ports 1 and 2	Port T	Assembly Model Code*
SAE-10	SAE-8	XRDC-LNN-AK
SAE-12	SAE-8	XRDC-LNN-AL

*Add modifier /S to order Ductile Iron for pressure rating over 3000 psi.

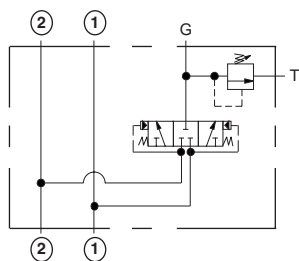
0-13 GPM Cavity T-10A



These Sun valve assemblies are for use in bleeding hot oil from the low pressure side of a hydrostatic transmission circuit. The hot oil can be cooled, filtered, or used as a source of oil for flushing other pump and motor cases. The hot oil is removed from the loop when the Sun RPEC cartridge is set below the hydrostatic charge pressure relief valve.

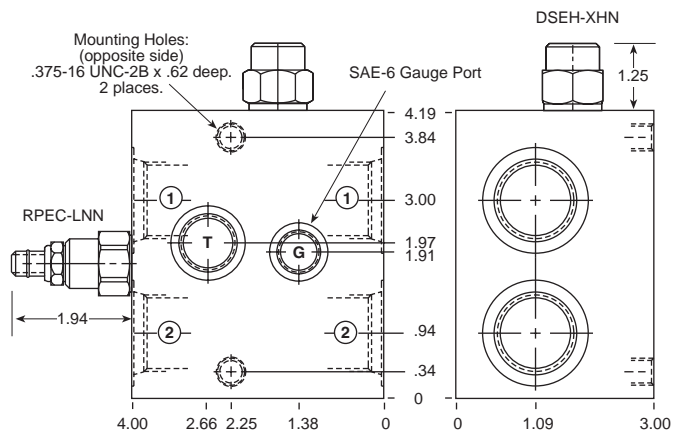


0-25 GPM Cavity T-10A

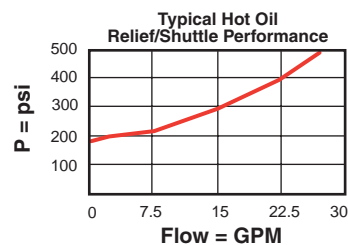


Ports 1 and 2	Port T	Assembly Model Code*
SAE-12	SAE-10	XRFC-LNN-AL

*Add modifier /S to order Ductile Iron for pressure rating over 3000 psi.



These Sun valve assemblies are for use in bleeding hot oil from the low pressure side of a hydrostatic transmission circuit. The hot oil can be cooled, filtered, or used as a source of oil for flushing other pump and motor cases. The hot oil is removed from the loop when the Sun RPEC cartridge is set below the hydrostatic charge pressure relief valve.



NOTES: Page 2 for cartridge model RP*C-*** shows performance curves, technical tips, and options.

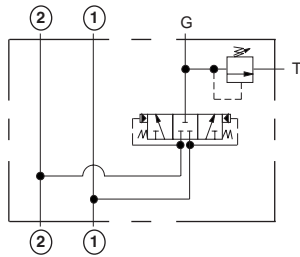
See page vii for technical information about line mount bodies including SAE flange pattern specifications.

Consult your local Sun Distributor or the Sun Web Site for other port sizes available in the bodies shown above.

Go to www.sunhydraulics.com for more product information and pricing.

HOT OIL SHUTTLE AND RELIEF APPLICATIONS (INLINE BODIES)

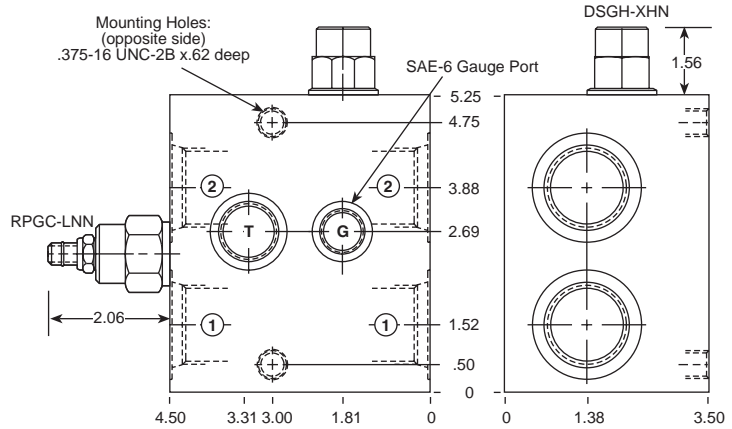
PILOT OPERATED



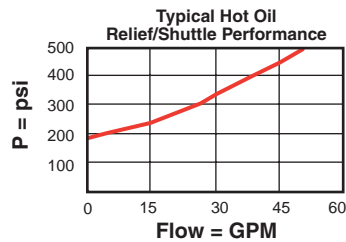
Ports 1 and 2	Port T	Assembly Model Code*
SAE-16	SAE-12	XRHC-LNN-AM

*Add modifier /S to order Ductile Iron for pressure rating over 3000 psi.

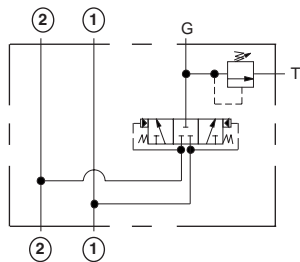
0-50 GPM Cavity T-3A



These Sun valve assemblies are for use in bleeding hot oil from the low pressure side of a hydrostatic transmission circuit. The hot oil can be cooled, filtered, or used as a source of oil for flushing other pump and motor cases. The hot oil is removed from the loop when the Sun RPGC cartridge is set below the hydrostatic charge pressure relief valve.

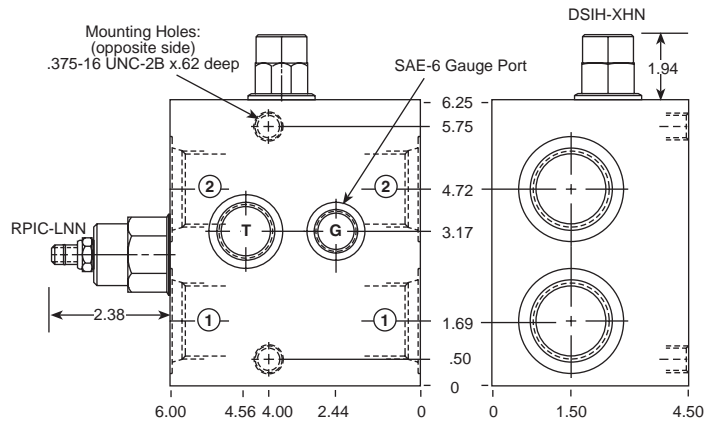


0-100 GPM Cavity T-16A

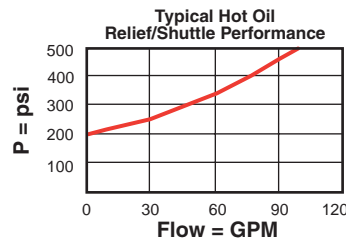


Ports 1 and 2	Port T	Assembly Model Code*
SAE-20	SAE-16	XRJC-LNN-AM

*Add modifier /S to order Ductile Iron for pressure rating over 3000 psi.



These Sun valve assemblies are for use in bleeding hot oil from the low pressure side of a hydrostatic transmission circuit. The hot oil can be cooled, filtered, or used as a source of oil for flushing other pump and motor cases. The hot oil is removed from the loop when the Sun RPIC cartridge is set below the hydrostatic charge pressure relief valve.

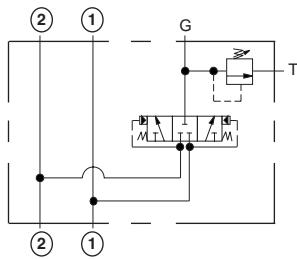


NOTES: Page 2 for cartridge model RP*C-*** shows performance curves, technical tips, and options. See page vii for technical information about line mount bodies including SAE flange pattern specifications. Consult your local Sun Distributor or the Sun Web Site for other port sizes available in the bodies shown above. Go to www.sunhydraulics.com for more product information and pricing.

Standard Assemblies: Hydrostatic Transmission Valves and Hot Oil Shuttles

HOT OIL SHUTTLE AND RELIEF APPLICATIONS (1.50" SAE FLANGE PORT BODIES)

PILOT OPERATED

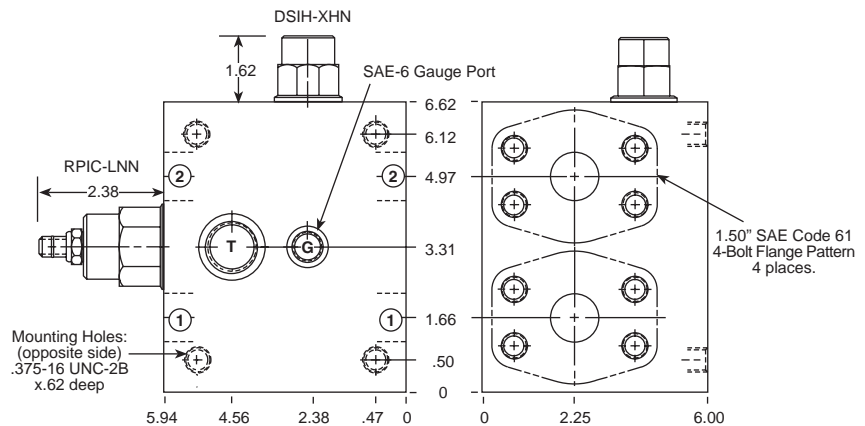


Ports 1 and 2	Port T	Assembly Model Code*
1 1/2" SAE C61	SAE-16	XRJC-LNN-AR

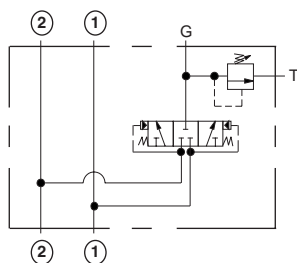
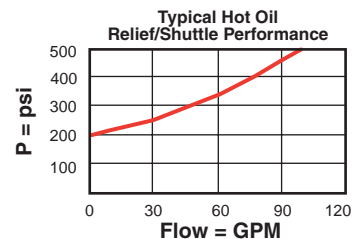
*Add modifier /S to order Ductile Iron for pressure rating over 3000 psi.

0-100 GPM

Cavity T-16A



These Sun valve assemblies are for use in bleeding hot oil from the low pressure side of a hydrostatic transmission circuit. The hot oil can be cooled, filtered, or used as a source of oil for flushing other pump and motor cases. The hot oil is removed from the loop when the Sun RPIC cartridge is set below the hydrostatic charge pressure relief valve.

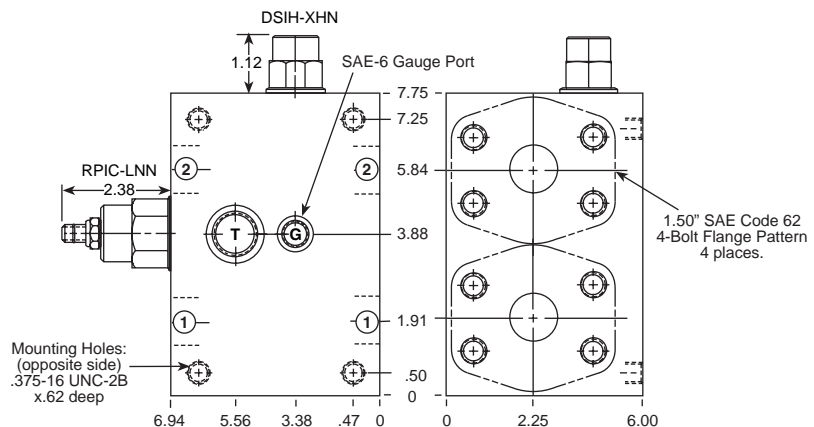


Ports 1 and 2	Port T	Assembly Model Code*
1 1/2" SAE C62	SAE-16	XRJC-LNN-A6

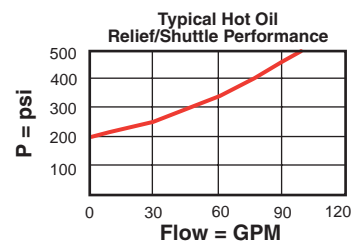
*Add modifier /S to order Ductile Iron for pressure rating over 3000 psi.

0-100 GPM

Cavity T-16A



These Sun valve assemblies are for use in bleeding hot oil from the low pressure side of a hydrostatic transmission circuit. The hot oil can be cooled, filtered, or used as a source of oil for flushing other pump and motor cases. The hot oil is removed from the loop when the Sun RPIC cartridge is set below the hydrostatic charge pressure relief valve.

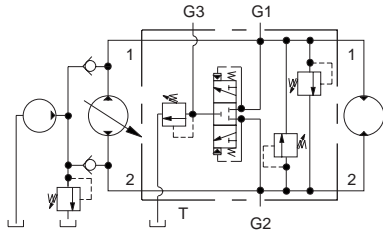


NOTES: Page 2 for cartridge model RP*C-*** shows performance curves, technical tips, and options.
See page vii for technical information about line mount bodies including SAE flange pattern specifications.
Consult your local Sun Distributor or the Sun Web Site for other port sizes available in the bodies shown above.
Go to www.sunhydraulics.com for more product information and pricing.

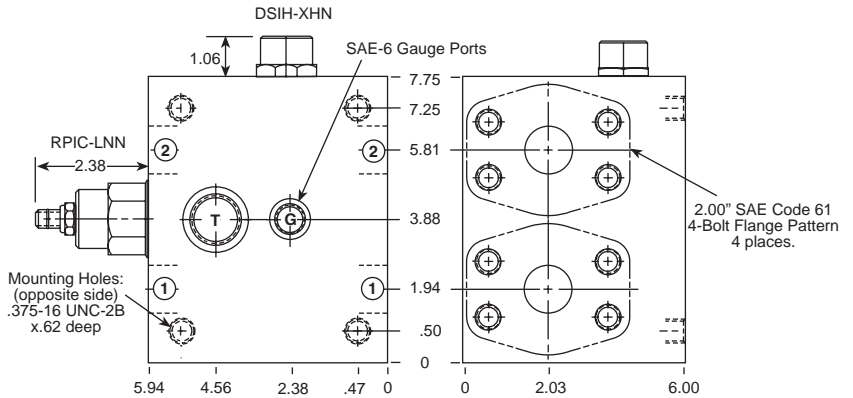
**HOT OIL SHUTTLE AND RELIEF APPLICATIONS
(2.00" SAE FLANGE PORT BODY)**

PILOT OPERATED

0-100 GPM Cavity T-16A

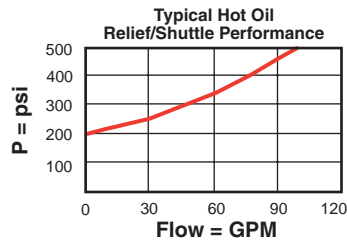


Ports 1 and 2	Port T	Assembly Model Code*
2" SAE C61	SAE-16	XRJC-LNN-AS



*Add modifier /S to order Ductile Iron for pressure rating over 3000 psi.

These Sun valve assemblies are for use in bleeding hot oil from the low pressure side of a hydrostatic transmission circuit. The hot oil can be cooled, filtered, or used as a source of oil for flushing other pump and motor cases. The hot oil is removed from the loop when the Sun RPIC cartridge is set below the hydrostatic charge pressure relief valve.

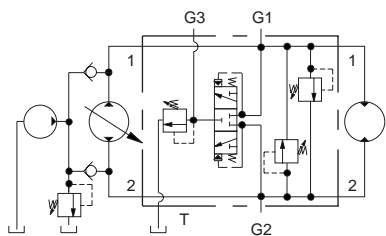


NOTES: Page 2 for cartridge model RP*C-*** shows performance curves, technical tips, and options.
See page vii for technical information about line mount bodies including SAE flange pattern specifications.
Consult your local Sun Distributor or the Sun Web Site for other port sizes available in the bodies shown above.
Go to www.sunhydraulics.com for more product information and pricing.

Standard Assemblies: Hydrostatic Transmission Valves and Hot Oil Shuttles

HYDROSTATIC TRANSMISSION APPLICATIONS (INLINE BODY)

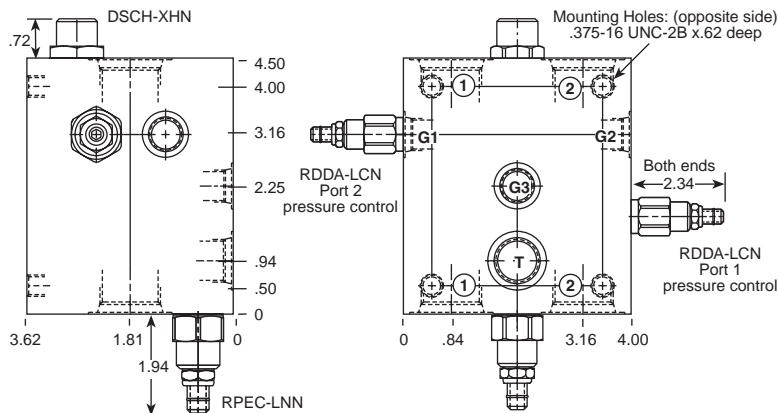
DIRECT ACTING



Ports 1 and 2	Port T	Ports G1, G2 & G3	Assembly Model Code*
SAE-12	SAE-8	1/2" NPTF	XRDB-LCN-AL

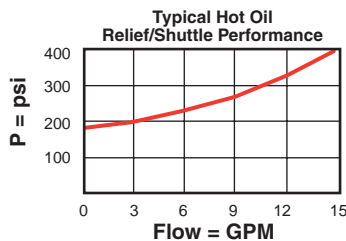
0-25 GPM

Cavity T-10A



*Add modifier **/S** to order Ductile Iron for pressure rating over 3000 psi.

These Sun valve assemblies are for use with hydrostatic transmissions to provide overload relief valve protection for the main circuit in both directions. Additionally, an auxiliary shuttle valve allows bleeding of hot oil from the low pressure side. Hot oil can be cooled, filtered, or used as a source of oil for flushing other pump and motor cases. Hot oil is removed from the loop when the Sun RPEC cartridge is set below the hydrostatic charge pressure relief valve.
NOTE: A mechanical brake is recommended to positively lock any static live load.

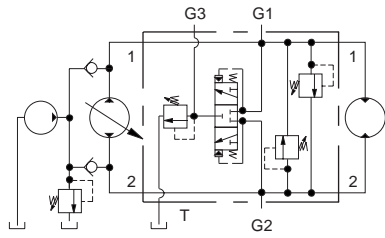


NOTES: Page 2 for cartridge model RP*C-*** shows performance curves, technical tips, and options.
 See page vii for technical information about line mount bodies including SAE flange pattern specifications.
 Consult your local Sun Distributor or the Sun Web Site for other port sizes available in the bodies shown above.
 Go to www.sunhydraulics.com for more product information and pricing.

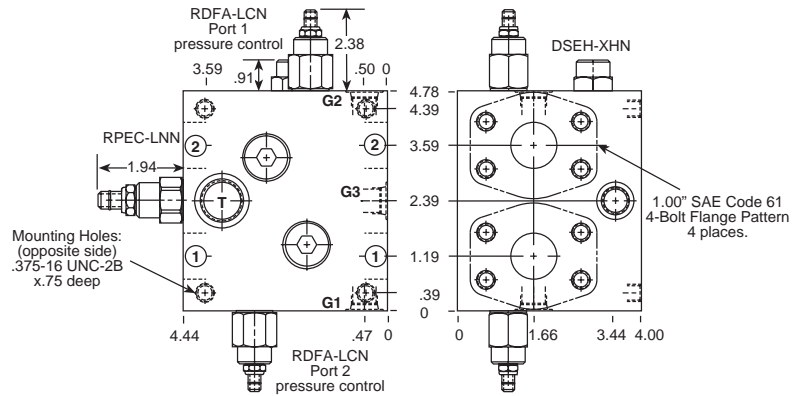
HYDROSTATIC TRANSMISSION APPLICATIONS (1.00" SAE FLANGE PORT BODIES)

DIRECT ACTING

0-50 GPM Cavity T-3A



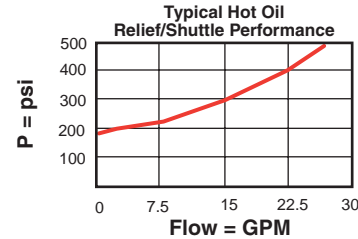
Ports 1 and 2	Port T	Ports G1, G2 & G3	Assembly Model Code*
1" SAE C61	SAE-10	SAE-6	XRFB-LCN-AP



*Add modifier /S to order Ductile Iron for pressure rating over 3000 psi.

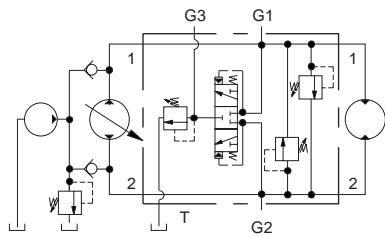
These Sun valve assemblies are for use with hydrostatic transmissions to provide overload relief valve protection for the main circuit in both directions. Additionally, an auxiliary shuttle valve allows bleeding of hot oil from the low pressure side. Hot oil can be cooled, filtered, or used as a source of oil for flushing other pump and motor cases. Hot oil is removed from the loop when the Sun RPEC cartridge is set below the hydrostatic charge pressure relief valve.

NOTE: A mechanical brake is recommended to positively lock any static live load.

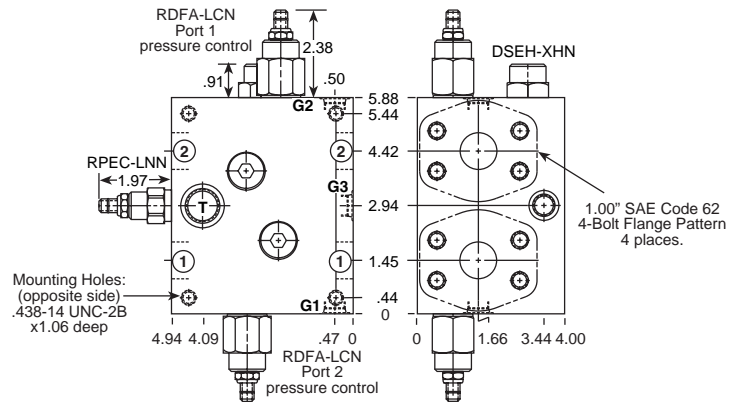


DIRECT ACTING

0-50 GPM Cavity T-3A



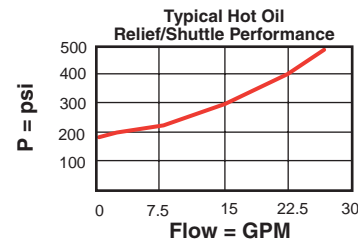
Ports 1 and 2	Port T	Ports G1, G2 & G3	Assembly Model Code*
1" SAE C62	SAE-10	SAE-6	XRFB-LCN-A4



*Add modifier /S to order Ductile Iron for pressure rating over 3000 psi.

These Sun valve assemblies are for use with hydrostatic transmissions to provide overload relief valve protection for the main circuit in both directions. Additionally, an auxiliary shuttle valve allows bleeding of hot oil from the low pressure side. Hot oil can be cooled, filtered, or used as a source of oil for flushing other pump and motor cases. Hot oil is removed from the loop when the Sun RPEC cartridge is set below the hydrostatic charge pressure relief valve.

NOTE: A mechanical brake is recommended to positively lock any static live load.



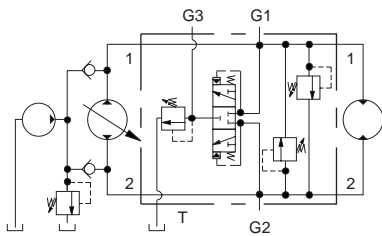
NOTES: Page 2 for cartridge model RP*C-*** shows performance curves, technical tips, and options. See page vii for technical information about line mount bodies including SAE flange pattern specifications. Consult your local Sun Distributor or the Sun Web Site for other port sizes available in the bodies shown above. Go to www.sunhydraulics.com for more product information and pricing.

Standard Assemblies: Hydrostatic Transmission Valves and Hot Oil Shuttles

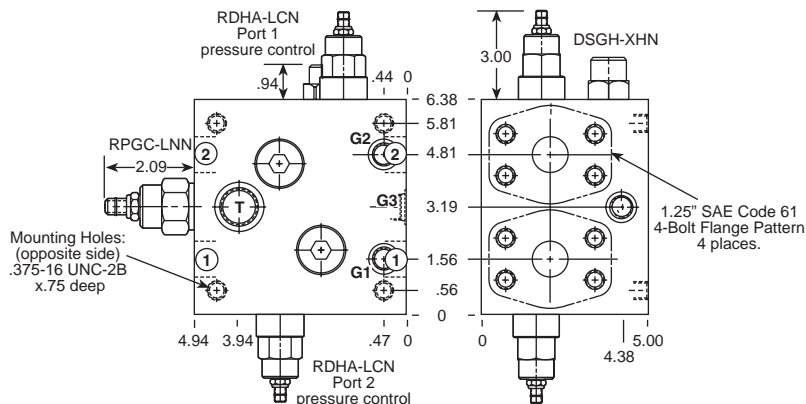
HYDROSTATIC TRANSMISSION APPLICATIONS (1.25" SAE FLANGE PORT BODIES)

DIRECT ACTING

0-100 GPM Cavity T-16A



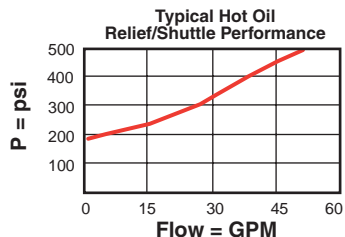
Port T	Ports G1, G2 & G3	Assembly Model Code*
SAE-12	SAE-6	XRHB-LCN-AQ



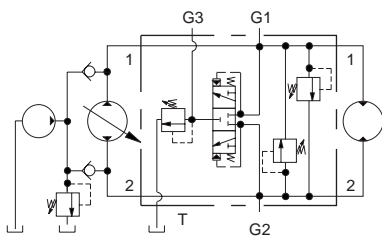
*Add modifier **/S** to order Ductile Iron for pressure rating over 3000 psi.

These Sun valve assemblies are for use with hydrostatic transmissions to provide overload relief valve protection for the main circuit in both directions. Additionally, an auxiliary shuttle valve allows bleeding of hot oil from the low pressure side. Hot oil can be cooled, filtered, or used as a source of oil for flushing other pump and motor cases. Hot oil is removed from the loop when the Sun RPGC cartridge is set below the hydrostatic charge pressure relief valve.

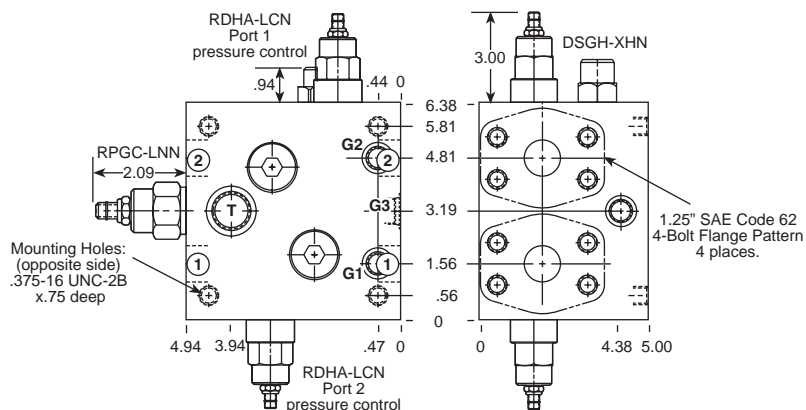
NOTE: A mechanical brake is recommended to positively lock any static live load.



0-100 GPM Cavity T-16A



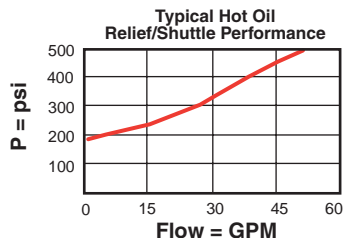
Port T	Ports G1, G2 & G3	Assembly Model Code*
SAE-12	SAE-6	XRHB-LCN-A5



*Add modifier **/S** to order Ductile Iron for pressure rating over 3000 psi.

These Sun valve assemblies are for use with hydrostatic transmissions to provide overload relief valve protection for the main circuit in both directions. Additionally, an auxiliary shuttle valve allows bleeding of hot oil from the low pressure side. Hot oil can be cooled, filtered, or used as a source of oil for flushing other pump and motor cases. Hot oil is removed from the loop when the Sun RPGC cartridge is set below the hydrostatic charge pressure relief valve.

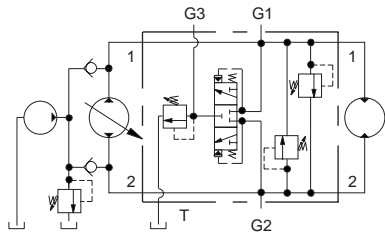
NOTE: A mechanical brake is recommended to positively lock any static live load.



NOTES: Page 2 for cartridge model RP*C-*** shows performance curves, technical tips, and options. See page vii for technical information about line mount bodies including SAE flange pattern specifications. Consult your local Sun Distributor or the Sun Web Site for other port sizes available in the bodies shown above. Go to www.sunhydraulics.com for more product information and pricing.

HYDROSTATIC TRANSMISSION APPLICATIONS (1.50" / 2.00" SAE FLANGE PORT BODIES)

DIRECT ACTING



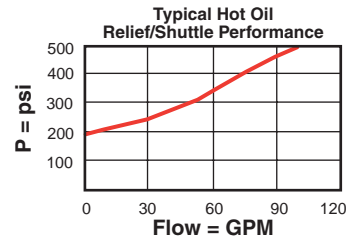
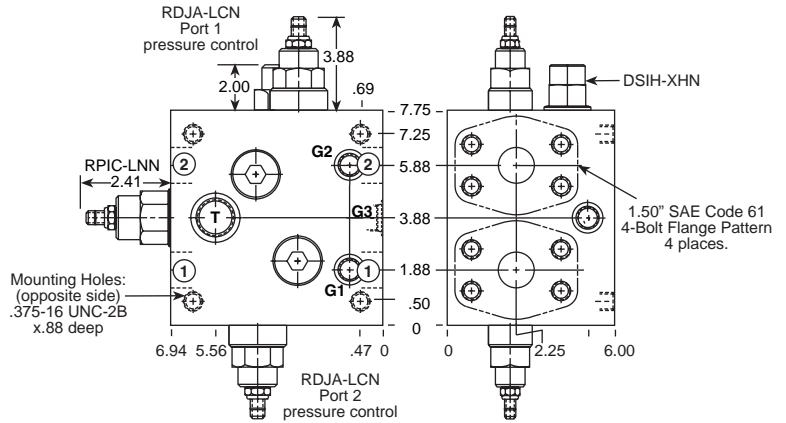
Ports 1 and 2	Port T	Ports G1, G2 & G3	Assembly Model Code*
1 1/2" SAE C61	SAE-16	SAE-6	XRJB-LCN-AR

*Add modifier /S to order Ductile Iron for pressure rating over 3000 psi.

