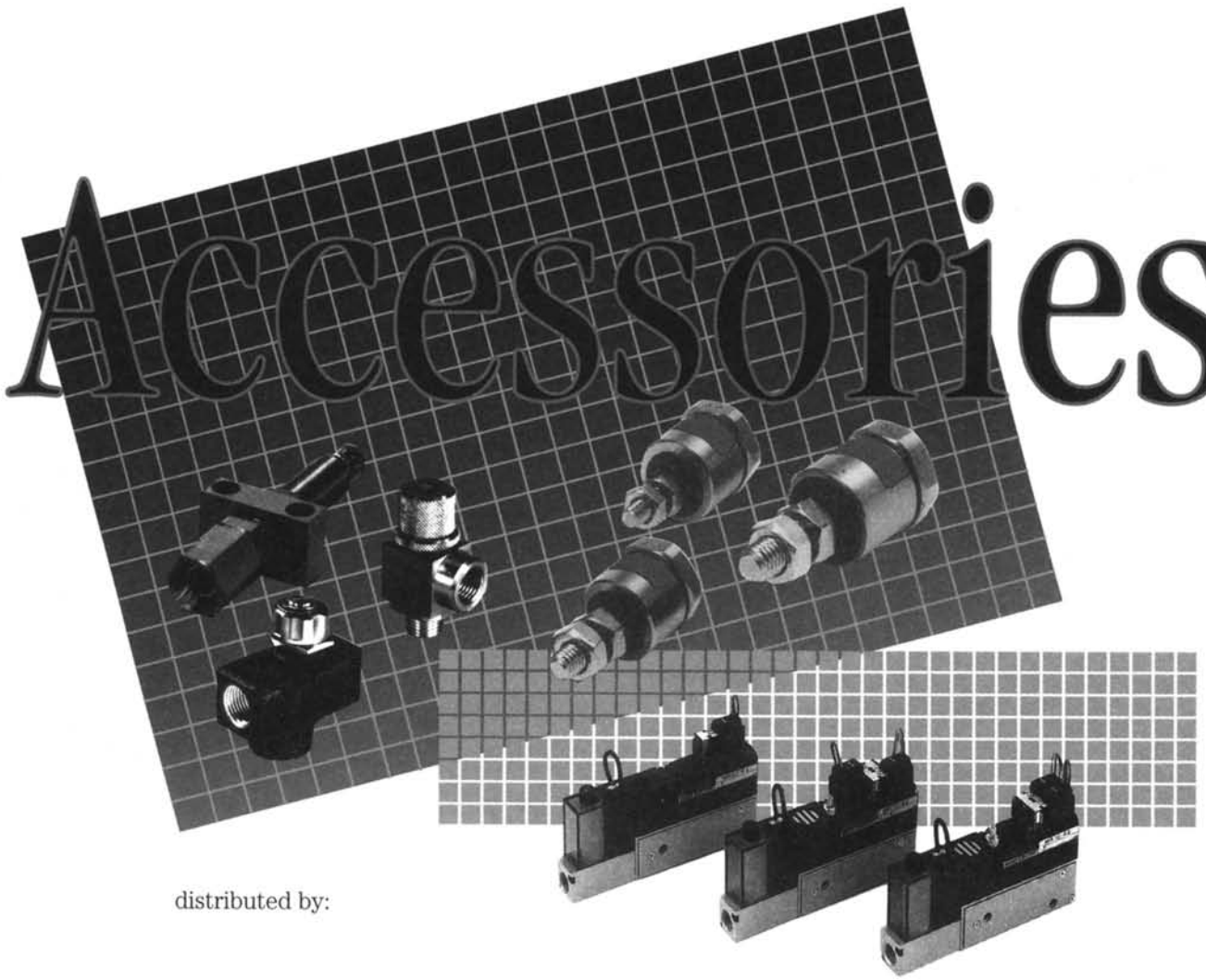
HUMPHREY PNEUMATIC ACCESSORIES



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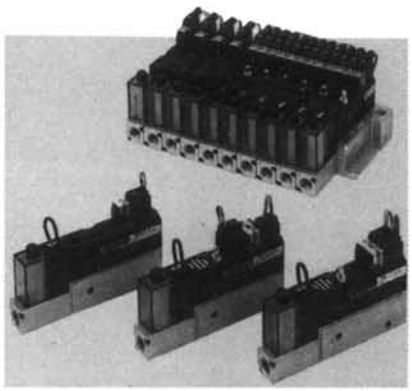
Humphrey®

MICRO EJECTOR VACUUM GENERATORS

HMED07, HMED10

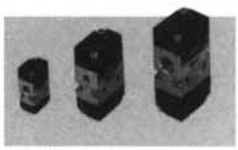


Micro Ejector, solenoid actuators, vacuum switch, and filter, all in one unit.

Double-step nozzle provides high vacuum flow.

Mount with body mounting holes or on manifolds.

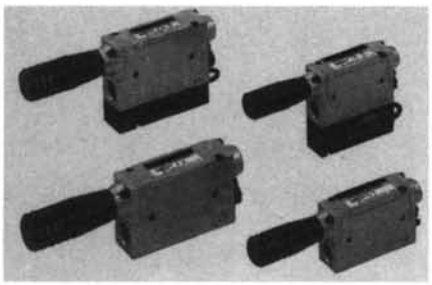
HME03, HME05, HME07



Highly compact. Provides vacuum service in a minimum of space.

In-line, single-step nozzle design.

HMEDT07, HMEDT10, HMEDT12, HMEDT14



In-line, double-step nozzle design, compact size.

Easy vacuum line installation.

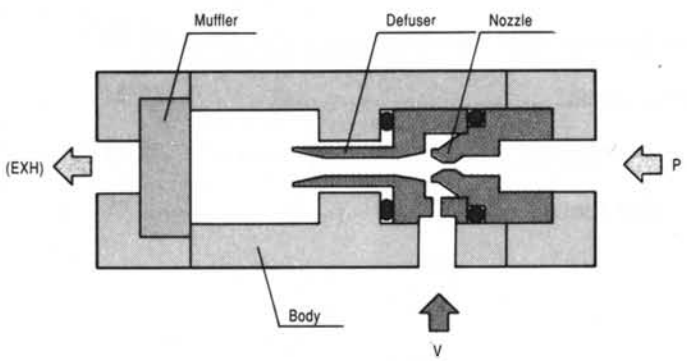
Electronic vacuum switch is optional.

WHAT IS THE HUMPHREY MICRO EJECTOR?

Humphrey Micro Ejectors use compressed air to create vacuum. Vacuum is developed when air flows from the supply port (P) through the nozzle. This creates vacuum at the vacuum port (V).

Vacuum can be used to hold parts during processing, or to transfer parts from one location to another.

Use with either 2-way or 3-way valves that have an effective area greater than three times the effective area of the Micro Ejector nozzle.



MICRO EJECTORS

In-line, solenoid, vacuum switch, filter

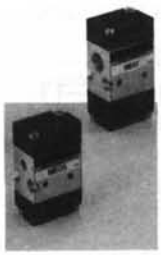
Model	Nozzle dimensions in. (mm)	Vacuum flow[NOTE] scfm (ℓ/min.)	Maximum Vacuum in. (mm) Hg	Air flow consumption[NOTE] scfm (ℓ/min.)	Solenoid			Vacuum switch	Manifold
					None	E1	E2		
HMED07	0.028 (0.7)	0.88 (25)	24.8 (–630)	0.81 (23)		□	□	□	□
HMED10	0.039 (1.0)	1.8 (50)	24.8 (–630)	1.62 (46)		□	□	□	□
HME03	0.012 (0.3)	0.10 (3)	23.6 (–600)	0.17 (5)	□				
HME05	0.020 (0.5)	0.21 (6)	25.5 (–650)	0.42 (12)	□				
HME07	0.028 (0.7)	0.42 (12)	25.5 (–650)	0.81 (23)	□				
HMEDT07	0.028 (0.7)	0.88 (25)	24.8 (–630)	0.81 (23)	□			□	
HMEDT10	0.039 (1.0)	1.76 (50)	24.8 (–630)	1.62 (46)	□			□	
HMEDT12	0.047 (1.2)	3.0 (85)	24.8 (–630)	2.54 (72)	□			□	
HMEDT14	0.055 (1.4)	3.35 (95)	24.8 (–630)	3.39 (96)	□			□	

NOTE: Pressure at 71 psig (5 kgf/cm^2).

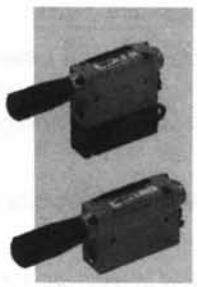
MICRO EJECTORS: MODELS AND FUNCTIONS

IN-LINE

- Light weight, and compact.
- Mounts close to work for maximum vacuum efficiency.
- Fast response: Mounting close to work minimizes length and volume of vacuum line.



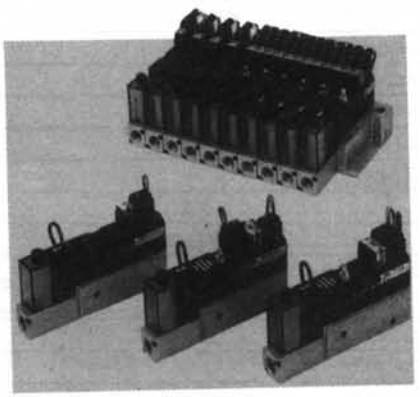
Single-step type



Double-step type

MANIFOLD

- Manifolds centralize many Micro Ejectors in one location.
- Common inlet simplifies plumbing.
- Suction random parts or many parts at once.



Individual or manifold mounting

DOUBLE-STEP EJECTOR

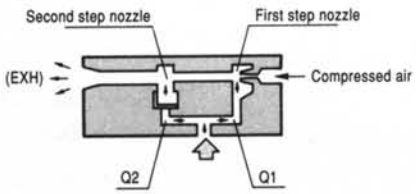
Humphrey double-step Micro Ejectors use compressed air to generate vacuum. They develop vacuum quickly to provide fast response required in rapid cycling applications.

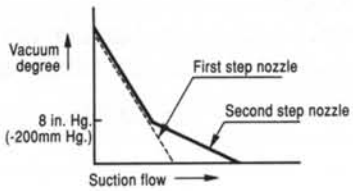
As vacuum begins to develop (less than 8" [-200mm] Hg.), the double-step type generates vacuum twice as fast as single-step types; thus higher, more useful levels of vacuum are obtained rapidly.

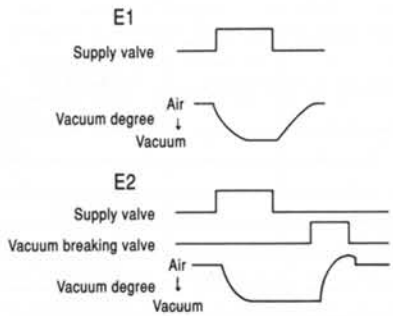
Below 8" (-200mm) Hg., the flow rate is Q1 + Q2 (see chart), effectively doubling vacuum flow over that of single-step types.

Above 8" (-200mm) Hg., an integral check valve closes Q2, and only Q1 generates vacuum.

For these reasons, double-step Micro Ejectors are ideal for applications involving handling of permeable objects that require low vacuum levels. Conversely, double-step types are also the component of choice in higher vacuum applications requiring rapid response.







SOLENOID FUNCTION

–E1:

Single solenoid controls air supply to the nozzle. ON supplies air and starts vacuum. OFF stops air and vacuum. Atmospheric air via the exhaust port breaks vacuum.

–E2:

Twin solenoid: One solenoid controls air supply to create vacuum, the other controls blow-off air which breaks vacuum instantly. This assures fast, accurate pickup and release of parts.

Supply solenoid ON: Air is supplied to the nozzle which creates vacuum at the vacuum generating port.

Vacuum breaking solenoid ON (supply valve OFF): Air pressure flows through needle valve to the vacuum generating port for release of part. Needle valve provides precise blow-off control. Adjust needle valve to suit application requirements.

Code 11: The supply port is normally open. Connect the positive lead wires together and the negative lead wires together to assure adequate vacuum generation and positive parts pick up and release.

A built-in check valve prevents atmospheric air from entering through the exhaust port. This maintains vacuum even if supply air is shut off, providing there are no leaks in tubing or vacuum pads. Vacuum switch shuts off supply air when vacuum falls below setting on switch. Saves compressed air.

VACUUM SWITCHES

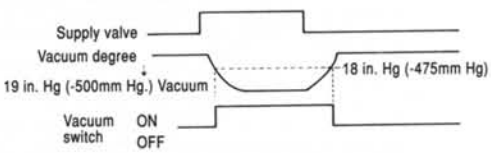
- Control vacuum setting.
- Check individual pads.
- Check where parts are suctioned.
- Check loading and unloading performance.

SET:

Turn pressure adjustment screw to set pressure. LED light will signal presence of operating pressure. Turning screw clockwise increases pressure setting.

HYS:

Turn hysteresis adjustment screw to set hysteresis. Turning screw clockwise will shift the OFF point to within 2-6° of the ON point and increase the hysteresis. Switch and LED light will turn off.



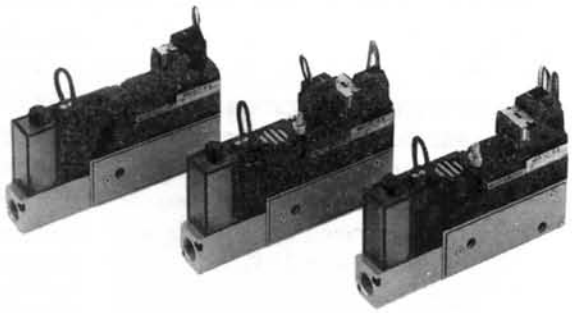
Cautions:

1. Parts may still be on even if the switch is off.

2. When designing the control circuit, refer to response times t2 and t3 (Vacuum Development and Vacuum Breaking Time).

MICRO EJECTOR – DOUBLE-STEP

HMED07, HMED10



- Instant vacuum, where you need it, when you need it.
- A highly efficient vacuum generator.
- Simple and reliable.
- Small size and light weight, reduces size and weight of your equipment.
- Easy, versatile mounting.
- Can be mounted close to work for extra fast response.
- Can be manifold mounted for mounting convenience and plumbing simplicity.
- Both single solenoid E1 and twin solenoid E2, (for pressure blow-off) models are available.
- Electronic vacuum switch has simple adjustments for precise control of part pick up and release.
- Single solenoid models are 2-position (on/off) as standard.
- Twin solenoid models are 3-position as standard.
- Twin solenoid models can be ordered with a normally open air supply control valve (Code: -11) for 2-position operation. De-energized = vacuum. Energized = blow-off.
- Solenoids are available with optional LED and surge protection.
- Blow-off flow control is standard on twin solenoid models.
- Vacuum port filter is standard on these models for protection against ambient contaminants.
- Manual override is standard.

SPECIFICATIONS

Item		Model	
		HMED07-E□	HMED10-E□
Media		Air[NOTE 2]	
Pressure range – psig (kgf/cm²)		28 ~ 85 (2 ~ 6)	
Temperature range (fluid or atmosphere) – °F (°C)		41 ~ 122 (5 ~ 50)	
Nozzle dimensions – in. (mm)		0.028 (0.7)	0.039 (1.0)
Vacuum[NOTE 1] – in. (mm) Hg		25 (–630)	
Flow at vacuum[NOTE 1] – scfm (ℓ/ min. ANR)		0.88 (25)	1.77 (50)
Compressed air consumption – scfm (ℓ/ min. ANR)		0.81 (23)	1.62 (46)
Lubrication		Do not lubricate	
Filtration – μm		30	
Piping connect port	Vacuum starting port – NPT	1/4"	
	Compressed air supply port – NPT	1/8" (1/4")[NOTE 3]	
Mounting direction		Any direction	
Main valve specifications	Operating method	Direct acting	
	Number of positions and ports	2 positions, 2 ports	
	Valve function	N/C standard (N/O optional)	
	Effective area – in.² (mm²)	0.698 (4.5)	
	Shock resistance	140 (60 to direction of axis)	
	Override	Non-locking type	

NOTE 1: Air pressure at 71 psig (5 kgf/cm²) – reference point.
NOTE 2: Use clean air (no oil mist, dust, etc.).
NOTE 3: ( ) = manifold.

SOLENOID SPECIFICATIONS

Item		5 VDC	6 VDC	12 VDC	24 VDC
Voltage Range		4.5 ~ 5.5 (5 ± 10%)	5.4 ~ 6.6 (6 ± 10%)	10.8 ~ 13.2 (12 ± 10%)	21.6 ~ 26.4 (24 ± 10%)
Current value (rated voltage applied) – mA		325 (1.6W) 335 (1.7W) with LED	270 (1.6W) 280 (1.7W) with LED	130 (1.6W) 140 (1.7W) with LED	70 (1.6W) 80 (1.7W) with LED
Leak rate (maximum allowed) mA		30	25	15	5
Temperature rise (at rated voltage) – °F (°C)		95 (35) maximum			
Insulation		Type B			
Insulation MΩ		Minimum 100			
Lead wire: length	Standard	Grommet 11.8" (300mm)			
	Option	Plug connector 11.8" (300mm)			
Lead wire: color		Green/Black	Blue/Black	Brown/Black	Red/Black
LED indicator (option) color		Red			
Surge suppression		Flywheel diode			

ELECTRONIC VACUUM SWITCH SPECIFICATIONS

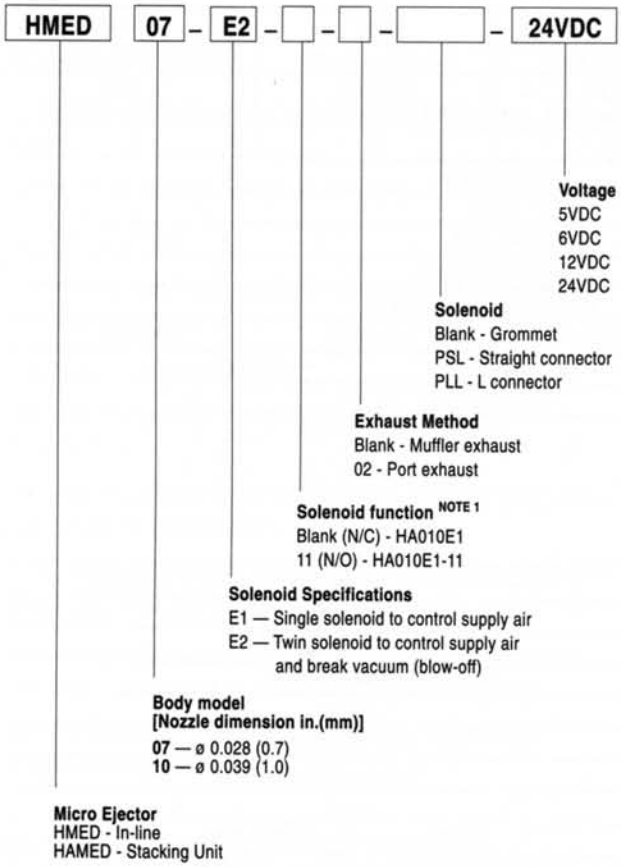
Item		Model
		HPS310
Media		Air or inert gas
Temperature – °F (°C)		14 ~ 140 (–10 ~ 60)
Humidity – %RH		35 ~ 95
Pressure range – in. (mm) Hg		29.9 ~ 0 (–760 ~ 0)
Maximum set pressure – in. (mm) Hg		29.9 ~ 3 (–760 ~ –76)
Differential – %		2 ~ 9
Repeatability		±3% FS maximum (32 ~ 122°F/0 ~ 50° C)
Electric specifications	Operating method	NPN open collector output (ON when below set pressure)
	Power range – VDC	12 ~ 24 ± 10% (max. ripple Vp-p 10%)
	Open/close capacity	Voltage drop 30VDC•100mA max. Internal drop-out power: Max. 1V at load current 100mA, max. 0.4V at load current 16mA.
	Current consumption – mA max.	20
	Insulation resistance – MΩ	(500 VDC) Minimum 100
	Surge suppression	Zenar diode standard
Mechanical features	Shock resistance – G	50
	Vibration resistance	10 ~ 55 Hz (vibration range – length 1.5mm) or 10 CT (XYZ axis. 2 hours max each)
LED		LED indicator ON (red)
Lead wire		Nylon cap tire: 0.14 sq. x 3 centers (white/black/red) x 19.6 in. (500mm) (entire length)
Mounting		Any direction
Material (Body cover)		Plastic

NOTE: Set pressure at 25.5 (–650mm) Hg.

PIPING CONNECTING PORT DIMENSIONS

Basic model		Pipe connection port	
		Vacuum	Compressed air supply port
Micro Ejector	HMED07-E1, HMED07-E2	1/4" NPT	1/8" NPT (1/4" NPT at manifold)
	HMED10-E1, HMED10-E2		
	Piped exhaust port option	1/4" NPT	
Manifold	HMEDM□A	1/4" NPT	1/4" NPT
	Pipe connection location	Ejector	Manifold

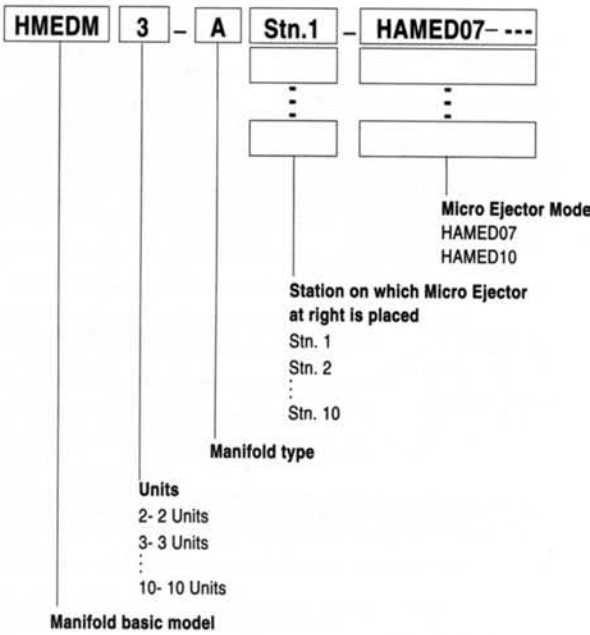
MICRO EJECTOR



NOTE 1: -11 (N/O) is available only for air supply control solenoid valve. Solenoid E2 type vacuum breaking solenoid valve is N/C only.

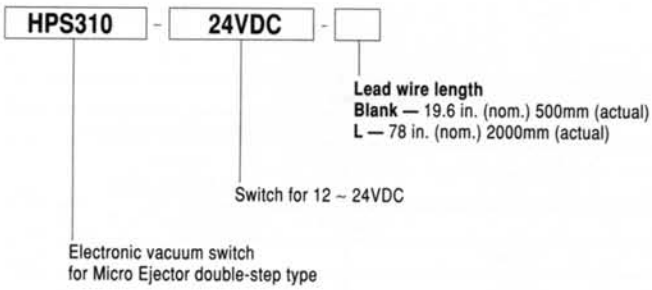
NOTE 2: Lead wire length 78 in. (2000mm) available for electronic vacuum switch as an option.

STACKING MANIFOLD KIT



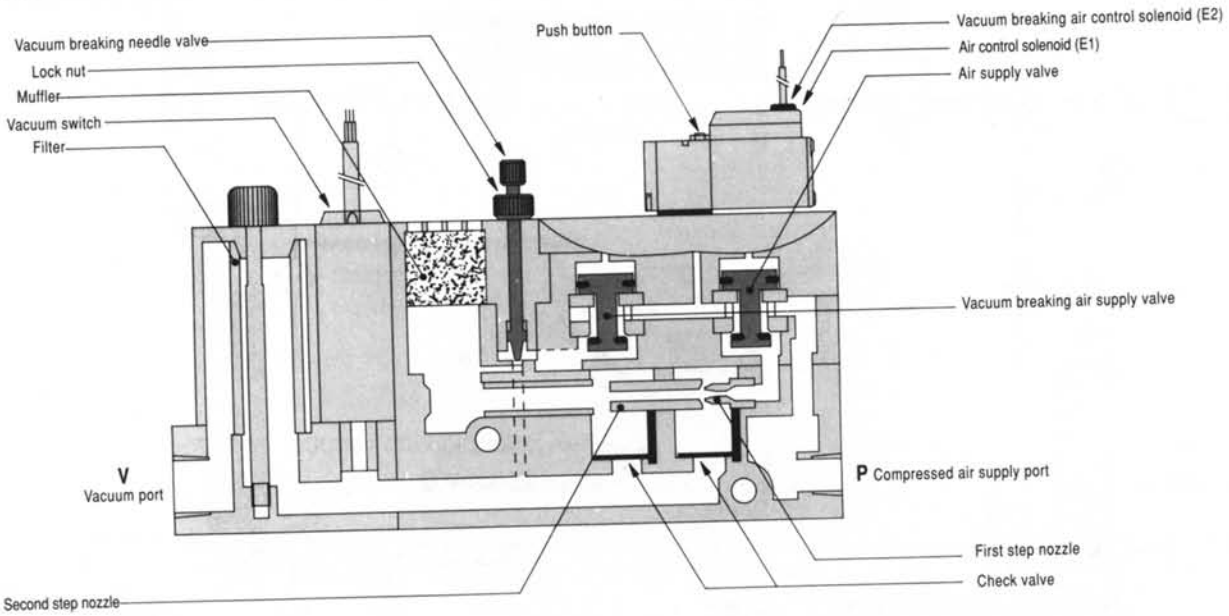
Consists of End Plates and Tie Rods.

ELECTRONIC VACUUM SWITCH ORDERING INFORMATION

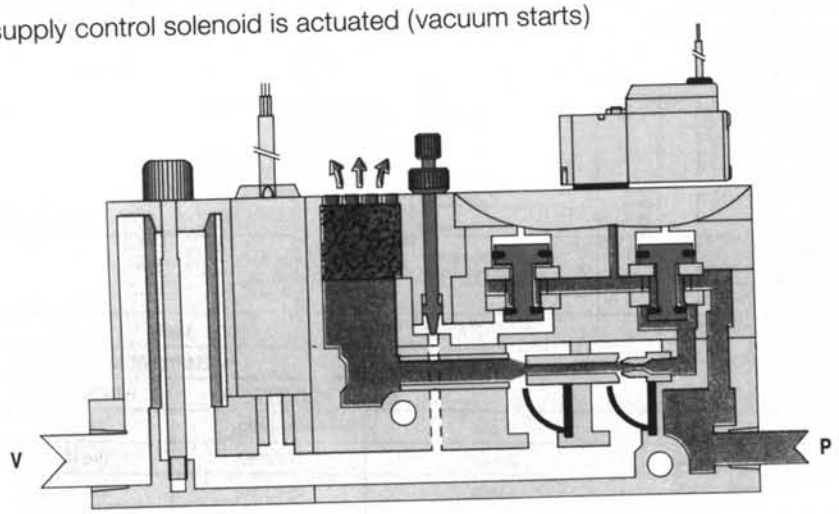


OPERATING PRINCIPLE AND PART NAMES

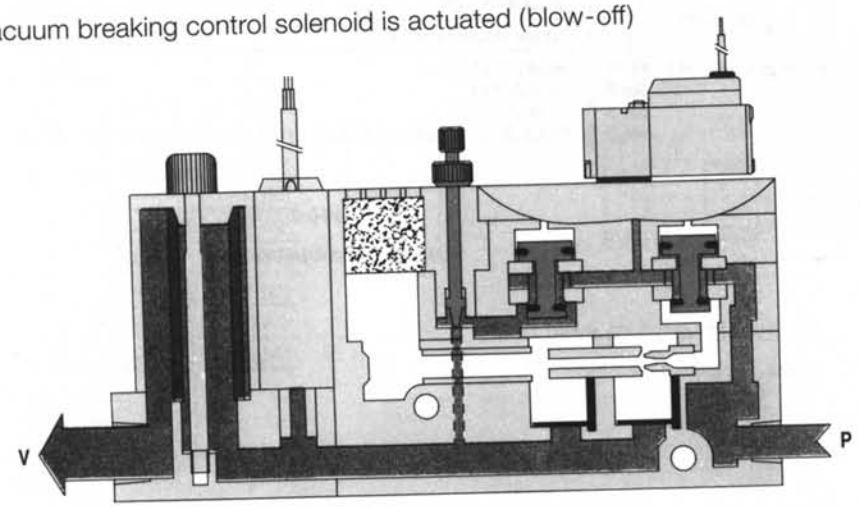
Unactuated



Air supply control solenoid is actuated (vacuum starts)



Vacuum breaking control solenoid is actuated (blow-off)

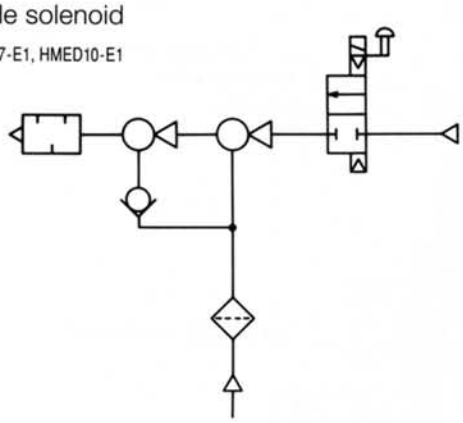


MATERIALS OF MAIN PARTS

Item	Parts	Materials
Micro Ejector	Body	Aluminum alloy (painted) and plastic
	Nozzle	Brass
	Muffler	Plastic
	O-ring	Buna
	Gasket	
Manifold	End plate	Aluminum alloy (painted)

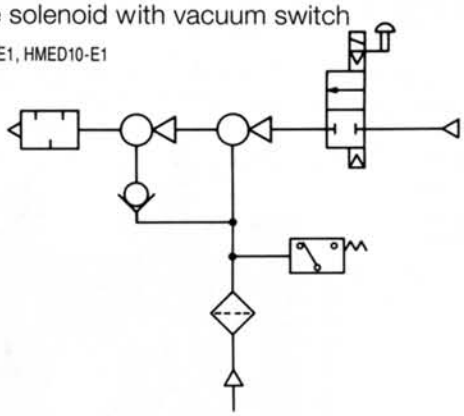
Single solenoid

HMED07-E1, HMED10-E1



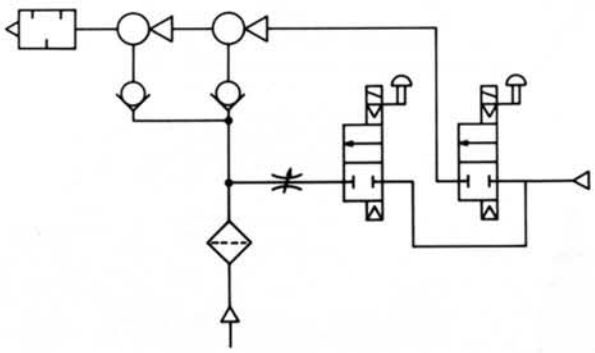
Single solenoid with vacuum switch

HMED07-E1, HMED10-E1



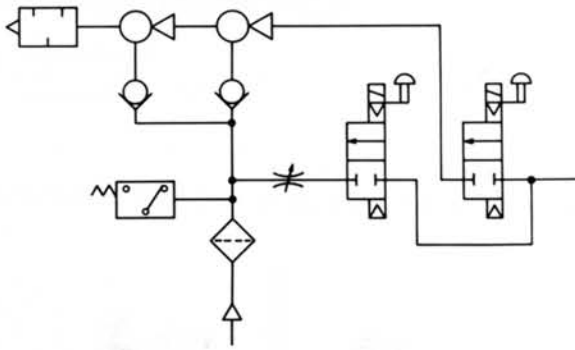
Twin solenoid

HMED07-E2, HMED10-E2



Twin solenoid with vacuum switch

HMED07-E2, HMED10-E2



WEIGHT

oz. (gf)

In line

Item		Model
		HMED07/HMED10
Single	HMED□□-E1	10.4 (295)
Twin	HMED□□-E2	11.5 (325)
Added weight	Port exhaust: -02	0.5 (14)

Calculation: HMED07-E2-02

Weight: 11.5 (325) + 0.5 (14) = 12 oz. (339 gf)

Port exhaust weight

HMED07-E2 weight

Manifold

Items		Model	
		HMED07/HMED10	
		HAMED□□-E1	HAMED□□-E2
Manifold body weight by unit	1 unit	8.8 (250)	9.9 (280)
	2 units	17.6 (500)	19.8 (560)
	3 units	26.5 (750)	29.6 (840)
	4 units	35.3 (1,000)	39.5 (1,120)
	5 units	44.1 (1,250)	4.94 (1,400)
Added weight	Manifold end plate	4.9 (140)	
	w/electronic vacuum switch: -E	0.5 (15)	

Calculation: HMEDM5A

Stn. 1 HAMED07-E1

Stn. 2 HAMED10-E1

Stn. 3 ~ 5 HAMED10-E2-E

Stn. 5: Weight: 8.8 (250) + 8.8 (250) + 3 x 9.9 (280) + 0.5 (15) + 4.9 (140) = 53.7 oz. (1,525 gf)

Manifold end plate weight

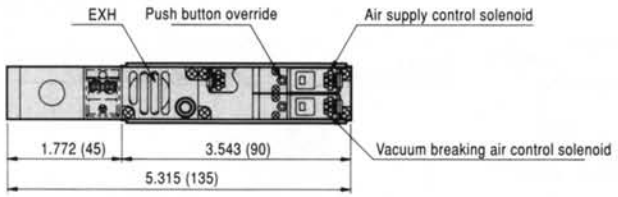
HAMED10-E2 lbs.

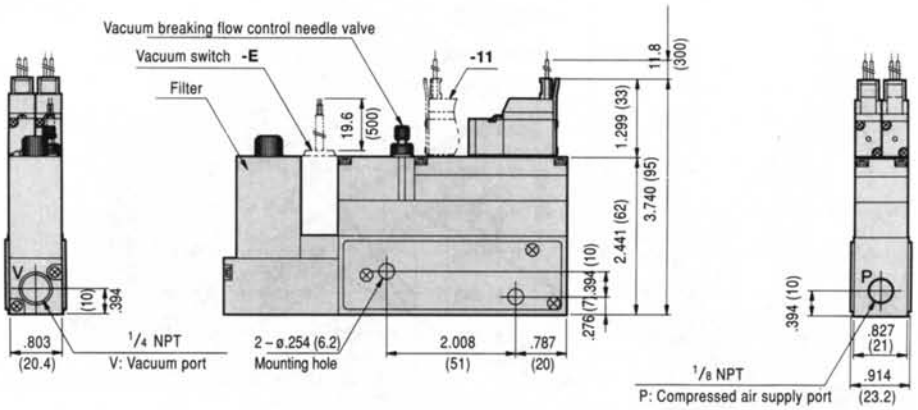
HAMED07-E1 and HAMED10-E1 lbs.