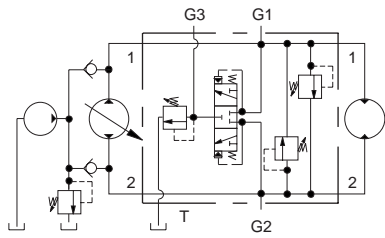
These Sun valve assemblies are for use with hydrostatic transmissions to provide overload relief valve protection for the main circuit in both directions. Additionally, an auxiliary shuttle valve allows bleeding of hot oil from the low pressure side. Hot oil can be cooled, filtered, or used as a source of oil for flushing other pump and motor cases. Hot oil is removed from the loop when the Sun RPIC cartridge is set below the hydrostatic charge pressure relief valve.

NOTE: A mechanical brake is recommended to positively lock any static live load.

0-200 GPM Cavity T-18A



DIRECT ACTING



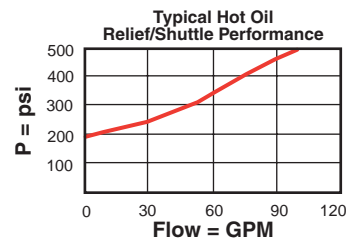
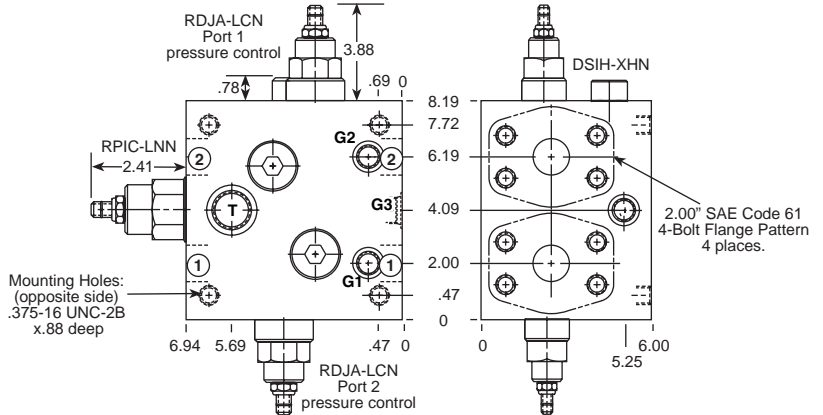
Ports 1 and 2	Port T	Ports G1, G2 & G3	Assembly Model Code*
2" SAE C61	SAE-16	SAE-6	XRJB-LCN-AS

*Add modifier /S to order Ductile Iron for pressure rating over 3000 psi.

These Sun valve assemblies are for use with hydrostatic transmissions to provide overload relief valve protection for the main circuit in both directions. Additionally, an auxiliary shuttle valve allows bleeding of hot oil from the low pressure side. Hot oil can be cooled, filtered, or used as a source of oil for flushing other pump and motor cases. Hot oil is removed from the loop when the Sun RPIC cartridge is set below the hydrostatic charge pressure relief valve.

NOTE: A mechanical brake is recommended to positively lock any static live load.

0-200 GPM Cavity T-18A



NOTES: Page 2 for cartridge model RP*C-*** shows performance curves, technical tips, and options.
See page vii for technical information about line mount bodies including SAE flange pattern specifications.
Consult your local Sun Distributor or the Sun Web Site for other port sizes available in the bodies shown above.
Go to www.sunhydraulics.com for more product information and pricing.

NOTES

TECHNICAL PRODUCT INFORMATION
LINE MOUNTED REGENERATIVE ASSEMBLIES

Applications

Regenerative circuits are used to provide faster cylinder extension speeds by taking the oil from the rod end and diverting it to the head end of the cylinder. This means that the effective area during extension is only the rod area that gives a faster speed **but also a reduced force**. This means using a cylinder with a 2:1 area ratio between piston and rod, equal speeds and forces can be obtained in both directions without using a double rod.

Sun offers two types of regenerative valve assemblies. One provides full time regeneration and the other is a pressure sensitive regenerative circuit. The full time regeneration has only a limited number of applications and is most commonly used for providing fast extension speeds with low force.

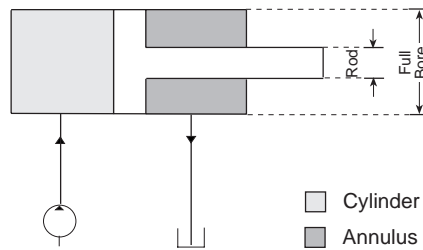
The pressure sensitive regenerative circuit is used in many applications such as compacting machines. The first part of the cylinder extension occurs when there is very little load (for example during initial compaction) and regeneration provides a faster speed. When the load resistance increases, the pressure on the full bore side starts to increase and will pilot open a counterbalance valve connecting the rod side to tank and take the circuit out of regeneration. This then provides a slower speed, as it is now operating on the full bore area, but also a corresponding increase in force. Regenerative circuits **do not** affect the retraction of the cylinder.

It is important to remember to size pipe work correctly to allow for the increased flow going into the full bore side of the cylinder.

The circuit Sun uses for all types of regeneration includes a pilot to close check valve connecting from the rod side to the full bore side. If this circuit is used in applications where the load can extend in the cylinder it will be necessary to incorporate a vented load control valve on the rod side to prevent the load running away.

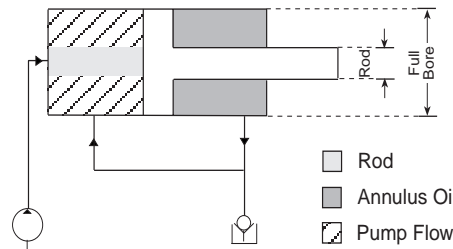
The illustration shows the appropriate calculations for regenerative circuits.

Normal Operation



Oil from the pump fills the full bore of a cylinder. With a cylinder ratio of 2:1 and the annulus connected to tank the flow out of the annulus is half of the flow into the full bore.

Regenerative Operation



During regen, pump flow into the full bore end fills only the effective area of the rod. The area not filled by the pump flow is made up by the annulus oil feeding back into the full bore. Hence, the reason why during regen, the cylinder extends at a faster rate.

Design Concepts and Features

The first main feature of all Sun regenerative packages is that they are installed after the directional valve controlling the actuator. This means that the higher flows generated are not passed through the directional valve, which can be the same size as for normal circuits. This also means that this package can more easily be added to an existing circuit with the minimum of disruption.

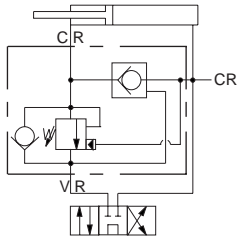
The main feature for the pressure sensitive regenerative circuit is that Sun uses a counterbalance valve to transfer from regeneration to normal operation. This type of valve opens gradually as the pilot pressure increases and gives a much smoother transition compared to the more commonly used sequence valve. It therefore eliminates a great deal of the shock, which can occur during this transition.

The assemblies can be supplied for various flow rates and packages such as line mounted, ISO sandwich assemblies and gasket-mounted subplates. It is also possible to mount the cartridges directly into the cylinder head.

Standard Assemblies: Line Mounted Regenerative Assemblies

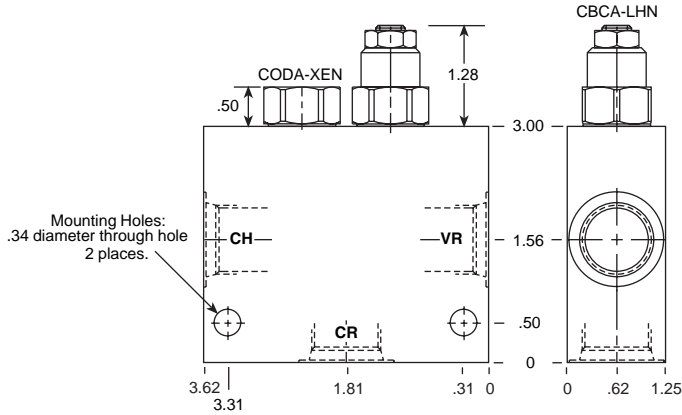
PRESSURE SENSITIVE REGENERATION APPLICATIONS

REGENERATION



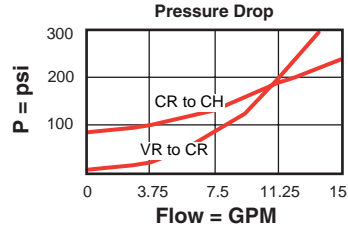
Ports CH, CR & VR	Assembly Model Code*
1/2" NPTF	YDCC-LHN-AC
SAE-10	YDCC-LHN-AK

15 GPM Maximum Regenerative Flow

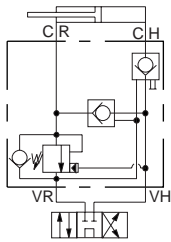


*Add modifier /S to order Ductile Iron for pressure rating over 3000 psi.

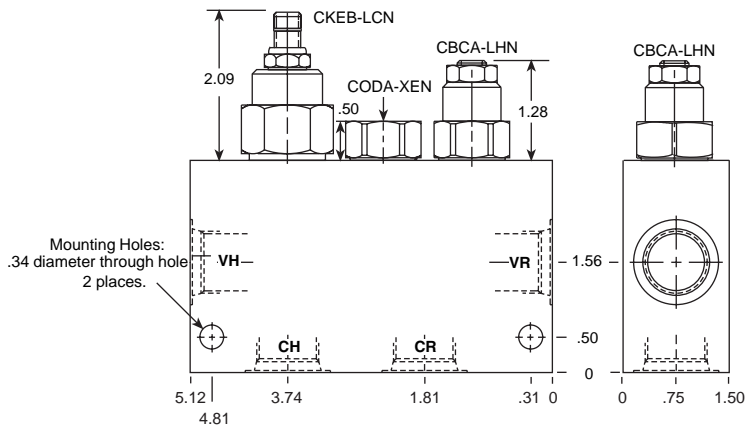
Regeneration diminishes progressively above setting of CBCA.
NOTE: Refer to page 223 if load causes cylinder to extend.
 *For part number and price for body only contact your local Sun distributor.



10 GPM Maximum Regenerative Flow

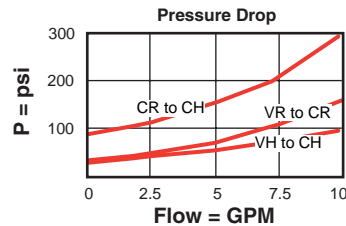


Ports CH, CR & VR	Assembly Model Code*
1/2" NPTF	YDCD-LHN-AC
SAE-10	YDCD-LHN-AK



*Add modifier /S to order Ductile Iron for pressure rating over 3000 psi.

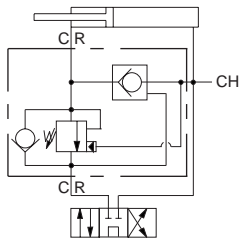
Includes CKEB load holding check valve.
Regeneration diminishes progressively above setting of CBCA.
NOTE: Refer to page 223 if load causes cylinder to extend.
 *For part number and price for body only contact your local Sun distributor.



NOTES: Page 50 for cartridge model CB**-* and page 78 for CK*B-* shows performance curves, technical tips, and options. See page vii for technical information about line mount bodies including SAE flange pattern specifications. Consult your local Sun Distributor or the Sun Web Site for other port sizes available in the bodies shown above. Go to www.sunhydraulics.com for more product information and pricing.

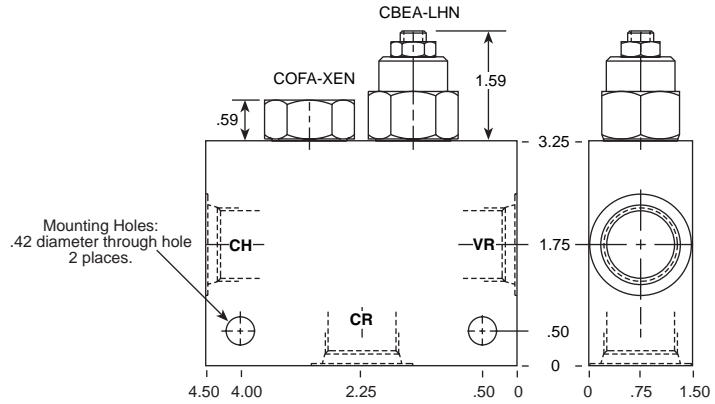
PRESSURE SENSITIVE REGENERATION APPLICATIONS

REGENERATION



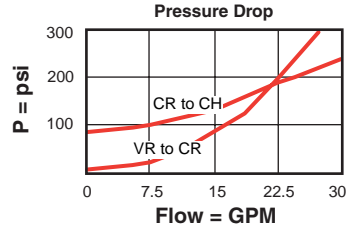
Ports CH, CR & VR	Assembly Model Code*
3/4" NPTF	YDEC-LHN-AD
SAE-12	YDEC-LHN-AL

30 GPM Maximum Regenerative Flow

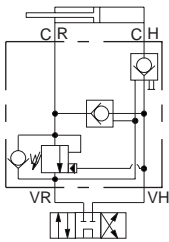


*Add modifier /S to order Ductile Iron for pressure rating over 3000 psi.

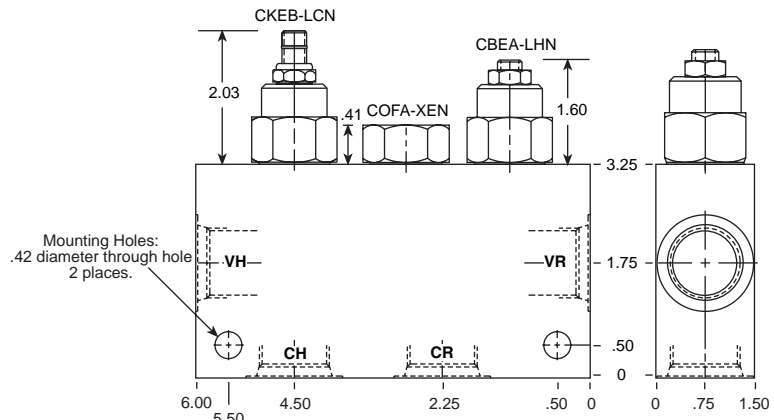
Regeneration diminishes progressively above setting of CBEA.
NOTE: Refer to page 223 if load causes cylinder to extend.
 *For part number and price for body only contact your local Sun distributor.



20 GPM Maximum Total Flow with Load Holding Check Valve

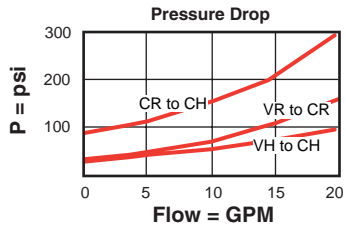


Ports CH, CR & VR	Assembly Model Code*
3/4" NPTF	YDED-LHN-AD
SAE-12	YDED-LHN-AL



*Add modifier /S to order Ductile Iron for pressure rating over 3000 psi.

Regeneration diminishes progressively above setting of CBEA.
NOTE: Refer to page 223 if load causes cylinder to extend.
 *For part number and price for body only contact your local Sun distributor.

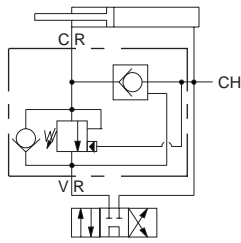


NOTES: Page 50 for cartridge model CB**.* and page 78 for CK*B-*** shows performance curves, technical tips, and options. See page vii for technical information about line mount bodies including SAE flange pattern specifications. Consult your local Sun Distributor or the Sun Web Site for other port sizes available in the bodies shown above. Go to www.sunhydraulics.com for more product information and pricing.

Standard Assemblies: Line Mounted Regenerative Assemblies

PRESSURE SENSITIVE REGENERATION APPLICATIONS

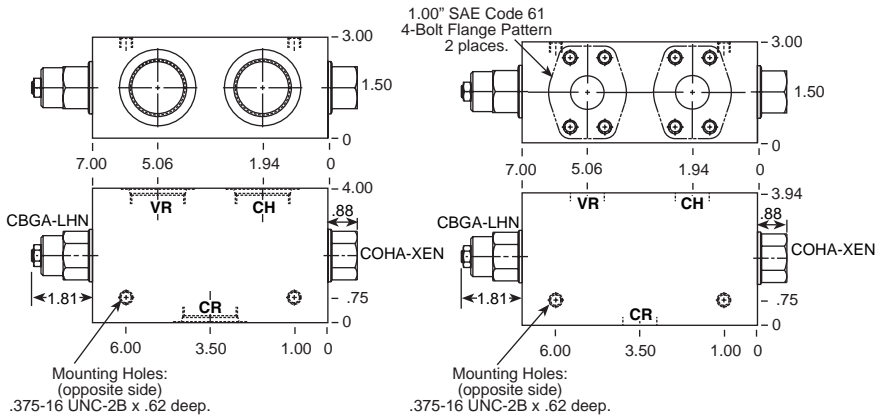
REGENERATION



Ports CH, CR & VR	Assembly Model Code*
3/4" NPTF	YDGC-LHN-AD
1" NPTF	YDGC-LHN-AE
1 1/4" NPTF	YDGC-LHN-AF
SAE-12	YDGC-LHN-AL
SAE-16	YDGC-LHN-AM

*Add modifier /S to order Ductile Iron for pressure rating over 3000 psi.

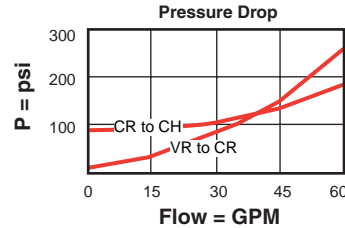
60 GPM Maximum Regenerative Flow



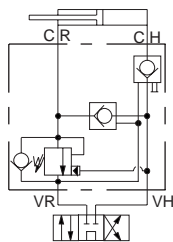
Regeneration diminishes progressively above setting of CBGA.

NOTE: Refer to page 223 if load causes cylinder to extend.

*For part number and price for body only contact your local Sun distributor.

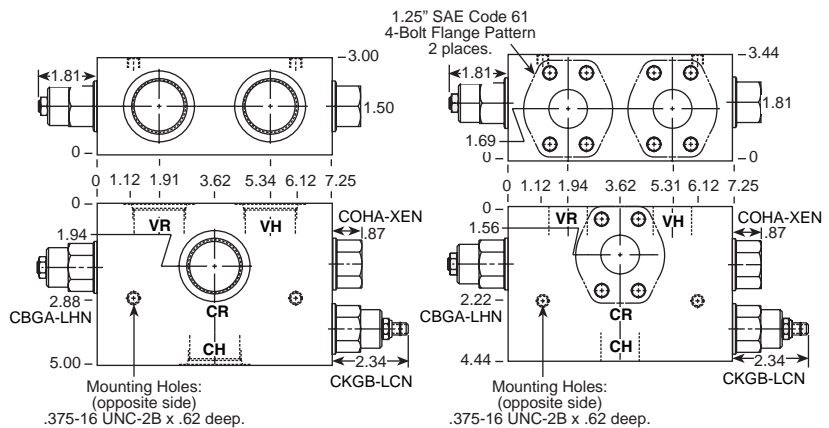


50 GPM Maximum Regenerative Flow



Ports CH, CR & VR	Assembly Model Code*
3/4" NPTF	YDGD-LHN-AD
1" NPTF	YDGD-LHN-AE
1 1/4" NPTF	YDGD-LHN-AF
SAE-12	YDGD-LHN-AL
SAE-16	YDGD-LHN-AM

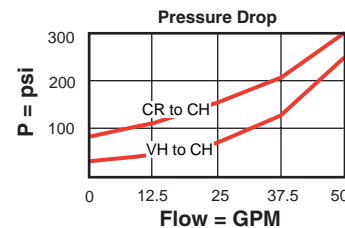
*Add modifier /S to order Ductile Iron for pressure rating over 3000 psi.



Regeneration diminishes progressively above setting of CBGA.

NOTE: Refer to page 223 if load causes cylinder to extend.

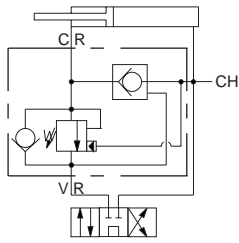
*For part number and price for body only contact your local Sun distributor.



NOTES: Page 50 for cartridge model CB**.* and page 78 for CK*B-*** shows performance curves, technical tips, and options. See page vii for technical information about line mount bodies including SAE flange pattern specifications. Consult your local Sun Distributor or the Sun Web Site for other port sizes available in the bodies shown above. Go to www.sunhydraulics.com for more product information and pricing.

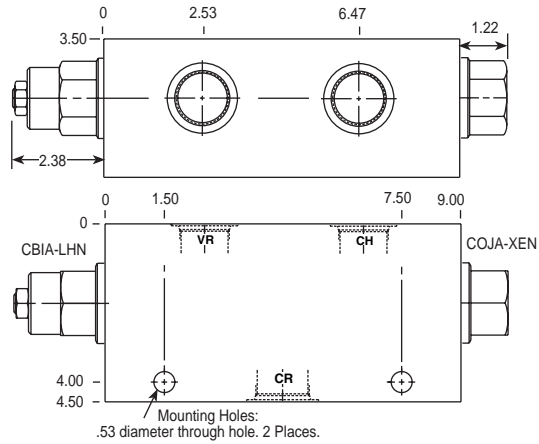
PRESSURE SENSITIVE REGENERATION APPLICATIONS

REGENERATION



Ports CH, CR & VR	Assembly Model Code*
SAE 16	YDJC-LHN-AN

120 GPM Maximum Regenerative Flow

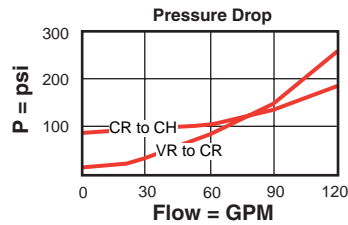


*Add modifier /S to order Ductile Iron for pressure rating over 3000 psi.

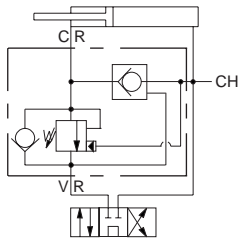
Regeneration diminishes progressively above setting of CBIA.

NOTE: Refer to page 223 if load causes cylinder to extend.

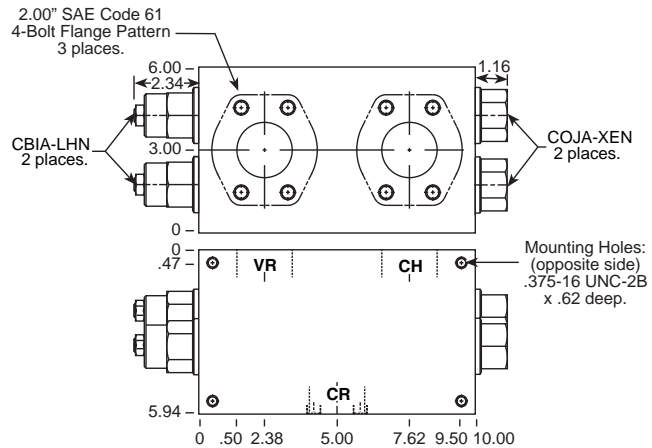
*For part number and price for body only contact your local Sun distributor.



240 GPM Maximum Regenerative Flow



Ports CH, CR, VR	Assembly Model Code*
2" SAE C61	YDJC-LHN-AS

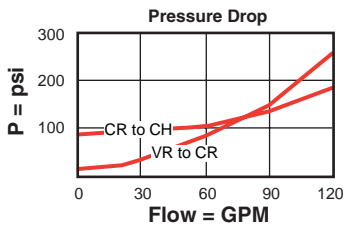


*Add modifier /S to order Ductile Iron for pressure rating over 3000 psi.

Regeneration diminishes progressively above setting of CBIA.

NOTE: Refer to page 223 if load causes cylinder to extend.

*For part number and price for body only contact your local Sun distributor.



NOTES: Page 50 for cartridge model CB**_*** shows performance curves, technical tips, and options. See page vii for technical information about line mount bodies including SAE flange pattern specifications. Consult your local Sun Distributor or the Sun Web Site for other port sizes available in the bodies shown above. Go to www.sunhydraulics.com for more product information and pricing.

NOTES

TECHNICAL PRODUCT INFORMATION
DIRECT MOTOR MOUNTED ASSEMBLIES
Char-Lynn S Series

Applications

The gerotor type gear motor is used on a large number of mobile and industrial applications. It is often necessary to incorporate valves in the circuit with the motor to control the flow and pressure. It may also be necessary to incorporate load control valves in the circuit.

It is possible to mount line mounted valves into the pipework feeding the motor, but Sun offers a large range of valves that can be bolted directly onto the motor interface. This eliminates pipework and provides the control directly at the motor.

The use of Sun cartridge valves in these assemblies means that in the event of a problem, it is a simple task to replace the cartridge rather than have to replace the complete valve.

On the smaller size motors the same gasket mounted face is used by at least four different manufacturers of this type of motor. The list below provides a quick cross-reference.

Manufacturer (general motor type with gasket mounted interface)

Eaton (S Type)
White (RS 06 and RS 46)
Parker/Ross/Nichols/Prince (TA, TB, TD, NE, 110A, 130S, 400S)

On the specification in this catalogue for the smaller size of motor, we are using the Eaton reference number type as they are probably the largest manufacturer.

For the larger size of motors we are only showing the Eaton reference of 2000 series and 4000 series.

Design Concepts and Features

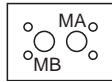
The valve assemblies shown for all sizes of motor are counterbalance valves and cross line relief valves. The counterbalance valves provide load holding and load control while the cross line relief valves provide over pressure protection. The Sun counterbalance valves provide excellent control with low hysteresis and minimum leakage. The relief valves are fast acting with minimum overshoot for excellent protection.

On the smaller sizes of motor, Sun also offers flow control, which can accurately control the motor speed. The type of valve offered is a pressure compensated flow control valve but for more basic flow control a simple restrictor valve can also be used. Sun also has a further expanded range of bolt on valve assemblies. Consult the Sun factory or your local distributor for further information.

Standard Assemblies: Direct Motor Mounted Assemblies: Char-Lynn S Series Motors

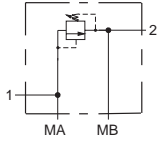
SINGLE / DUAL CROSS-PORT RELIEF AND SINGLE COUNTERBALANCE APPLICATIONS

T-10A / T-11A Cavities



Go to www.sunhydraulics.com for more product information.

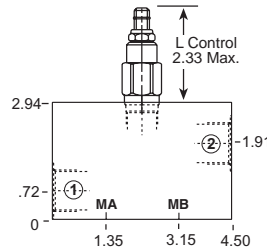
DIRECT ACTING



Ports
1, 2
SAE 10

Assembly Model Code*
RDDA-L*N-ZFK

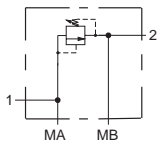
*Add modifier /S to order Ductile Iron for pressure rating over 3000 psi.



PILOT RATIO 3:1

Function

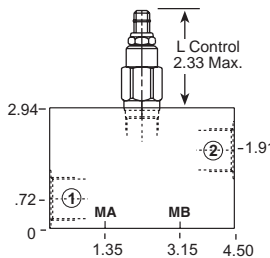
Single Cross-Port Relief A to B



Ports
1, 2
SAE 10

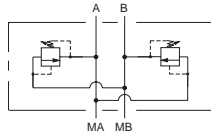
Assembly Model Code*
RDDA-L*N-ZFK

*Add modifier /S to order Ductile Iron for pressure rating over 3000 psi.



Function

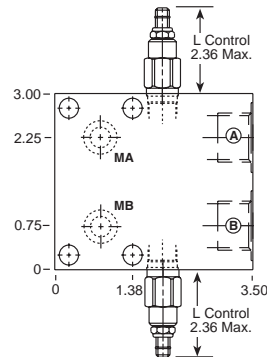
Single Cross-Port Relief B to A



Ports
A, B
SAE 8

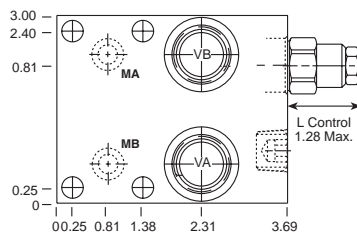
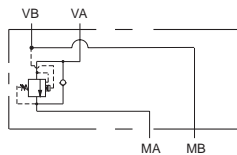
Assembly Model Code*
RDDA-L*N-YXB

*Add modifier /S to order Ductile Iron for pressure rating over 3000 psi.



Function

Dual Cross-Port Relief



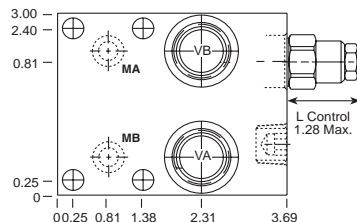
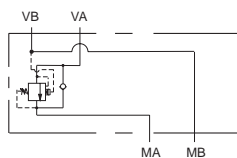
Function

Single Counterbalance on A

Ports
VA, VB
SAE 10

Assembly Model Code*
CBCA-LAN-ZPD

*Add modifier /S to order Ductile Iron for pressure rating over 3000 psi.



Function

Single Counterbalance on B

Ports
VA, VB
SAE 10

Assembly Model Code*
CBCA-LAN-ZPB

*Add modifier /S to order Ductile Iron for pressure rating over 3000 psi.

NOTES: Page 2 for cartridge model RD*A-*** and page 50 for CB**-.*** show performance curves, technical tips, and options. See page 229 for technical information about bolt-on packages.

SINGLE / DUAL COUNTERBALANCE AND DUAL FLOW CONTROL APPLICATIONS

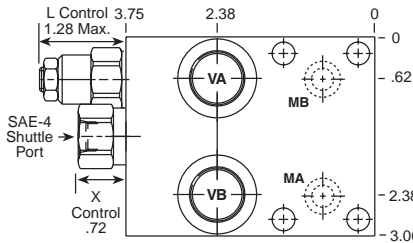
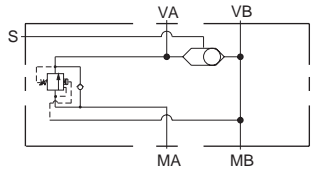
T-11A / T-13A Cavities



Go to www.sunhydraulics.com for more product information.

FULLY ADJUSTABLE PRESSURE COMPENSATED WITH FREE FLOW CHECK

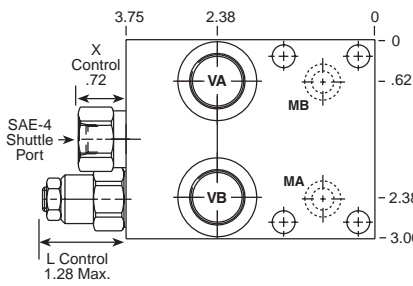
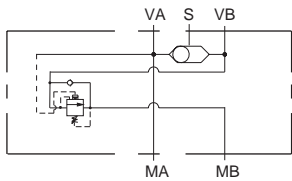
PILOT RATIO 3:1



Function
Single Counterbalance on **A** with Shuttle

Ports VA, VB	Assembly Model Code*
SAE 10	CBCA-LAN-ZDV

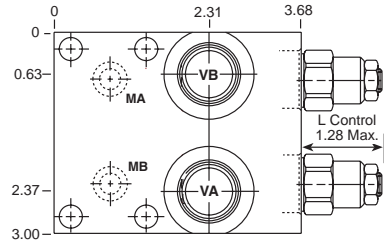
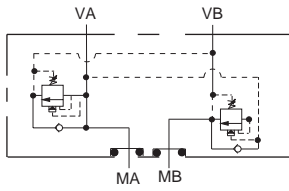
*Add modifier **/S** to order Ductile Iron for pressure rating over 3000 psi.