Electronic vacuum switch

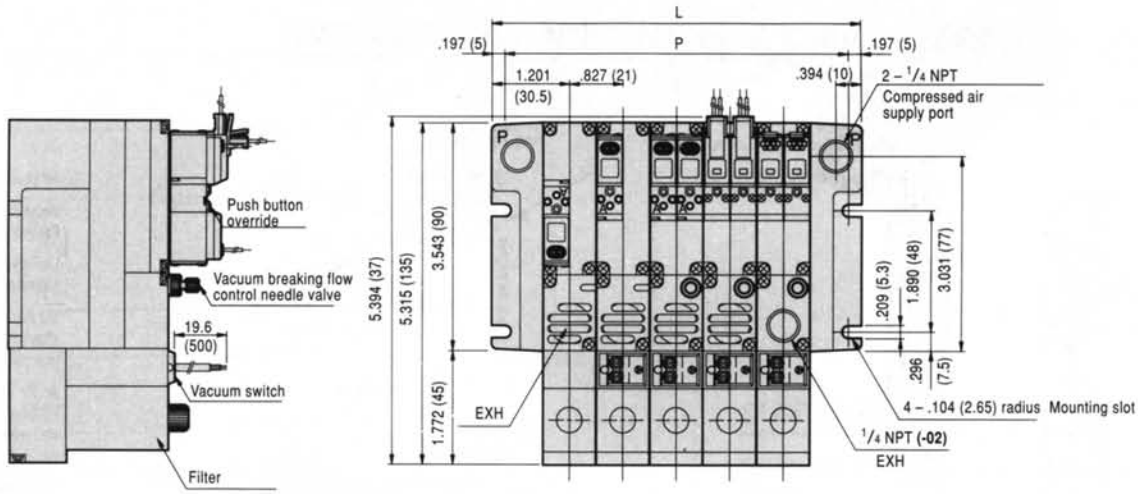
HPS310 (body only) – 0.5 oz. (15 gf)

HMED07-E2
HMED10-E2



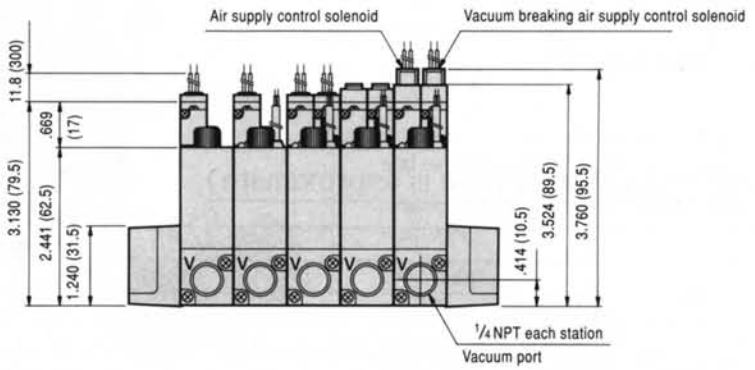


HMEDM□A



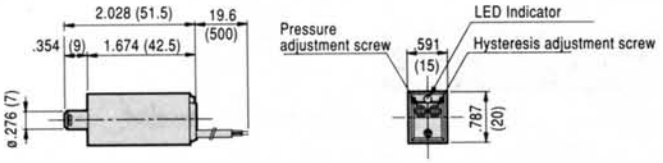
UNIT DIMENSIONS in. (mm)

Units	L	P
2	3.228 (82)	2.835 (72)
3	4.055 (103)	3.661 (93)
4	4.882 (124)	4.488 (114)
5	5.709 (145)	5.315 (135)
6	6.535 (166)	6.142 (156)
7	7.362 (187)	6.968 (177)
8	8.189 (208)	7.795 (198)
9	9.016 (229)	8.622 (219)
10	9.843 (250)	9.449 (240)



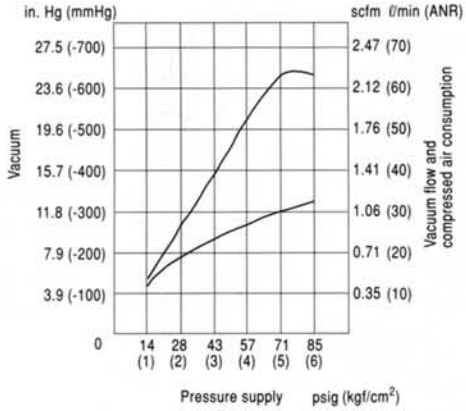
ELECTRONIC VACUUM SWITCH DIMENSIONS

HPS310

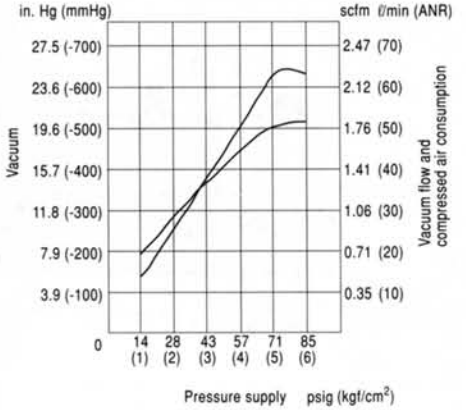


AIR CONSUMPTION/VACUUM DEGREE/FLOW AT VACUUM SIDE

HMED07

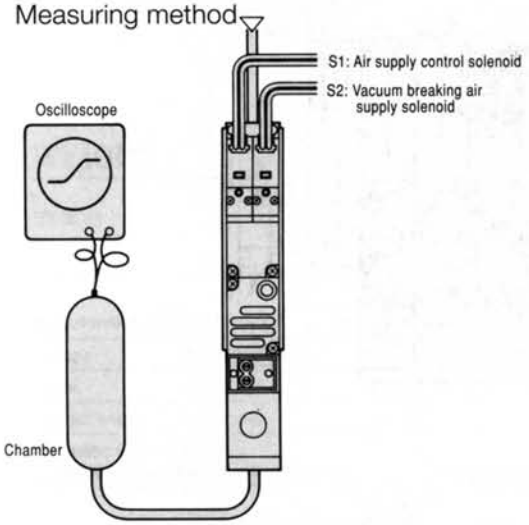


HMED10

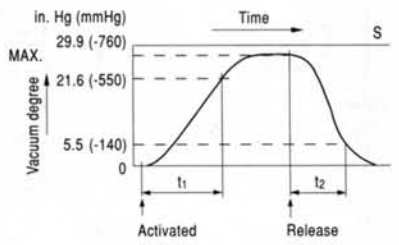


VACUUM DEVELOPMENT TIME/VACUUM BREAKING TIME

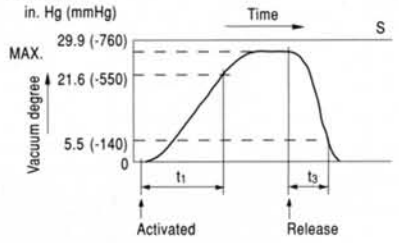
Measuring method



Single solenoid



Twin solenoid



Air pressure: 70 psig (5 kgf/cm²)

Vacuum flow control needle valve: Fully open

t_1: Time to reach 21.6" Hg in the chamber after S1 is activated.

t_2: Time to reach 5.5" Hg in the chamber after cancelling S1 activation using HMED□-E1.

t_3: Time to reach 5.5" Hg vacuum in the chamber after S2 is activated and when vacuum was at maximum vacuum degree.

Cautions:

1. The parts may still be held by vacuum even if the switch is in the OFF position.

2. When designing the control circuit, refer to all response times and compare t_2 and t_3 (vacuum arrive time and breaking time).

RESPONSE TIME (Time is approximate)

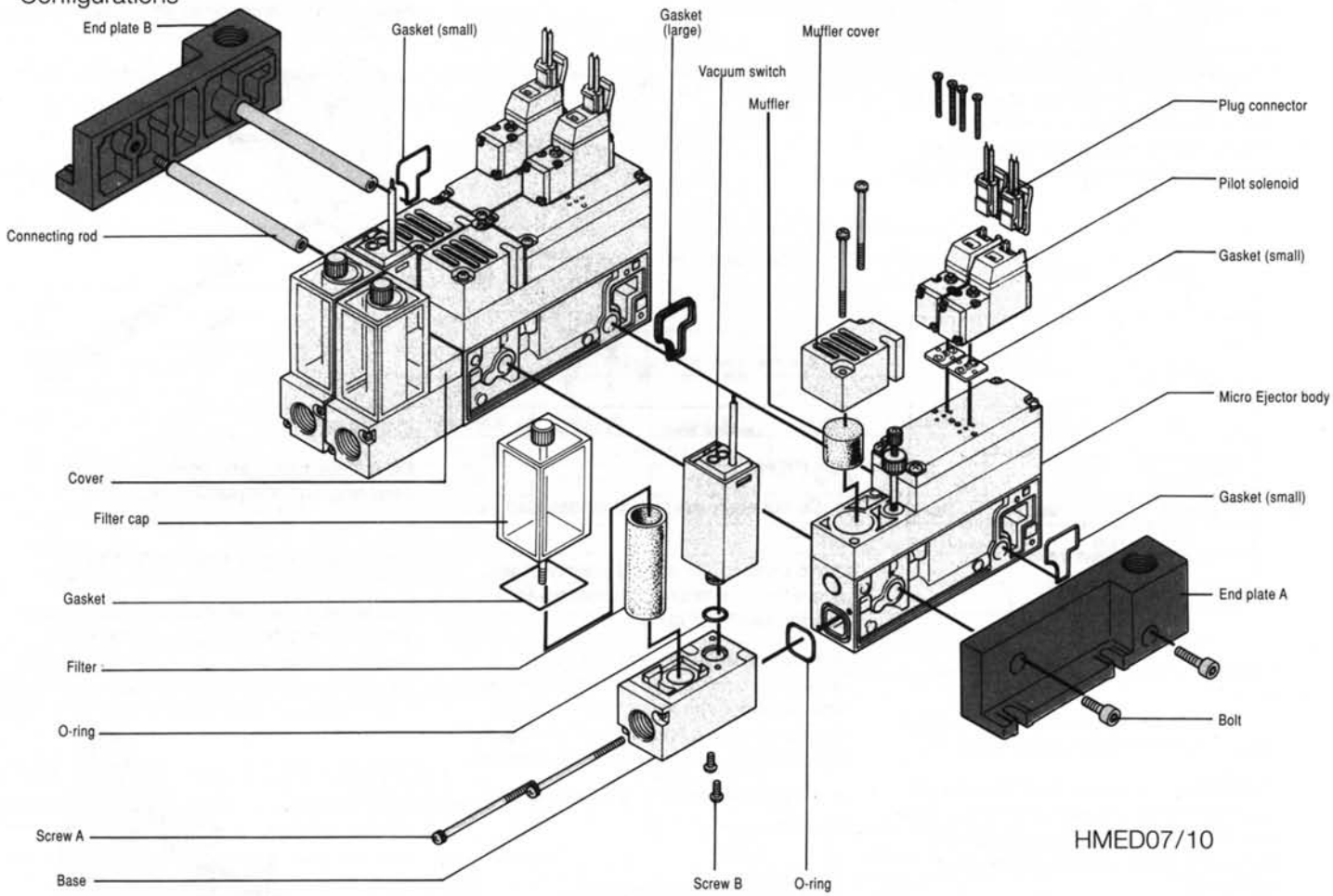
Item	Chamber capacity – in.³ (cc)											
	0.3 (5)			0.6 (10)			1.2 (20)			3.0 (50)		
	Time – sec.											
	t_1	t_2	t_3	t_1	t_2	t_3	t_1	t_2	t_3	t_1	t_2	t_3
HMED07	0.2	0.1	0.1	0.3	0.1	0.1	0.3	0.1	0.1	0.5	0.2	0.1
HMED10	0.2	0.1	0.1	0.2	0.1	0.1	0.2	0.1	0.1	0.3	0.1	0.1

Item	Chamber capacity – in.³ (cc)											
	6.0 (100)			12.0 (200)			30.0 (500)			60.0 (1000)		
	Time – sec.											
	t_1	t_2	t_3	t_1	t_2	t_3	t_1	t_2	t_3	t_1	t_2	t_3
HMED07	0.8	0.3	0.1	1.5	0.5	0.1	3.4	0.9	0.2	6.8	1.7	0.3
HMED10	0.5	0.2	0.1	0.9	0.3	0.1	2.1	0.5	0.2	4.1	0.9	0.3

HANDLING AND CAUTIONS

MICRO EJECTOR – DOUBLE-STEP TYPE

Configurations



MANIFOLD ASSEMBLY

1. Hand tighten connecting rods into End Plate B.

2. Assemble ejector bodies to the connecting rods.

3. Secure entire assembly to End Plate A, and tighten bolts with hex drive wrench (not supplied).

NOTES:

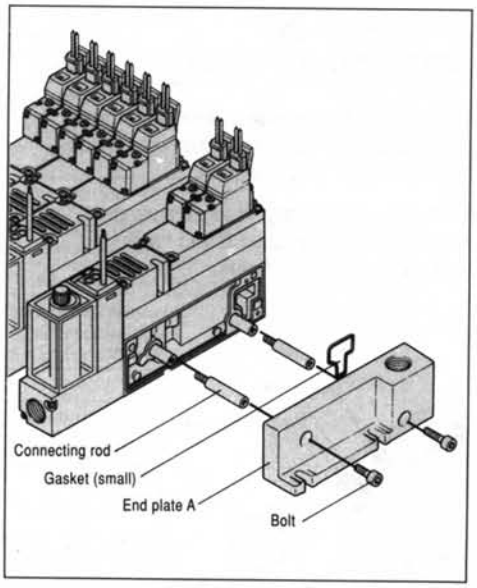
1. Place end plates on a flat surface to tighten connecting rods and screws.

2. Use a large gasket between ejector bodies and a small gasket on each end plate.

STACKING (HCMED)

Remove screws from End Plate A. Hand tighten two stacking rods to connecting rods attached to End Plate B. Make sure connecting rods are firmly attached to End Plate B.

Use gaskets as specified above between ejector bodies and end plates.



CAUTION:

HMED Series. Ejector bodies function as manifolds eliminating the need for separate block plates. When assembling a stack, follow the instructions above. Reduction of unit cannot be done due to fixed length connecting rods.

ELECTRONIC VACUUM SWITCH

Installation: Remove cover to install vacuum switch:

1. Remove both A screws to separate the base from ejector body.

2. Remove both B screws to release the cover.

3. Mount vacuum switch body to the base and secure with both B screws.

4. Mount ejector body to the base with both A screws.

CAUTION:

1. Be sure to install o-ring between vacuum switch body and base. Before connecting switch and base, blow all foreign material from these components. Foreign objects may cause leakage and improper operation.

2. Refer to pressure adjusting and connecting information, page 3.

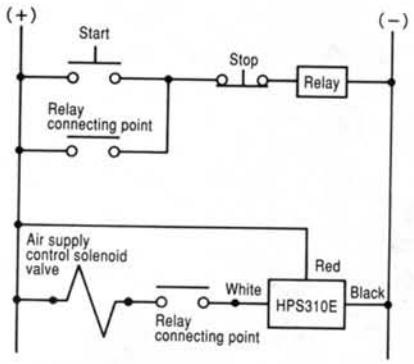
FUNCTION

HMED07/10 SERIES

Single solenoid air supply control.

Twin solenoid vacuum breaking control and air supply control.

With twin solenoid, by supplying air to the vacuum side, breaking vacuum and blow-off is achieved. The vacuum flow control needle permits setting flow manually. Vacuum can be maintained using a check valve and cutting off air flow to the inlet port.



PIPING

1. Connect air supply to inlet port. Connect vacuum work (pads) to vacuum port.

2. Manifolds have a common inlet on each end. One inlet is plugged for shipping. Connect air supply to both ends. Or remove plug and seal with sealant, and re-plug before use.

3. The use of 1/4-inch I.D. polyurethane tubing is recommended for plumbing to vacuum port on HMED07/10 series Micro Ejectors.

CAUTION:

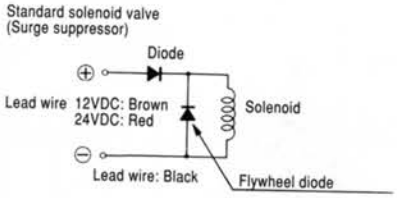
1. Performance can be adversely affected by supply lines of insufficient diameter or excessive length. If diameter is too small, pressure and vacuum will be insufficient and performance will be adversely affected.

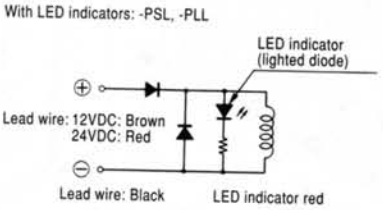
2. Avoid excessively long or coiled tubing. Do not use elbow fittings between Micro Ejector and vacuum pads.

3. Manifolds should not exceed ten stations for HMED07 models or five stations for HMED10 models. Longer manifolds adversely affect flow.

SOLENOIDS

INTERNAL CIRCUIT





CAUTION:

1. Do not apply mega-test across lead wires.

2. No shorting will occur if polarity of lead connections is incorrect, however Micro Ejector will not function.

3. If current leakage within the circuit exceeds the recommended maximum, the solenoid may not de-energize. This malfunction can be demonstrated by vacuum not decaying when solenoid is de-energized.

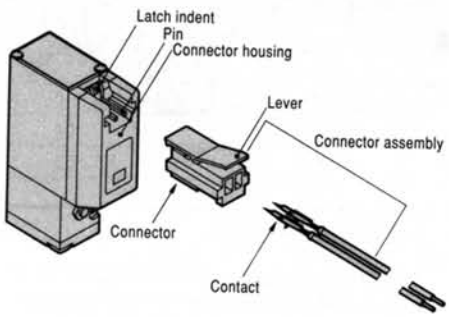
4. Do not energize twin solenoids simultaneously.

PLUG CONNECTOR

ATTACHING AND REMOVING CONNECTOR

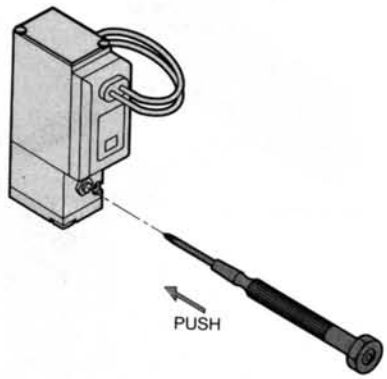
Hold connector between thumb and forefinger and push connector onto pins. Push until lever claw engages pins.

To remove connector, squeeze lever and connector between thumb and forefinger and pull connector off pins.



NON-LOCKING PUSHBUTTON OVERRIDE

Actuate by fully depressing pushbutton with small tool. Micro Ejector remains activated until pushbutton is released. Upon release, Micro Ejector returns to normal position.

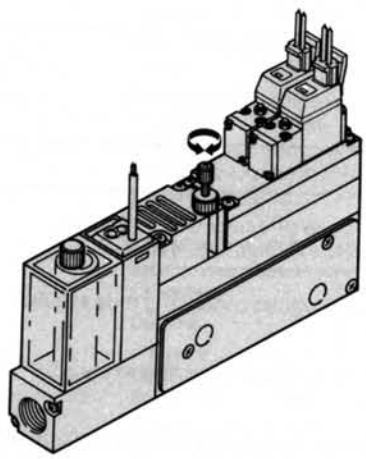


CAUTION:

Do not use tools with needle sharp tips. They may damage pushbutton.

CONTROLLING VACUUM FLOW

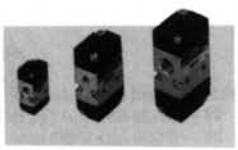
To decrease flow, turn control needle clockwise. To increase flow, turn control needle counter-clockwise.



MICRO EJECTOR – SINGLE- AND DOUBLE-STEP

HME03, HME05, HME07, HMEDT07, HMEDT10, HMEDT12, HMEDT14

Non-electric, air operated models are ideal for applications where electricity cannot be used.