Function
Single Counterbalance on **B** with Shuttle

Ports VA, VB	Assembly Model Code*
SAE 10	CBCA-LAN-ZDY

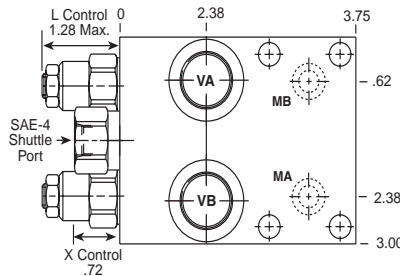
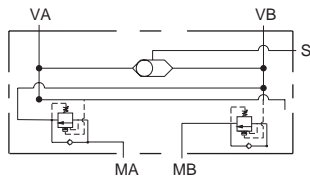
*Add modifier **/S** to order Ductile Iron for pressure rating over 3000 psi.



Function
Dual Counterbalance

Ports VA, VB	Assembly Model Code*
SAE 10	CBCA-LAN-YTA

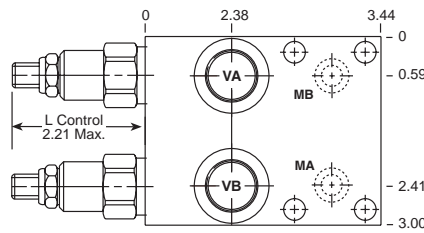
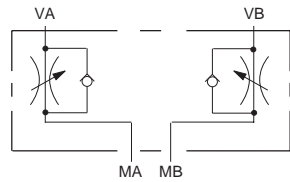
*Add modifier **/S** to order Ductile Iron for pressure rating over 3000 psi.



Function
Dual Counterbalance with Shuttle

Ports VA, VB	Assembly Model Code*
SAE 10	CBCA-LAN-XTS

*Add modifier **/S** to order Ductile Iron for pressure rating over 3000 psi.



Function
Dual Flow Control Meter-out on **A** and **B**

Ports VA, VB	Assembly Model Code*
SAE 10	FDBA-LAN-XWT

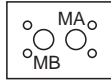
*Add modifier **/S** to order Ductile Iron for pressure rating over 3000 psi.

NOTES: Page 126 for cartridge model FD**-*** and page 50 for CB**-*** show performance curves, technical tips, and options. See page 229 for technical information about bolt-on packages.

Standard Assemblies: Direct Motor Mounted: Char-Lynn S Series Motor

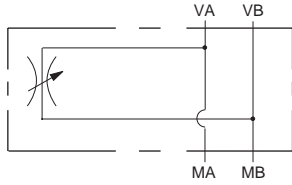
SINGLE FLOW CONTROL APPLICATIONS

T-13A Cavity



Go to www.sunhydraulics.com for more product information.

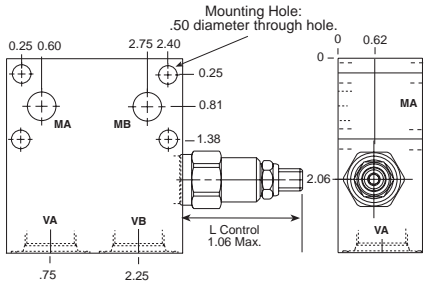
FULLY ADJUSTABLE



Function

Single Flow Control Bleed-Off

Ports VA, VB	Assembly Model Code*
SAE 10	NFCC-LCN-ZFZ



*Add modifier **/S** to order Ductile Iron for pressure rating over 3000 psi.

NOTES: Page 110 for cartridge model NF**_*** show performance curves, technical tips, and options. See page 229 for technical information about bolt-on packages.

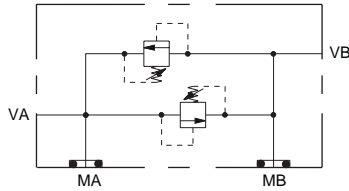
DUAL CROSS-PORT RELIEF AND SINGLE COUNTERBALANCE APPLICATIONS

T-10A / T-2A Cavities



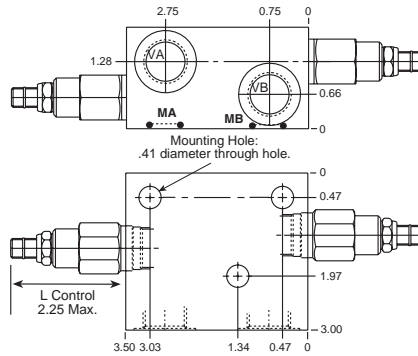
Go to www.sunhydraulics.com for more product information.

DIRECT ACTING



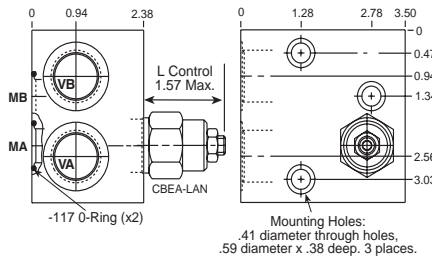
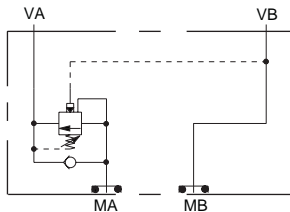
Ports VA, VB
SAE 10
Assembly Model Code*
RDDA-L*N-YWA

*Add modifier /S to order Ductile Iron for pressure rating over 3000 psi.



PILOT RATIO 3:1

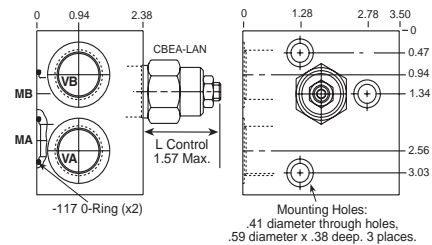
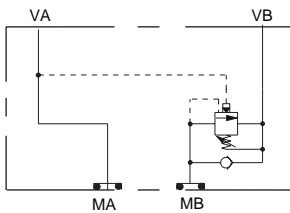
Function
Dual Cross-Port Relief



Function
Single Counterbalance on A

Ports VA, VB
SAE 12
Assembly Model Code*
CBEA-LAN-ZPG

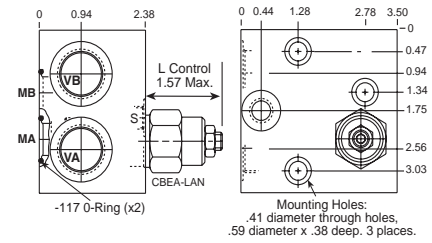
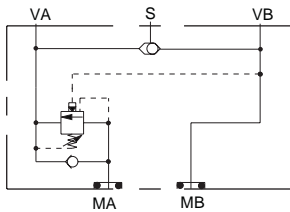
*Add modifier /S to order Ductile Iron for pressure rating over 3000 psi.



Function
Single Counterbalance on B

Ports VA, VB
SAE 12
Assembly Model Code*
CBEA-LAN-ZPI

*Add modifier /S to order Ductile Iron for pressure rating over 3000 psi.



Function
Single Counterbalance on A with Shuttle

Ports VA, VB
SAE 12
Assembly Model Code*
CBEA-LAN-ZPM

*Add modifier /S to order Ductile Iron for pressure rating over 3000 psi.

NOTES: Page 2 for cartridge model RD*A-*** and page 50 for CB**.* show performance curves, technical tips, and options. See page 229 for technical information about bolt-on packages.

Standard Assemblies: Direct Motor Mounted: Char-Lynn 2000 Series Motors

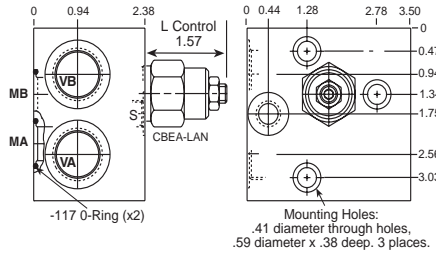
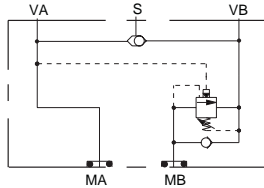
SINGLE / DUAL COUNTERBALANCE APPLICATIONS

T-2A Cavity



Go to www.sunhydraulics.com for more product information.

PILOT RATIO 3:1



Function

Single Counterbalance on **B** with Shuttle

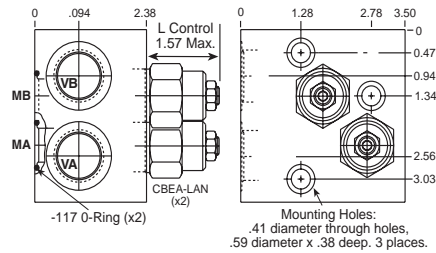
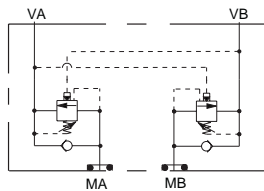
Ports
VA, VB

Assembly
Model Code*

SAE 12

CBEA-LAN-ZPO

*Add modifier **/S** to order Ductile Iron for pressure rating over 3000 psi.



Function

Dual Counterbalance

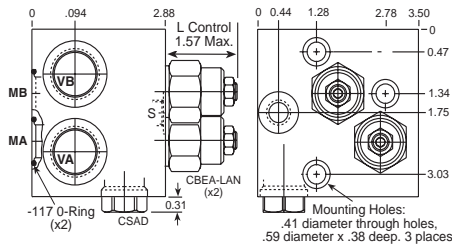
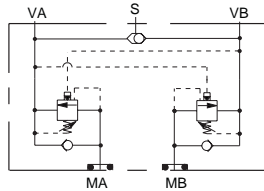
Ports
VA, VB

Assembly
Model Code*

SAE 12

CBEA-LAN-YTC

*Add modifier **/S** to order Ductile Iron for pressure rating over 3000 psi.



Function

Dual Counterbalance with Shuttle

Ports
VA, VB

Assembly
Model Code*

SAE 12

CBEA-LAN-XYC

*Add modifier **/S** to order Ductile Iron for pressure rating over 3000 psi.

NOTES: Page 50 for cartridge model CB**.* show performance curves, technical tips, and options. See page 229 for technical information about bolt-on packages.

DUAL CROSS-PORT RELIEF AND DUAL COUNTERBALANCE APPLICATIONS

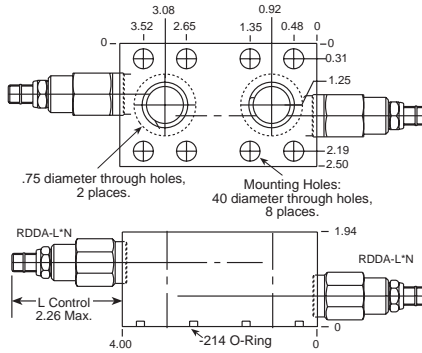
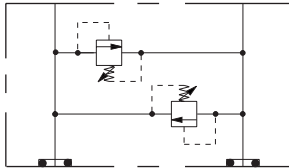
T-10A / T-2A Cavities



Go to www.sunhydraulics.com for more product information.

DIRECT ACTING

PILOT RATIOS 3:1

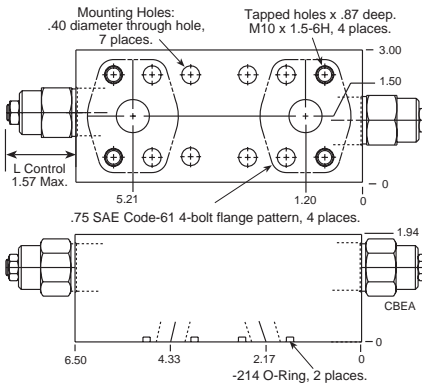
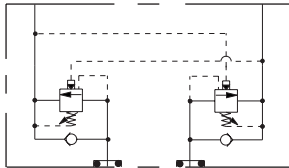


Assembly Model Code*
RDDA-L*N-YVP

*Add modifier **/S** to order Ductile Iron for pressure rating over 3000 psi.

Function

Dual Cross-Port Relief

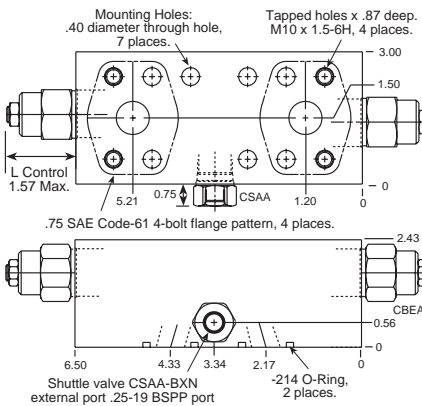
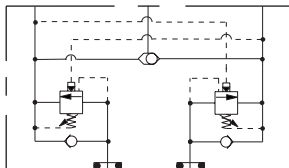


Function

Dual Counterbalance on A and B

Ports
3/4" SAE C61
Assembly Model Code*
CBEA-LAN-VZX/M

Add modifier **/T** to order Ductile Iron for pressure rating over 3000 psi.



Function

Dual Counterbalance on A and B with Shuttle

Ports
3/4" SAE C61
Assembly Model Code*
CBEA-LAN-VWZ

*Add modifier **/T** to order Ductile Iron for pressure rating over 3000 psi.

NOTES: Page 2 for cartridge model RD*A-*** and page 50 for CB*-*** show performance curves, technical tips, and options. See page 229 for technical information about bolt-on packages.

Standard Assemblies: Direct Motor Mounted

NOTES

TECHNICAL PRODUCT INFORMATION
DIRECT MOTOR MOUNTED ASSEMBLIES
Danfoss (OMP/OMR Series and OMT Series)

Applications

The Danfoss gerotor type gear motor is used on a large number of mobile and industrial applications. It is often necessary to incorporate valves in the circuit with the motor to control the flow and pressure. It is also sometimes necessary to incorporate load control valves in the circuit.

It is possible to mount line-mounted valves into the pipework feeding the motor but Sun offers a large range of valves that can be bolted directly onto the motor interface. This eliminates pipework and provides the control directly at the motor.

The use of Sun cartridge valves in these valve assemblies means that in the event of a problem it is a simple task to replace the cartridge rather than have to replace the complete valve.

We are showing a range of bolt-on valve assemblies for the two most common ranges of Danfoss motors, the OMP/OMR range and the OMT range.

Design Concepts and Features

The valve assemblies shown for all sizes of motor are counterbalance valves and cross line relief valves. The counterbalance valves provide load holding and load control while the cross line relief valves provide protection from over pressurisation. The Sun counterbalance valves provide excellent control with low hysteresis and minimum leakage. The relief valves are fast acting with minimum overshoot for excellent protection.

On the smaller sizes of motor, Sun also offers flow control, which can accurately control the motor speed. The type of valve offered is a restrictor type control valve but for more accurate flow control a pressure compensated valve can also be used. Sun also has a further expanded range of bolt on valve assemblies. Consult your local Sun company or distributor for further information.

Standard Assemblies: Direct Motor Mounted: Danfoss (OMP/OMR Series)

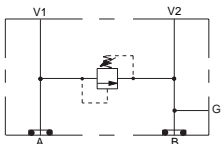
SINGLE / DUAL CROSS-PORT RELIEF AND SINGLE COUNTERBALANCE APPLICATIONS

T-10A / T-11A Cavities



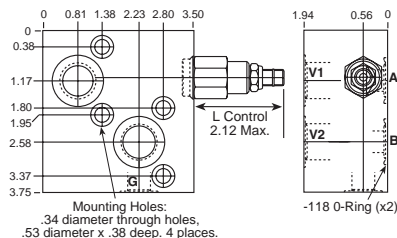
Go to www.sunhydraulics.com for more product information.

DIRECT ACTING



Ports V1, V2	Guage Port	Assembly Model Code*
SAE10	SAE-6	RDDA-L*N-WVY

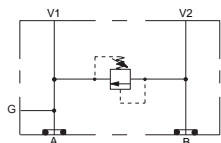
*Add modifier /S to order Ductile Iron for pressure rating over 3000 psi.



PILOT RATIO 3:1

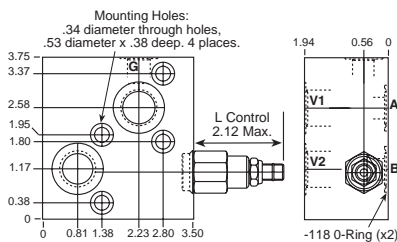
Function

Single Cross-Port Relief A to B



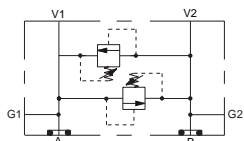
Ports V1, V2	Guage Port	Assembly Model Code*
SAE10	SAE-6	RDDA-L*N-WVS

*Add modifier /S to order Ductile Iron for pressure rating over 3000 psi.



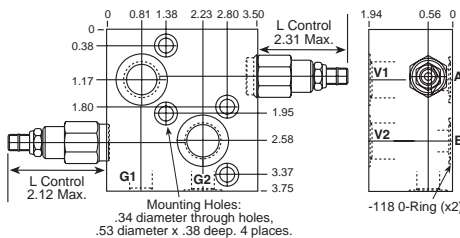
Function

Single Cross-Port Relief B to A



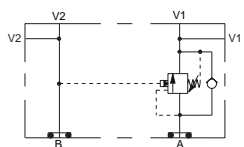
Ports V1, V2	Guage Port	Assembly Model Code*
SAE10	SAE-6	RDDA-L*N-WVP

*Add modifier /S to order Ductile Iron for pressure rating over 3000 psi.

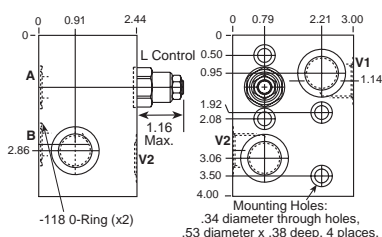


Function

Dual Cross-Port Relief



*Add modifier /S to order Ductile Iron for pressure rating over 3000 psi.

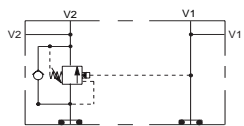


Function

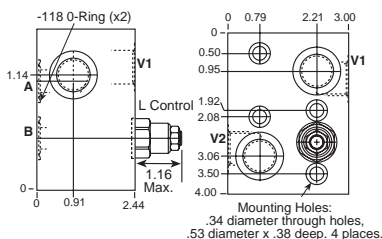
Single Counterbalance on A

Ports V1, V2	Assembly Model Code*
SAE10	CBCA-LAN-WZH

*Add modifier /S to order Ductile Iron for pressure rating over 3000 psi.



*Add modifier /S to order Ductile Iron for pressure rating over 3000 psi.



Function

Single Counterbalance on B

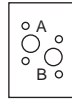
Ports V1, V2	Assembly Model Code*
SAE10	CBCA-LAN-WZE

*Add modifier /S to order Ductile Iron for pressure rating over 3000 psi.

NOTES: Page 2 for cartridge models RD*A-*** and page 50 for CB**-*** show performance curves, technical tips, and options. See page 229 for technical information about bolt-on packages.

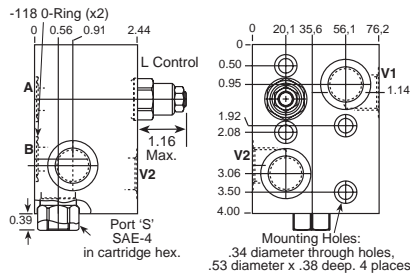
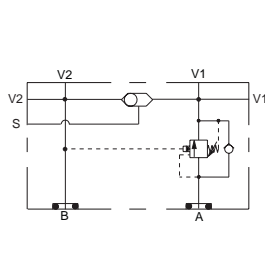
SINGLE / DUAL COUNTERBALANCE APPLICATIONS (SHUTTLES)

T-11A Cavity



Go to www.sunhydraulics.com for more product information.

PILOT RATIO 3:1

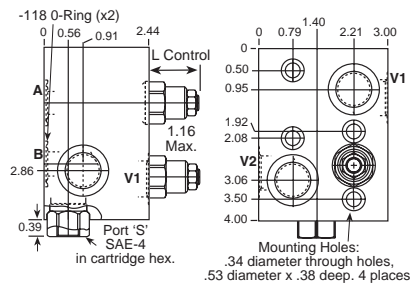
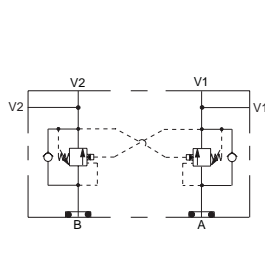


Function

Single Counterbalance on A with Shuttle

Ports V1, V2	Assembly Model Code*
SAE10	CBCA-LAN-WZS

*Add modifier /S to order Ductile Iron for pressure rating over 3000 psi.

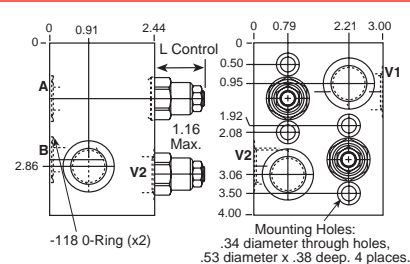
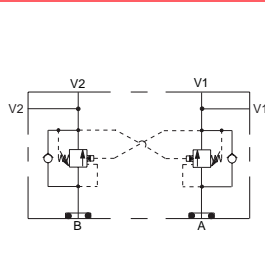


Function

Single Counterbalance on B with Shuttle

Ports V1, V2	Assembly Model Code*
SAE10	CBCA-LAN-WZP

*Add modifier /S to order Ductile Iron for pressure rating over 3000 psi.

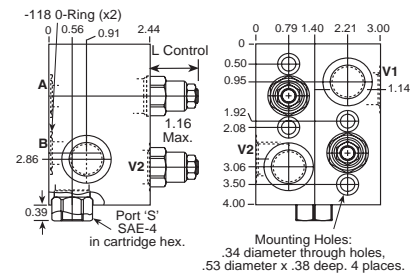
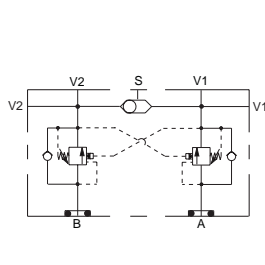


Function

Dual Counterbalance

Ports V1, V2	Assembly Model Code*
SAE10	CBCA-LAN-WZL

*Add modifier /S to order Ductile Iron for pressure rating over 3000 psi.

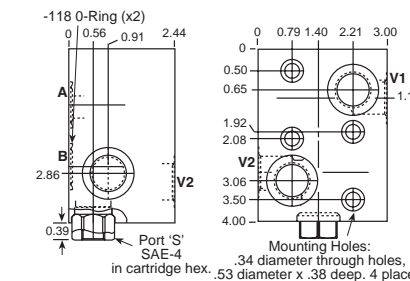
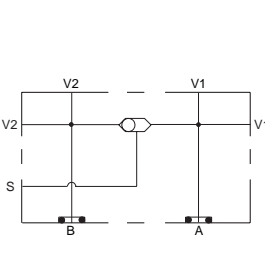


Function

Dual Counterbalance with Shuttle

Ports V1, V2	Assembly Model Code*
SAE10	CBCA-LAN-WZV

*Add modifier /S to order Ductile Iron for pressure rating over 3000 psi.



Function

Shuttle Only

Ports V1, V2	Assembly Model Code*
SAE10	CSAA-BXN-WZY

*Add modifier /S to order Ductile Iron for pressure rating over 3000 psi.

NOTES: Page 50 for cartridge models CB**-* show performance curves, technical tips, and options. See page 229 for technical information about bolt-on packages.

Standard Assemblies: Direct Motor Mounted: Danfoss (OMP/OMR Series)

DUAL FLOW CONTROL APPLICATIONS

T-5A Cavity

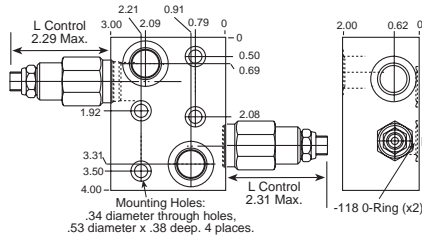
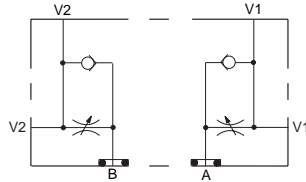


Go to www.sunhydraulics.com for more product information.

FULLY ADJUSTABLE PRESSURE COMPENSATED FLOW CONTROL WITH REVERSE FREE FLOW CHECK

Function

Dual Flow Control
Meter-in on **A** and **B**



Ports
V1, V2

Assembly
Model Code*

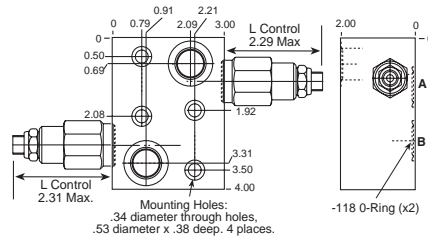
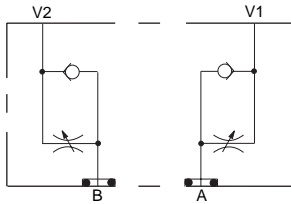
SAE10

FDCB-LAN-WZB

*Add modifier **/S** to order Ductile Iron for pressure rating over 3000 psi.

Function

Dual Flow Control
Meter-out on **A** and **B**



Ports
V1, V2

Assembly
Model Code*

SAE10

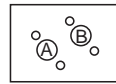
FDCB-LAN-WXH

*Add modifier **/S** to order Ductile Iron for pressure rating over 3000 psi.

NOTES: Page 126 for cartridge models FD*B-*** show performance curves, technical tips, and options. See page 229 for technical information about bolt-on packages.

SINGLE / DUAL CROSS-PORT RELIEF AND SINGLE COUNTERBALANCE APPLICATIONS

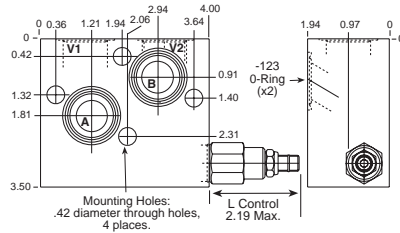
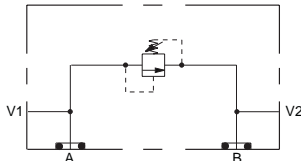
T-10A / T-2A Cavities



Go to www.sunhydraulics.com for more product information.

DIRECT ACTING

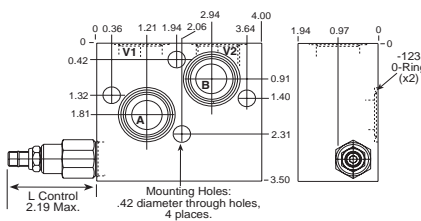
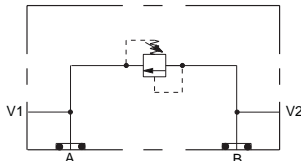
PILOT RATIO 3:1



Function
Single Cross-Port Relief A to B

Ports V1, V2 Assembly Model Code*
SAE 12 **RDDA-L*N-WLV**

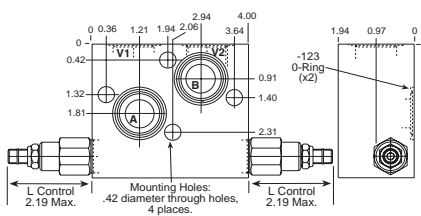
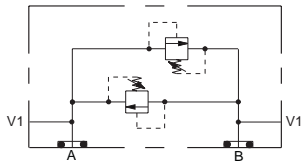
*Add modifier /S to order Ductile Iron for pressure rating over 3000 psi.



Function
Single Cross-Port Relief B to A

Ports V1, V2 Assembly Model Code*
SAE 12 **RDDA-L*N-WMV**

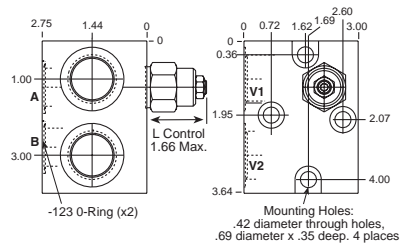
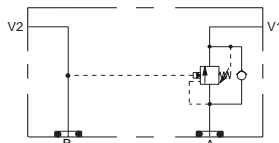
*Add modifier /S to order Ductile Iron for pressure rating over 3000 psi.



Function
Dual Cross-Port Relief

Ports V1, V2 Assembly Model Code*
SAE 12 **RDDA-L*N-WLV**

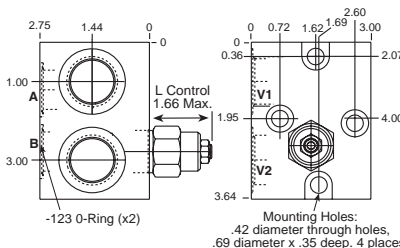
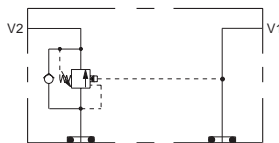
*Add modifier /S to order Ductile Iron for pressure rating over 3000 psi.



Function
Single Counterbalance on A

Ports V1, V2 Assembly Model Code*
SAE 12 **CBEA-LAN-WKH**

*Add modifier /S to order Ductile Iron for pressure rating over 3000 psi.



Function
Single Counterbalance on B

Ports V1, V2 Assembly Model Code*
SAE 12 **CBEA-LAN-WKL**

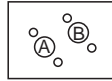
*Add modifier /S to order Ductile Iron for pressure rating over 3000 psi.

NOTES: Pages 2 for cartridge models RD*A-*** and page 50 for CB*-*** show performance curves, technical tips, and options. See page 229 for technical information about bolt-on packages.

Standard Assemblies: Direct Motor Mounted: Danfoss (OMT Series)

SINGLE / DUAL COUNTERBALANCE APPLICATIONS (SHUTTLES)

T-2A Cavity

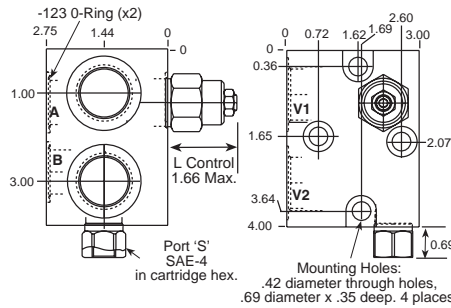
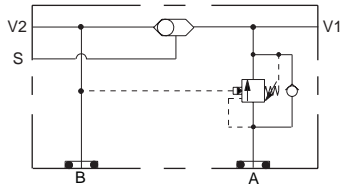


Go to www.sunhydraulics.com for more product information.

PILOT RATIO 3:1

Function

Single Counterbalance on A with Shuttle

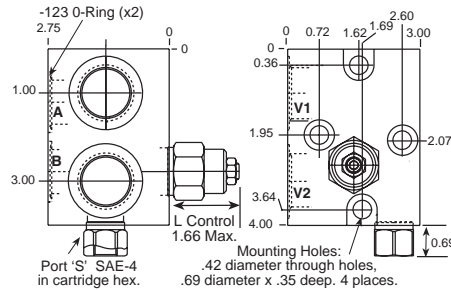
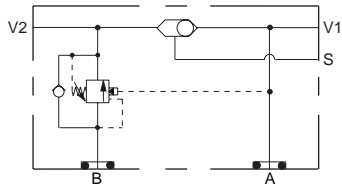


Ports V1, V2 SAE 12
Assembly Model Code* **CBEA-LAN-WKP**

*Add modifier /S to order Ductile Iron for pressure rating over 3000 psi.