SPECIFICATIONS

Item		Model						
		HME03	HME05	HME07	HMEDT07	HMEDT10	HMEDT12	HMEDT14
Media		Air[NOTE 1]						
Type		Single step			Double step			
Pressure range – psig (kgf/cm²)		15 ~ 85 (1 ~ 6)			28 ~ 85 (2 ~ 6)			
Temperature range – °F (°C)		40 ~ 122 (5 ~ 50)						
Nozzle diameter – in. (mm)		0.012 (0.3)	0.020 (0.5)	0.028 (0.7)	0.028 (0.7)	0.039 (1.0)	0.047 (1.2)	0.055 (1.4)
Vacuum degree[NOTE 2] – in. (mm) Hg		23.6 (–600)	25.6 (–650)		24.8 (–630)			
Flow at vacuum[NOTE 2] – scfm (ℓ/ min. ANR)		0.11 (3.0)	0.22 (6.3)	0.49 (12.5)	0.88 (25)	1.77 (50)	3.00 (85)	3.35 (95)
Air consumption[NOTE 2] – scfm (ℓ/ min. ANR)		0.16 (4.5)	0.41 (11.5)	0.81 (23)	0.81 (23)	1.62 (46)	2.54 (72)	3.39 (96)
Lubrication		None						
Filtration – μm		30 micron						
Port size	Vacuum port	10-32 UNF		1/8" NPT			1/4" NPT	
	Air supply port	M3x0.5	10-32 UNF		1/8" NPT		1/4" NPT	
Mounting direction		Free						

NOTE 1: HMEDT models must have clean dry air (no oil, mists, dust, moisture, etc.).
NOTE 2: Valves are approximate and measured at 70 psi (5 kgf/cm²).

ELECTRONIC VACUUM SWITCH SPECIFICATIONS (HMEDT Models)

Item		Model
		HPS310
Media		Air or inert gas
Temperature – °F (°C)		14 ~ 140 (–10 ~ 60)
Humidity – %RH		35 ~ 95
Pressure range – in. (mm) Hg		30 ~ 0 (–760 ~ 0)
Maximum set pressure – in. (mm) Hg		30 ~ 3 (–760 ~ –76)
Differential[NOTE] – %		2 ~ 9
Repeatability		±3% FS max. (32 ~ 122° F/0 ~ 50° C)
Electric specifications	Operating method	NPN open collector output (ON when below set pressure)
	Power range – VDC	12 ~ 24 ±10% (max. ripple Vp-p 10%)
	Open/close capacity	30VDC•100mA max. Internal drop-out power: Max. 1V at load current 100mA, Max. 0.4V at load current 16mA
	Current consumption – mA max.	20
	Insulation resistance – MΩ	(500 VDC) Minimum 100
	Surge suppression	Zenar diode standard
Mechanical features	Shock – G	50
	Vibration	10 ~ 55 Hz (vibration range – length 1.5mm) or 10 CT (XYZ axis. 2 hours max each)
LED		LED indicator ON (red)
Lead wire		Nylon cap tire: 0.14 sq. x 3 centers (white/black/red) x 19.6 in. (500mm) (entire length)
Mounting		Any direction
Material (Body cover)		Plastic

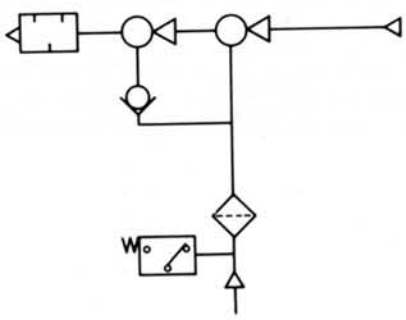
NOTE: Set pressure at 25.5" Hg (–650mm Hg).

WEIGHT oz. (gf)

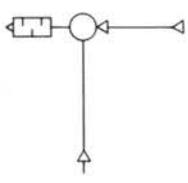
Model	Weight	Model (w/electronic vacuum switch)	Weight
HME03	0.3 (9)	–	–
HME05	1.2 (34)	–	–
HME07	1.8 (52)	–	–
HMEDT07	2.6 (75)	HMEDT07-E	3.7 (105)
HMEDT10		HMEDT10-E	
HMEDT12	4.6 (130)	HMEDT12-E	6.0 (170)
HMEDT14		HMEDT14-E	

SYMBOLS

HMEDT07-E
HMEDT10-E
HMEDT12-E
HMEDT14-E



HME03
HME05
HME07



HOW TO ORDER INFORMATION

HME [ ] [ ] – [ ]

Vacuum switch (HPS310)[Note]
Blank — no switch
E — with switch

Size, type and orifice–in. (mm) diameter
03 — Single step 0.012 (0.3)
05 — Single step 0.020 (0.5)
07 — Single or double step 0.028 (0.7)
10 — Double step 0.039 (1.0)
12 — Double step 0.047 (1.2)
14 — Double step 0.055 (1.4)

Type
Blank — Single step
DT — Double step

Series

NOTE: HMEDT, double step only.

ELECTRONIC VACUUM SWITCH ORDERING INFORMATION

HPS310 - **24VDC** - [ ]

Lead wire length
Blank — 19.6 in. (nom.) 500m
L — 78 in. (nom.) 2000mm (ac

12 ~ 24VDC switch

Vacuum switch

REPLACEMENT PARTS (HMEDT)

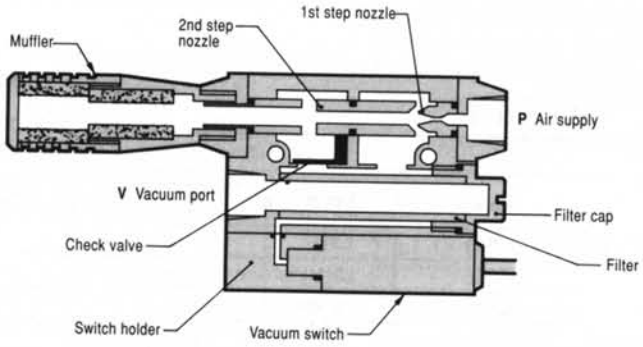
HMEDT [07] - **F**

Replacement part
F — Filter

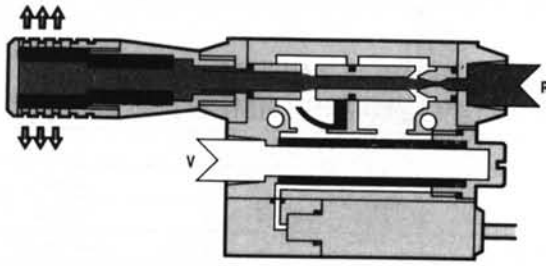
07 — HMEDT07
HMEDT10
12 — HMEDT12
HMEDT14

OPERATION PRINCIPLE AND PART NAMES

Unactuated



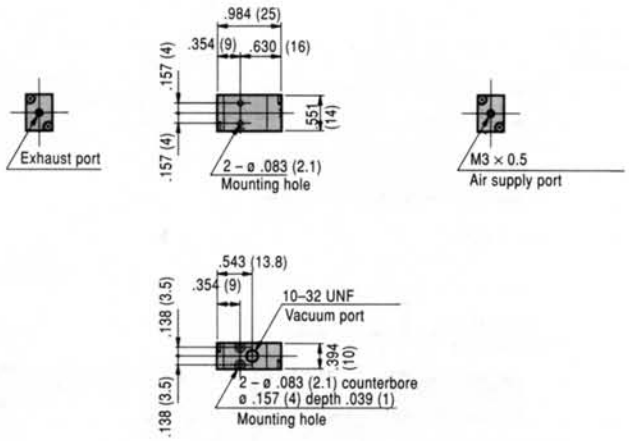
Actuated (vacuum starts)



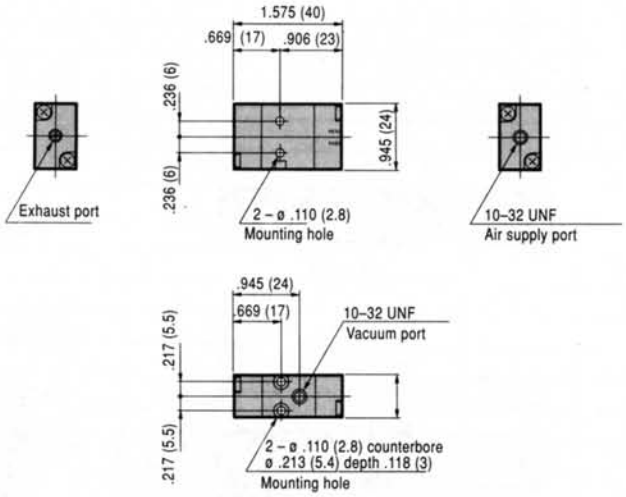
MATERIALS

Item	Material
Body	Aluminum (painted)
Nozzle	Brass
Filter, muffler	Plastic
O-ring gasket	Buna
Switch holder	Anodized aluminum

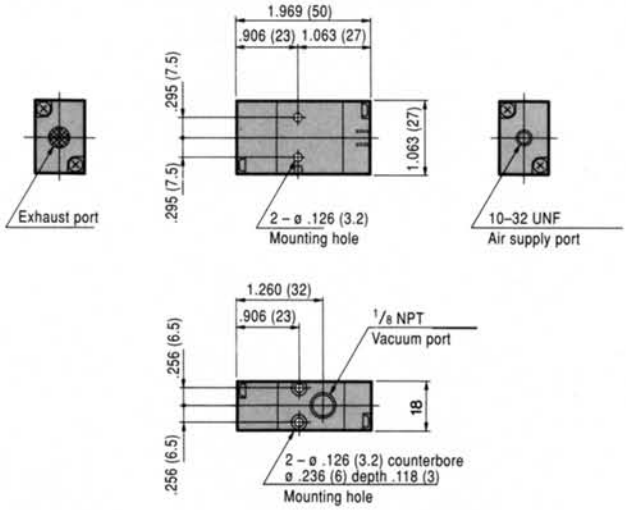
HME03



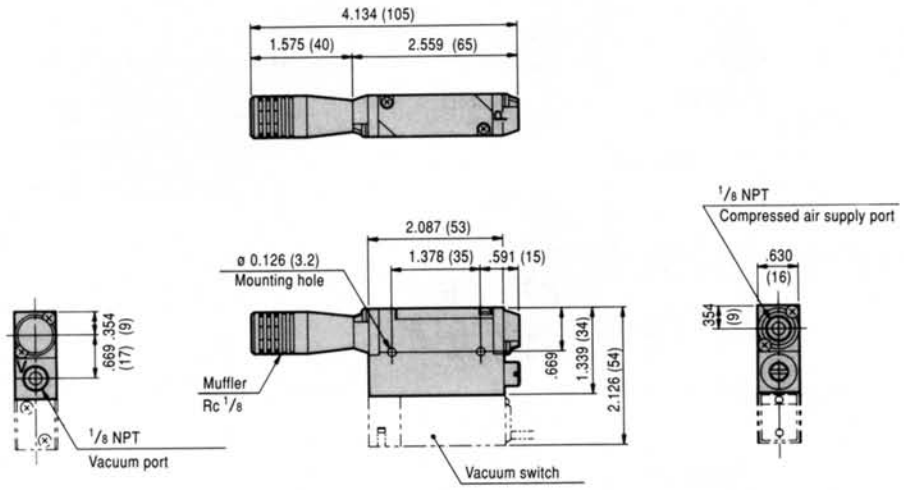
HME05



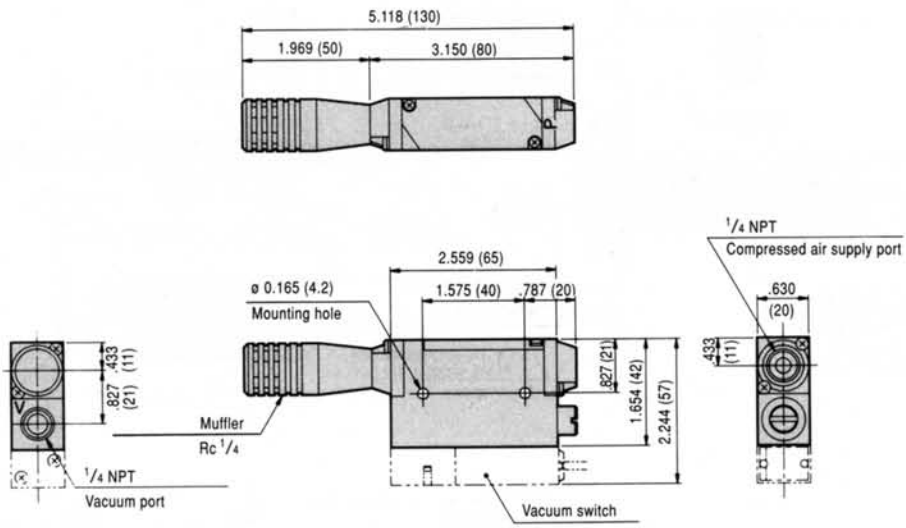
HME07



HMEDT07-E
HMEDT10-E

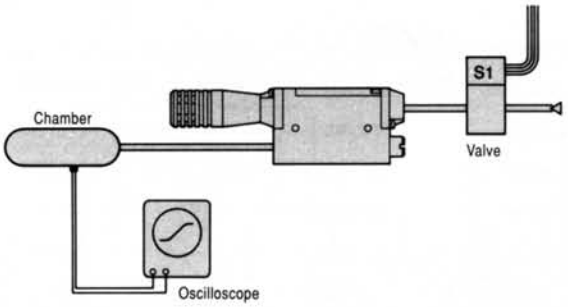


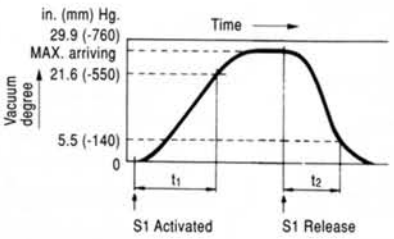
HMEDT12-E
HMEDT14-E



VACUUM DEVELOPMENT TIME/VACUUM BREAKING TIME

Measuring method





Air pressure: 70 psig (5 kgf/cm²)

t_1: Time to reach 21.6" Hg in the chamber after S1 is activated.

t_2: Time to reach 5.5" Hg in the chamber after cancelling S1 activation with HMED□-E1.

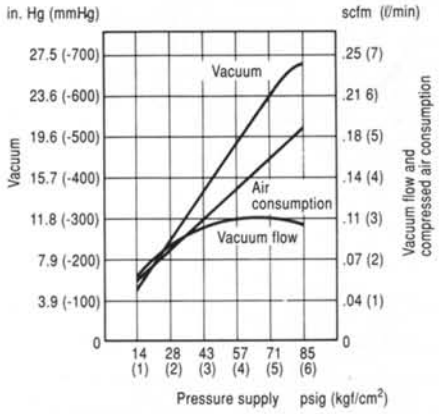
RESPONSE TIME (Time is approximate)

Item	Chamber capacity – in. (cc)									
	0.3 (5)		0.6 (10)		1.2 (20)		3.0 (50)		6.0 (100)	
	Time – sec.									
	t_1	t_2	t_1	t_2	t_1	t_2	t_1	t_2	t_1	t_2
HME03	0.4	0.1	0.7	0.2	1.1	0.3	3.2	0.6	5.8	1.1
HME05	0.2	0.1	0.3	0.1	0.5	0.1	1.5	0.3	2.6	0.5
HME07	0.1	0.1	0.2	0.1	0.3	0.1	0.6	0.2	1.0	0.3
HMEDT07	0.2	0.1	0.2	0.1	0.3	0.1	0.4	0.2	0.7	0.3
HMEDT10	0.1	0.1	0.1	0.1	0.2	0.1	0.3	0.1	0.4	0.2
HMEDT12	0.1	0.1	0.1	0.1	0.2	0.1	0.2	0.1	0.3	0.1
HMEDT14	0.1	0.1	0.1	0.1	0.1	0.1	0.2	0.1	0.3	0.1

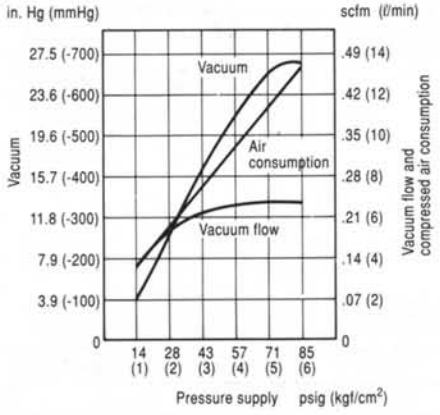
Item	Chamber capacity – in. (cc)							
	12.0 (200)		30.0 (500)		60.0 (1000)		120.0 (2000)	
	Time – sec.							
	t_1	t_2	t_1	t_2	t_1	t_2	t_1	t_2
HME03	–	–	–	–	–	–	–	–
HME05	7.0	0.8	12.0	1.8	–	–	–	–
HME07	1.8	0.4	4.7	1.0	–	–	–	–
HMEDT07	1.2	0.4	2.7	0.8	5.2	1.6	–	–
HMEDT10	0.7	0.3	1.4	0.5	2.7	0.8	5.5	1.5
HMEDT12	0.5	0.2	0.9	0.3	1.8	0.6	3.5	1.1
HMEDT14	0.4	0.2	0.8	0.3	1.6	0.5	3.1	0.9

AIR CONSUMPTION
VACUUM DRIVING DEGREE
VACUUM SIDE FLOW

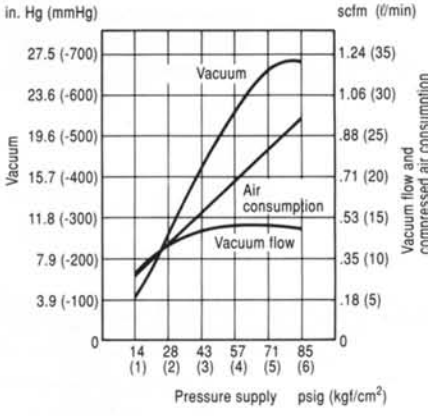
HME03



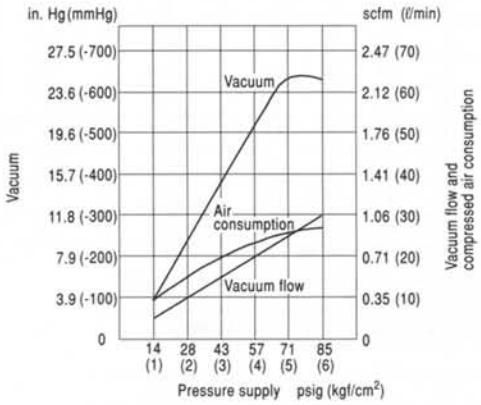
HME05



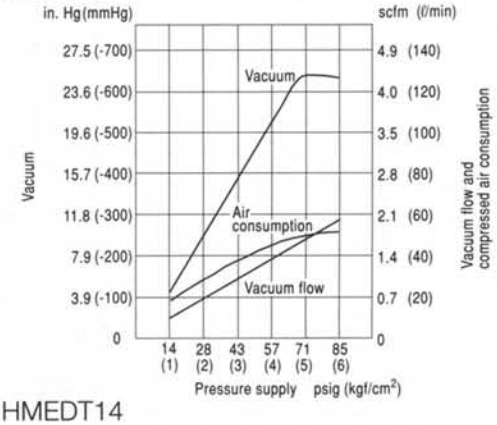
HME07



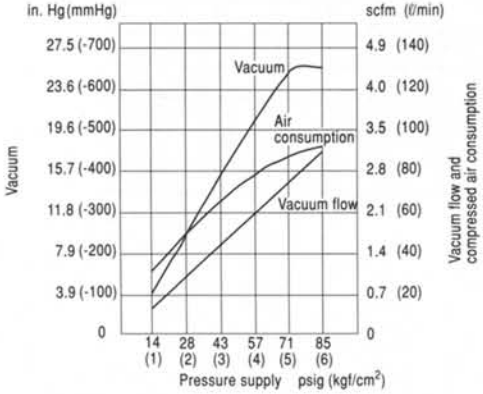
HMEDT07



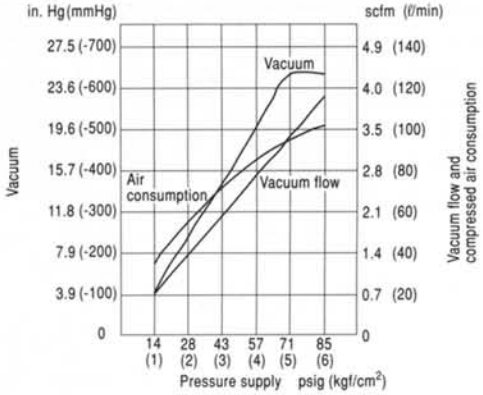
HMEDT10



HMEDT12



HMEDT14



GENERAL CAUTIONS

1. Use cover to protect from water, oil or dust.

2. Before connecting fittings and tubing, blow out all foreign material. If using a sealant, take extra care that sealant does not enter Micro Ejector causing malfunction and/or leaks.

3. Compressed air should be clean and uncontaminated. Install an air filter with filtering capacity of 40 microns. Periodically remove and clean or replace filter element.

4. Supply air should be regulated to pressures listed in the specifications. In applications involving long runs of piping to the Micro Ejector, the pressure should be on the high side of these specifications.

5. Use one vacuum pad for each Micro Ejector. If two or more vacuum pads are used per Micro Ejector, vacuum development times may be lengthened or improper pick up of parts may occur.

6. Periodically change the filter provided as standard equipment for manifolds.

7. Compressed air and vacuum are powerful forces and may be dangerous. Before attempting to remove a component from an air or vacuum line or system, *always* disconnect the supply air and thoroughly exhaust the line or system. *Never* attempt to construct, operate, or service anything using compressed air unless you have been properly trained to do so. Failure to heed this warning could result in SERIOUS, EVEN FATAL, PERSONAL INJURY.

FLOW CONTROL VALVES - HTSCO SERIES

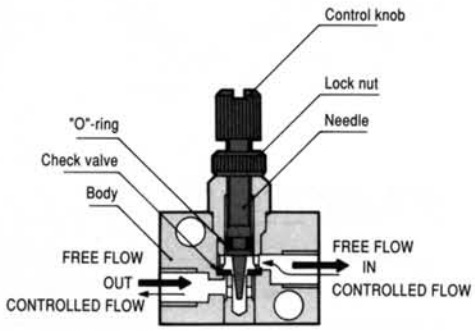
M3x0.5mm

- Able to control speed on sensitive M3 port pen cylinders.
- Extra small, lightweight, easy handling.

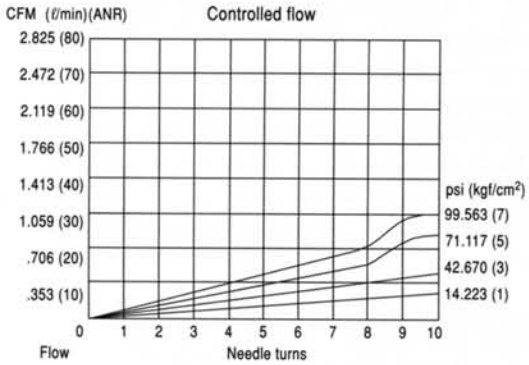
SPECIFICATIONS

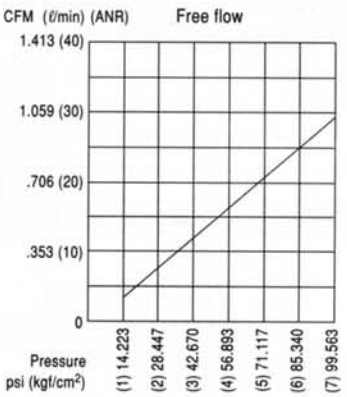
Item		Model			
		HTSCO	HTSCO-L	HTSCO-UC	HTSCO-UL
Piping method	Controlled flow in	Female thread		Universal male thread	
	Controlled flow out	Female thread			
Port dimension		M3x0.5			
Media		Air			
Max. pressure psi (kgf/cm²)		100 (7)			
Guaranteed pressure psi (kgf/cm²)		150 (10.5)			
Cracking pressure psi (kgf/cm²)		7.112 (0.5)			
Temperature range °F (°C)		41 ~ 140 (5 ~ 60)			
Weight oz. (gf)		0.177 (5)	0.141 (4)	0.212 (6)	0.212 (6)

DESIGN AND COMPONENT FEATURES



FLOW CHARACTERISTICS





MATERIALS

Name	Materials
Body	Copper (nickel plated)
Needle	Stainless steel
Lock nut	Copper (nickel plated)
Check valve	Buna N
"O"- ring	
Control knob	Copper (nickel plated)

SPECIAL HANDLING AND PRECAUTIONS

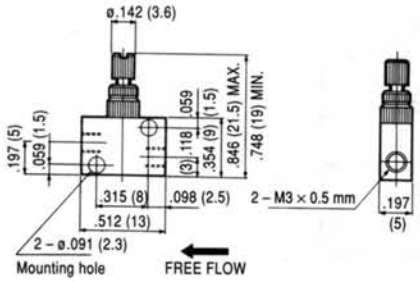
Set lock nuts and thread tightening torques below 0.362 lbs.·ft. (5 kgf·cm).

When closing the needle completely, lightly tighten by turning control knob with fingers. If tightened too tight, it may break.

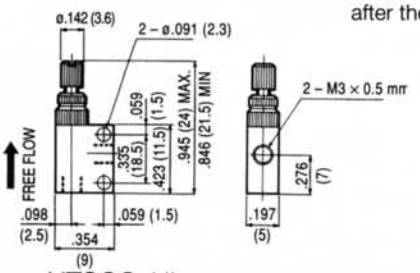
Universal male thread type should be connected after the male piping thread is tightened.

DIMENSIONS inches (mm)

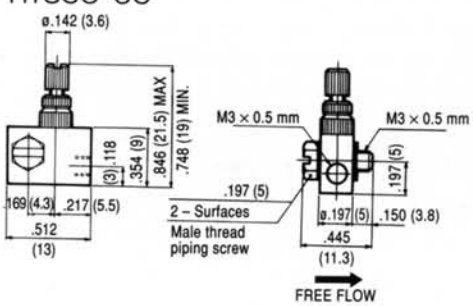
HTSCO



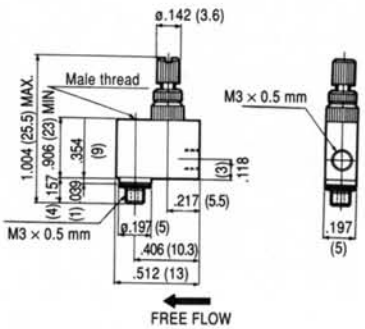
HTSCO-L



HTSCO-UC



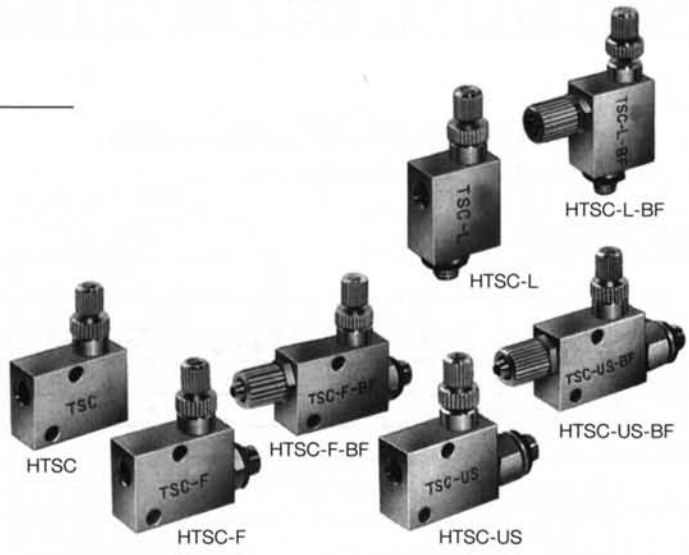
HTSCO-UL



HTSC SERIES

10-32 UNF PORT, FLOW CONTROLS

- Best suited for pen and block cylinders. Extra compact and lightweight.
- Large selection of mounting options.
- Straight and "L" type controls offered.



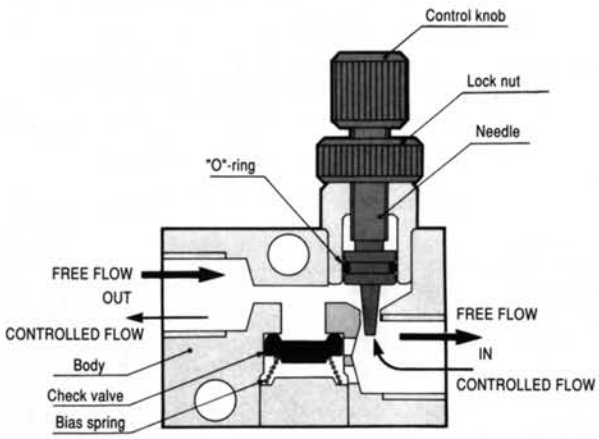
SPECIFICATIONS

Item		Model						
		HTSC	**HTSC-F**	**HTSC-F-BF**	**HTSC-US**	**HTSC-US-BF**	**HTSC-L**	**HTSC-L-BF**
Piping method and port thread	Controlled flow in	Female 10-32 UNF	Male 10-32 UNF	Male 10-32 UNF	Male swivel union 10-32 UNF		Male 10-32 UNF	Male 10-32 UNF
	Controlled flow out	Female 10-32 UNF	Female 10-32 UNF	Compression fitting for ø 4x2.5mm tubing	Female 10-32 UNF	Compression fitting for ø 4x2.5mm tubing	Female 10-32 UNF	Compression fitting for ø 4x2.5mm tubing
Media		Air						
Max. pressure psi (kgf/cm^2)		128 (9)						
Guaranteed pressure psi (kgf/cm^2)		192 (13.5)						
Cracking pressure psi (kgf/cm^2)		7.112 (0.5)						
Temperature range °F (°C)		41 ~ 140 (5 ~ 60)						
Weight oz. (gf)		0.566 (16)	0.637 (18)	0.726 (20.5)	0.673 (19)	0.761 (21.5)	0.531 (15)	0.602 (17)

MATERIALS

Name	Materials
Body	Copper (nickel plated)
Needle	Stainless steel
Lock nut	Copper (nickel plated)
Check valve	Buna N
"O"-ring	
Control knob	Copper (nickel plated)

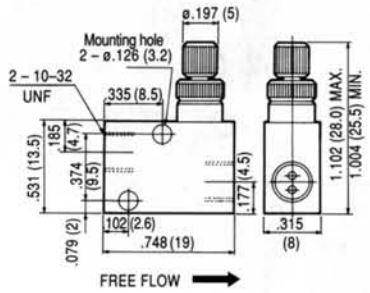
DESIGN AND COMPONENT FEATURES



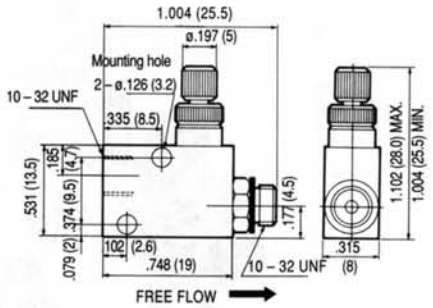
DIMENSIONS inches (mm)

Straight type

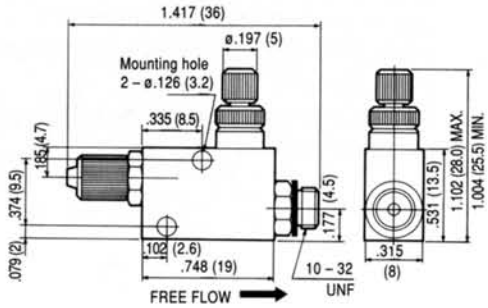
HTSC



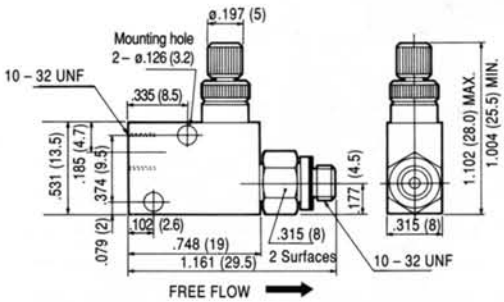
HTSC-F



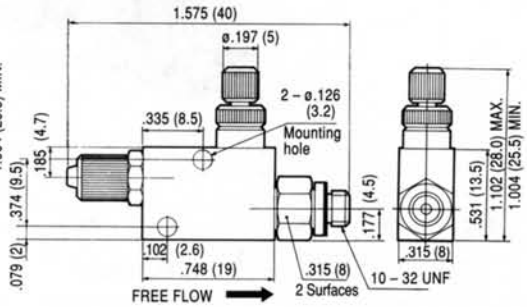
HTSC-F-BF



HTSC-US

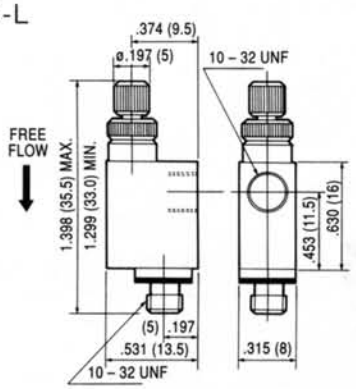


HTSC-US-BF

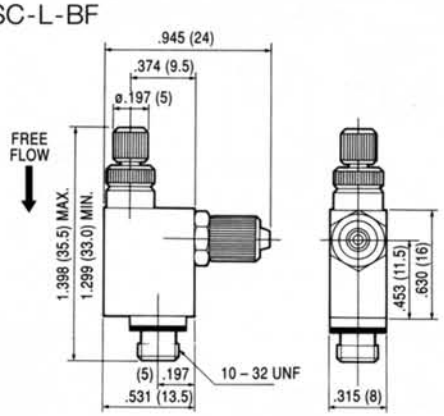


"L" type

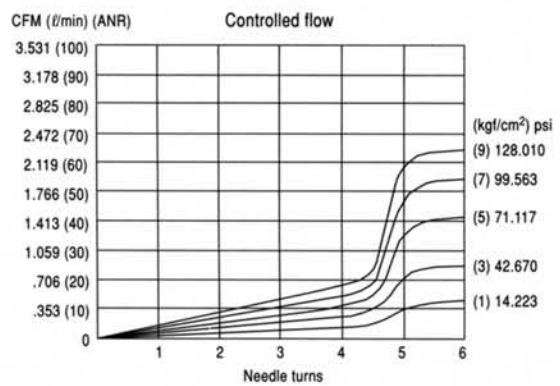
HTSC-L

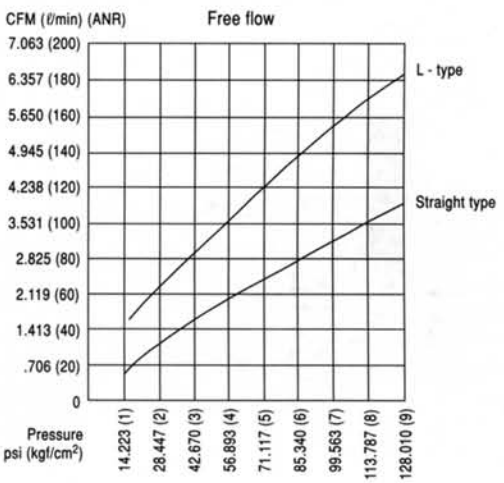


HTSC-L-BF



FLOW CHARACTERISTICS





HSC SERIES

10-32 UNF, 1/8" NPT

- Best suited for pen, block and slim cylinders. Extra compact and lightweight.
- Many mounting positions available using straight and "L" type valves.
- Swivel union type can easily set piping and needle in convenient positions.

SPECIFICATIONS

Item	Model					
	HSCO	HSCO-F	HSCO-US	HSCO-UL	SC1	HSC2
Piping methods	Female thread	Male thread	Swivel union male thread		Female thread	
			Straight	Elbow		
Port threads	10-32 UNF					1/8" NPT
Max. pressure psi (kgf/cm²)	128 (9)					
Guaranteed pressure psi (kgf/cm²)	192 (13.5)					
Cracking pressure psi (kgf/cm²)	7.112 (0.5)				5.689 (0.4)	4.267 (0.3)
Temperature range °F (°C)	41 ~ 140 (5 ~ 60)					
Weight oz. (gf)	1.058 (30)		1.234 (35)	1.269 (36)	3.103 (88)	1.939 (55)

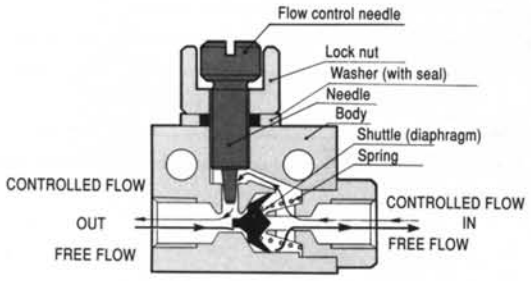
MATERIALS

Name	Materials
Body	Copper (nickel plated)
Needle	Stainless steel
Lock nut	Copper (nickel plated)
Check valve	Buna N
"O" ring	
Flow control needle	Copper (nickel plated)

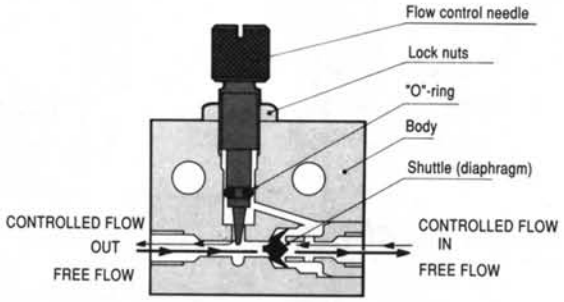
NOTE: HSC2 material is aluminum alloy.