Function

Single Counterbalance on B with Shuttle

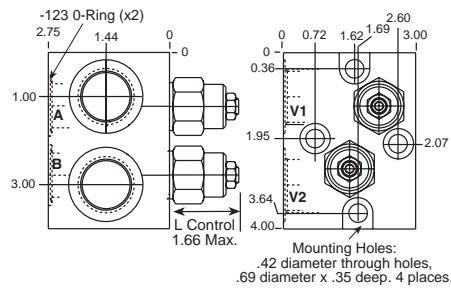
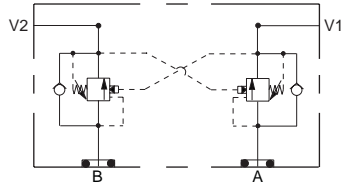


Ports V1, V2 SAE 12
Assembly Model Code* **CBEA-LAN-WKS**

*Add modifier /S to order Ductile Iron for pressure rating over 3000 psi.

Function

Dual Counterbalance

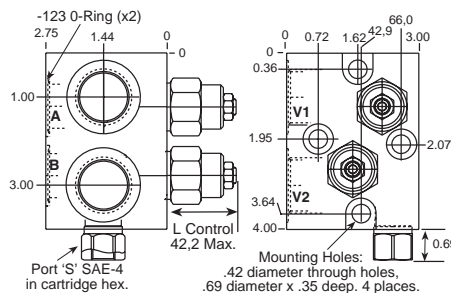
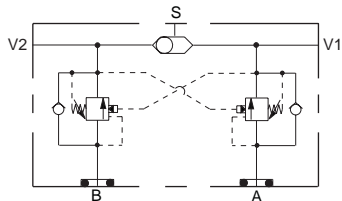


Ports V1, V2 SAE 12
Assembly Model Code* **CBEA-LAN-WKV**

*Add modifier /S to order Ductile Iron for pressure rating over 3000 psi.

Function

Dual Counterbalance with Shuttle

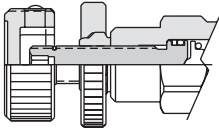
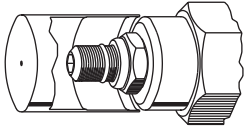
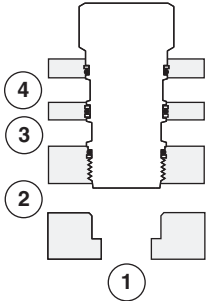
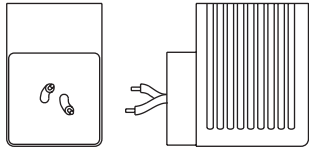
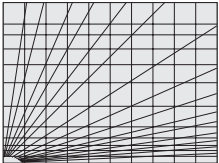
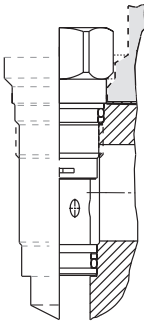


Ports V1, V2 SAE 12
Assembly Model Code* **CBEA-LAN-WKY**

*Add modifier /S to order Ductile Iron for pressure rating over 3000 psi.

NOTES: Page 50 for cartridge model CB**-* show performance curves, technical tips, and options. See page 229 for technical information about bolt-on packages.

General Information

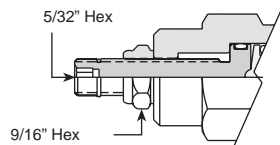
	<i>Page</i>	
Cartridge Control Options	244	
Cartridge Control Kits	245	
Cavity Plugs	246	
Solenoid Electrical Connector Options	248	
Pressure Drop Data Chart	249	
Cartridge Cavities and Cavity Tools	250	

CARTRIDGE CONTROL OPTIONS

General Purpose Controls

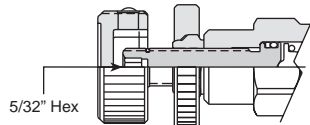
L Standard Screw Adjustment

O-ring seal on adjust screw. Adjust screw positively retained. Overset protection-pilot spring cannot go solid.



K Handknob with Lock Knob

Handknob and lock knob added to L control. Sun handknob kits for field conversion are available. See cartridge control kits.

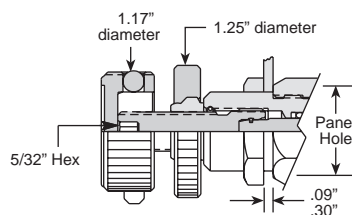


O Handknob with Panel Mount

Special threaded cartridge hex body with panel nut for mounting cartridge through access hole in control panel. Handknob and lock knob included.

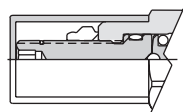
Panel Hole:

Series 1 cartridges .75" dia.
Series 2 cartridges 1.00" dia.



C Tamper Resistant Factory Set

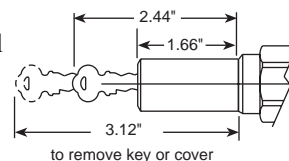
Steel cover press-fits onto L control cartridge shoulder. Valves may be ordered in this configuration. **Specify pressure setting on order.** Setting stamped on cartridge hex. Kits for field conversion are available. See cartridge control kits.



Key Lock Kit

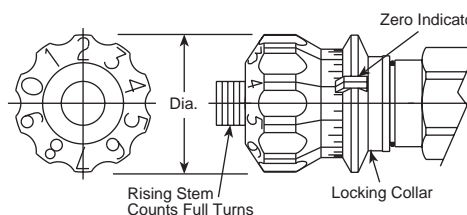
Optional adjustment Key Lock Cover Kit for L controls allows adjustment to be locked with a key to prevent unauthorized changes in valve setting. Adjustment easily accessible when lock assembly is removed.

Requires replacement of standard locknut with special locknut which accepts assembly, and new wire stop ring for overset protection.



H Calibrated Handknob with Detent Lock

Fully calibrated handknob for flow control cartridges. 40 radial calibrations per turn. Moveable zero indicator. (Minor disassembly required.) Rising detented locking collar positively locks adjustment knob against vibration or accidental tampering. Any desired setting may be recorded and repeated. U.S. Patent #4,577,831

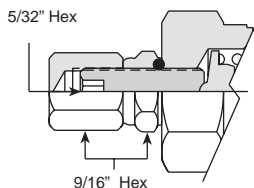


Diameter	1.13" Dia.	1.38" Dia.	1.62" Dia.	1.62" Dia.
Series	1	2	3	4
	NCCB	NCEB	NCFB	NCGB
	NCCC	NCEC	NCFC	NCGC
	NFCC	NFDC	NFEC	NFFC
	NFCD	NFDD	NFED	NFFD
	FDBA	FDCB	FDEA	FDFA

Special Purpose Controls (for use in systems where adjustment is seldom changed after installation)

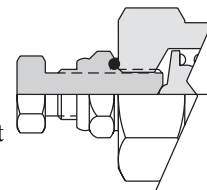
J Socket Head Set Screw with Cap

Stem seal O-ring under locknut. Adjusting screw is not retained. No overset protection.



F Wrench Adjustment

Stem seal O-ring under locknut. Adjusting screw is not retained. Overset protection-pilot spring cannot go solid.

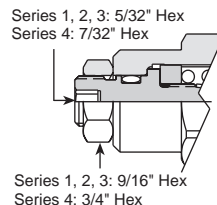


Counterbalance Valves

All Sun counterbalance cartridges are built with a leakproof adjustment (O-ring seals on the adjusting screw) but are not designed for frequent adjustment in the field. Cartridges that are factory pre-set by Sun to a customer specified pressure setting are available and can be installed directly on a machine without the need for further adjustment.

L Standard Leakproof Screw Adjustment.

O-ring seal on adjust screw.

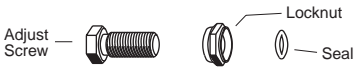

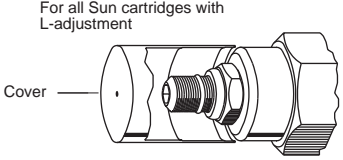
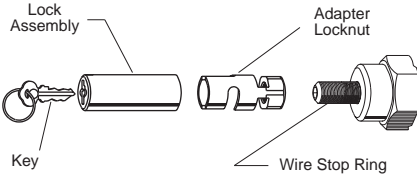
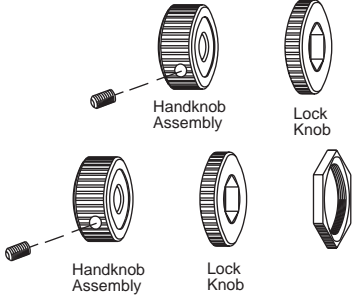
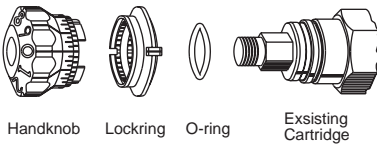

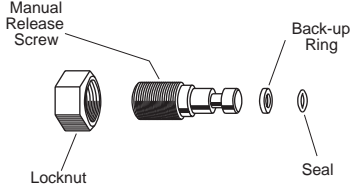


C Tamper Resistant Factory Set

See C Control description above.

General Information

CARTRIDGE CONTROL KITS

Service Kit Number Description	Use specifically with Control/Cartridge	Description	Notes
Adjustment Screw Kit 991-006	All F controls		To assure a complete seal on the stem - release all pressure on the cartridge after setting. Then... tighten locknut (and cap, on J).
Adjustment Screw Kit 991-010	All J controls		
Tamper Resistant Cover 991-000 991-004 991-001 991-002 991-003	For all Sun cartridges with L adjustment Series 0 - 3/4" (19,0 mm) hex Series 1 - 7/8" (22,2 mm) hex Series 2 - 1 1/8" (28,6 mm) hex Series 3 - 1 1/4" (31,8 mm) hex Series 4 - 1 5/8" (41,0 mm) hex	<p>For all Sun cartridges with L-adjustment</p> 	Tamper Resistant Cover <ol style="list-style-type: none"> 1. Adjust valve to desired setting and tighten locknut. 2. Using an arbor press or a soft hammer, install cover until it seats on cartridge hex. 3. Cover is a press fit on cartridge shoulder.
Key Lock Kit 993-008	For all Sun cartridges with L adjustment (except Series 0 and counterbalance cartridges).		<ol style="list-style-type: none"> 1. Remove original wire stop ring and locknut. 2. Thread on the adapter locknut and install new wire stop ring through slot provided. 3. Adjust valve to desired setting and tighten adapter locknut. 4. Slide lock assembly over adapter, lock and remove key.
K Handknob Kit 991-211 991-222	Use this kit to adapt all L controls to K controls (except Series 0 and counterbalance cartridges). K control for Series 0		Only cartridges date stamped "41" or later and originally supplied with plastic knobs. Lock knob snaps onto locknut furnished on cartridge.
Panel Handknob Kit 991-215	O controls All Series 1 cartridges 7/8" (22,2 mm) hex M20 thread		
Panel Handknob Kit 991-216	O controls All Series 2 cartridges 1 1/8" (28,6 mm) hex 1"-14 thread		
H Calibrated Handknob Kit 991-219 991-220 991-221	H controls All series of flow controls FDCB, NCEB, NCEC, NFDC, NFDD only FDEA, FDFA, NCFB, NCFC, NCGB, NCGC, NFEC, NFED, NFFC, NFFD only FDBA, NCCB, NCCC, NFFC, NFDC only		<p>Only for cartridges originally supplied with an H handknob. Valves can not be modified in the field.</p> <p>Note: The H control is Only available for the cartridges shown to the left.</p>
Lockwire 911-012	All M, Q and R controls (except solenoid operated cartridges).		
Adjustment Screw Kit 991-112-003 Viton 991-112-007 Buna-N	For cartridge models: CKCA L**CKCD L** CKCB L**CPCA L** CKCC L**		Only cartridges date stamped "62" or earlier.
Adjustment Screw Kit 991-212-003 Viton 991-212-007 Buna-N	For cartridge models: CKEA L**CKED L** CKEB L**CPEA L** CKEC L**		

General Information

CAVITY PLUGS

It is sometimes desirable to remove a Sun cartridge valve and still maintain the integrity of the hydraulic system. This may be necessitated by the need to flush a system after repairs or a piping change, or to change an operating function in the circuit. For these requirements, Sun offers two styles of cavity plugs - all ports blocked and main ports open to flow.

Plugs for Two Port Cavities:

		All Ports Open	All Ports Blocked
Series	Cavity	Cavity Plug Model Code	Cavity Plug Model Code
P	T-8A	XAOA-XX*	XACA-XX*
0	T-162A	XZOA-XX*	XZCA-XX*
1	T-10A	XFOA-XX*	XFCA-XX*
	T-13A		XGCA-XX*
2	T-3A	XCOA-XX*	XCCA-XX*
	T-5A		XDCA-XX*
3	T-16A	XIOA-XX*	XICA-XX*
4	T-18A	XKOA-XX*	XKCA-XX*

Plugs for Three Port Cavities

		Ports 1 to 2 Open Port 3 Blocked	All Ports Blocked
Series	Cavity	Cavity Plug Model Code	Cavity Plug Model Code
P	T-9A	XAOB-XX*	XACB-XX*
0	T-163A	XZOB-XX*	XZCB-XX*
1	T-11A	XEOA-XX*	XECA-XX*
2	T-2A	XBOA-XX*	XBCA-XX*
3	T-17A	XHOA-XX*	XHCA-XX*
4	T-19A	XJOA-XX*	XJCA-XX*

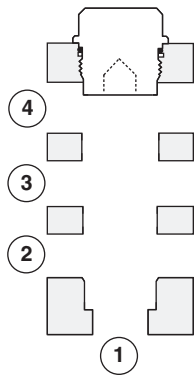
Plugs for Four Port Cavities (Internal Locating Shoulder)

		Ports 1 to 2 Open Port 3 and 4 Blocked	All Ports Blocked
Series	Cavity	Cavity Plug Model Code	Cavity Plug Model Code
1	T-21A	XMOA-XX*	XMCA-XX*
2	T-22A	XNOA-XX*	XNCA-XX*
3	T-23A	XPOA-XX*	XPCA-XX*
4	T-24A	XQOA-XX*	XQCA-XX*

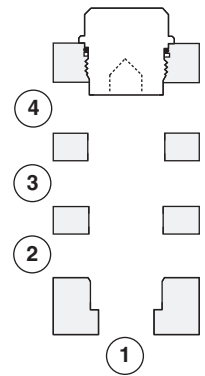
*Insert in the seventh position model code digit N to order Buna-N seals or V to order Viton seals.

CAVITY PLUGS

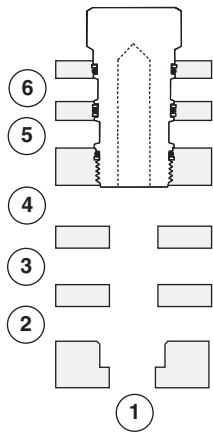
Plugs for Four Port Cavities (External Locating Shoulder)



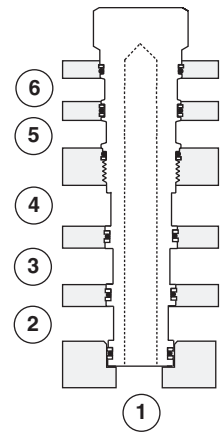
Series	Cavity	All Ports Open Cavity Plug Model Code*	All Ports Blocked Cavity Plug Model Code*
1	T-31A	XFOA-XX*	XRCA-XX*
2	T-32A	XCOA-XX*	XSCA-XX*
3	T-33A	XIOA-XX*	XTCA-XX*
4	T-34A	XKOA-XX*	XVCA-XX*



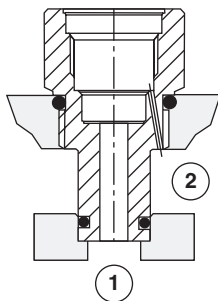
Plugs for Six Port Cavities



Series	Cavity	Ports 1, 2, 3 and 4 Open Ports 5 and 6 Blocked Cavity Plug Model Code*	All Ports Blocked Cavity Plug Model Code*
1	T-61A	XMOA-XX*	XRCC-XX*
2	T-62A	XNOA-XX*	XSCC-XX*
3	T-63A	XPOA-XX*	XTCC-XX*
4	T-64A	XQOA-XX*	XVCC-XX*



Cavity Adaptor (Adapts Waterman 12-2 Cavity to the Sun T-8A Cavity)



Cavity	All Ports Open Cavity Plug Model Code*
12-2	XAAA-8X*

*Insert in the seventh position model code digit N to order Buna-N seals or V to order Viton seals.

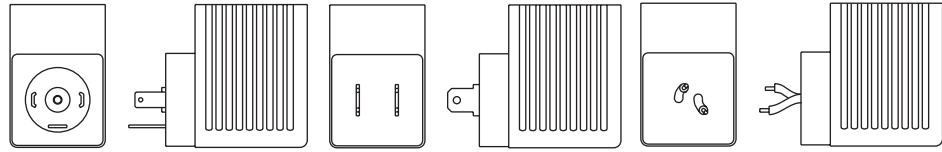
SOLENOID ELECTRICAL CONNECTOR OPTIONS

Pilot Flow Solenoid Valves: DAAA, DBAA

ISO / DIN 43650

SAE J858-A

Twin Lead



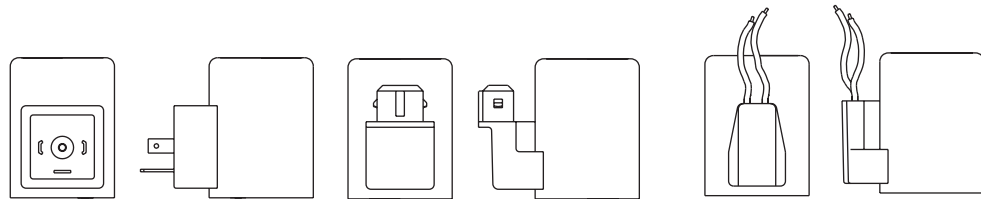
Description	Coil only part number		Coil only part number		Coil only part number	
115 V AC 50/60 Hz	760-211		N/A		N/A	
230 V AC 50/60 Hz	760-223		N/A		N/A	
6 V DC	760-206		760-506		N/A	
12 V DC	760-212		760-512		760-712	
24 V DC	760-224		760-524		760-724	
36 V DC	760-236		N/A		N/A	
48 V DC	760-248		N/A		N/A	

Full Flow Solenoid Valves: DLDA, DTDA, DMDA, DNDA

ISO / DIN 43650

AMP® Junior Timer

Twin Lead

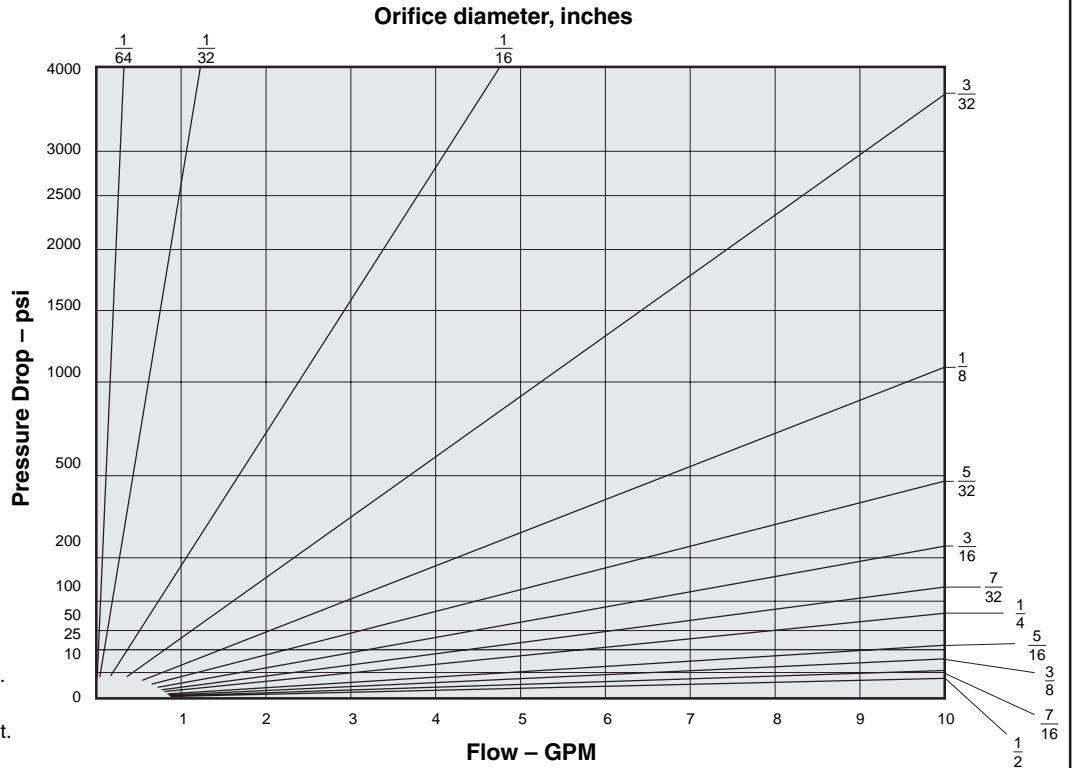


Description	Coil only part number		Coil only part number		Coil only part number	
115 V AC 50/60 Hz	770-211		N/A		N/A	
230 V AC 50/60 Hz	770-223		N/A		N/A	
12 V DC	770-212		770-612		770-712	
24 V DC	770-224		770-624		770-724	
48 V DC	770-248		770-648		770-748	

AMP® is a registered trademark.

ORIFICE PRESSURE DROP DATA

No allowance has been made for viscosity effects, or regain of pressure downstream.



These charts are based on the formula:

$$Q \approx C \pm A \pm \sqrt{2gH}$$

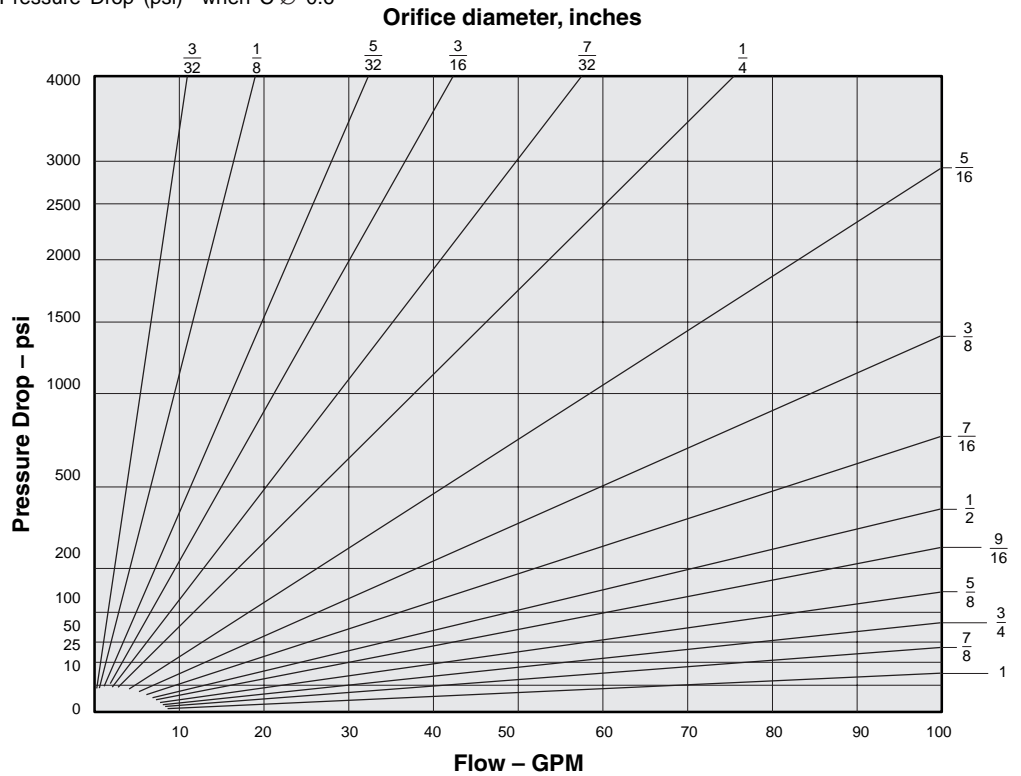
Where:

- Q = Flow in Cu. Ft. per Sec.
- C = Orifice Coefficient
- A = Area of Orifice in Sq. Ft.
- H = Pressure Head in Ft.

Specify Gravity of Fluid = .895

This equation becomes

$$Q(\text{GPM}) = 24.12 \pm A(\text{sq.in.}) \pm \sqrt{\text{Pressure Drop (psi)}} \text{ when } C \approx 0.6$$

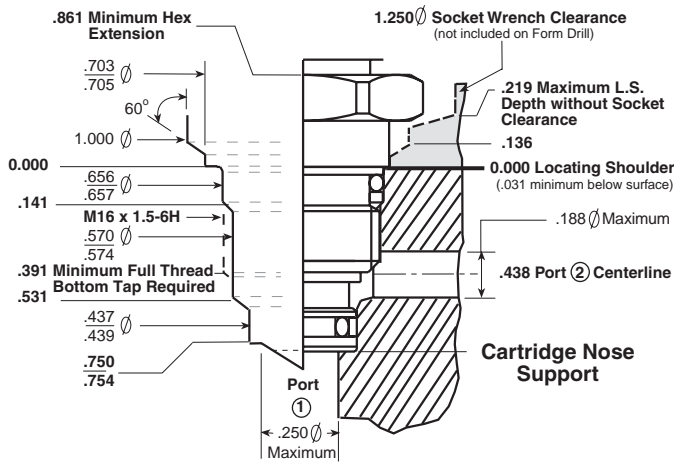


General Information: Cartridge Cavities and Cavity Tools

NOTES: Thin wall deep hex sockets, preferred for installing Sun cartridges, are available from Sun or Snap-On Tools Corporation. Complete cavity machining dimensions are provided with form tools or supplied upon request. Dimensions shown below are simplified for manifold design purposes.

SERIES P

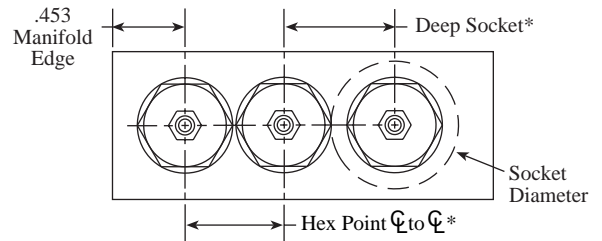
T-8A 2 Port Sun Cavity



Cavity Diameters to be concentric to threads within .002.

© SUN Hydraulics Corporation

Minimum Clearance Distances:



* See respective Pilot Stage Cartridge Outline Drawing for Deep Socket and Hex Point clearance centerline dimensions

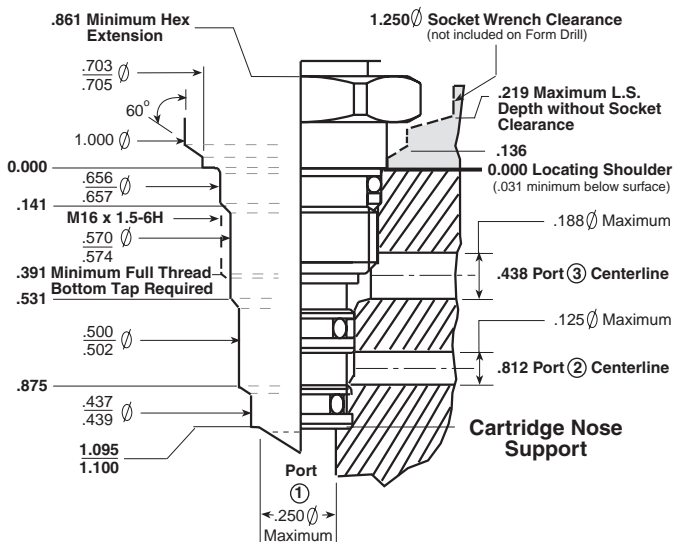
Description	High Speed Steel	Titanium Coated
	Model Code	Model Code
Form Drill TD-8A	994-008-001	994-008-101
Form Reamer TR-8A	995-008-001	995-008-101
Metric Tap M16x1.5-6H	998-991	998-991-101

Note: Drill and Reamer have a #3 Morse taper. Tap has straight shank.

7/8" Hex Deep Socket:

Sun P/N: 998-100-006, Snap-On P/N: SIML280

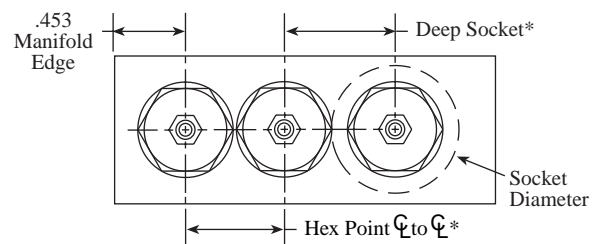
T-9A 3 Port Sun Cavity



Cavity Diameters to be concentric to threads within .002.

© SUN Hydraulics Corporation

Minimum Clearance Distances:



* See respective Pilot Stage Cartridge Outline Drawing for Deep Socket and Hex Point clearance centerline dimensions.

Description	High Speed Steel	Titanium Coated
	Model Code	Model Code
Form Drill TD-9A	994-009-001	994-009-101
Form Reamer TR-9A	995-009-001	995-009-101
Metric Tap M16x1.5-6H	998-991	998-991-101

Note: Drill and Reamer have a #3 Morse taper. Tap has straight shank.

7/8" Hex Deep Socket:

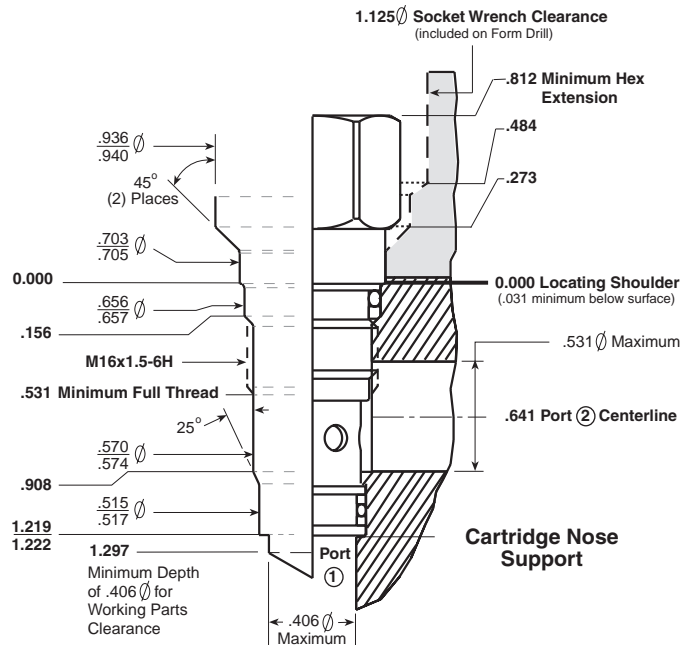
Sun P/N: 998-100-006, Snap-On P/N: SIML280

General Information: Cartridge Cavities and Cavity Tools

NOTES: Thin wall deep hex sockets, preferred for installing Sun cartridges, are available from Sun or Snap-On Tools Corporation. Complete cavity machining dimensions are provided with form tools or supplied upon request. Dimensions shown below are simplified for manifold design purposes.

SERIES 0

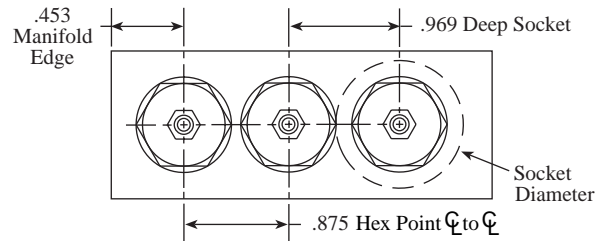
T-162A 2 Port Sun Cavity



Cavity Diameters to be concentric to threads within .002.