DESIGN AND COMPONENT PARTS

HSCO

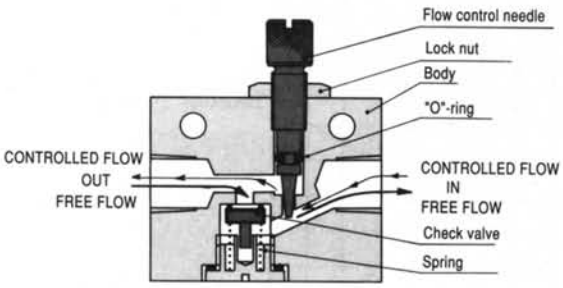


HSC1



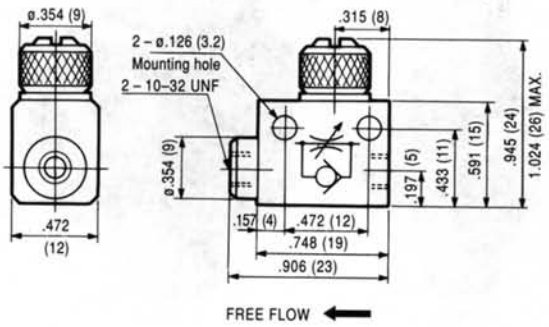
NOTE: HSC1 product not identical to product SC1.

HSC2

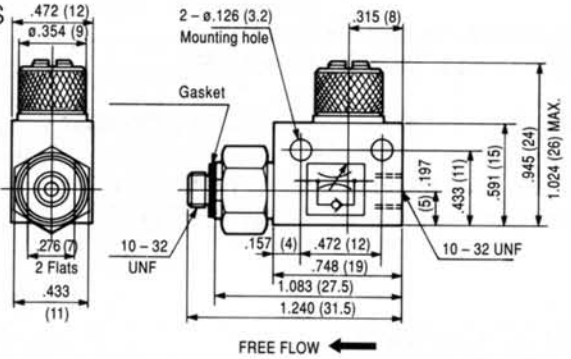


DIMENSIONS inches (mm)

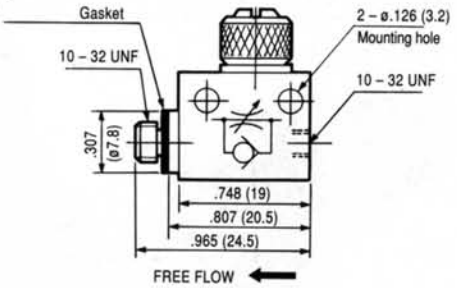
HSCO



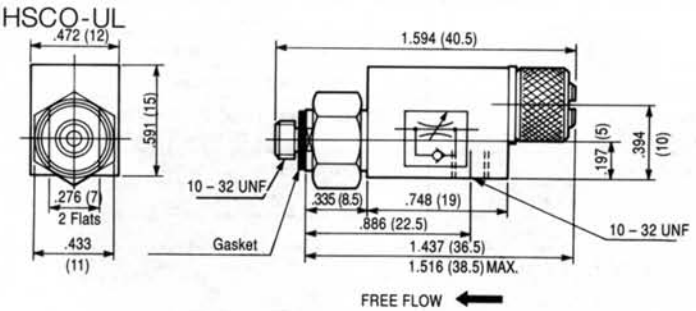
HSCO-US



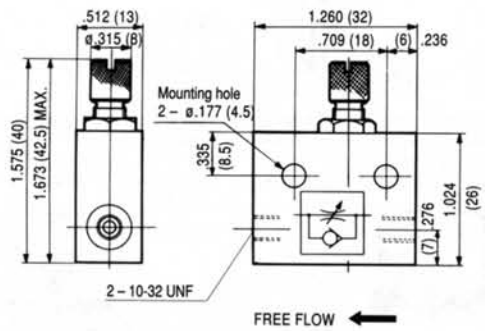
HSCO-F



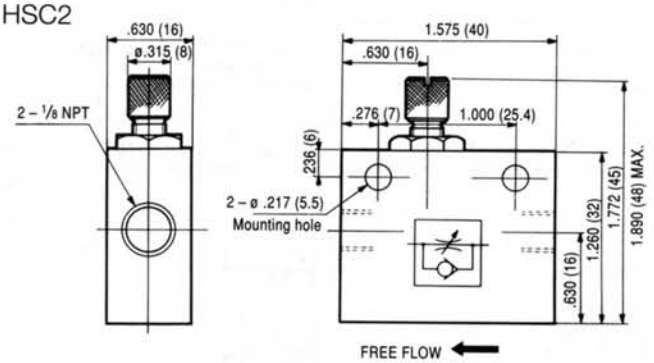
HSCO-UL



HSC1

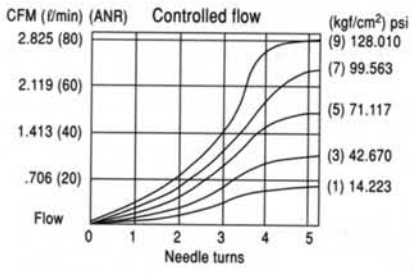


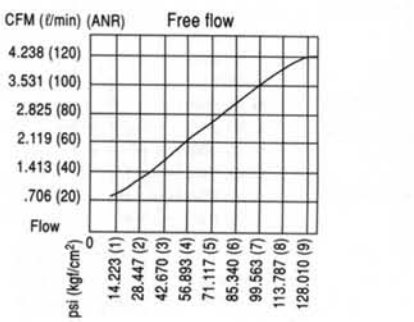
HSC2



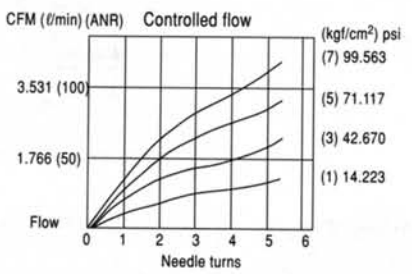
FLOW CHARACTERISTICS

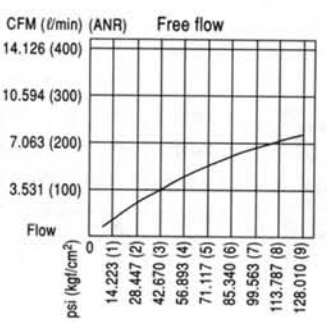
HSCO



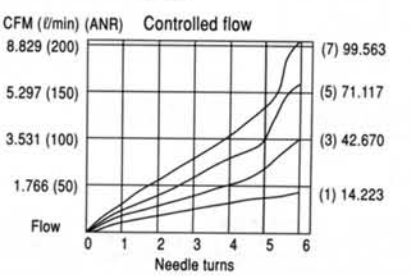


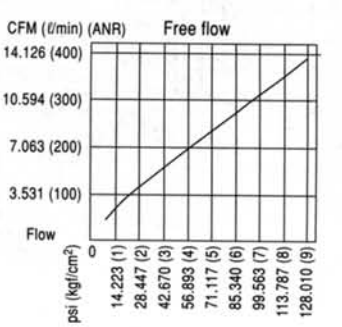
HSC1





HSC2





HSCL SERIES

Male thread: 1/8 and 1/4 inch NPT
Female thread: 1/8 and 1/4 inch NPT

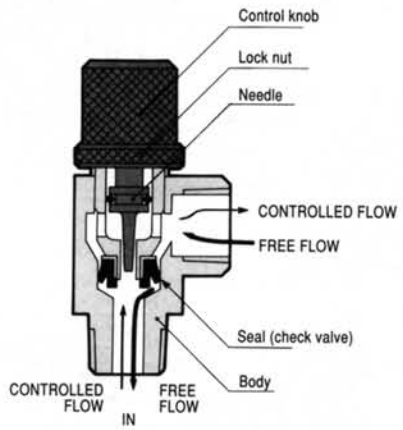
- Recommended for disposable type cylinders. Extra small, lightweight.
- Direct connection to cylinder ports.
- Compact installations. "L" type piping.

HSCL1 HSCL2

SPECIFICATIONS

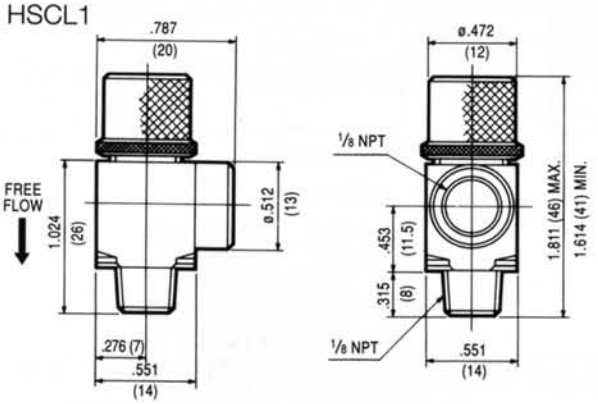
Item		Model	
		HSCL1	HSCL2
Type mounting		Male thread specifications	
Piping connections dimensions		1/8" NPT control flow "in" male, "out" female	1/4" NPT control flow "in" male, "out" female
Media		Compressed air (no vacuum)	
Max. pressure psi (kgf/cm²)		128 (9)	
Guaranteed pressure psi (kgf/cm²)		192 (13.5)	
Cracking pressure psi (kgf/cm²)		8.534 (0.6)	
Temperature range °F (°C)		41 ~ 140 (5 ~ 60)	
Weight		1.628 (46)	4.425 (125)
Materials	Body	Copper (nickel plated)	
	Needle	Stainless steel	
	Seal	Buna N	

DESIGN AND COMPONENT FEATURES

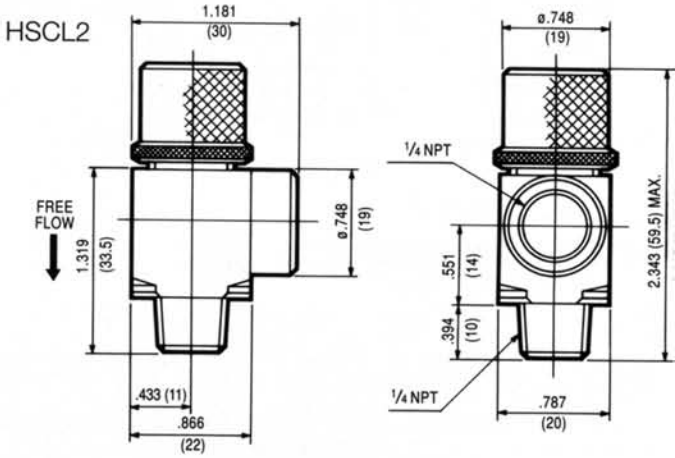


DIMENSIONS inches (mm)

HSCL1

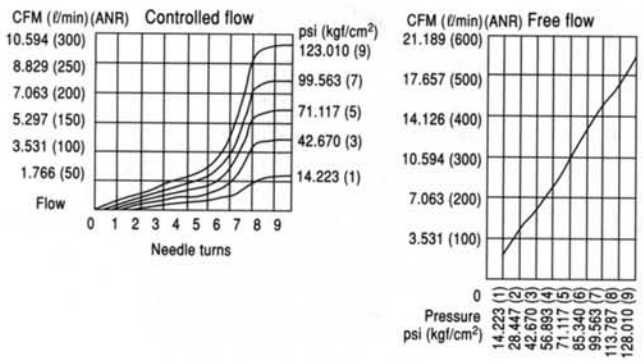


HSCL2

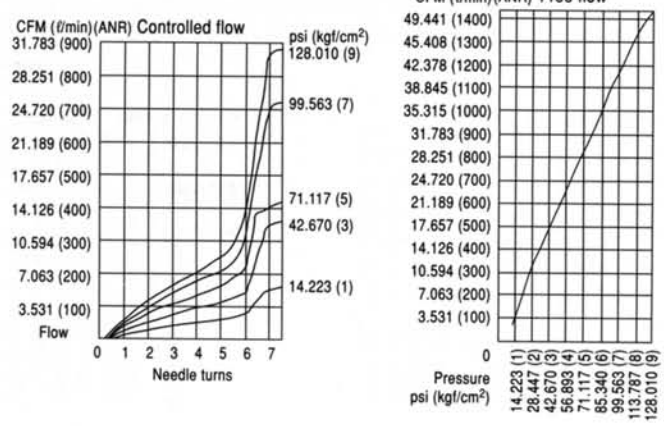


FLOW CHARACTERISTICS

HSCL1



HSCL2



Humphrey Super Quick Exhaust Valves

Humphrey Super Quick Exhaust valves feature a special molded shuttle designed especially for quick exhaust valve service. The shuttle's full-formed seating surface provides long cycle life and outperforms the flat-disk (sheet stock) diaphragms found in competitive valve designs. Because of its shuttle design, the Humphrey Super Quick Exhaust valve does not require the flow-restricting metal body webbing used in flat-disk designs. There are many practical uses for these low-cost Super Quick Exhaust valves, and there is a size for virtually every need, with pipe ports from #10-32 to ¾-inch.

SQE1

SQE2

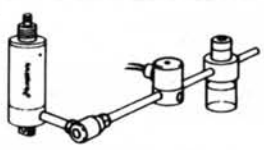
QE2

QE3

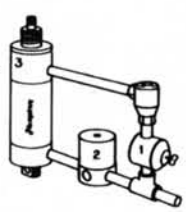
How Super Quick Exhaust Valves are used to enhance the performance of air cylinders

Lubrication Problem. Small bore cylinders are often poorly lubricated due to the small displacement of air per cycle. Lubricant back-flows through control valve on the exhaust cycle without reaching cylinder. Oil traces at the valve exhaust port does not prove proper cylinder lubrication.

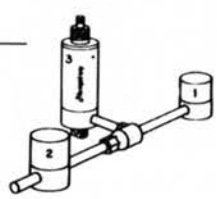
Solution: Close nipple Super Quick Exhaust to cylinder. This stops back-flow and allows progressive oil flow to cylinder. Oil traces at the Super QE exhaust port prove cylinder lubrication.



"Air Spring" Return. Provides controlled "air spring" return, a potential advantage over standard spring return cylinders in that the "air spring" return force can be adjusted by a regulator. Also provides a method of controlling double acting cylinders with a 3-way valve. Return-regulator (1) set at selected pressure. (2) Normally closed 3-way valve. (3) Double acting cylinder. Example of use: Cylinder rod extends with high pressure for impact. Rod retracts under low pressure.



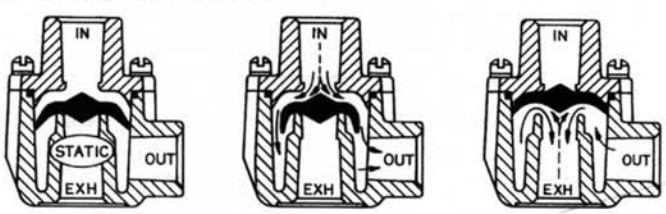
Super Quick Exhaust used as a shuttle valve. Air from 3-way valves (1 or 2) always directed to cylinder (3).



High-Low Pressure. Reduce noise, shock, and stress on cylinder. Extend rod with low pressure (2) to position, hold, etc. Switch to high pressure (1) to lock, bend, reposition, etc. Return to low pressure by closing (1), or retract rod by closing (1) and (2).

How It Works:

(Broken Lines - Shuttle Valve)
(Solid Lines - Quick Exhaust)



*Always exhausts out this port. Add muffler to reduce noise. Plug for use as check valve.

QE4

QE5

8-12 Mounting Bracket for QE4 and QE5

8-1A Mounting Bracket for QE2 and QE3

Specifications

MEDIA:
Compressed Air (Consult factory for others)
PRESSURE RANGE:
150 psig (10.7 bars) Maximum
TEMPERATURE RANGE:
–25 to 180°F (–31.7 to 82.2°C)

OPERATING SPEEDS:
To 600 CPM
MATERIALS:
Zinc & Aluminum Die Cast, Zinc Plated Steel Fasteners, Buna N, Polyurethane
LUBRICATION ..... Not required

	PORT SIZE			PSI/BARS		30 PSIG	(2.1 BARS)	50 PSIG	(3.5 BARS)
MODEL	IN	OUT	EXHAUST	MIN	MAX	CFM	LPM	CPM	LPM
SQE1	⅛″	⅛″	¼″	4/.3	150/10.7	22.5	636.8	33.5	948.1
SQE2	¼″	¼″	¼″	4/.3	150/10.7	32.0	905.6	47.0	1330.1
QE2	¼″	¼″	⅜″	3/.2	150/10.7	45.0	1273.5	65.0	1839.5
QE3	⅜″	⅜″	⅜″	2/.14	150/10.7	55.0	1556.5	80.0	2264.0
QE4	½″	½″	¾″	1/.07	150/10.7	Consult Factory			
QE5	¾″	¾″	¾″	1/.07	150/10.7				

Air Flow to Atmosphere

MODEL	80 PSIG CFM	(5.5 BARS) LPM	100 PSIG CFM	(7.0 BARS) LPM	125 PSIG CFM	(8.6 BARS) LPM
SQE1	51.0	1443.3	63.0	1782.9	75.0	2122.5
SQE2	70.0	1981.0	85.0	2405.5	104.0	2943.2
QE2	96.0	2716.8	120.0	3396.0	150.0	4245.0
QE3	125.0	3537.5	155.0	4386.5	190.0	5377.0
QE4	Consult Factory					
QE5						

Weight

ACTUAL LBS	KGS
0.17	0.08
0.16	0.07
0.31	0.14
0.29	0.13
0.99	0.45
0.93	0.42

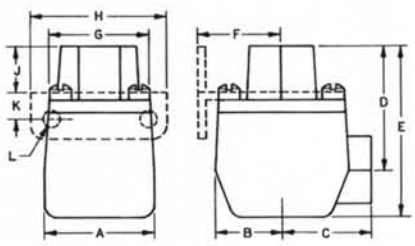
Fill/Exhaust Time (Seconds)

	PORT-NPT			A = 10 CU. IN. (164cc)	B = 100 CU. IN. (1640cc)	C = 1000 CU. IN. (16,400cc)
MODEL	IN	OUT	EXHAUST	FILL 0-80 PSIG (0-5.5 BARS) EXHAUST 100-20 PSIG (7.0-1.4 BARS)		
SQE1	⅛″	⅛″	¼″	A	.036	.022
SQE2	¼″	¼″	¼″	A	.027	.021
QE2	¼″	¼″	⅜″	B	.170	.160
QE3	⅜″	⅜″	⅜″	B	.130	.100
QE4	½″	½″	¾″	C	.537	.440
QE5	¾″	¾″	¾″	C	.508	.417

Dimensions

MODEL	A	B	C	D	E	F	G	H	J	K	L	
SQE1	1.09	.55	.81	1.40	1.86	BRACKET NOT AVAILABLE						INCHES
SQE2	27.7	13.9	20.5	30.9	42.4							MM
QE2	1.50	.83	1.25	1.78	2.38	1.14	1.50	2.19	.86	.55	.34	INCHES
QE3	38.1	21.1	31.8	45.2	60.4	28.9	38.1	55.6	21.8	13.9	.86	MM
QE4	2.18	1.14	1.81	2.78	3.66	1.48	2.00	2.75	1.33	.61	.27	INCHES
QE5	55.4	28.9	45.9	70.6	92.9	37.5	50.8	69.8	33.7	15.4	.68	MM

Steel brackets 8-1A (14 gauge) and 8-12 (12 gauge) are shipped loose. Mount to valve at 90° increment.