© SUN Hydraulics Corporation

Minimum Clearance Distances:



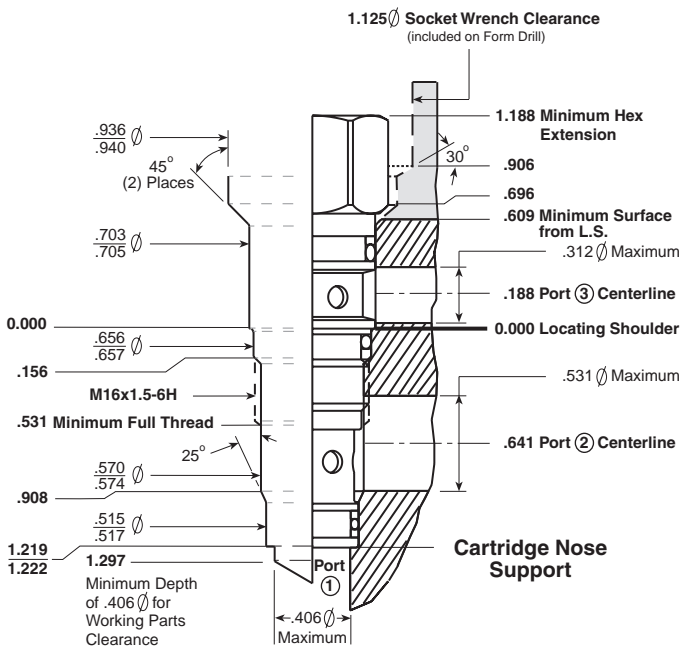
Description	High Speed Steel	Titanium Coated
	Model Code	Model Code
Form Drill TD-162A	994-162-001	994-162-101
Form Reamer TR-162A	995-162-001	995-162-101
Metric Tap M16x1.5-6H	998-991	998-991-101

Note: Drill and Reamer have a #3 Morse taper. Tap has straight shank.

3/4" Hex Deep Socket:

Sun P/N: 998-100-005, Snap-On P/N: S241

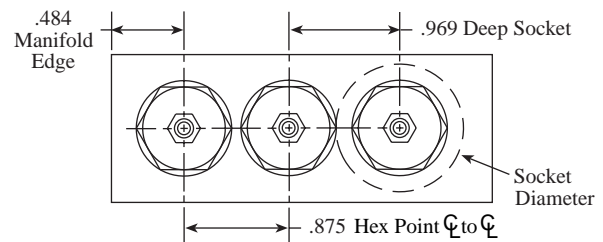
T-163A 3 Port Sun Cavity



Cavity Diameters to be concentric to threads within .002.

© SUN Hydraulics Corporation

Minimum Clearance Distances:



Description	High Speed Steel	Titanium Coated
	Model Code	Model Code
Form Drill TD-163A	994-163-001	994-163-101
Form Reamer TR-163A	995-163-001	995-163-101
Metric Tap M16x1.5-6H	998-991	998-991-101

Note: Drill and Reamer have a #3 Morse taper. Tap has straight shank.

3/4" Hex Deep Socket:

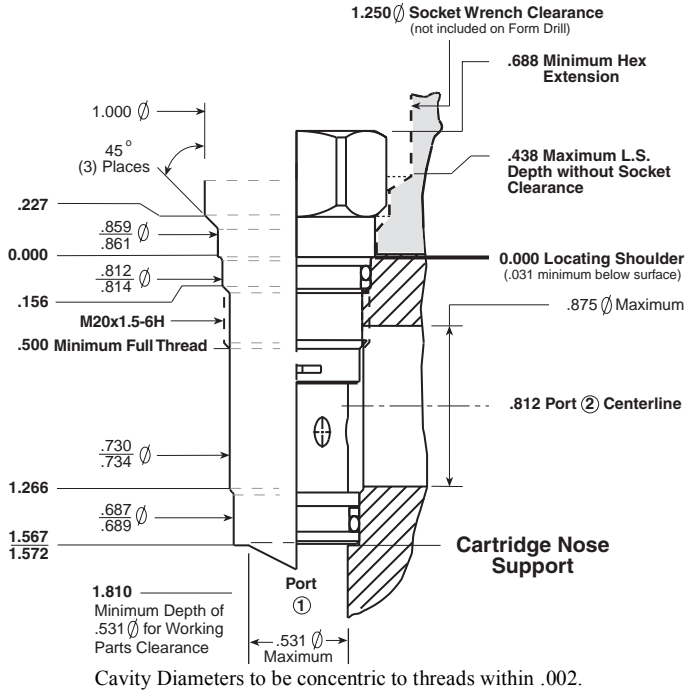
Sun P/N: 998-100-005, Snap-On P/N: S241

General Information: Cartridge Cavities and Cavity Tools

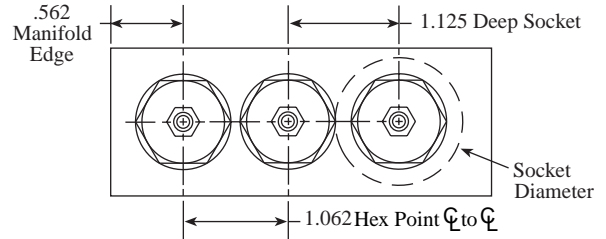
NOTES: Thin wall deep hex sockets, preferred for installing Sun cartridges, are available from Sun or Snap-On Tools Corporation. Complete cavity machining dimensions are provided with form tools or supplied upon request. Dimensions shown below are simplified for manifold design purposes.

SERIES 1

T-10A 2 Port Sun Cavity



Minimum Clearance Distances:



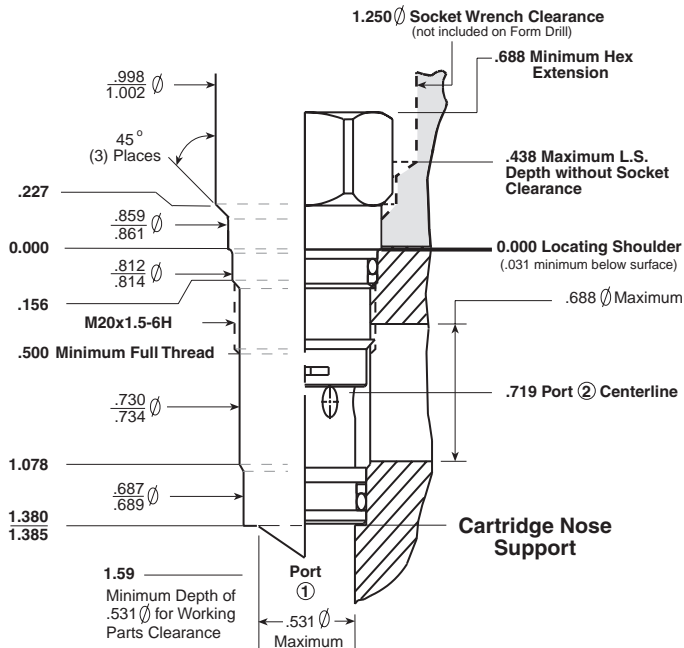
Description	High Speed Steel	Titanium Coated
	Model Code	Model Code
Form Drill TD-10A	994-010-001	994-010-101
Form Reamer TR-10A	995-010-001	995-010-101
Metric Tap M20x1.5-6H	998-998	998-998-101

Note: Drill and Reamer have a #3 Morse taper. Tap has straight shank.

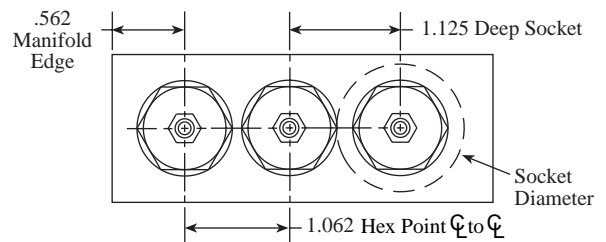
7/8" Hex Deep Socket:

Sun P/N: 998-100-001, Snap-On P/N: S281

T-13A 2 Port Sun Cavity



Minimum Clearance Distances:



Description	High Speed Steel	Titanium Coated
	Model Code	Model Code
Form Drill TD-13A	994-013-001	994-013-101
Form Reamer TR-13A	995-013-001	995-013-101
Metric Tap M20x1.5-6H	998-998	998-998-101

Note: Drill and Reamer have a #3 Morse taper. Tap has straight shank.

7/8" Hex Deep Socket:

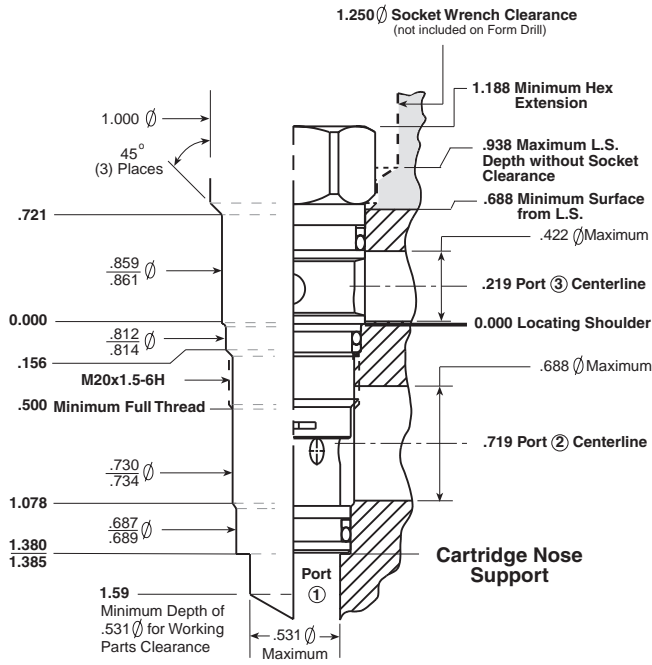
Sun P/N: 998-100-001, Snap-On P/N: S281

General Information: Cartridge Cavities and Cavity Tools

NOTES: Thin wall deep hex sockets, preferred for installing Sun cartridges, are available from Sun or Snap-On Tools Corporation. Complete cavity machining dimensions are provided with form tools or supplied upon request. Dimensions shown below are simplified for manifold design purposes.

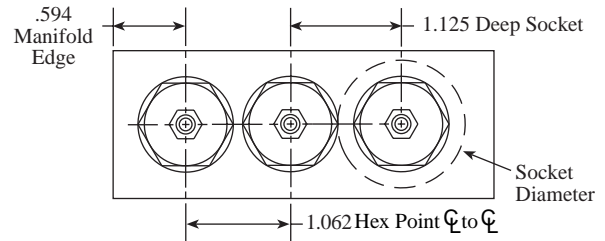
SERIES 1

T-11A 3 Port Sun Cavity



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Minimum Clearance Distances:



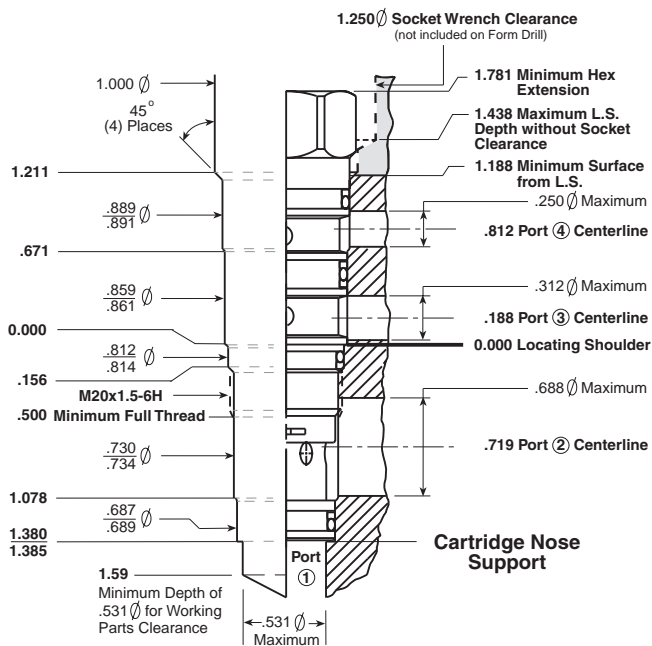
Description	High Speed Steel	Titanium Coated
	Model Code	Model Code
Form Drill TD-11A	994-011-001	994-011-101
Form Reamer TR-11A	995-011-001	995-011-101
Metric Tap M20x1.5-6H	998-998	998-998-101

Note: Drill and Reamer have a #3 Morse taper. Tap has straight shank.

7/8" Hex Deep Socket:

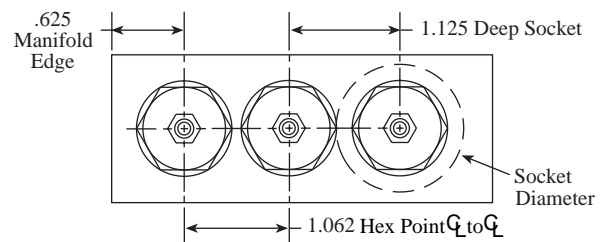
Sun P/N: 998-100-001, Snap-On P/N: S281

T-21A 4 Port Sun Cavity



© SUN Hydraulics Corporation

Minimum Clearance Distances:



Description	High Speed Steel	Titanium Coated
	Model Code	Model Code
Form Drill TD-21A	994-021-001	994-021-101
Form Reamer TR-21A	995-021-001	995-021-101
Metric Tap M20x1.5-6H	998-998	998-998-101

Note: Drill and Reamer have a #3 Morse taper. Tap has straight shank.

7/8" Hex Deep Socket:

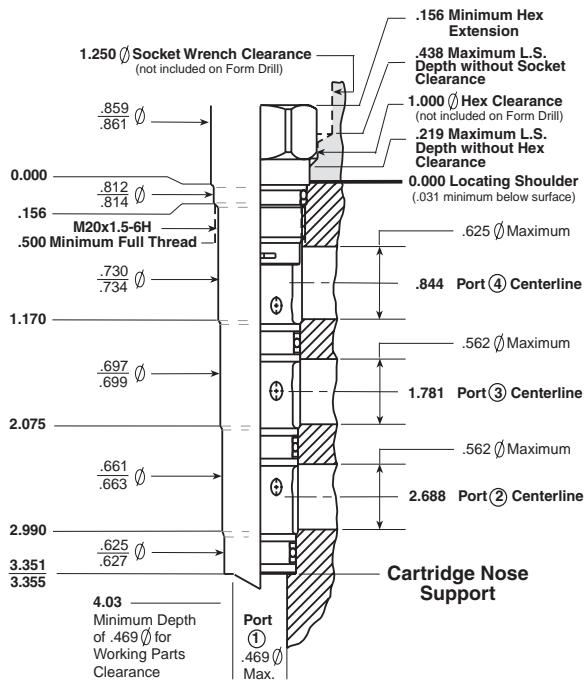
Sun P/N: 998-100-001, Snap-On P/N: S281

General Information: Cartridge Cavities and Cavity Tools

NOTES: Thin wall deep hex sockets, preferred for installing Sun cartridges, are available from Sun or Snap-On Tools Corporation. Complete cavity machining dimensions are provided with form tools or supplied upon request. Dimensions shown below are simplified for manifold design purposes.

SERIES 1

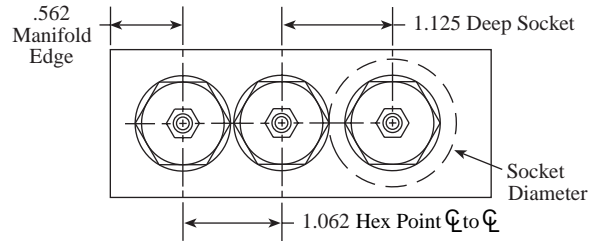
T-31A 4 Port Sun Cavity



Cavity Diameters to be concentric to threads within .002.

© SUN Hydraulics Corporation

Minimum Clearance Distances:



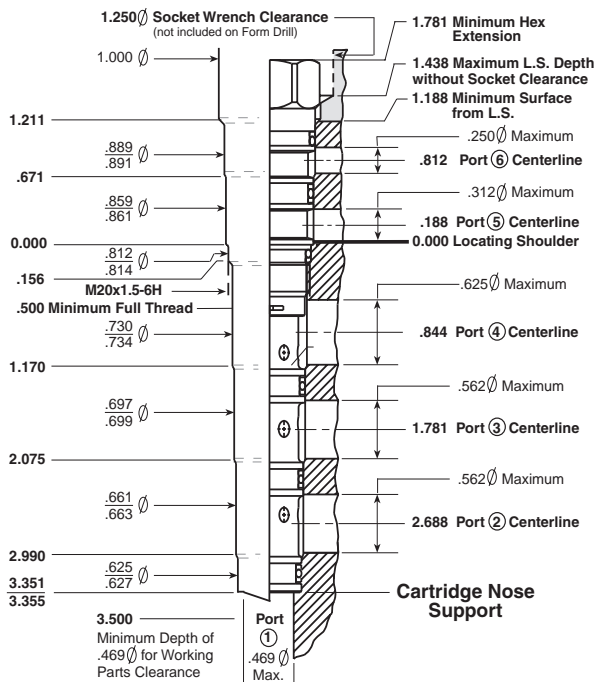
Description	High Speed Steel	Titanium Coated
	Model Code	Model Code
Form Drill TD-31A	994-031-001	994-031-101
Form Reamer TR-31A	995-031-001	995-031-101
Metric Tap M20x1.5-6H	998-998	998-998-101

Note: Drill and Reamer have a #3 Morse taper. Tap has straight shank.

7/8" Hex Deep Socket:

Sun P/N: 998-100-001, Snap-On P/N: S281

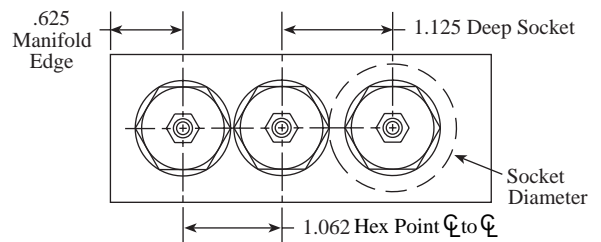
T-61A 6 Port Sun Cavity



Cavity Diameters to be concentric to threads within .002.

© SUN Hydraulics Corporation

Minimum Clearance Distances:



Description	High Speed Steel	Titanium Coated
	Model Code	Model Code
Form Drill TD-61A	994-061-001	994-061-101
Form Reamer TR-61A	995-061-001	995-061-101
Metric Tap M20x1.5-6H	998-998	998-998-101

Note: Drill and Reamer have a #3 Morse taper. Tap has straight shank.

7/8" Hex Deep Socket:

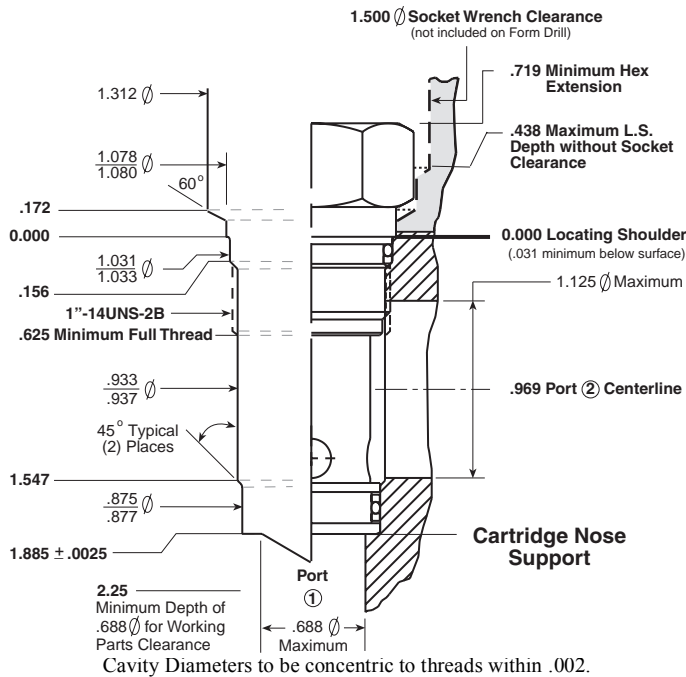
Sun P/N: 998-100-001, Snap-On P/N: S281

General Information: Cartridge Cavities and Cavity Tools

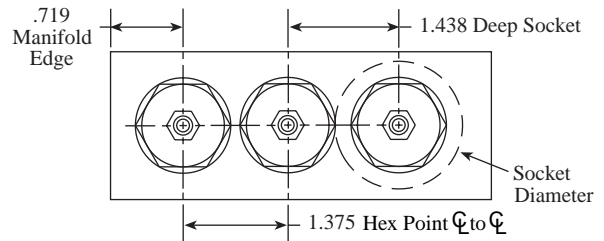
NOTES: Thin wall deep hex sockets, preferred for installing Sun cartridges, are available from Sun or Snap-On Tools Corporation. Complete cavity machining dimensions are provided with form tools or supplied upon request. Dimensions shown below are simplified for manifold design purposes.

SERIES 2

T-3A 2 Port Sun Cavity



Minimum Clearance Distances:



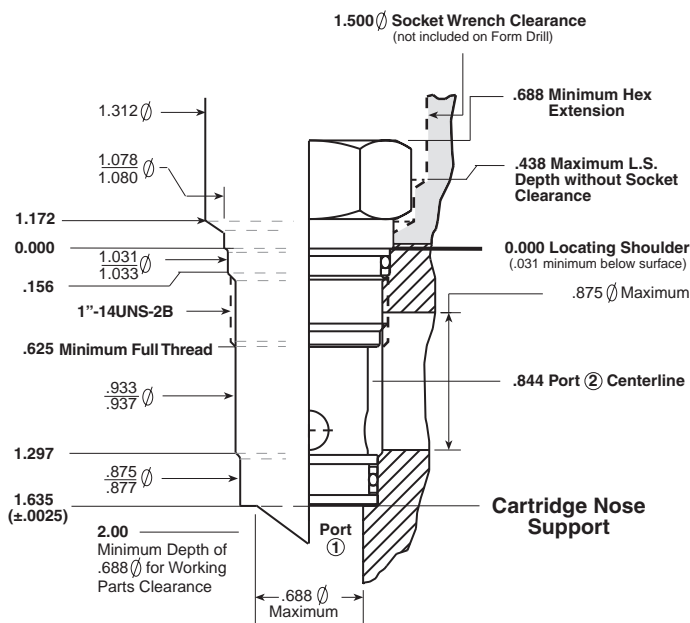
Description	High Speed Steel	Titanium Coated
	Model Code	Model Code
Form Drill TD-3A	994-003-001	994-003-101
Form Reamer TR-3A	995-003-001	995-003-101
UNS Tap 1"-14	998-999	998-999-101

Note: Drill and Reamer have a #3 Morse taper. Tap has straight shank.

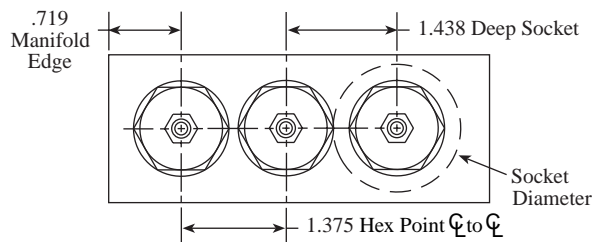
1 1/8" Hex Deep Socket:

Sun P/N: 998-100-002, Snap-On P/N: S361

T-5A 2 Port Sun Cavity



Minimum Clearance Distances:



Description	High Speed Steel	Titanium Coated
	Model Code	Model Code
Form Drill TD-5A	994-005-001	994-005-101
Form Reamer TR-5A	995-005-001	995-005-101
UNS Tap 1"-14	998-999	998-999-101

Note: Drill and Reamer have a #3 Morse taper. Tap has straight shank.

1 1/8" Hex Deep Socket:

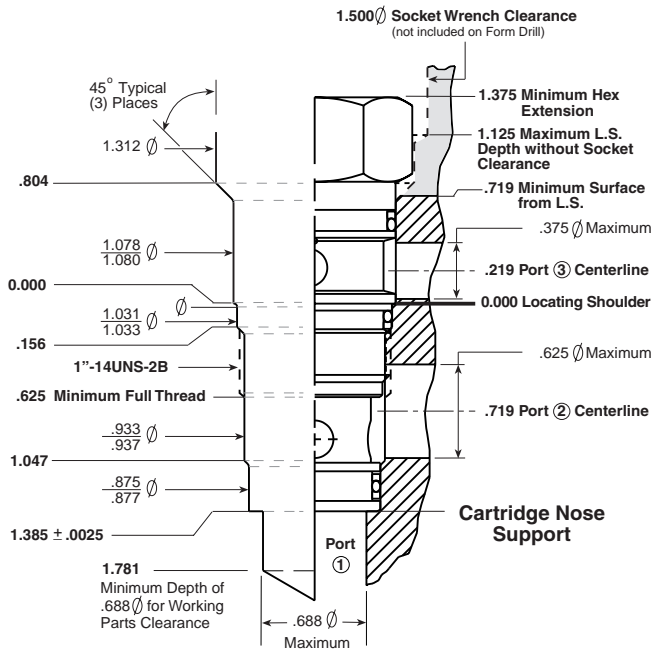
Sun P/N: 998-100-002, Snap-On P/N: S361

General Information: Cartridge Cavities and Cavity Tools

NOTES: Thin wall deep hex sockets, preferred for installing Sun cartridges, are available from Sun or Snap-On Tools Corporation. Complete cavity machining dimensions are provided with form tools or supplied upon request. Dimensions shown below are simplified for manifold design purposes.

SERIES 2

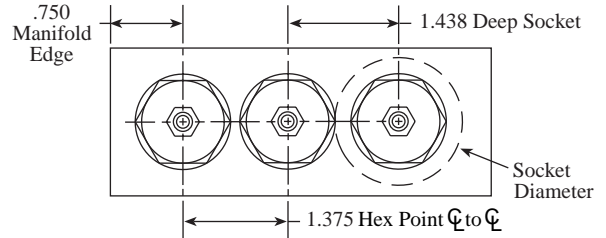
T-2A 3 Port Sun Cavity



Cavity Diameters to be concentric to threads within .002.

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Minimum Clearance Distances:



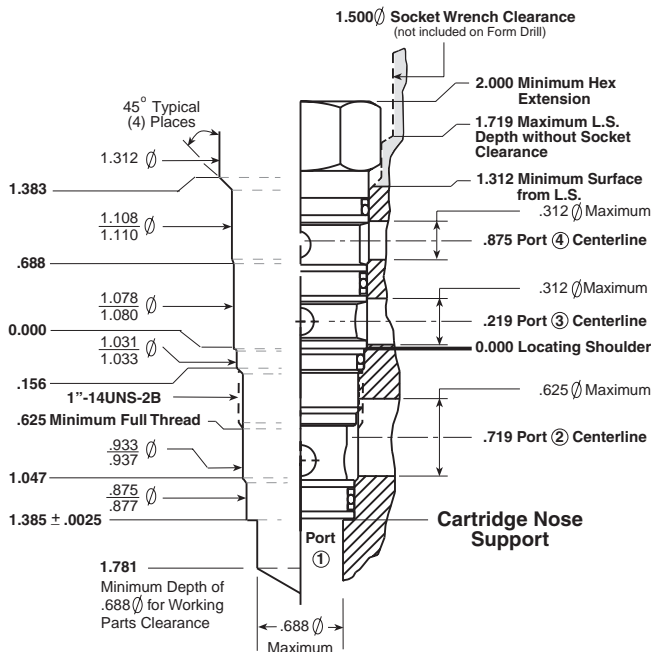
Description	High Speed Steel	Titanium Coated
	Model Code	Model Code
Form Drill TD-2A	994-002-001	994-002-101
Form Reamer TR-2A	995-002-001	995-002-101
UNS Tap 1"-14	998-999	998-999-101

Note: Drill and Reamer have a #3 Morse taper. Tap has straight shank.

1 1/8" Hex Deep Socket:

Sun P/N: 998-100-002, Snap-On P/N: S361

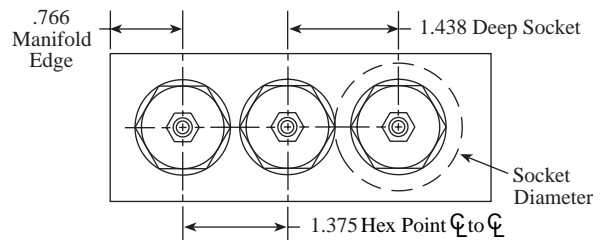
T-22A 4 Port Sun Cavity



Cavity Diameters to be concentric to threads within .002.

© SUN Hydraulics Corporation

Minimum Clearance Distances:



Description	High Speed Steel	Titanium Coated
	Model Code	Model Code
Form Drill TD-22A	994-022-001	994-022-101
Form Reamer TR-22A	995-022-001	995-022-101
UNS Tap 1"-14	998-999	998-999-101

Note: Drill and Reamer have a #3 Morse taper. Tap has straight shank.

1 1/8" Hex Deep Socket:

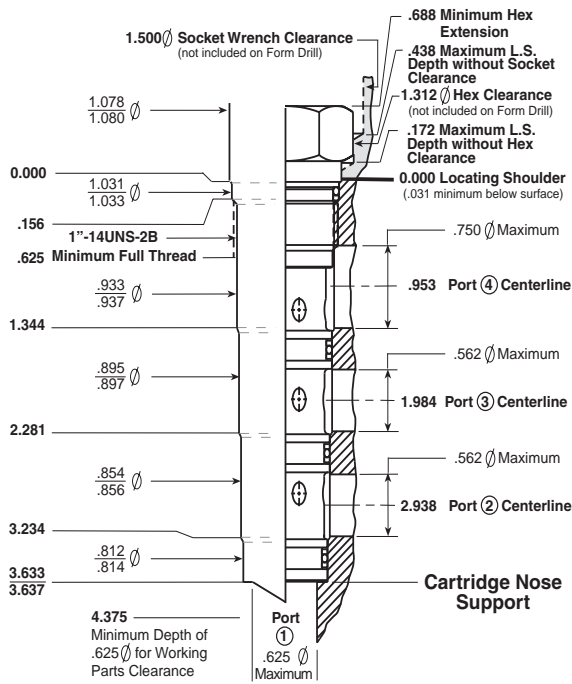
Sun P/N: 998-100-002, Snap-On P/N: S361

General Information: Cartridge Cavities and Cavity Tools

NOTES: Thin wall deep hex sockets, preferred for installing Sun cartridges, are available from Sun or Snap-On Tools Corporation. Complete cavity machining dimensions are provided with form tools or supplied upon request. Dimensions shown below are simplified for manifold design purposes.

SERIES 2

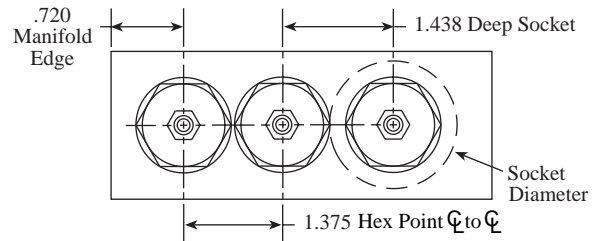
T-32A 4 Port Sun Cavity



Cavity Diameters to be concentric to threads within .002.

© SUN Hydraulics Corporation

Minimum Clearance Distances:



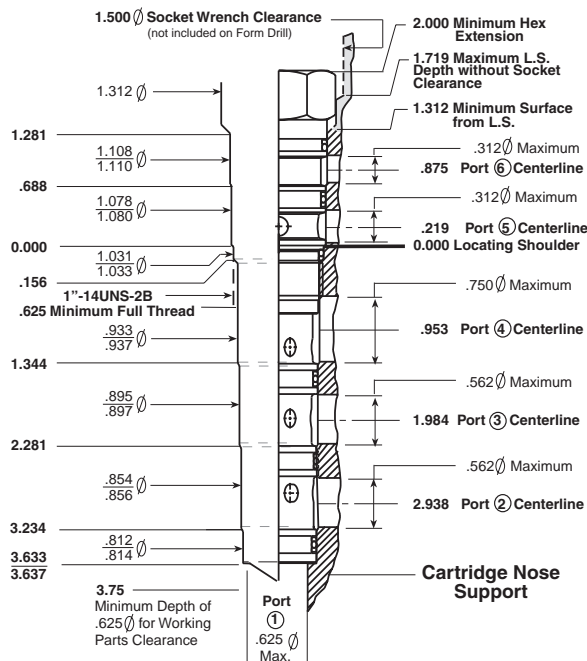
Description	High Speed Steel	Titanium Coated
	Model Code	Model Code
Form Drill TD-32A	994-032-001	994-032-101
Form Reamer TR-32A	995-032-001	995-032-101
UNS Tap 1"-14UNS-2B	998-999	998-999-101

Note: Drill and Reamer have a #3 Morse taper. Tap has straight shank.

1 1/8" Hex Deep Socket:

Sun P/N: 998-100-002, Snap-On P/N: S361

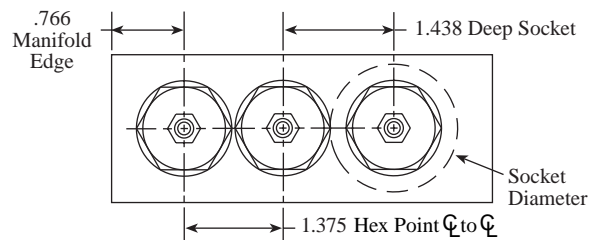
T-62A 6 Port Sun Cavity



Cavity Diameters to be concentric to threads within .002.

© SUN Hydraulics Corporation

Minimum Clearance Distances:



Description	High Speed Steel	Titanium Coated
	Model Code	Model Code
Form Drill TD-62A	994-062-001	994-062-101
Form Reamer TR-62A	995-062-001	995-062-101
UNS Tap 1"-14UNS-2B	998-999	998-999-101

Note: Drill and Reamer have a #3 Morse taper. Tap has straight shank.

1 1/8" Hex Deep Socket:

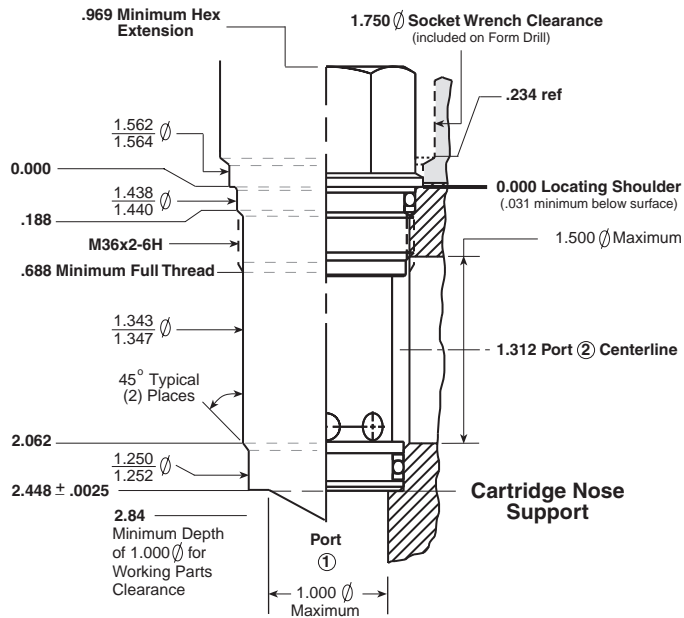
Sun P/N: 998-100-002, Snap-On P/N: S361

General Information: Cartridge Cavities and Cavity Tools

NOTES: Thin wall deep hex sockets, preferred for installing Sun cartridges, are available from Sun or Snap-On Tools Corporation. Complete cavity machining dimensions are provided with form tools or supplied upon request. Dimensions shown below are simplified for manifold design purposes.

SERIES 3

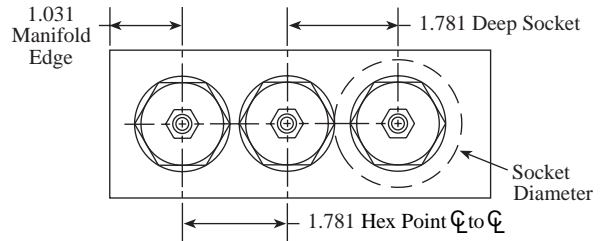
T-16A 2 Port Sun Cavity



Cavity Diameters to be concentric to threads within .002.

© SUN Hydraulics Corporation

Minimum Clearance Distances:



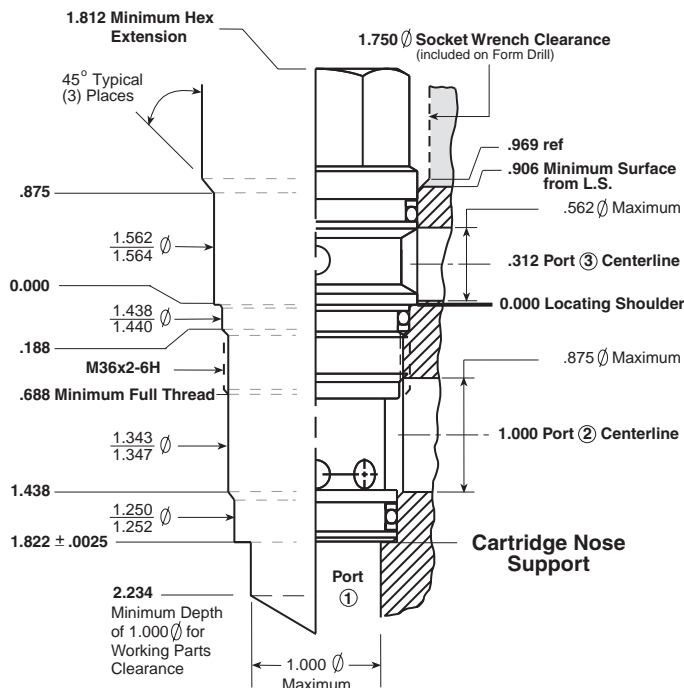
Description	High Speed Steel	Titanium Coated
	Model Code	Model Code
Form Drill TD-16A	994-016-001	994-016-101
Form Reamer TR-16A	995-016-001	995-016-101
Metric Tap M36x2-6H	998-996	998-996-101

Note: Drill and Reamer have a #3 Morse taper. Tap has straight shank.

1 1/4" Hex Deep Socket:

Sun P/N: 998-100-003, Snap-On P/N: S401

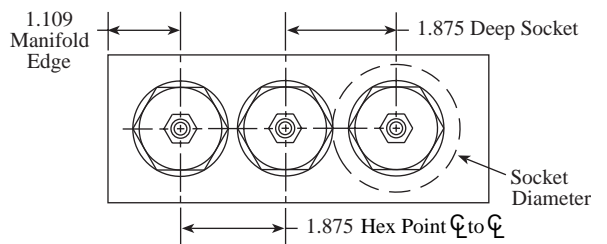
T-17A 3 Port Sun Cavity



Cavity Diameters to be concentric to threads within .002.

© SUN Hydraulics Corporation

Minimum Clearance Distances:



Description	High Speed Steel	Titanium Coated
	Model Code	Model Code
Form Drill TD-17A	994-017-001	994-017-101
Form Reamer TR-17A	995-017-001	995-017-101
Metric Tap M36x2-6H	998-996	998-996-101

Note: Drill and Reamer have a #3 Morse taper. Tap has straight shank.

1 1/4" Hex Deep Socket:

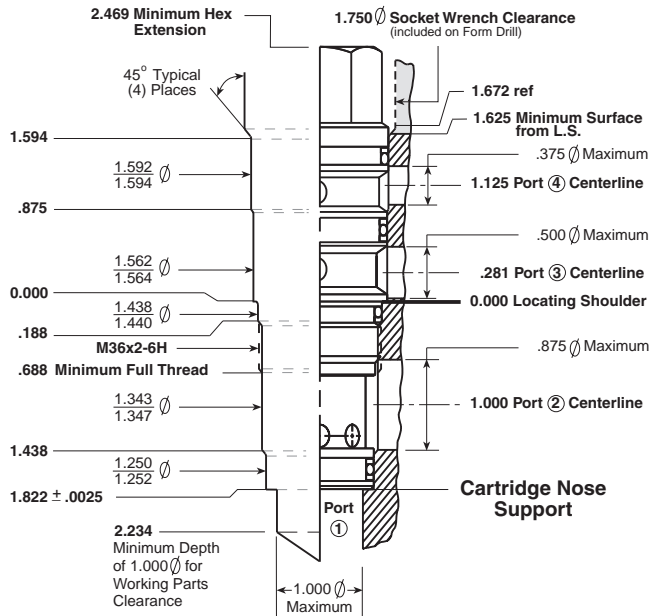
Sun P/N: 998-100-003, Snap-On P/N: S401

General Information: Cartridge Cavities and Cavity Tools

NOTES: Thin wall deep hex sockets, preferred for installing Sun cartridges, are available from Sun or Snap-On Tools Corporation. Complete cavity machining dimensions are provided with form tools or supplied upon request. Dimensions shown below are simplified for manifold design purposes.

SERIES 3

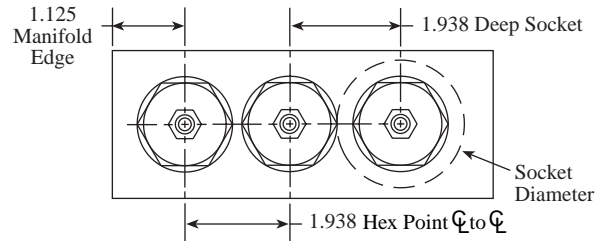
T-23A 4 Port Sun Cavity



Cavity Diameters to be concentric to threads within .002.

© SUN Hydraulics Corporation

Minimum Clearance Distances:



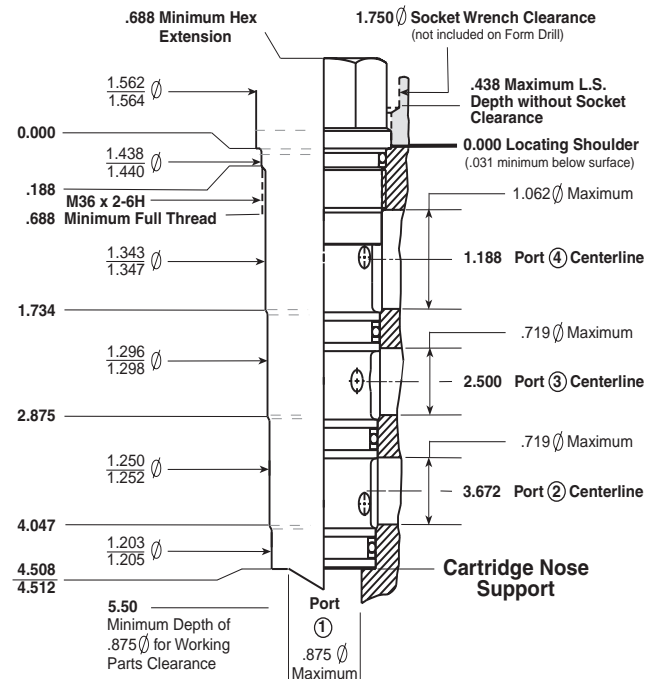
Description	High Speed Steel	Titanium Coated
	Model Code	Model Code
Form Drill TD-23A	994-023-001	994-023-101
Form Reamer TR-23A	995-023-001	995-023-101
Metric Tap M36x2-6H	998-996	998-996-101

Note: Drill and Reamer have a #3 Morse taper. Tap has straight shank.

1 1/4" Hex Deep Socket:

Sun P/N: 998-100-003, Snap-On P/N: S401

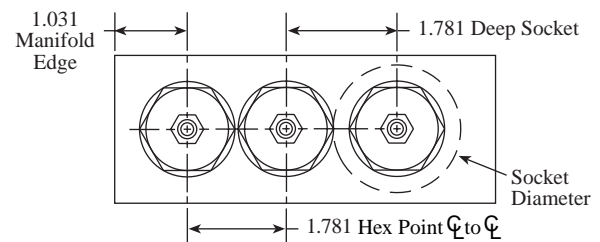
T-33A 4 Port Sun Cavity



Cavity Diameters to be concentric to threads within .002.

© SUN Hydraulics Corporation

Minimum Clearance Distances:



Description	High Speed Steel	Titanium Coated
	Model Code	Model Code
Form Drill TD-33A	994-033-001	994-033-101
Form Reamer TR-33A	995-033-001	995-033-101
Metric Tap M36x2-6H	998-996	998-996-101

Note: Drill and Reamer have a #3 Morse taper. Tap has straight shank.

1 1/4" Hex Deep Socket:

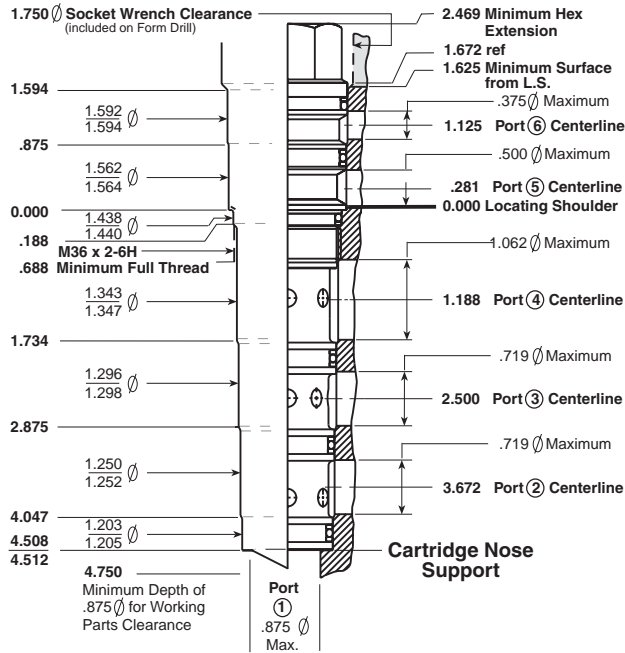
Sun P/N: 998-100-003, Snap-On P/N: S401

General Information: Cartridge Cavities and Cavity Tools

NOTES: Thin wall deep hex sockets, preferred for installing Sun cartridges, are available from Sun or Snap-On Tools Corporation. Complete cavity machining dimensions are provided with form tools or supplied upon request. Dimensions shown below are simplified for manifold design purposes.

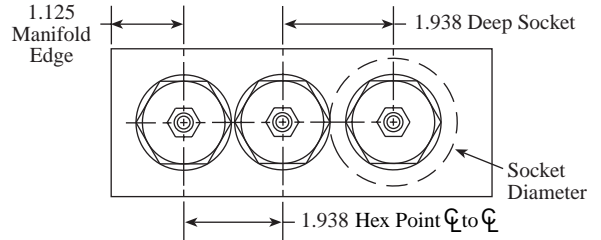
SERIES 3

T-63A 6 Port Sun Cavity



© SUN Hydraulics Corporation

Minimum Clearance Distances:



Description	High Speed Steel	Titanium Coated
	Model Code	Model Code
Form Drill TD-63A	994-063-001	994-063-101
Form Reamer TR-63A	995-063-001	995-063-101
Metric Tap M36x2-6H	998-996	998-996-101

Note: Drill and Reamer have a #3 Morse taper. Tap has straight shank.

1 1/4" Hex Deep Socket:

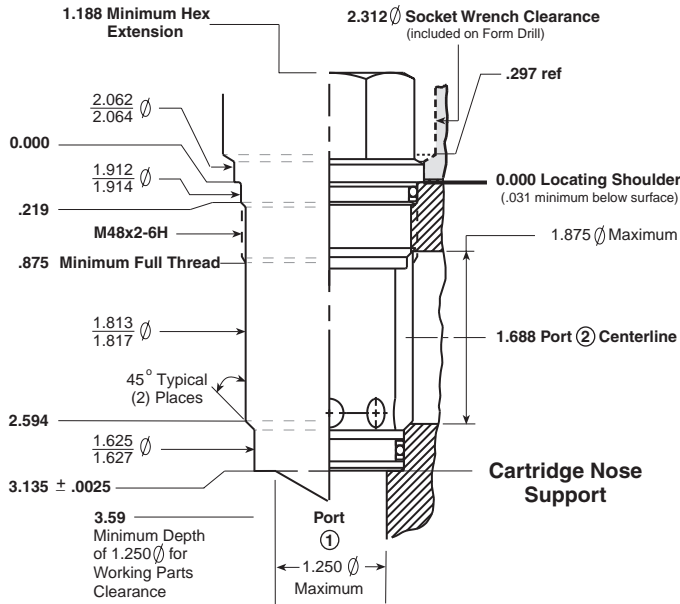
Sun P/N: **998-100-003**, Snap-On P/N: S401

General Information: Cartridge Cavities and Cavity Tools

NOTES: Thin wall deep hex sockets, preferred for installing Sun cartridges, are available from Sun or Snap-On Tools Corporation. Complete cavity machining dimensions are provided with form tools or supplied upon request. Dimensions shown below are simplified for manifold design purposes.

SERIES 4

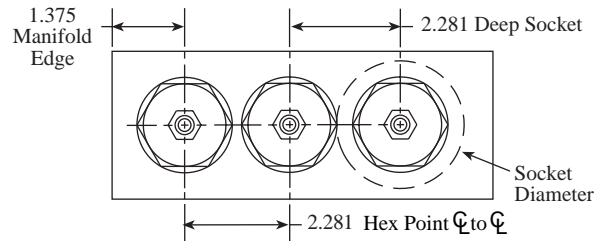
T-18A 2 Port Sun Cavity



Cavity Diameters to be concentric to threads within .002.

© SUN Hydraulics Corporation

Minimum Clearance Distances:



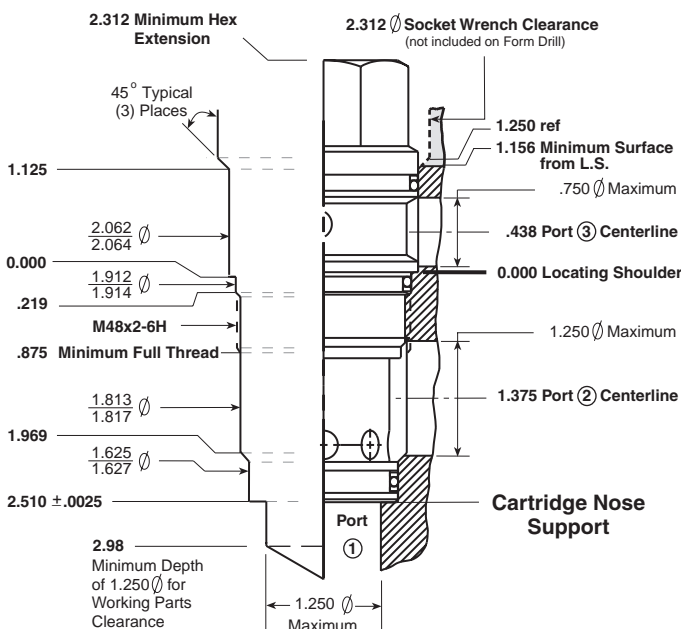
Description	High Speed Steel	Titanium Coated
	Model Code	Model Code
Form Drill TD-18A	994-018-001	994-018-101
Form Reamer TR-18A	995-018-001	995-018-101
Metric Tap M48x2-6H	998-992	998-992-101

Note: Drill and Reamer have a #3 Morse taper. Tap has straight shank.

1 5/8" Hex Deep Socket:

Sun P/N: 998-100-004, Snap-On P/N: LS522

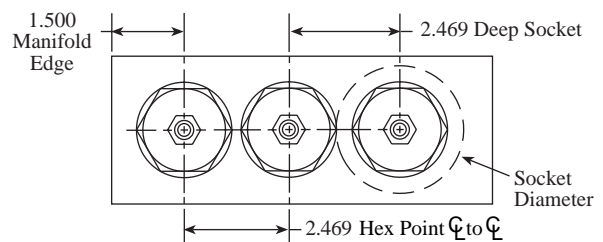
T-19A 3 Port Sun Cavity



Cavity Diameters to be concentric to threads within .002.

© SUN Hydraulics Corporation

Minimum Clearance Distances:



Description	High Speed Steel	Titanium Coated
	Model Code	Model Code
Form Drill TD-19A	994-019-001	994-019-101
Form Reamer TR-19A	995-019-001	995-019-101
Metric Tap M48x2-6H	998-992	998-992-101

Note: Drill and Reamer have a #3 Morse taper. Tap has straight shank.

1 5/8" Hex Deep Socket:

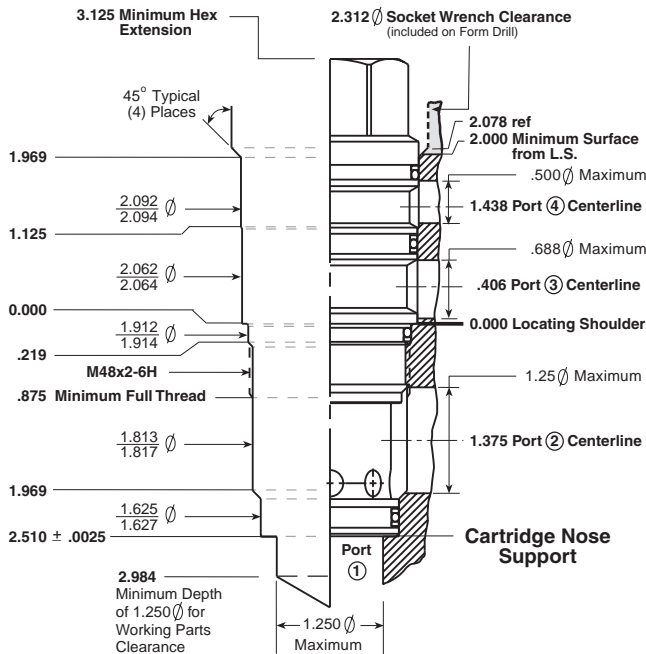
Sun P/N: 998-100-004, Snap-On P/N: LS522

General Information: Cartridge Cavities and Cavity Tools

NOTES: Thin wall deep hex sockets, preferred for installing Sun cartridges, are available from Sun or Snap-On Tools Corporation. Complete cavity machining dimensions are provided with form tools or supplied upon request. Dimensions shown below are simplified for manifold design purposes.

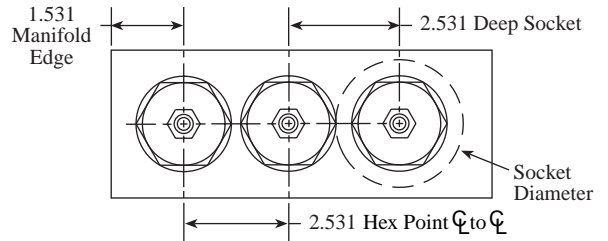
SERIES 4

T-24A 4 Port Sun Cavity



© SUN Hydraulics Corporation

Minimum Clearance Distances:



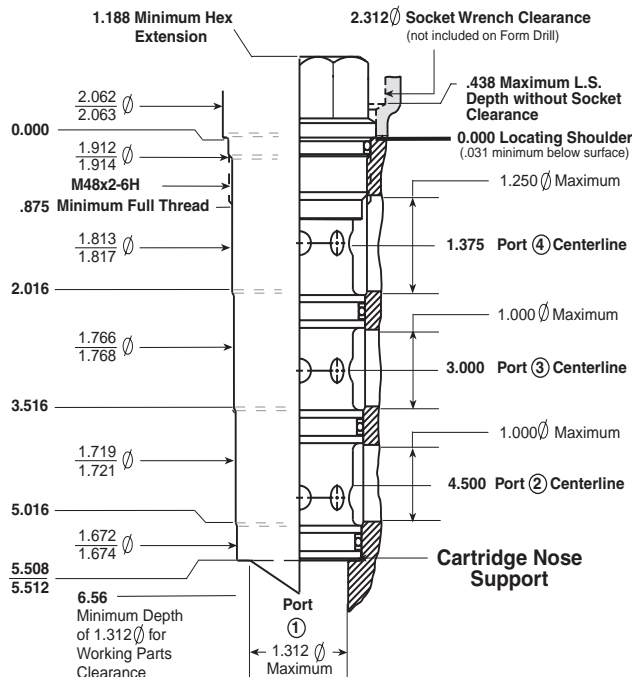
Description	High Speed Steel	Titanium Coated
	Model Code	Model Code
Form Drill TD-24A	994-024-001	994-024-101
Form Reamer TR-24A	995-024-001	995-024-101
Metric Tap M48x2-6H	998-992	998-992-101

Note: Drill and Reamer have a #3 Morse taper. Tap has straight shank.

1 5/8" Hex Deep Socket:

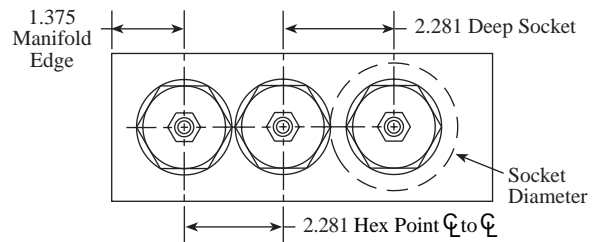
Sun P/N: 998-100-004, Snap-On P/N: LS522

T-34A 4 Port Sun Cavity



© SUN Hydraulics Corporation

Minimum Clearance Distances:



Description	High Speed Steel	Titanium Coated
	Model Code	Model Code
Form Drill TD-34A	994-034-001	994-034-101
Form Reamer TR-34A	995-034-001	995-034-101
Metric Tap M48x2-6H	998-992	998-992-101

Note: Drill and Reamer have a #3 Morse taper. Tap has straight shank.

1 5/8" Hex Deep Socket:

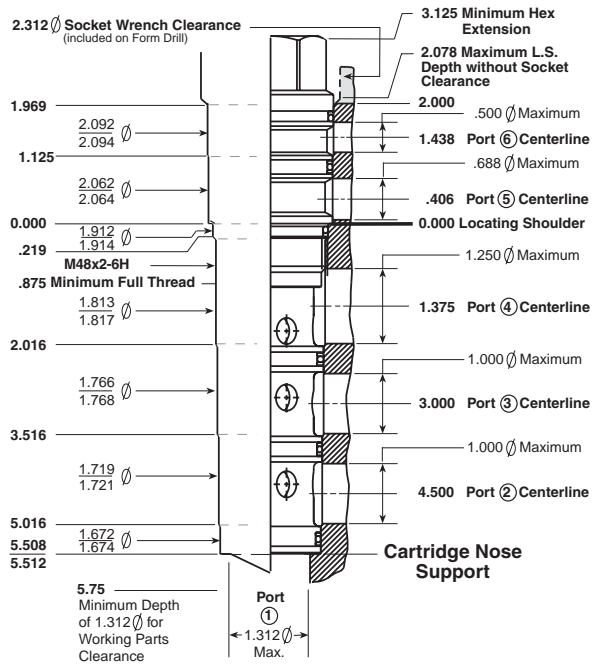
Sun P/N: 998-100-004, Snap-On P/N: LS522

General Information: Cartridge Cavities and Cavity Tools

NOTES: Thin wall deep hex sockets, preferred for installing Sun cartridges, are available from Sun or Snap-On Tools Corporation. Complete cavity machining dimensions are provided with form tools or supplied upon request. Dimensions shown below are simplified for manifold design purposes.

SERIES 4

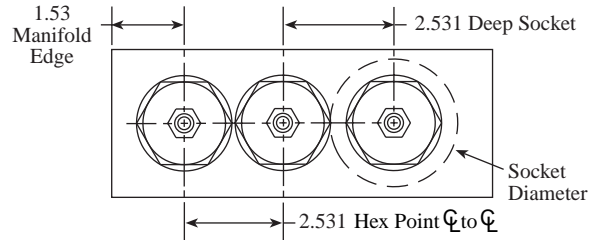
T-64A 6 Port Sun Cavity



Cavity Diameters to be concentric to threads within .002.

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Minimum Clearance Distances:



Description	High Speed Steel	Titanium Coated
	Model Code	Model Code
Form Drill TD-64A	994-064-001	994-064-101
Form Reamer TR-64A	995-064-001	995-064-101
Metric Tap M48x2-6H	998-992	998-992-101

Note: Drill and Reamer have a #3 Morse taper. Tap has straight shank.