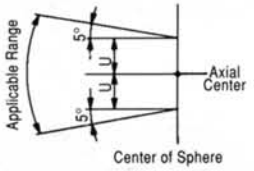


HUMPHREY CYLINDER JOINTS

- Compensates for cylinder piston rod misalignment that is common when rod is fully extended.
- Eliminates complex matching and positioning.
- Fast, easy installation.
- Compact, simple and reliable design.
- Built-in dust seal provides protection from ambient contamination.
- A variety of sizes, from 10-32 UNF to 3/4-10 UNC.

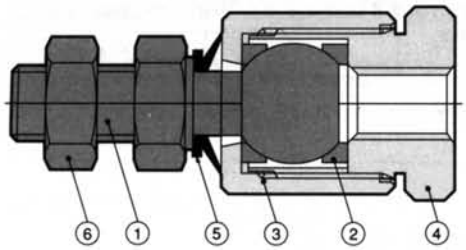
SMALL SERIES SPECIFICATIONS

Type	Piston rod thread size	Max. allowable pull force (load) lbs. (kgf)	Max. eccentricity U in. (mm)	Swivel angle
HCJ 10-32	10-32 UNF	1320 (600)	0.020 (0.5)	
HCJ 1/4-20	1/4-20 UNC	1320 (600)	0.020 (0.5)	±5°
HCJ 1/4-28	1/4-28 UNF	1320 (600)	0.020 (0.5)	



NOTE: Figures for maximum allowable pull force represent static conditions.

INNER CONSTRUCTION AND MAJOR PARTS



Number	Item	Material	Note
1	Stud	Hard steel	Nickel plated
2	Ring	Hard steel	-
3	Casing	Brass	Nickel plated
4	Socket	Brass	Nickel plated
5	Dust seal	Buna	-
6	Rod Nut	Steel	(Sold separately)

HOW TO ORDER INFORMATION

HCJ – **10 – 32**

Cylinder Joint

Thread size
- **10 – 32** — 10 – 32 UNF
- **1/4 – 20** — 1/4 – 20 UNC
- **1/4 – 28** — 1/4 – 28 UNF

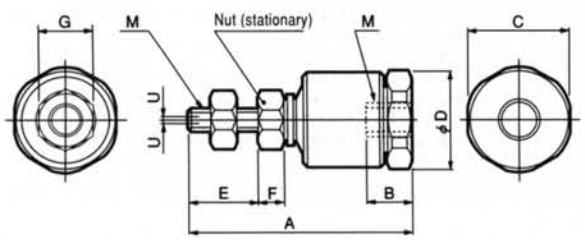
ROD NUTS

RN **8**

Rod nut

Size
- **5** — 10 – 32 UNF
- **6** — 1/4 – 20 UNC
- **7** — 1/4 – 28 UNF
- **8** — 5/16 – 18 UNC
- **9** — 5/16 – 24 UNF
- **10** — 3/8 –16 UNC
- **11** — 7/16 – 20 UNF
- **12** — 1/2 – 13 UNC
- **13** — 1/2 – 20 UNF
- **14** — 3/4 – 10 UNC

DIMENSIONS in. (mm)



Type	M	A	B	C	D
HCJ 10-32	10-32 UNF	1.299 (33)	0.276 (7)	0.551 (14)	0.591 (15)
HCJ 1/4-20	1/4-20 UNF	1.417 (36)	0.276 (7)	0.551 (14)	0.591 (15)
HCJ 1/4-28	1/4-28 UNF	1.417 (36)	0.276 (7)	0.551 (14)	0.591 (15)

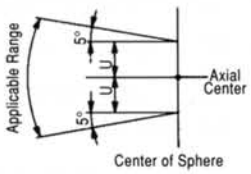
Type	E	F	G	Max. eccentricity U	Weight oz. (gf)
HCJ 10-32	0.413 (10.5)	0.157 (4)	0.315 (8)	0.020 (0.5)	0.906 (23)
HCJ 1/4-20	0.472 (12)	0.197 (5)	0.394 (10)	0.020 (0.5)	0.984 (25)
HCJ 1/4-28	0.472 (12)	0.197 (5)	0.394 (10)	0.020 (0.5)	0.984 (25)

HUMPHREY CYLINDER JOINTS

LARGE SERIES

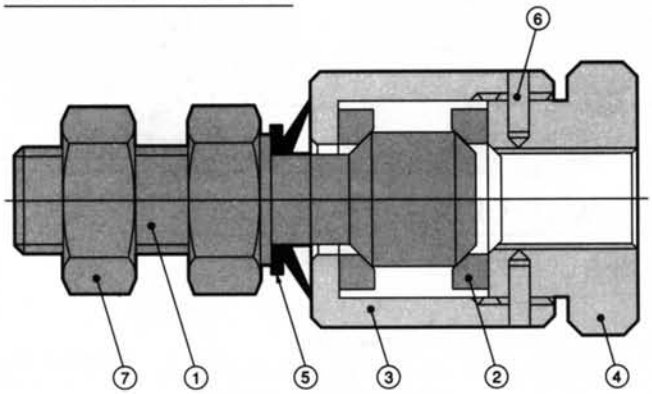
SPECIFICATIONS

Type	Piston rod thread size	Max. allowable pull force (load) lbs. (kgf)	Max. eccentricity U in. (mm)	Swivel angle
HCJ□ 5/16-18	5/16-18 UNC	4620 (2100)	0.020 (0.5)	±5°
HCJ□ 5/16-24	5/16-24 UNF	4620 (2100)	0.020 (0.5)	
HCJ□ 3/8-16	3/8-16 UNC	7040 (3200)	0.030 (0.75)	
HCJ□ 7/16-20	7/16-20 UNF	11,000 (5000)	0.040 (1.0)	
HCJ□ 1/2-13	1/2-13 UNC	11,000 (5000)	0.040 (1.0)	
HCJ□ 1/2-20	1/2-20 UNF	11,000 (5000)	0.040 (1.0)	
HCJ□ 3/4-10	3/4-10 UNC	14,080 (6400)	0.050 (1.25)	



NOTE: Figures for maximum allowable pull force represent static conditions.

INNER CONSTRUCTION AND MAJOR PARTS



Number	Item	Material	Note
1	Stud	Hard steel	Nickel plated
2	Ring	Hard steel	–
3	Casing	Hard steel	Nickel plated
4	Socket	Hard steel	Nickel plated
5	Dust seal	Buna	–
6	Pin	Steel	–
7	Rod Nut	Steel	(Sold seperately)

HANDLING INSTRUCTIONS

1. Humphrey Cylinder Joints are to be used with air cylinders. For applications other than air cylinders, consult factory.

2. Cylinder Joints are not to be used as swiveling joint connections

3. Cylinder Joints are not to be disassembled since they are filled with a lubricant.

4. The depth of the socket is within catalog specifications (Dim. B). In order to detect the actual depth, thread the cylinder rod into the female end of the joint until it bottoms out. Then "unthread" the rod to the desired position.

5. Be sure to protect the female end of the joint from contaminants such as dust particles.

HOW TO ORDER INFORMATION

HCJ [L] – [5/16 × 18]

Type
S — Short nose type
L — Long nose type*

Cylinder Joint

*Order rod nut separately, shipped loose.

Thread size
5/16 – 18 — 5/16 – 18 UNC
5/16 – 24 — 5/16 – 24 UNF
3/8 – 16 — 3/8 – 16 UNC
7/16 – 20 — 7/16 – 20 UNF
1/2 – 13 — 1/2 – 13 UNC
1/2 – 20 — 1/2 – 20 UNF
3/4 – 10 — 3/4 – 10 UNC

ROD NUTS

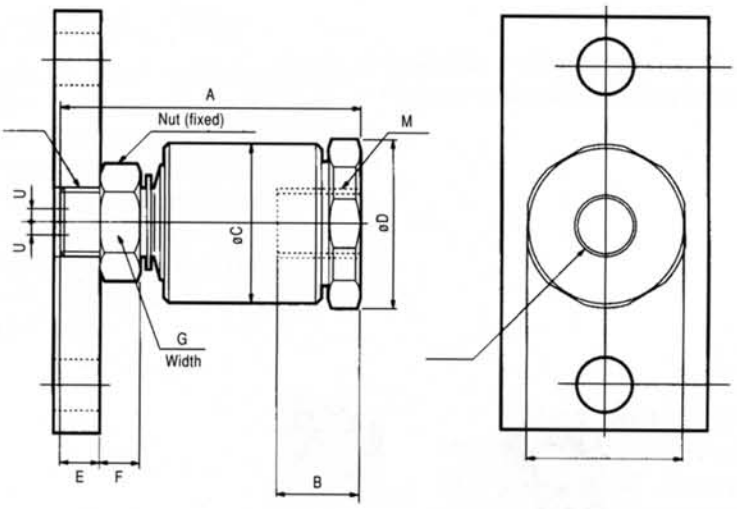
RN [8]

Rod nut

Size
5 — 10 – 32 UNF
6 — 1/4 – 20 UNC
7 — 1/4 – 28 UNF
8 — 5/16 – 18 UNC
9 — 5/16 – 24 UNF
10 — 3/8 –16 UNC
11 — 7/16 – 20 UNF
12 — 1/2 – 13 UNC
13 — 1/2 – 20 UNF
14 — 3/4 – 10 UNC

Bores 3/4 (20) ~ 2 1/2 (63)

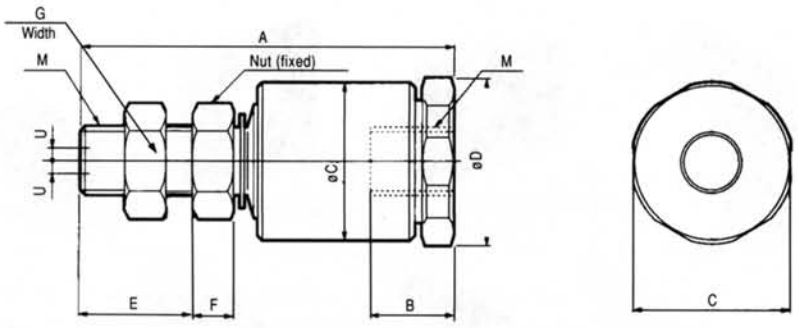
Short nose type



Type	M	A	B	C	D	E	F	G	Max. eccentricity U	Weight oz. (gf)
HCJS 5/16-18	5/16-18 UNC	1.496 (38)	0.394 (10)	0.748 (19)	0.787 (20)	0.197 (5)	0.197 (5)	0.472 (12)	0.020 (0.5)	1.76 (50)
HCJS 5/16-24	5/16-24 UNF	1.496 (38)	0.394 (10)	0.748 (19)	0.787 (20)	0.197 (5)	0.197 (5)	0.472 (12)	0.020 (0.5)	1.76 (50)
HCJS 3/8-16	3/8-16 UNC	1.890 (48)	0.472 (12)	0.945 (24)	1.004 (25.5)	0.315 (8)	0.236 (6)	0.551 (14)	0.030 (0.75)	3.53 (100)
HCJS 7/16-20	7/16-20 UNF	2.343 (59.5)	0.630 (16)	1.181 (30)	1.260 (32)	0.315 (8)	0.276 (7)	0.669 (17)	0.040 (1.0)	7.23 (205)
HCJS 1/2-13	1/2-13 UNC	2.500 (63.5)	0.630 (16)	1.181 (30)	1.260 (32)	0.433 (11)	0.315 (8)	0.748 (19)	0.040 (1.0)	7.58 (215)
HCJS 1/2-20	1/2-20 UNF	2.500 (63.5)	0.630 (16)	1.181 (30)	1.260 (32)	0.433 (11)	0.315 (8)	0.748 (19)	0.040 (1.0)	7.58 (215)
HCJS 3/4-10	3/4-10 UNC	3.031 (77)	0.827 (21)	1.496 (38)	NOTE	0.551 (14)	0.433 (11)	1.063 (27)	0.049 (1.25)	12.70 (360)

NOTE: HCJS 3/4-10 has a wrench flat on female end. Length of the flat is 0.551 (14). Width of flat is 1.063 in. (27).

Long nose type



Type	M	A	B	C	D	E	F	G	Max. eccentricity U	Weight oz. (gf)
HCJL 5/16-18	5/16-18 UNC	1.850 (47)	0.394 (10)	0.748 (19)	0.787 (20)	0.551 (14)	0.197 (5)	0.472 (12)	0.020 (0.5)	1.9 (55)
HCJL 5/16-24	5/16-24 UNF	1.850 (47)	0.394 (10)	0.748 (19)	0.787 (20)	0.551 (14)	0.197 (5)	0.472 (12)	0.020 (0.5)	1.9 (55)
HCJL 3/8-16	3/8-16 UNC	2.244 (57)	0.472 (12)	0.945 (24)	1.004 (25.5)	0.669 (17)	0.236 (6)	0.551 (14)	0.030 (0.75)	3.7 (105)
HCJL 7/16-20	7/16-20 UNF	2.776 (70.5)	0.630 (16)	1.181 (30)	1.260 (32)	0.748 (19)	0.276 (7)	0.669 (17)	0.040 (1.0)	7.6 (220)
HCJL 1/2-13	1/2-13 UNC	2.854 (72.5)	0.630 (16)	1.181 (30)	1.260 (32)	0.787 (20)	0.315 (8)	0.748 (19)	0.040 (1.0)	8.3 (235)
HCJL 1/2-20	1/2-20 UNF	2.854 (72.5)	0.630 (16)	1.181 (30)	1.260 (32)	0.787 (20)	0.315 (8)	0.748 (19)	0.040 (1.0)	8.3 (235)
HCJL 3/4-10	3/4-10 UNC	3.465 (88)	0.827 (21)	1.496 (38)	NOTE	0.984 (25)	0.433 (11)	1.063 (27)	0.049 (1.25)	14.46 (410)

NOTE: HCJL 3/4-10 has a wrench flat on female end. Length of the flat is 0.551 (14). Width of flat is 1.063 in. (27).

SHOCK ABSORBERS SELECTION CRITERIA

FEATURES

- Maintenance free
- Consistent performance even with temperature variations
- Gradual, smooth response and shock absorption even in high speed applications

MODELS

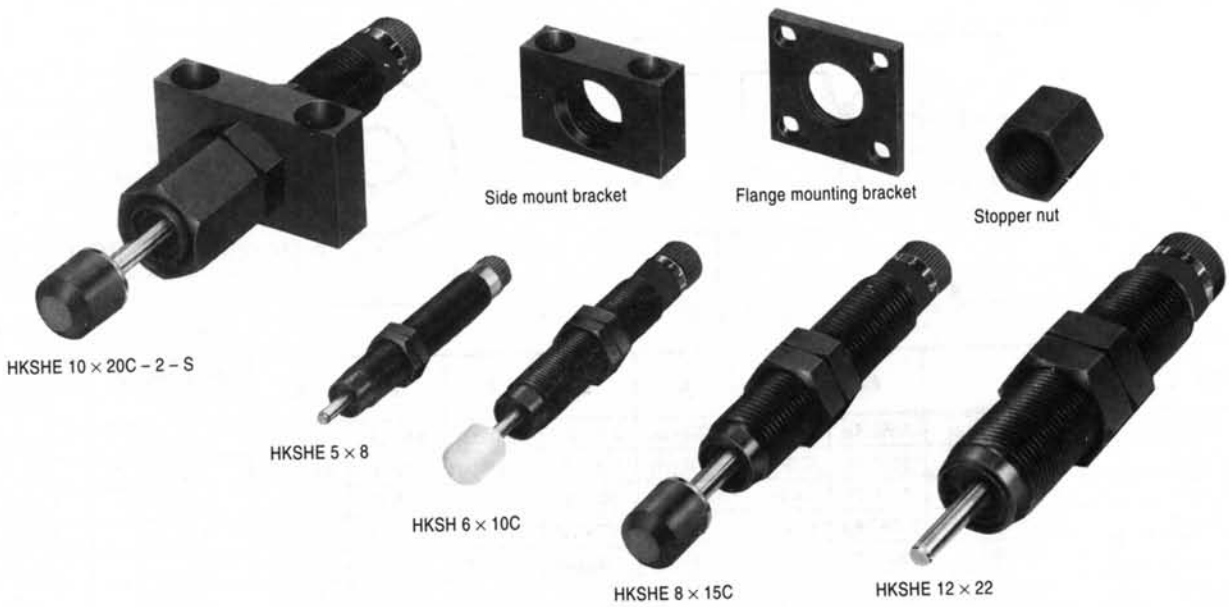
Adjustable Shock Absorbers

HKSH – Single Step Type

These models are recommended for low speed applications, where the impact velocity is a maximum of 1.5 feet (0.5 meters) per second. They have simple, single orifice operation and can be adjusted for varying loads. Use stopper nuts to stop the piston approximately 0.02 in. (0.5mm) prior to fully retracted stroke for optimum cycle life.