1 5/8" Hex Deep Socket:

Sun P/N: **999-100-004**, Snap-On P/N: LS522

Model Code Index

CARTRIDGES

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CBCA - ***	T-11A	50	CWIA - ***	T-24A	70	PBJB - ***	T-19A	34
CBCB - ***	T-11A	50	CWIG - ***	T-24A	70	PPDB - ***	T-11A	42
CBCG - ***	T-11A	50	CWIK - ***	T-24A	70	PPFB - ***	T-2A	42
CBCH - ***	T-11A	50	CWIL - ***	T-24A	70	PPHB - ***	T-17A	42
CBCL - ***	T-11A	50	CXAD - ***	T-162A	102	PPJB - ***	T-19A	42
CBCY - ***	T-11A	50	CXBA - ***	T-162A	102	PRDB - ***	T-11A	42
CBEA - ***	T-2A	50	CXCD - ***	T-13A	102	PRFB - ***	T-2A	42
CBEB - ***	T-2A	50	CXDA - ***	T-13A	102	PRHB - ***	T-17A	42
CBEG - ***	T-2A	50	CXED - ***	T-5A	102	PRJB - ***	T-19A	42
CBEH - ***	T-2A	50	CXFA - ***	T-5A	102	RDBA - ***	T-162A	2
CBEL - ***	T-2A	50	CXGD - ***	T-16A	102	RDDA - ***	T-10A	2
CBEY - ***	T-2A	50	CXHA - ***	T-16A	102	RDFA - ***	T-3A	2
CBGA - ***	T-17A	50	CXID - ***	T-18A	102	RDHA - ***	T-16A	2
CBGB - ***	T-17A	50	CXJA - ***	T-18A	102	RDJA - ***	T-18A	2
CBGG - ***	T-17A	50	FCBB - ***	T-162A	118	RPCC - ***	T-162A	2
CBGH - ***	T-17A	50	FCCB - ***	T-13A	118	RPEC - ***	T-10A	2
CBGL - ***	T-17A	50	FCDB - ***	T-5A	118	RPGC - ***	T-3A	2
CBGY - ***	T-17A	50	FCEB - ***	T-16A	118	RPIC - ***	T-16A	2
CBIA - ***	T-19A	50	FCFB - ***	T-18A	118	RPKC - ***	T-18A	2
CBIB - ***	T-19A	50	FDBA - ***	T-13A	126	RSBC - ***	T-163A	20
CBIG - ***	T-19A	50	FDCB - ***	T-5A	126	RSDC - ***	T-11A	20
CBIH - ***	T-19A	50	FDEA - ***	T-16A	126	RSFC - ***	T-2A	20
CBIL - ***	T-19A	50	FDFA - ***	T-18A	126	RSHC - ***	T-17A	20
CBiy - ***	T-19A	50	FRBA - ***	T-163A	134	RSJC - ***	T-19A	20
CKBB - ***	T-163A	78	FRCA - ***	T-11A	134	RVBA - ***	T-163A	12
CKBD - ***	T-163A	78	FRDA - ***	T-2A	134	RVCA - ***	T-11A	12
CKCB - ***	T-11A	78	FREA - ***	T-17A	134	RVEA - ***	T-2A	12
CKCD - ***	T-11A	78	FRFA - ***	T-19A	134	RVGA - ***	T-17A	12
CKEB - ***	T-2A	78	FXBA - ***	T-162A	118	RVIA - ***	T-19A	12
CKED - ***	T-2A	78	FXCA - ***	T-13A	118	SCCA - ***	T-11A	28
CKGB - ***	T-17A	78	FXDA - ***	T-5A	118	SCEA - ***	T-2A	28
CKGD - ***	T-17A	78	FXEA - ***	T-16A	118	SCGA - ***	T-17A	28
CKIB - ***	T-19A	78	FXFA - ***	T-18A	118	SCIA - ***	T-19A	28
CKID - ***	T-19A	78	NCCB - ***	T-162A	110	SXCA - ***	T-11A	20
CVCV - ***	T-21A	94	NCCB - ***	T-13A	110	SXEA - ***	T-2A	20
CVEV - ***	T-22A	94	NCCC - ***	T-13A	110			
CVGV - ***	T-23A	94	NCEB - ***	T-5A	110			
CVIV - ***	T-24A	94	NCEC - ***	T-5A	110			
CWCA - ***	T-21A	70	NCFB - ***	T-16A	110			
CWCG - ***	T-21A	70	NCGB - ***	T-18A	110			
CWCK - ***	T-21A	70	NCGC - ***	T-18A	110			
CWCL - ***	T-21A	70	NFBC - ***	T-162A	110			
CWEA - ***	T-22A	70	NFCC - ***	T-13A	110			
CWEG - ***	T-22A	70	NFDC - ***	T-5A	110			
CWEK - ***	T-22A	70	NFEC - ***	T-16A	110			
CWEL - ***	T-22A	70	NFFC - ***	T-18A	110			
CWGA - ***	T-23A	70	PBBB - ***	T-163A	34			
CWGG - ***	T-23A	70	PBDB - ***	T-11A	34			
CWGK - ***	T-23A	70	PBFB - ***	T-2A	34			
CWGL - ***	T-23A	70	PBHB - ***	T-17A	34			

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CBE*-L*N-EMB	T-11A	205	CBC*-LHN-XVH	T-11A	60	CBCA-LAN-WZE	T-11A	238
CBE*-L*N-EMC	T-11A	205	CBC*-LHN-XVI	T-11A	60	CBCA-LAN-WZH	T-11A	238
CBE*-L*N-EMJ	T-11A	205	CBC*-LHN-YEB	T-11A	58	CBCA-LAN-WZL	T-11A	239
CBE*-L*N-EMK	T-11A	205	CBC*-LHN-YEC	T-11A	58	CBCA-LAN-WZP	T-11A	239
CBE*-L*N-ENB	T-11A	207	CBC*-LHN-YEI	T-11A	58	CBCA-LAN-WZS	T-11A	239
CBE*-L*N-ENC	T-11A	207	CBC*-LHN-YEJ	T-11A	58	CBCA-LAN-WZV	T-11A	239
CBE*-L*N-ENJ	T-11A	207	CBC*-LHN-YEK	T-11A	58	CBCA-LAN-XTS	T-11A	231
CBE*-L*N-ENK	T-11A	207	CBC*-LHN-YGB	T-11A	61	CBCA-LAN-YTA	T-11A	231
CBE*-L*N-EPB	T-11A	209	CBC*-LHN-YGC	T-11A	61	CBCA-LAN-ZDV	T-11A	231
CBE*-L*N-EPC	T-11A	209	CBC*-LHN-YGI	T-11A	61	CBCA-LAN-ZDY	T-11A	231
CBE*-L*N-EPJ	T-11A	209	CBC*-LHN-YGJ	T-11A	61	CBCA-LAN-ZPD	T-11A	230
CBE*-L*N-EPK	T-11A	209	CBC*-LHN-YGK	T-11A	61	CBCA-LAN-ZPD	T-11A	230
CBE*-L*N-EQB	T-11A	211	CBC*-LHN-YVM	T-11A	67	CBE*-L*N-BMC	T-2A	205
CBE*-L*N-EQC	T-11A	211	CBC*-LHN-YVY	T-11A	67	CBE*-L*N-BMD	T-2A	205
CBE*-L*N-EQJ	T-11A	211	CBC*-LHN-ZTC	T-11A	66	CBE*-L*N-BMK	T-2A	205
CBE*-L*N-EQK	T-11A	211	CBC*-LHN-ZTN	T-11A	66	CBE*-L*N-BML	T-2A	205
CBG*-L*N-HME	T-17A	206	CBC*-LJN-EBA	T-11A / T-21A	151	CBE*-L*N-BNC	T-2A	207
CBG*-L*N-HMF	T-17A	206	CBC*-LJN-EBY	T-11A / T-21A	151	CBE*-L*N-BND	T-2A	207
CBG*-L*N-HMM	T-17A	206	CBC*-LJN-ECB	T-11A	52	CBE*-L*N-BNK	T-2A	207
CBG*-L*N-HMN	T-17A	206	CBC*-LJN-ECC	T-11A	52	CBE*-L*N-BNL	T-2A	207
CBG*-L*N-HNE	T-17A	208	CBC*-LJN-ECH	T-11A	52	CBE*-L*N-BPC	T-2A	209
CBG*-L*N-HNF	T-17A	208	CBC*-LJN-ECI	T-11A	52	CBE*-L*N-BPD	T-2A	209
CBG*-L*N-HNM	T-17A	208	CBC*-LJN-ECJ	T-11A	52	CBE*-L*N-BPK	T-2A	209
CBG*-L*N-HNN	T-17A	208	CBC*-LJN-EGB	T-11A	56	CBE*-L*N-BPL	T-2A	209
CBG*-L*N-HPE	T-17A	210	CBC*-LJN-EGC	T-11A	56	CBE*-L*N-BQC	T-2A	211
CBG*-L*N-HPF	T-17A	210	CBC*-LJN-EGI	T-11A	56	CBE*-L*N-BQD	T-2A	211
CBG*-L*N-HPM	T-17A	210	CBC*-LJN-EGJ	T-11A	56	CBE*-L*N-BQK	T-2A	211
CBG*-L*N-HPN	T-17A	210	CBC*-LJN-EGK	T-11A	56	CBE*-L*N-BQL	T-2A	211
CBG*-L*N-HQE	T-17A	212	CBC*-LJN-EJB	T-11A	55	CBE*-LHN-BB8	T-2A	167
CBG*-L*N-HQF	T-17A	212	CBC*-LJN-EJI	T-11A	55	CBE*-LHN-BBA	T-2A	167
CBG*-L*N-HQM	T-17A	212	CBC*-LJN-EJJ	T-11A	55	CBE*-LHN-BBB	T-2A	167
CBG*-L*N-HQN	T-17A	212	CBC*-LJN-XGB	T-11A	63	CBE*-LHN-BBY	T-2A	167
CBC*-LHN-EBA	T-11A	151	CBC*-LJN-XGI	T-11A	63	CBE*-LHN-BCC	T-2A	52
CBC*-LHN-EBY	T-11A	151	CBC*-LJN-XGJ	T-11A	63	CBE*-LHN-BCD	T-2A	52
CBC*-LHN-ECB	T-11A	52	CBC*-LJN-XVG	T-11A	60	CBE*-LHN-BCI	T-2A	52
CBC*-LHN-ECC	T-11A	52	CBC*-LJN-XVH	T-11A	60	CBE*-LHN-BCJ	T-2A	52
CBC*-LHN-ECH	T-11A	52	CBC*-LJN-XVI	T-11A	60	CBE*-LHN-BGC	T-2A	56
CBC*-LHN-ECI	T-11A	52	CBC*-LJN-YEB	T-11A	58	CBE*-LHN-BGD	T-2A	56
CBC*-LHN-ECJ	T-11A	52	CBC*-LJN-YEC	T-11A	58	CBE*-LHN-BGI	T-2A	56
CBC*-LHN-EGB	T-11A	56	CBC*-LJN-YEI	T-11A	58	CBE*-LHN-BGJ	T-2A	56
CBC*-LHN-EGC	T-11A	56	CBC*-LJN-YEJ	T-11A	58	CBE*-LHN-BJ8	T-2A	178
CBC*-LHN-EGI	T-11A	56	CBC*-LJN-YEK	T-11A	58	CBE*-LHN-BJA	T-2A	178
CBC*-LHN-EGJ	T-11A	56	CBC*-LJN-YGB	T-11A	61	CBE*-LHN-BJB	T-2A	178
CBC*-LHN-EGK	T-11A	56	CBC*-LJN-YGC	T-11A	61	CBE*-LHN-BJY	T-2A	178
CBC*-LHN-EJB	T-11A	55	CBC*-LJN-YGI	T-11A	61	CBE*-LHN-BVC	T-2A	55
CBC*-LHN-EJI	T-11A	55	CBC*-LJN-YGJ	T-11A	61	CBE*-LHN-BVD	T-2A	55
CBC*-LHN-EJJ	T-11A	55	CBC*-LJN-YGK	T-11A	61	CBE*-LHN-BVI	T-2A	55
CBC*-LHN-XGB	T-11A	63	CBC*-LJN-YVM	T-11A	67	CBE*-LHN-BVJ	T-2A	55
CBC*-LHN-XGI	T-11A	63	CBC*-LJN-YVY	T-11A	67	CBE*-LHN-XAC	T-2A	60
CBC*-LHN-XGJ	T-11A	63	CBC*-LJN-ZTC	T-11A	66	CBE*-LHN-XAD	T-2A	60
CBC*-LHN-XVG	T-11A	60	CBC*-LJN-ZTN	T-11A	66	CBE*-LHN-XHC	T-2A	63

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CBE*-LHN-XKD	T-17A	63	CBE*-LJN-YHD	T-2A	61	CBG*-LHN-ZNW	T-17A	64
CBE*-LHN-XKE	T-17A	63	CBE*-LJN-YHK	T-2A	61	CBG*-LHN-ZNX	T-19A	64
CBE*-LHN-XZQ	T-19A	63	CBE*-LJN-YHL	T-2A	61	CBG*-LHN-ZTJ	T-17A	66
CBE*-LHN-YAB	T-2A	58	CBE*-LJN-YVV	T-2A	67	CBG*-LHN-ZTK	T-17A	66
CBE*-LHN-YAC	T-2A	58	CBE*-LJN-YVW	T-2A	67	CBG*-LJN-BKA	T-17A	188
CBE*-LHN-YAD	T-2A	58	CBE*-LJN-ZDS	T-2A	65	CBG*-LJN-BKB	T-17A	188
CBE*-LHN-YAI	T-2A	58	CBE*-LJN-ZNV	T-2A	64	CBG*-LJN-BKY	T-17A	188
CBE*-LHN-YAJ	T-2A	58	CBE*-LJN-ZTF	T-2A	66	CBG*-LJN-HCE	T-17A	53
CBE*-LHN-YHC	T-2A	61	CBE*-LJN-ZTG	T-2A	66	CBG*-LJN-HCF	T-17A	53
CBE*-LHN-YHD	T-2A	61	CBEA-LAN-VWZ	T-2A	235	CBG*-LJN-HCL	T-17A	53
CBE*-LHN-YHK	T-2A	61	CBEA-LAN-VZX/M	T-2A	235	CBG*-LJN-HCM	T-17A	53
CBE*-LHN-YHL	T-2A	61	CBEA-LAN-WKH	T-2A	241	CBG*-LJN-HDD	T-17A	55
CBE*-LHN-YVV	T-2A	67	CBEA-LAN-WKL	T-2A	241	CBG*-LJN-HDE	T-17A	55
CBE*-LHN-YVW	T-2A	67	CBEA-LAN-WKP	T-2A	242	CBG*-LJN-HDE	T-17A	56
CBE*-LHN-ZDS	T-2A	65	CBEA-LAN-WKS	T-2A	242	CBG*-LJN-HDF	T-17A	56
CBE*-LHN-ZNV	T-2A	64	CBEA-LAN-WKV	T-2A	242	CBG*-LJN-HDL	T-17A	55
CBE*-LHN-ZTF	T-2A	66	CBEA-LAN-WKY	T-2A	242	CBG*-LJN-HDL	T-17A	56
CBE*-LHN-ZTG	T-2A	66	CBEA-LAN-XYS	T-2A	234	CBG*-LJN-HDM	T-17A	55
CBE*-LJN-BB8	T-2A	167	CBEA-LAN-YTC	T-2A	234	CBG*-LJN-HDM	T-17A	56
CBE*-LJN-BBA	T-2A	167	CBEA-LAN-ZPG	T-2A	233	CBG*-LJN-YJE	T-17A	59
CBE*-LJN-BBB	T-2A	167	CBEA-LAN-ZPI	T-2A	233	CBG*-LJN-YJF	T-17A	59
CBE*-LJN-BBY	T-2A	167	CBEA-LAN-ZPM	T-2A	233	CBG*-LJN-YJL	T-17A	59
CBE*-LJN-BCC	T-2A	52	CBEA-LAN-ZPO	T-2A	234	CBG*-LJN-YJM	T-17A	59
CBE*-LJN-BCD	T-2A	52	CBG*-LHN-BKA	T-17A	188	CBG*-LJN-YKE	T-17A	61
CBE*-LJN-BCI	T-2A	52	CBG*-LHN-BKB	T-17A	188	CBG*-LJN-YKF	T-17A	61
CBE*-LJN-BCJ	T-2A	52	CBG*-LHN-BKY	T-17A	188	CBG*-LJN-YKL	T-17A	61
CBE*-LJN-BGC	T-2A	56	CBG*-LHN-HCE	T-17A	53	CBG*-LJN-YKM	T-17A	61
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CBE*-LJN-BJA	T-2A	178	CBG*-LHN-HDE	T-17A	55	CBG*-LJN-ZNX	T-19A	64
CBE*-LJN-BJB	T-2A	178	CBG*-LHN-HDE	T-17A	56	CBG*-LJN-ZTJ	T-17A	66
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CBE*-LJN-BVC	T-2A	55	CBG*-LHN-HDL	T-17A	55	CBI*-LHN-HBA	T-19A	198
CBE*-LJN-BVD	T-2A	55	CBG*-LHN-HDL	T-17A	56	CBI*-LHN-HBB	T-19A	198
CBE*-LJN-BVI	T-2A	55	CBG*-LHN-HDM	T-17A	55	CBI*-LHN-HBY	T-19A	198
CBE*-LJN-BVJ	T-2A	55	CBG*-LHN-HDM	T-17A	56	CBI*-LHN-KCE	T-19A	53
CBE*-LJN-XAC	T-2A	60	CBG*-LHN-XJW	T-17A	60	CBI*-LHN-KCF	T-19A	53
CBE*-LJN-XAD	T-2A	60	CBG*-LHN-XJX	T-17A	60	CBI*-LHN-KCM	T-19A	53
CBE*-LJN-XHC	T-2A	63	CBG*-LHN-YJE	T-17A	59	CBI*-LHN-KCN	T-19A	53
CBE*-LJN-XHD	T-2A	63	CBG*-LHN-YJF	T-17A	59	CBI*-LHN-KG6	T-19A	57
CBE*-LJN-XKD	T-17A	63	CBG*-LHN-YJL	T-17A	59	CBI*-LHN-KGR	T-19A	57
CBE*-LJN-XKE	T-17A	63	CBG*-LHN-YJM	T-17A	59	CBI*-LHN-XZZ	T-11A	54
CBE*-LJN-XZQ	T-19A	63	CBG*LHN-YKE	T-17A	61	CBI*-LHN-YM6	T-19A	59
CBE*-LJN-YAB	T-2A	58	CBG*LHN-YKF	T-17A	61	CBI*-LHN-YMR	T-19A	59
CBE*-LJN-YAC	T-2A	58	CBG*LHN-YKL	T-17A	61	CBI*-LHN-YN6	T-19A	62
CBE*-LJN-YAD	T-2A	58	CBG*LHN-YKM	T-17A	61	CBI*-LHN-YNR	T-19A	62
CBE*-LJN-YAI	T-2A	58	CBG*-LHN-YVS	T-17A	67	CBI*-LHN-Z8Z	T-19A	54
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CBI*-LJN-HBA	T-19A	198	CKEB-XCN-BBA	T-2A	168	CKIB-XCN-HBY	T-19A	199
CBI*-LJN-HBB	T-19A	198	CKEB-XCN-BBB	T-2A	168	CKIB-XCN-KCE	T-19A	81
CBI*-LJN-HBY	T-19A	198	CKEB-XCN-BBY	T-2A	168	CKIB-XCN-KCF	T-19A	81
CBI*-LJN-KCE	T-19A	53	CKEB-XCN-BCC	T-2A	80	CKIB-XCN-KCM	T-19A	81
CBI*-LJN-KCF	T-19A	53	CKEB-XCN-BCD	T-2A	80	CKIB-XCN-KCN	T-19A	81
CBI*-LJN-KCM	T-19A	53	CKEB-XCN-BCI	T-2A	80	CKIB-XCN-XZZ	T-19A	84
CBI*-LJN-KCN	T-19A	53	CKEB-XCN-BCJ	T-2A	80	CKIB-XCN-YM6	T-19A	87
CBI*-LJN-KG6	T-19A	57	CKEB-XCN-BJA	T-2A	179	CKIB-XCN-Z8Z	T-19A	84
CBI*-LJN-KGR	T-19A	57	CKEB-XCN-BJB	T-2A	179	CKIB-XCN-ZFD	T-19A	90
CBI*-LJN-XZZ	T-11A	54	CKEB-XCN-BJY	T-2A	179	CKIB-XCN-ZNX	T-19A	89
CBI*-LJN-YM6	T-19A	59	CKEB-XCN-BVC	T-2A	83	CSAA-BXN-DKS	T-13A	192
CBI*-LJN-YMR	T-19A	59	CKEB-XCN-BVD	T-2A	83	CSAA-BXN-GBS	T-13A	158
CBI*-LJN-YN6	T-19A	62	CKEB-XCN-BVI	T-2A	83	CSAA-BXN-IBS	T-13A	202
CBI*-LJN-YNR	T-19A	62	CKEB-XCN-BVJ	T-2A	83	CSAA-BXN-WZY	T-11A	239
CBI*-LJN-Z8Z	T-19A	54	CKEB-XCN-XAC	T-2A	88	CVCV-XCN-MAA	T-21A	96
CBI*-LJN-ZFD	T-19A	65	CKEB-XCN-XAD	T-2A	88	CVCV-XCN-MAB	T-21A	96
CBIA-LHN-XZP	T-19A	60	CKEB-XCN-XAI	T-2A	88	CVCV-XCN-MAC	T-21A	96
CKBB-XCN-JCA	T-163A	80	CKEB-XCN-XAJ	T-2A	88	CVCV-XCN-MAI	T-21A	96
CKBB-XCN-JCB	T-163A	80	CKEB-XCN-YAC	T-2A	86	CVCV-XCN-MAJ	T-21A	96
CKBB-XCN-JCH	T-163A	80	CKEB-XCN-YAD	T-2A	86	CVCV-XCN-MAK	T-21A	96
CKBB-XCN-JCI	T-163A	80	CKEB-XCN-YAJ	T-2A	86	CVCV-XCN-MBA	T-21A	152
CKBB-XCN-JJA	T-163A	82	CKEB-XCN-YAK	T-2A	86	CVCV-XCN-MBB	T-21A	152
CKBB-XCN-JJB	T-163A	82	CKEB-XCN-YVV	T-2A	92	CVCV-XCN-MBY	T-21A	152
CKBB-XCN-JJH	T-163A	82	CKEB-XCN-YVW	T-2A	92	CVCV-XCN-XPA	T-21A	99
CKBB-XCN-JJI	T-163A	82	CKEB-XCN-ZDS	T-2A	90	CVCV-XCN-XPB	T-21A	99
CKBB-XCN-JYA	T-163A	85	CKEB-XCN-ZNV	T-2A	89	CVCV-XCN-XPC	T-21A	99
CKBB-XCN-JYB	T-163A	85	CKEB-XCN-ZNW	T-17A	89	CVCV-XCN-XPI	T-21A	99
CKBB-XCN-JYH	T-163A	85	CKEB-XCN-ZTF	T-2A	91	CVCV-XCN-XPJ	T-21A	99
CKBB-XCN-JYI	T-163A	85	CKEB-XCN-ZTG	T-2A	91	CVCV-XCN-XPK	T-21A	99
CKCB-XCN-EBA	T-11A	152	CKGB-XCN-BKA	T-17A	189	CVEV-XCN-NAB	T-22A	96
CKCB-XCN-EBY	T-11A	152	CKGB-XCN-BKB	T-17A	189	CVEV-XCN-NAC	T-22A	96
CKCB-XCN-ECB	T-11A	80	CKGB-XCN-BKY	T-17A	189	CVEV-XCN-NAD	T-22A	96
CKCB-XCN-ECC	T-11A	80	CKGB-XCN-HCE	T-17A	81	CVEV-XCN-NAJ	T-22A	96
CKCB-XCN-ECH	T-11A	80	CKGB-XCN-HCF	T-17A	81	CVEV-XCN-NAK	T-22A	96
CKCB-XCN-ECI	T-11A	80	CKGB-XCN-HCL	T-17A	81	CVEV-XCN-XIB	T-22A	99
CKCB-XCN-ECJ	T-11A	80	CKGB-XCN-HCM	T-17A	81	CVEV-XCN-XIC	T-22A	99
CKCB-XCN-EJB	T-11A	82	CKGB-XCN-HDD	T-17A	83	CVEV-XCN-XID	T-22A	99
CKCB-XCN-EJI	T-11A	82	CKGB-XCN-HDE	T-17A	83	CVEV-XCN-XII	T-22A	99
CKCB-XCN-EJJ	T-11A	82	CKGB-XCN-HDL	T-17A	83	CVEV-XCN-XIJ	T-22A	99
CKCB-XCN-XEB	T-11A	88	CKGB-XCN-HDM	T-17A	83	CVGV-XCN-PCD	T-23A	97
CKCB-XCN-XEI	T-11A	88	CKGB-XCN-YJE	T-17A	87	CVGV-XCN-PCE	T-23A	97
CKCB-XCN-XEJ	T-11A	88	CKGB-XCN-YJF	T-17A	87	CVGV-XCN-PCF	T-23A	97
CKCB-XCN-YEB	T-11A	85	CKGB-XCN-YJL	T-17A	87	CVGV-XCN-PCL	T-23A	97
CKCB-XCN-YEC	T-11A	85	CKGB-XCN-YJM	T-17A	87	CVGV-XCN-PCM	T-23A	97
CKCB-XCN-YEI	T-11A	85	CKGB-XCN-YVS	T-17A	92	CVGV-XCN-XMD	T-23A	100
CKCB-XCN-YEJ	T-11A	85	CKGB-XCN-YVT	T-17A	92	CVGV-XCN-XME	T-23A	100
CKCB-XCN-YEK	T-11A	85	CKGB-XCN-ZDR	T-17A	90	CVGV-XCN-XMF	T-23A	100
CKCB-XCN-YVM	T-11A	92	CKGB-XCN-ZTJ	T-17A	91	CVGV-XCN-XML	T-23A	100
CKCB-XCN-YVY	T-11A	92	CKGB-XCN-ZTK	T-17A	91	CVGV-XCN-XMM	T-23A	100
CKCB-XCN-ZTC	T-11A	91	CKIB-XCN-HBA	T-19A	199	CVIV-XCN-QAE	T-24A	97
CKCB-XCN-ZTN	T-11A	91	CKIB-XCN-HBB	T-19A	199	CVIV-XCN-QAF	T-24A	97

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CVIV-XCN-QAN	T-24A	97	CWG*-LGN-XME	T-23A	76	CXDA-X*N-GAA	T-13A	104
CVIV-XCN-XLE	T-24A	100	CWG*-LGN-XMF	T-23A	76	CXDA-X*N-GAB	T-13A	104
CVIV-XCN-XLF	T-24A	100	CWG*-LGN-XML	T-23A	76	CXDA-X*N-GAH	T-13A	104
CVIV-XCN-Z9T	T-24A	98	CWG*-LGN-XMM	T-23A	76	CXDA-X*N-GAI	T-13A	104
CWC*-LGN-MAB	T-21A	72	CWG*-LHN-PAE	T-23A	73	CXDA-X*N-GAJ	T-13A	104
CWC*-LGN-MAC	T-21A	72	CWG*-LHN-PAF	T-23A	73	CXDA-X*N-GCA	T-13A	106
CWC*-LGN-MAI	T-21A	72	CWG*-LHN-PAL	T-23A	73	CXDA-X*N-GCB	T-13A	106
CWC*-LGN-MAJ	T-21A	72	CWG*-LHN-PAM	T-23A	73	CXDA-X*N-GCI	T-13A	106
CWC*-LGN-MAK	T-21A	72	CWG*-LHN-XME	T-23A	76	CXDA-X*N-GCJ	T-13A	106
CWC*-LGN-MBA	T-21A	151	CWG*-LHN-XMF	T-23A	76	CXDA-X*N-GDA	T-13A / T-5A	153
CWC*-LGN-MBB	T-21A	151	CWG*-LHN-XML	T-23A	76	CXDA-X*N-GDP	T-13A / T-5A	153
CWC*-LGN-MBY	T-21A	151	CWG*-LHN-XMM	T-23A	76	CXDA-X*N-GDW	T-13A / T-5A	153
CWC*-LGN-XPB	T-21A	75	CWI*-LHN-XLE	T-24A	76	CXDA-X*N-GDY	T-13A / T-5A	153
CWC*-LGN-XPC	T-21A	75	CWI*-LHN-XLF	T-24A	76	CXED-X*N-DAB	T-5A	104
CWC*-LGN-XPI	T-21A	75	CWI*-LFN-QCE	T-24A	73	CXED-X*N-DAC	T-5A	104
CWC*-LGN-XPJ	T-21A	75	CWI*-LFN-QCF	T-24A	73	CXED-X*N-DAJ	T-5A	104
CWC*-LGN-XPK	T-21A	75	CWI*-LFN-QCM	T-24A	73	CXED-X*N-DAK	T-5A	104
CWC*-LHN-MAB	T-21A	72	CWI*-LFN-QCN	T-24A	73	CXED-X*N-DCB	T-5A	106
CWC*-LHN-MAC	T-21A	72	CWI*-LFN-XLE	T-24A	76	CXED-X*N-DCC	T-5A	106
CWC*-LHN-MAI	T-21A	72	CWI*-LFN-XLF	T-24A	76	CXED-X*N-DCI	T-5A	106
CWC*-LHN-MAJ	T-21A	72	CWI*-LFN-Z9T	T-24A	74	CXED-X*N-DCJ	T-5A	106
CWC*-LHN-MAK	T-21A	72	CWI*-LHN-QCE	T-24A	73	CXED-X*N-DCK	T-5A	106
CWC*-LHN-MBA	T-21A	151	CWI*-LHN-QCF	T-24A	73	CXFA-X*N-DAB	T-5A	104
CWC*-LHN-MBB	T-21A	151	CWI*-LHN-QCM	T-24A	73	CXFA-X*N-DAC	T-5A	104
CWC*-LHN-MBY	T-21A	151	CWI*-LHN-QCN	T-24A	73	CXFA-X*N-DAJ	T-5A	104
CWC*-LHN-XPB	T-21A	75	CWI*-LHN-Z9T	T-24A	74	CXFA-X*N-DAK	T-5A	104
CWC*-LHN-XPC	T-21A	75	CXAD-X*N-AAA	T-162A	104	CXFA-X*N-DCB	T-5A	106
CWC*-LHN-XPI	T-21A	75	CXAD-X*N-AAB	T-162A	104	CXFA-X*N-DCC	T-5A	106
CWC*-LHN-XPJ	T-21A	75	CXAD-X*N-AAH	T-162A	104	CXFA-X*N-DCI	T-5A	106
CWC*-LHN-XPK	T-21A	75	CXAD-X*N-AAI	T-162A	104	CXFA-X*N-DCJ	T-5A	106
CWE*-LFN-NAC	T-22A	72	CXAD-X*N-ACA	T-162A	106	CXFA-X*N-DCK	T-5A	06
CWE*-LFN-NAD	T-22A	72	CXAD-X*N-ACB	T-162A	106	CXFA-X*N-GDF	T-13A	153
CWE*-LFN-NAJ	T-22A	72	CXAD-X*N-ACH	T-162A	106	CXFA-XAN-DBW	T-5A	169
CWE*-LFN-NAK	T-22A	72	CXAD-X*N-ACI	T-162A	106	CXFA-XAN-DJW	T-5A	180
CWE*-LFN-XIC	T-22A	75	CXBA-X*N-AAA	T-162A	104	CXFA-XCN-DBJ	T-5A	169
CWE*-LFN-XID	T-22A	75	CXBA-X*N-AAB	T-162A	104	CXFA-XCN-DBK	T-5A	169
CWE*-LFN-XII	T-22A	75	CXBA-X*N-AAH	T-162A	104	CXFA-XCN-DBP	T-5A	169
CWE*-LFN-XIJ	T-22A	75	CXBA-X*N-AAI	T-162A	104	CXFA-XCN-DJJ	T-5A	180
CWE*-LHN-NAC	T-22A	72	CXBA-X*N-ACA	T-162A	106	CXFA-XCN-DJK	T-5A	180
CWE*-LHN-NAD	T-22A	72	CXBA-X*N-ACB	T-162A	106	CXFA-XCN-DJP	T-5A	180
CWE*-LHN-NAJ	T-22A	72	CXBA-X*N-ACH	T-162A	106	CXGD-X*N-IAD	T-16A	105
CWE*-LHN-NAK	T-22A	72	CXBA-X*N-ACI	T-162A	106	CXGD-X*N-IAE	T-16A	105
CWE*-LHN-XIC	T-22A	75	CXCD-X*N-GAA	T-13A	104	CXGD-X*N-IAF	T-16A	105
CWE*-LHN-XID	T-22A	75	CXCD-X*N-GAB	T-13A	104	CXGD-X*N-IAL	T-16A	105
CWE*-LHN-XIE	T-22A	75	CXCD-X*N-GAH	T-13A	104	CXGD-X*N-IAM	T-16A	105
CWE*-LHN-XII	T-22A	75	CXCD-X*N-GAI	T-13A	104	CXGD-X*N-ICD	T-16A	107
CWE*-LHN-XIJ	T-22A	75	CXCD-X*N-GAJ	T-13A	104	CXGD-X*N-ICE	T-16A	107
CWG*-LGN-PAE	T-23A	73	CXCD-X*N-GCA	T-13A	106	CXGD-X*N-ICF	T-16A	107
CWG*-LGN-PAF	T-23A	73	CXCD-X*N-GCB	T-13A	106	CXGD-X*N-ICL	T-16A	107
CWG*-LGN-PAL	T-23A	73	CXCD-X*N-GCI	T-13A	106	CXGD-X*N-ICM	T-16A	107

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CXHA-X*N-IAD	T-16A	105	FCCB-LAN-GCH	T-13A	122	FDCB-LAN-DAC	T-5A	128
CXHA-X*N-IAE	T-16A	105	FCCB-LAN-GCI	T-13A	122	FDCB-LAN-DAI	T-5A	128
CXHA-X*N-IAF	T-16A	105	FCCB-LAN-GCJ	T-13A	122	FDCB-LAN-DAJ	T-5A	128
CXHA-X*N-IAL	T-16A	105	FCCB-LAN-XWT	T-13A	231	FDCB-LAN-DAK	T-5A	128
CXHA-X*N-IAM	T-16A	105	FCDB-LAN-DAA	T-5A	120	FDCB-LAN-DAW	T-5A	128
CXHA-X*N-ICD	T-16A	107	FCDB-LAN-DAB	T-5A	120	FDCB-LAN-DBA	T-5A	170
CXHA-X*N-ICE	T-16A	107	FCDB-LAN-DAC	T-5A	120	FDCB-LAN-DBB	T-5A	170
CXHA-X*N-ICF	T-16A	107	FCDB-LAN-DAI	T-5A	120	FDCB-LAN-DBC	T-5A	170
CXHA-X*N-ICL	T-16A	107	FCDB-LAN-DAJ	T-5A	120	FDCB-LAN-DBP	T-5A	170
CXHA-X*N-ICM	T-16A	107	FCDB-LAN-DAK	T-5A	120	FDCB-LAN-DBY	T-5A	170
CXHA-XAN-CDV	T-16A	200	FCDB-LAN-DCB	T-5A	122	FDCB-LAN-DCB	T-5A	130
CXHA-XAN-DKX	T-16A	190	FCDB-LAN-DCC	T-5A	122	FDCB-LAN-DCC	T-5A	130
CXHA-XCN-DKP	T-16A	190	FCDB-LAN-DCI	T-5A	122	FDCB-LAN-DCI	T-5A	130
CXHA-XCN-DKT	T-16A	190	FCDB-LAN-DCJ	T-5A	122	FDCB-LAN-DCJ	T-5A	130
CXHA-XCN-DKZ	T-16A	190	FCDB-LAN-DCK	T-5A	122	FDCB-LAN-DCK	T-5A	130
CXID-X*N-VTN	T-18A	108	FCEB-LAN-IAD	T-16A	121	FDCB-LAN-DJA	T-5A	181
CXID-X*N-LAD	T-18A	105	FCEB-LAN-IAE	T-16A	121	FDCB-LAN-DJB	T-5A	181
CXID-X*N-LAE	T-18A	105	FCEB-LAN-IAF	T-16A	121	FDCB-LAN-DJP	T-5A	181
CXID-X*N-LAF	T-18A	105	FCEB-LAN-IAL	T-16A	121	FDCB-LAN-DJY	T-5A	181
CXID-X*N-LAL	T-18A	105	FCEB-LAN-IAM	T-16A	121	FDCB-LAN-WVA	T-5A	240
CXID-X*N-LAM	T-18A	105	FCEB-LAN-ICD	T-16A	123	FDCB-LAN-WXH	T-5A	240
CXID-X*N-ZLR	T-18A	107	FCEB-LAN-ICE	T-16A	123	FDCB-LAN-WZB	T-5A	240
CXID-X*N-ZLS	T-18A	107	FCEB-LAN-ICF	T-16A	123	FDEA-LAN-DKA	T-16A	191
CXID-X*N-XZY	T-18A	108	FCEB-LAN-ICL	T-16A	123	FDEA-LAN-DKB	T-16A	191
CXJA-X*N-LAD	T-18A	105	FCEB-LAN-ICM	T-16A	123	FDEA-LAN-DKP	T-16A	191
CXJA-X*N-LAE	T-18A	105	FCFB-LAN-LAD	T-18A	121	FDEA-LAN-DKY	T-16A	191
CXJA-X*N-LAF	T-18A	105	FCFB-LAN-LAE	T-18A	121	FDEA-LAN-DKZ	T-16A	191
CXJA-X*N-LAL	T-18A	105	FCFB-LAN-LAF	T-18A	121	FDEA-LAN-IAD	T-16A	129
CXJA-X*N-LAM	T-18A	105	FCFB-LAN-LAL	T-18A	121	FDEA-LAN-IAE	T-16A	129
CXJA-X*N-VTN	T-18A	108	FCFB-LAN-LAM	T-18A	121	FDEA-LAN-IAF	T-16A	129
CXJA-X*N-XZY	T-18A	108	FCFB-LAN-VTN	T-18A	124	FDEA-LAN-IAL	T-16A	129
CXJA-X*N-ZLR	T-18A	107	FCFB-LAN-XZY	T-18A	124	FDEA-LAN-IAM	T-16A	129
CXJA-X*N-ZLS	T-18A	107	FCFB-LAN-ZLR	T-18A	123	FDEA-LAN-ICD	T-16A	131
CXJA-XCN-IBO	T-18A	200	FCFB-LAN-ZLS	T-18A	123	FDEA-LAN-ICE	T-16A	131
CXJA-XCN-IBV	T-18A	200	FDBA-LAN-GAA	T-13A	128	FDEA-LAN-ICF	T-16A	131
CXJA-XCN-IBZ	T-18A	200	FDBA-LAN-GAB	T-13A	128	FDEA-LAN-ICL	T-16A	131
FCBB-LAN-AAA	T-162A	120	FDBA-LAN-GAH	T-13A	128	FDEA-LAN-ICM	T-16A	131
FCBB-LAN-AAB	T-162A	120	FDBA-LAN-GAI	T-13A	128	FDFA-LAN-IBE	T-18A	201
FCBB-LAN-AAH	T-162A	120	FDBA-LAN-GAJ	T-13A	128	FDFA-LAN-IBF	T-18A	201
FCBB-LAN-AAI	T-162A	120	FDBA-LAN-GBA	T-13A	155	FDFA-LAN-IBO	T-18A	201
FCBB-LAN-ACA	T-162A	122	FDBA-LAN-GBP	T-13A	154	FDFA-LAN-IBY	T-18A	201
FCBB-LAN-ACB	T-162A	122	FDBA-LAN-GBW	T-13A	155	FDFA-LAN-IBZ	T-18A	201
FCBB-LAN-ACH	T-162A	122	FDBA-LAN-GBX	T-13A	155	FDFA-LAN-LAD	T-18A	129
FCBB-LAN-ACI	T-162A	122	FDBA-LAN-GBY	T-13A	155	FDFA-LAN-LAE	T-18A	129
FCCB-LAN-GAA	T-13A	120	FDBA-LAN-GCA	T-13A	130	FDFA-LAN-LAF	T-18A	129
FCCB-LAN-GAB	T-13A	120	FDBA-LAN-GCB	T-13A	130	FDFA-LAN-LAL	T-18A	129
FCCB-LAN-GAH	T-13A	120	FDBA-LAN-GCH	T-13A	130	FDFA-LAN-LAM	T-18A	129
FCCB-LAN-GAI	T-13A	120	FDBA-LAN-GCI	T-13A	130	FDFA-LAN-VTN	T-18A	132
FCCB-LAN-GAJ	T-13A	120	FDBA-LAN-GCJ	T-13A	130	FDFA-LAN-XZY	T-18A	132
FCCB-LAN-GCA	T-13A	122	FDCB-LAN-DAA	T-5A	128	FDFA-LAN-ZLR	T-18A	131
FCCB-LAN-GCB	T-13A	122	FDCB-LAN-DAB	T-5A	128	FDFA-LAN-ZLS	T-18A	131

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FRBA-LAN-JCA	T-163A	136	FXEA-LAN-IAD	T-16A	121	NCEB-L*N-DCK	T-5A	114
FRBA-LAN-JCB	T-163A	136	FXEA-LAN-IAE	T-16A	121	NCEB-LAN-DBA	T-5A	170
FRBA-LAN-JCH	T-163A	136	FXEA-LAN-IAF	T-16A	121	NCEB-LAN-DBB	T-5A	170
FRBA-LAN-JCI	T-163A	136	FXEA-LAN-IAL	T-16A	121	NCEB-LAN-DBC	T-5A	170
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FRCA-LAN-EAC	T-11A	136	FXEA-LAN-ICD	T-16A	123	NCEB-LCN-DJA	T-5A	181
FRCA-LAN-EAJ	T-11A	136	FXEA-LAN-ICE	T-16A	123	NCEB-LCN-DJB	T-5A	181
FRCA-LAN-EAK	T-11A	136	FXEA-LAN-ICF	T-16A	123	NCEB-LCN-DJY	T-5A	181
FRCA-LAN-WBN	T-11A	154	FXEA-LAN-ICL	T-16A	123	NCFB-L*N-DKA	T-16A	191
FRDA-LAN-BAB	T-2A	136	FXEA-LAN-ICM	T-16A	123	NCFB-L*N-DKB	T-16A	191
FRDA-LAN-BAC	T-2A	136	FXFA-LAN-LAD	T-18A	121	NCFB-L*N-IAD	T-16A	113
FRDA-LAN-BAD	T-2A	136	FXFA-LAN-LAE	T-18A	121	NCFB-L*N-IAE	T-16A	113
FRDA-LAN-BAJ	T-2A	136	FXFA-LAN-LAF	T-18A	121	NCFB-L*N-IAF	T-16A	113
FRDA-LAN-BAK	T-2A	136	FXFA-LAN-LAL	T-18A	121	NCFB-L*N-IAL	T-16A	113
FRDA-LAN-BAL	T-2A	136	FXFA-LAN-LAM	T-18A	121	NCFB-L*N-IAM	T-16A	113
FREA-LAN-HED	T-17A	137	FXFA-LAN-VTN	T-18A	124	NCFB-L*N-ICD	T-16A	115
FREA-LAN-HEE	T-17A	137	FXFA-LAN-XZY	T-18A	124	NCFB-L*N-ICE	T-16A	115
FREA-LAN-HEF	T-17A	137	FXFA-LAN-ZLR	T-18A	123	NCFB-L*N-ICF	T-16A	115
FREA-LAN-HEL	T-17A	137	FXFA-LAN-ZLS	T-18A	123	NCFB-L*N-ICL	T-16A	115
FREA-LAN-HEM	T-17A	137	NCCB-L*N-AAA	T-162A	112	NCFB-L*N-ICM	T-16A	115
FRFA-LAN-KEE	T-19A	137	NCCB-L*N-AAB	T-162A	112	NCCB-L*N-LAD	T-18A	113
FRFA-LAN-KEF	T-19A	137	NCCB-L*N-AAH	T-162A	112	NCCB-L*N-LAE	T-18A	113
FXBA-LAN-AAA	T-162A	120	NCCB-L*N-AAI	T-162A	112	NCCB-L*N-LAF	T-18A	113
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FXBA-LAN-AAH	T-162A	120	NCCB-L*N-ACB	T-162A	114	NCCB-L*N-LAM	T-18A	113
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FXBA-LAN-ACA	T-162A	122	NCCB-L*N-ACI	T-162A	114	NCCB-L*N-XZY	T-18A	116
FXBA-LAN-ACB	T-162A	122	NCCB-L*N-GAA	T-13A	112	NCCB-L*N-ZLR	T-18A	115
FXBA-LAN-ACH	T-162A	122	NCCB-L*N-GAB	T-13A	112	NCCB-LCN-IBE	T-18A	201
FXBA-LAN-ACI	T-162A	122	NCCB-L*N-GAH	T-13A	112	NCCB-LCN-IBF	T-18A	201
FXCA-LAN-GAA	T-13A	120	NCCB-L*N-GAI	T-13A	112	NCCB-LCN-IBY	T-18A	201
FXCA-LAN-GAB	T-13A	120	NCCB-L*N-GAJ	T-13A	112	NCCB-LCN-IBZ	T-18A	201
FXCA-LAN-GAH	T-13A	120	NCCB-L*N-GCA	T-13A	114	NFBC-L*N-AAA	T-162A	112
FXCA-LAN-GAI	T-13A	120	NCCB-L*N-GCB	T-13A	114	NFBC-L*N-AAB	T-162A	112
FXCA-LAN-GAJ	T-13A	120	NCCB-L*N-GCH	T-13A	114	NFBC-L*N-AAH	T-162A	112
FXCA-LAN-GCA	T-13A	122	NCCB-L*N-GCI	T-13A	114	NFBC-L*N-AAI	T-162A	112
FXCA-LAN-GCB	T-13A	122	NCCB-L*N-GCJ	T-13A	114	NFBC-L*N-ACA	T-162A	114
FXCA-LAN-GCH	T-13A	122	NCCB-LAN-GBW	T-13A	155	NFBC-L*N-ACB	T-162A	114
FXCA-LAN-GCI	T-13A	122	NCCB-LAN-GBX	T-13A	155	NFBC-L*N-ACH	T-162A	114
FXCA-LAN-GCJ	T-13A	122	NCCB-LCN-GBA	T-13A	155	NFBC-L*N-ACI	T-162A	114
FXDA-LAN-DAA	T-5A	120	NCCB-LCN-GBY	T-13A	155	NFCB-L*N-DKY	T-16A	191
FXDA-LAN-DAB	T-5A	120	NCEB-L*N-DAA	T-5A	112	NFCB-L*N-DKZ	T-16A	191
FXDA-LAN-DAC	T-5A	120	NCEB-L*N-DAB	T-5A	112	NFCC-L*N-GAA	T-13A	112
FXDA-LAN-DAI	T-5A	120	NCEB-L*N-DAC	T-5A	112	NFCC-L*N-GAB	T-13A	112
FXDA-LAN-DAJ	T-5A	120	NCEB-L*N-DAI	T-5A	112	NFCC-L*N-GAH	T-13A	112
FXDA-LAN-DAK	T-5A	120	NCEB-L*N-DAJ	T-5A	112	NFCC-L*N-GAI	T-13A	112
FXDA-LAN-DCB	T-5A	122	NCEB-L*N-DAK	T-5A	112	NFCC-L*N-GAJ	T-13A	112
FXDA-LAN-DCC	T-5A	122	NCEB-L*N-DCB	T-5A	114	NFCC-L*N-GCA	T-13A	114
FXDA-LAN-DCI	T-5A	122	NCEB-L*N-DCC	T-5A	114	NFCC-L*N-GCB	T-13A	114
FXDA-LAN-DCJ	T-5A	122	NCEB-L*N-DCI	T-5A	114	NFCC-L*N-GCH	T-13A	114
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NFCC-L*N-GCJ	T-13A	114	PBDB-LAN-E6I	T-11A	39	PBJB-LAN-KF6	T-19-A	38
NFCC-LAN-DBS	T-13A	171	PBDB-LAN-E6J	T-11A	39	PBJB-LAN-KFE	T-19-A	37
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NFCC-LCN-GBP	T-13A	154	PBDB-LAN-EB3	T-11A	149	PBJB-LAN-KFR	T-19-A	38
NFCC-LCN-GBS	T-13A	154	PBDB-LAN-EBA	T-11A	149	PPDB-LAN-E4B	T-11A	47
NFCC-LCN-GBW	T-13A	154	PBDB-LAN-EBP	T-11A	149	PPDB-LAN-E4C	T-11A	47
NFCC-LCN-GBX	T-13A	154	PBDB-LAN-EBY	T-11A	149	PPDB-LAN-E4I	T-11A	47
NFCC-LCN-ZFZ	T-13A	232	PBDB-LAN-EFB	T-11A	36	PPDB-LAN-E4J	T-11A	47
NFDC-L*N-DAA	T-5A	112	PBDB-LAN-EFC	T-11A	36	PPDB-LAN-E4K	T-11A	47
NFDC-L*N-DAB	T-5A	112	PBDB-LAN-EFH	T-11A	36	PPDB-LAN-EB2	T-11A	150
NFDC-L*N-DAC	T-5A	112	PBDB-LAN-EFI	T-11A	36	PPDB-LAN-EB3	T-11A	150
NFDC-L*N-DAI	T-5A	112	PBDB-LAN-EFJ	T-11A	36	PPDB-LAN-EBA	T-11A	150
NFDC-L*N-DAJ	T-5A	112	PBFB-LAN-B6B	T-2A	39	PPDB-LAN-EBP	T-11A	150
NFDC-L*N-DAK	T-5A	112	PBFB-LAN-B6C	T-2A	39	PPDB-LAN-EBY	T-11A	150
NFDC-L*N-DCB	T-5A	114	PBFB-LAN-B6D	T-2A	39	PPDB-LAN-ELB	T-11A	44
NFDC-L*N-DCC	T-5A	114	PBFB-LAN-B6I	T-2A	39	PPDB-LAN-ELC	T-11A	44
NFDC-L*N-DCI	T-5A	114	PBFB-LAN-B6J	T-2A	39	PPDB-LAN-ELI	T-11A	44
NFDC-L*N-DCJ	T-5A	114	PBFB-LAN-BB2	T-2A	165	PPDB-LAN-ELJ	T-11A	44
NFDC-L*N-DCK	T-5A	114	PBFB-LAN-BB3	T-2A	165	PPDB-LAN-ELK	T-11A	44
NFDC-LAN-DBP	T-5A	170	PBFB-LAN-BBA	T-2A	165	PPFB-LAN-B4C	T-2A	47
NFDC-LAN-DJP	T-5A	181	PBFB-LAN-BBB	T-2A	165	PPFB-LAN-B4D	T-2A	47
NFEC-L*N-IAD	T-16A	113	PBFB-LAN-BBP	T-2A	165	PPFB-LAN-B4J	T-2A	47
NFEC-L*N-IAE	T-16A	113	PBFB-LAN-BFC	T-2A	36	PPFB-LAN-B4K	T-2A	47
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NFEC-L*N-IAL	T-16A	113	PBFB-LAN-BFH	T-2A	36	PPFB-LAN-BB3	T-2A	166
NFEC-L*N-IAM	T-16A	113	PBFB-LAN-BFI	T-2A	36	PPFB-LAN-BBP	T-2A	166
NFEC-L*N-ICD	T-16A	115	PBFB-LAN-BJ2	T-2A	176	PPFB-LAN-BJ2	T-2A	177
NFEC-L*N-ICE	T-16A	115	PBFB-LAN-BJ3	T-2A	176	PPFB-LAN-BJ3	T-2A	177
NFEC-L*N-ICF	T-16A	115	PBFB-LAN-BJA	T-2A	176	PPFB-LAN-BJA	T-2A	177
NFEC-L*N-ICL	T-16A	115	PBFB-LAN-BJB	T-2A	176	PPFB-LAN-BJB	T-2A	177
NFEC-L*N-ICM	T-16A	115	PBFB-LAN-BJP	T-2A	176	PPFB-LAN-BJP	T-2A	177
NFEC-LEN-DKP	T-16A	191	PBHB-LAN-BK2	T-17A	186	PPFB-LAN-BLC	T-2A	44
NFFC-L*N-LAD	T-18A	113	PBHB-LAN-BKA	T-17A	186	PPFB-LAN-BLD	T-2A	44
NFFC-L*N-LAE	T-18A	113	PBHB-LAN-BKB	T-17A	186	PPFB-LAN-BLI	T-2A	44
NFFC-L*N-LAF	T-18A	113	PBHB-LAN-BKJ	T-17A	186	PPFB-LAN-BLJ	T-2A	44
NFFC-L*N-LAL	T-18A	113	PBHB-LAN-BKP	T-17A	186	PPFB-LAN-BLK	T-2A	44
NFFC-L*N-LAM	T-18A	113	PBHB-LAN-H2*	T-17A	40	PPHB-LAN-BK2	T-17A	187
NFFC-L*N-VTN	T-18A	116	PBHB-LAN-H2*	T-17A	40	PPHB-LAN-BKA	T-17A	187
NFFC-L*N-XZY	T-18A	116	PBHB-LAN-H2*	T-17A	40	PPHB-LAN-BKB	T-17A	187
NFFC-L*N-ZLR	T-18A	115	PBHB-LAN-H2*	T-17A	40	PPHB-LAN-BKJ	T-17A	187
NFFC-L*N-ZLS	T-18A	115	PBHB-LAN-HBJ	T-17A	196	PPHB-LAN-BKP	T-17A	187
NFFC-LGN-IBO	T-18A	201	PBHB-LAN-HBK	T-17A	196	PPHB-LAN-H4E	T-17A	48
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PBBB-LAN-J2I	T-163A	39	PBHB-LAN-HFM	T-17A	37	PPHB-LAN-HBJ	T-17A	197
PBBB-LAN-JFB	T-163A	36	PBJB-LAN-HBA	T-19A	196	PPHB-LAN-HBK	T-17A	197
PBBB-LAN-JFH	T-163A	36	PBJB-LAN-HBB	T-19A	196	PPHB-LAN-HEE	T-17A	45
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PPJB-LAN-HBB	T-19A	197	PRHB-LAN-HBJ	T-17A	197	RDDA-LAN-FAL	T-10A	4
PPJB-LAN-HBO	T-19A	197	PRHB-LAN-HBK	T-17A	197	RDDA-LAN-FBA	T-10A	146
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PPJB-LAN-KEE	T-19A	45	PRHB-LAN-HEM	T-17A	45	RDDA-LAN-FBY	T-10A	146
PPJB-LAN-KEF	T-19A	45	PRJB-LAN-HBA	T-19A	197	RDDA-LAN-FEB	T-10A	6
PPJB-LAN-KEM	T-19A	45	PRJB-LAN-HBB	T-19A	197	RDDA-LAN-FEC	T-10A	6
PPJB-LAN-KEN	T-19A	45	PRJB-LAN-HBO	T-19A	197	RDDA-LAN-FEI	T-10A	6
PPJB-LAN-KER	T-19A	46	PRJB-LAN-K4E	T-19A	48	RDDA-LAN-FEJ	T-10A	6
PRDB-LAN-E4B	T-11A	47	PRJB-LAN-K4F	T-19A	48	RDDA-LAN-FRB	T-10A	145
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PRDB-LAN-EBP	T-11A	150	RDBA-LAN-AAB	T-162A	4	RDDA-LAN-FTC	T-10A	161
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PRDB-LAN-ELC	T-11A	44	RDBA-LAN-AEA	T-162A	6	RDDA-LAN-YFC	T-10A	9
PRDB-LAN-ELI	T-11A	4	RDBA-LAN-AEB	T-162A	6	RDDA-LAN-YFI	T-10A	9
PRDB-LAN-ELJ	T-11A	44	RDBA-LAN-AEH	T-162A	6	RDDA-LAN-YFJ	T-10A	9
PRDB-LAN-ELK	T-11A	44	RDBA-LAN-AEI	T-162A	6	RDDA-LAN-ZHH	T-10A	173
PRFB-LAN-B4C	T-2A	47	RDBA-LAN-AYA	T-162A	9	RDDA-LAN-ZHJ	T-10A	173
PRFB-LAN-B4D	T-2A	47	RDBA-LAN-AYB	T-162A	9	RDDA-LAN-ZHK	T-10A	173
PRFB-LAN-B4J	T-2A	47	RDBA-LAN-AYH	T-162A	9	RDDA-LAN-ZHL	T-10A	173
PRFB-LAN-B4K	T-2A	47	RDBA-LAN-AYI	T-162A	9	RDDA-LAN-ZHP	T-10A	173
PRFB-LAN-BB2	T-2A	166	RDDA-L*N-WLL	T-10A	241	RDDA-LAN-ZHQ	T-10A	173
PRFB-LAN-BB3	T-2A	166	RDDA-L*N-WLY	T-10A	241	RDDA-LAN-ZHR	T-10A	173
PRFB-LAN-BBP	T-2A	166	RDDA-L*N-WMV	T-10A	241	RDDA-LAN-ZHS	T-10A	173
PRFB-LAN-BJ2	T-2A	177	RDDA-L*N-WVP	T-10A	238	RDFA-LAN-CAC	T-3A	4
PRFB-LAN-BJ3	T-2A	177	RDDA-L*N-WVS	T-10A	238	RDFA-LAN-CAD	T-3A	4
PRFB-LAN-BJA	T-2A	177	RDDA-L*N-WVY	T-10A	238	RDFA-LAN-CAH	T-3A	4
PRFB-LAN-BJB	T-2A	177	RDDA-L*N-YVP	T-10A	235	RDFA-LAN-CAI	T-3A	4
PRFB-LAN-BJP	T-2A	177	RDDA-L*N-YWA	T-10A	233	RDFA-LAN-CEJ	T-3A	6
PRFB-LAN-BLC	T-2A	44	RDDA-L*N-YXB	T-10A	230	RDFA-LAN-CEL	T-3A	6
PRFB-LAN-BLD	T-2A	44	RDDA-L*N-ZFK	T-10A	230	RDFA-LAN-CJA	T-3A	174
PRFB-LAN-BLI	T-2A	44	RDDA-L*N-ZFK	T-10A	230	RDFA-LAN-CJB	T-3A	174
PRFB-LAN-BLJ	T-2A	44	RDDA-LAN-CBD	T-10A	162	RDFA-LAN-CJP	T-3A	174
PRFB-LAN-BLK	T-2A	44	RDDA-LAN-CBE	T-10A	162	RDFA-LAN-CJX	T-3A	174
PRHB-LAN-BK2	T-17A	187	RDDA-LAN-CBF	T-10A	162	RDFA-LAN-CKA	T-3A	184
PRHB-LAN-BKA	T-17A	187	RDDA-LAN-CBG	T-10A	162	RDFA-LAN-CKB	T-3A	184
PRHB-LAN-BKB	T-17A	187	RDDA-LAN-CBH	T-10A	163	RDFA-LAN-CKP	T-3A	184
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PRHB-LAN-BKP	T-17A	187	RDDA-LAN-CJY	T-10A	174	RDFA-LAN-CRE	T-3A	193
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RDJA-LAN-LAE	T-18A	5	RPEC-LAN-FSJ	T-10A	145	RPIC-LAN-IAF	T-16A	5
RDJA-LAN-LAF	T-18A	5	RPEC-LAN-FSK	T-10A	161	RPIC-LAN-IAL	T-16A	5
RDJA-LAN-LAL	T-18A	5	RPEC-LAN-FTC	T-10A	161	RPIC-LAN-IAM	T-16A	5
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RDJA-LAN-LEM	T-18A	7	RPEC-LAN-YFJ	T-10A	9	RPIC-LAN-YIF	T-16A	10
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RDJA-LAN-XYZ	T-18A	8	RPEC-LAN-ZHJ	T-10A	173	RPKC-LAN-LA6	T-18A	5
RDJA-LAN-YL6	T-18A	10	RPEC-LAN-ZHK	T-10A	173	RPKC-LAN-LAD	T-18A	5
RDJA-LAN-YLR	T-18A	10	RPEC-LAN-ZHL	T-10A	173	RPKC-LAN-LAE	T-18A	5
RPCC-LAN-AAA	T-162A	4	RPEC-LAN-ZHP	T-10A	173	RPKC-LAN-LAF	T-18A	5
RPCC-LAN-AAB	T-162A	4	RPEC-LAN-ZHQ	T-10A	173	RPKC-LAN-LAL	T-18A	5
RPCC-LAN-AAH	T-162A	4	RPEC-LAN-ZHR	T-10A	173	RPKC-LAN-LAM	T-18A	5
RPCC-LAN-AAI	T-162A	4	RPEC-LAN-ZHS	T-10A	173	RPKC-LAN-LEE	T-18A	7
RPCC-LAN-AEA	T-162A	6	RPGC-LAN-CAC	T-3A	4	RPKC-LAN-LEF	T-18A	7
RPCC-LAN-AEB	T-162A	6	RPGC-LAN-CAD	T-3A	4	RPKC-LAN-LEL	T-18A	7
RPCC-LAN-AEH	T-162A	6	RPGC-LAN-CAH	T-3A	4	RPKC-LAN-LEM	T-18A	7
RPCC-LAN-AEI	T-162A	6	RPGC-LAN-CAI	T-3A	4	RPKC-LAN-VTN	T-18A	8
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RSBC-LAN-JCB	T-163A	22	RSHC-LAN-HCE	T-17A	23	SXCA-LAN-E6C	T-11A	24
RSBC-LAN-JCH	T-163A	22	RSHC-LAN-HCF	T-17A	23	SXCA-LAN-E6I	T-11A	24
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RSDC-LAN-ECH	T-11A	22	RVCA-LAN-ECH	T-11A	14	SXCA-LAN-ECI	T-11A	22
RSDC-LAN-ECI	T-11A	22	RVCA-LAN-ECI	T-11A	14	SXCA-LAN-ECJ	T-11A	22
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RSFC-LAN-BBW	T-2A	164	RVIA-LAN-KCE	T-19A	15	SXEA-LAN-BCI	T-2A	22
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RSFC-LAN-BCL	T-2A	22	RVIA-LAN-Z8Z	T-19A	16	SXEA-LAN-BJ5	T-2A	175
RSFC-LAN-BJ4	T-2A	175	RVCA-LAN-EBC	T-11A	147	SXEA-LAN-BJW	T-2A	175
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XREA-LAN*D		17	YDCD-LHN-AC		224	YRDR-LAN-LK		138
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XRJB-LCN-AS		221	YDGD-LHN-AE		226	ZWV		159
XRJC-LNN-A6		216	YDGD-LHN-AF		226	ZWW		159
XRJC-LNN-AM		215	YDGD-LHN-AL		226			
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WARRANTY INFORMATION, PERFORMANCE ASSURANCE, AND APPLICATION LIMITATIONS

Caution

Sun Hydraulics Corporation manufactures a variety of cartridge valves that will fit into the same Sun cavity. Each cartridge is marked with a seven-digit part identification code and a four-digit date code, stamped on the hex surfaces. Designers and users of Sun components are advised that **physical interchangeability of cartridges does not necessarily mean functional interchangeability.** When

replacing any Sun cartridges, users should first check with the manufacturer's service literature, their local Sun distributor, or the Sun factory before making any part substitutions.

NOTE: To avoid serious injury, the manufacturer's service manual must be consulted before working on any hydraulic system.

Limited Warranty

Sun Hydraulics Corporation warrants its products free from defects in material, workmanship, and design for a period of three years after installation, provided the installation date is less than one year after manufacture. **“O-rings” and seals are specifically exempted from this warranty.** In no instance is there any warranty of fitness for a particular use and Sun Hydraulics Corporation cannot and does not accept responsibility of any type for any of its products that have been subjected to improper installation, improper application, negligence, tampering, or abuse, or which have been repaired or

altered outside of the Sun Hydraulics factory. Sun Hydraulics Corporation's liability under this warranty shall extend only to replacement or correction, f.o.b. our factory, of any defective part or product determined by inspection as not conforming to this warranty. We make no other warranties, expressed or implied, and are not responsible for any consequential damages resulting from use by any buyer or user, our liability being limited to the value of product sold or obligation to replace a defective part.

Performance Assurance

All Sun cartridges are individually tested at the factory and preset to specific pressure or flow settings where indicated in this catalog. However, as the actual performance of buyers' equipment cannot be reproduced in Sun's testing laboratory,

assurance of suitability of all Sun products in the buyer's application is the responsibility of the buyer. This is typically accomplished by the manufacture of a prototype followed by a test or qualification program on the part of the buyer.

Application Limitations

Sun's product designs and manufacturing facilities have been specifically developed to provide products for commercial, industrial and mobile hydraulic applications and Sun's products are only warranted for this type of use. **Sun's distributors are not authorized to approve the use of Sun products in any of the following applications:**

- Any product that comes under the Federal Highway Safety Act, namely steering or braking systems for passenger-carrying vehicles or on-highway trucks.

- Aircraft or space vehicles.
- Ordnance equipment.
- Life support equipment.
- Any end product that, when sold, comes under the U.S. Nuclear Regulatory Commission rules and regulations.

Specific written approval for any application of Sun products in any of the above named applications should be obtained from Sun Hydraulics Corporation. Consultation with Sun distributors or factory engineers is advised in unusual situations where applicability is questionable.