HKSHE SERIES – Double Step Type

These models are recommended for higher speed applications, where the impact velocity is a minimum of 1.0 foot (0.3m) per second. They have self-regulating, multi-orifice operation and can be adjusted for varying loads.

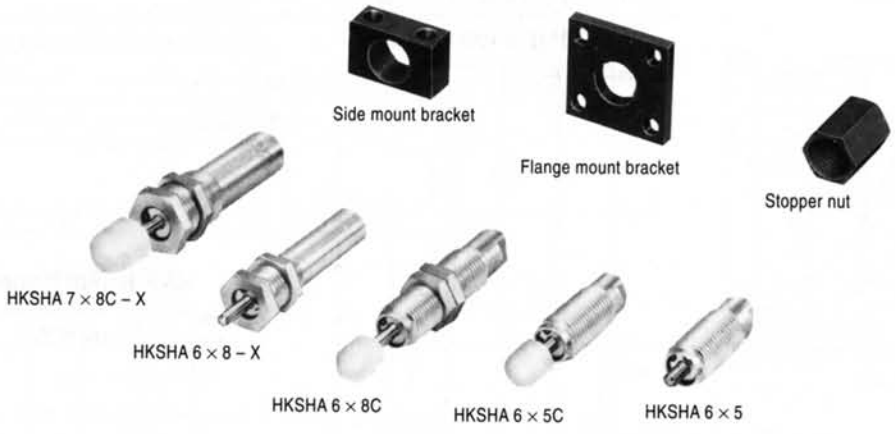


MODELS

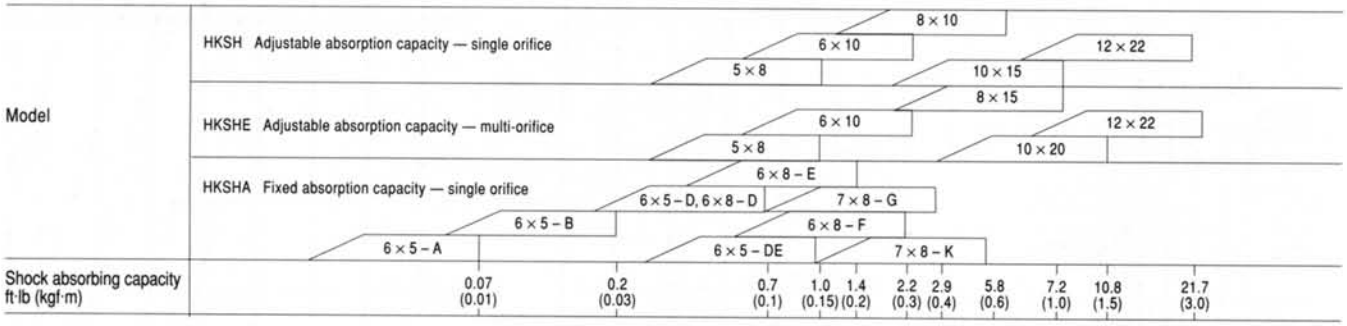
Fixed Shock Absorbers

HKSHA SERIES – Single Orifice Type

These compact, lightweight, low cost shock absorbers are ideal for OEM applications. Nose mounting saves space. HKSHA 6- models are similar to the HKSHE double step types mentioned above. HKSHA 7- models are similar to HKSH single step types. For HKSHA 6, use stopper nuts to stop piston approximately 0.02 in. (0.5mm) prior to fully retracted stroke for optimum cycle life. Use full stroke for optimum performance of HKSHA 7.



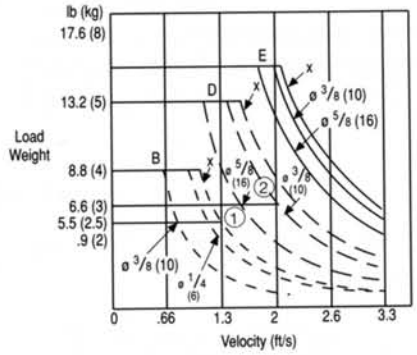
SELECTION CHART



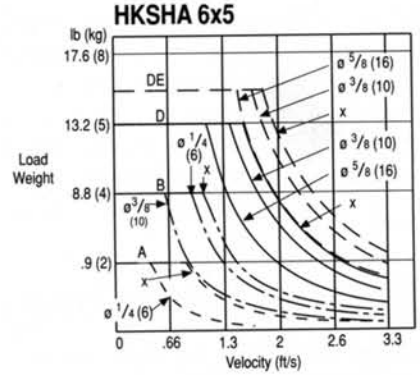
FIXED SHOCK ABSORBERS

x = no cylinder

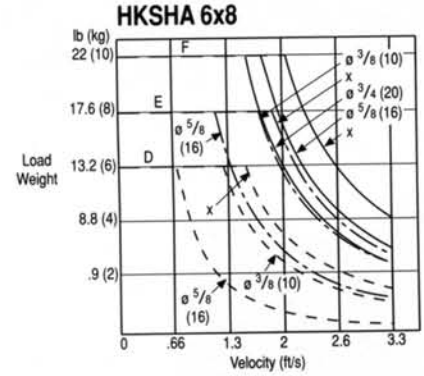
HKSHA 5x5



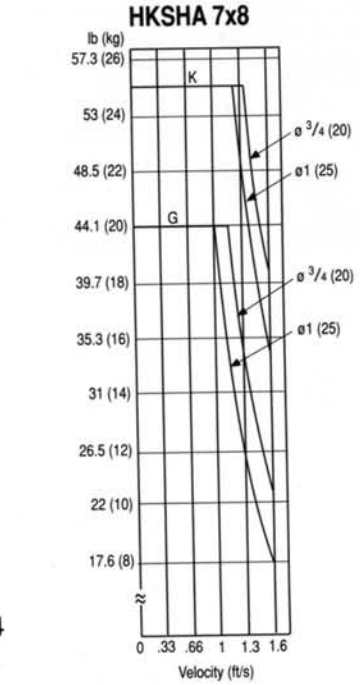
HKSHA 6x5



HKSHA 6x8

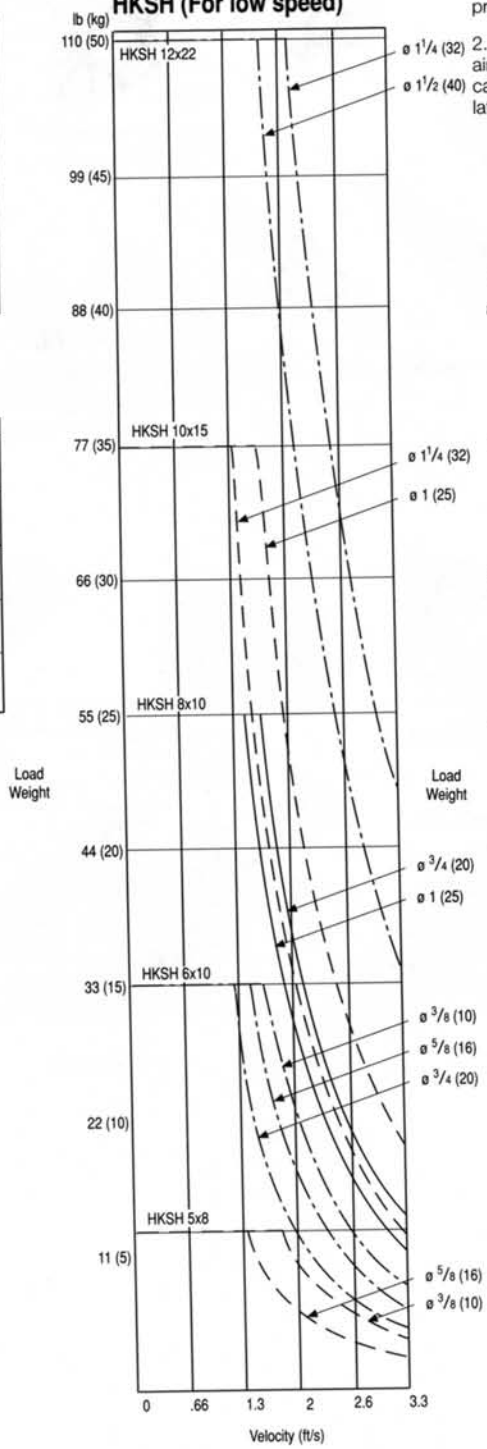


HKSHA 7x8

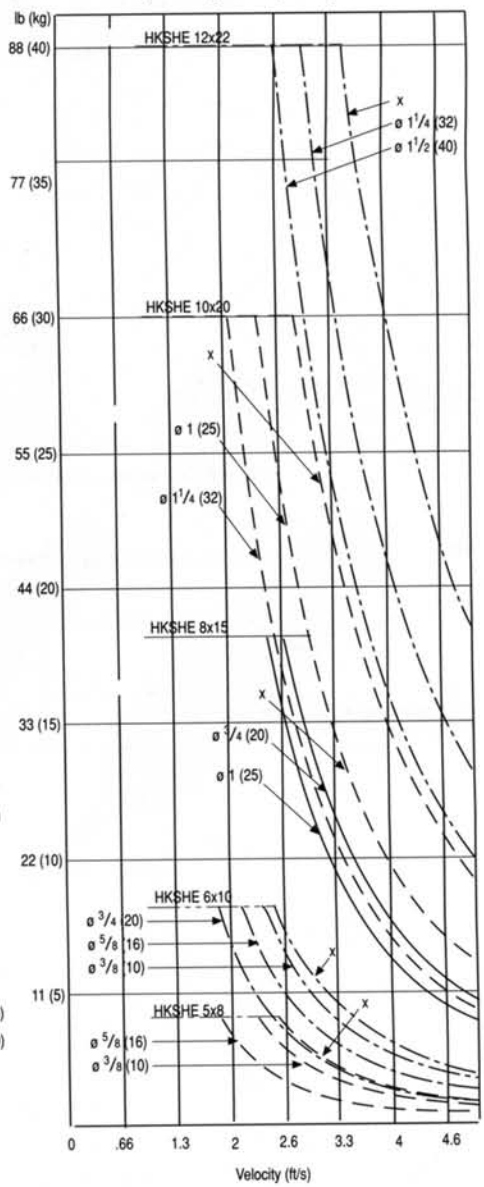


ADJUSTABLE SHOCK ABSORBERS

HKSH (For low speed)

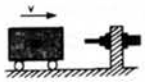


HKSHE (For higher speed)



HOW TO READ THE CHART

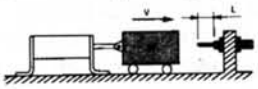
① Direct Horizontal Impact



W: Load weight 5.5 lbs.
V: Load velocity 1.3 ft/s

From the chart, select B type.

② Horizontal Impact Using Cylinder



W: Load weight 6.6 lbs.
V: Load velocity 2.0 ft/s
Cylinder 3/8 in.

From the chart, select D type.

NOTES

1. The chart indicates the best conditions for usage of the product with horizontal impact methods.
2. Calculation on the chart is based on the cylinder operating air pressure at 70 psig. If a pressure other than 70 psig is used, calculate the energy absorption using the appropriate calculation methods found in examples 1 - 6 on the following pages.

APPLICATION EXAMPLES

1. Fixed Speed Conveyor with Horizontal Impact

Impact by the loads on the conveyor operated with fixed speed.

Conveyor Velocity: V = 66 ft/min = 1.1 ft/s

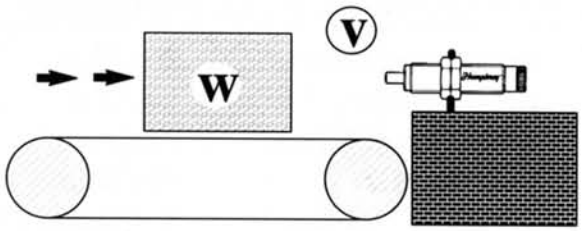
Load Weight: W = 22 lbs

Operating Cycle: 20 cycles/min

Kinetic Energy: $E_1: \frac{W \times V^2}{2g} = \frac{22 \text{ lbs} \times (1.1 \text{ ft/s})^2}{2 \times 32.2 \text{ ft/s}^2} = 0.4 \text{ ft-lbs}$

Select model by confirming that the operating cycles do not exceed 60/min and select HKSHA 6 × 5 D.

NOTE: In actuality, there is additional energy generated by friction between the load and conveyor. However, it is small compared with E_1 and was not considered.



Fixed speed conveyor with horizontal impact

2. Free Fall Conveyor with Direct Impact

Conveyor Length: L = 12 ft

Moving Time: t = 8 s

Load Weight: W = 26 lbs

Operating Cycle: 20 cycles/min

Starting from static point, the load travels 12 ft in 8 seconds before impacting the shock absorber.

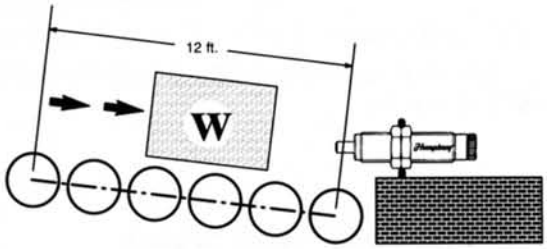
Load Average Velocity = L/t = 12 ft/8 s = 1.5 ft/s

Starting from 0, the speed at impact will be 2 times the average velocity.

Velocity at Impact: V = 2 × 1.5 ft/s = 3 ft/s

Kinetic Energy: $E_1: \frac{W \times V^2}{2g} = \frac{26 \text{ lbs} \times (3 \text{ ft/s})^2}{2 \times 32.2 \text{ ft/s}^2} = 3.6 \text{ ft-lbs}$

Confirm that operating cycles do not exceed 60/min and select HKSHE 8 × 15.

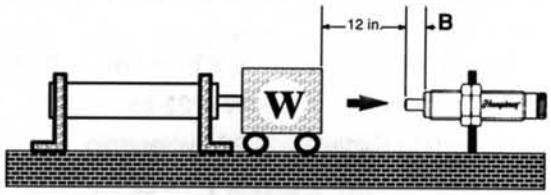


Free fall conveyor with direct impact

CODES		
W	Load weight	lbs
V	Load velocity at impact	ft/s
E	Total energy E_1: Kinetic energy E_2: Additional energy	ft-lbs ft-lbs ft-lbs
g	Acceleration due to gravity	32.2 ft/s^2
F	Cylinder thrust force $F = \pi/4 \times D^2 \times P^6$ D: Cylinder diameter P: Operating air pressure	lbs in psig (lb/in^2)
L_2	Shock absorber stroke	in
H	Height	in
T	Torque (Rotary)	ft-lbs
ω	Angular speed $\omega = 2\pi N/60$	rad/s
N	Rotating speed	rpm
R	Distance between rotation center and impact point	ft
B	Rotation angle $360° = 2\pi N/60$	
D	Cylinder diameter	in
t	Time	s

3. Horizontal Impact Using Cylinder

Cylinder Bore Diameter:	D = .75 in
Cylinder Stroke:	L = 12 in
Stroke Operating Time:	t = 0.6 s
Load Weight:	W = 10 lbs
Cylinder Air Pressure:	P = 60 psig
Operating Cycle:	40 cycles/min



Horizontal impact using cylinder

Cylinder Average Velocity = L/t = 12 in/0.6 s = 20 in/s

Considering cylinder start-up delay, the velocity at impact with the shock absorber should be approximately 1.5 times the average velocity.

Velocity at Impact: $V = 1.5 \times 20$ in/s = 30 in/s = 2.5 ft/s

Kinetic Energy: $E_1: \frac{W \times V^2}{2g} = \frac{10 \text{ lbs} \times (2.5 \text{ ft/s})^2}{2 \times 32.2 \text{ ft/s}^2} = 1.0$ ft-lbs

Cylinder Thrust Force: $F = \frac{\pi}{4} \times D^2P = \frac{\pi}{4} \times (0.75 \text{ in})^2 \times 60$ psig = 26.5 lbs

Thrust Force Energy: $E_2 = FL_2 = 26.5$ lbs $\times$ 0.39 in = 10.3 in-lbs = 0.9 ft-lbs

L_2 = Shock Absorber Stroke = 0.39 in

Total Load Energy: $E = E_1 + E_2 = 1.0$ ft-lbs + 0.9 ft-lbs = 1.9 ft-lbs

Confirm that operating cycles do not exceed 60/min and select HKSHE 6 x 10.

4. Free Fall Vertical Impact

Load Weight:	W = 22 lbs
Height :	H = 2 in
Operating Cycle:	60 cycles/min

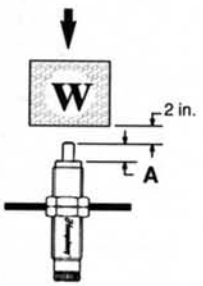
Kinetic Energy: $E_1 = WH = 22$ lb $\times$ 2 in = 44 in-lbs = 3.7 ft-lbs

Additional Energy: $E_2: WL_2 = 22$ lbs $\times$ 0.6 in = 13.2 in-lbs = 1.1 ft-lbs

L_2 = Shock Absorber Stroke = 0.6 in

Total Load Energy: $E = E_1 + E_2 = 3.7$ ft-lbs + 1.1 ft-lbs = 4.8 ft-lbs

Confirm that operating cycles do not exceed 60/min and select HKSHE 8 x 15.



Free fall vertical impact

CODES		
W	Load weight	lbs
V	Load velocity at impact	ft/s
E	Total energy E_1: Kinetic energy E_2: Additional energy	ft-lbs ft-lbs ft-lbs
g	Acceleration due to gravity	32.2 ft/s^2
F	Cylinder thrust force $F = \pi/4 \times D^2 \times P^6$ D: Cylinder diameter P: Operating air pressure	lbs in psig (lb/in^2)
L_2	Shock absorber stroke	in
H	Height	in
T	Torque (Rotary)	ft-lbs
ω	Angular speed $\omega = 2\pi N/60$	rad/s
N	Rotating speed	rpm
R	Distance between rotation center and impact point	ft
B	Rotation angle 360° = $2\pi N/60$	
D	Cylinder diameter	in
t	Time	s

5. Vertical Impact Using Cylinder

Cylinder Bore Diameter: D = 1.06 in
Cylinder Stroke: L = 16 in
Stroke Operating Time: t = 2 s
Load Weight: W = 17 lbs
Cylinder Air Pressure: P = 60 psig
Operating Cycle: 30 cycles/min

Cylinder Average Velocity = L/t = 16 in/2 s = 8 in/s

Considering required stroke time and longer strokes, the impact velocity should be approximately 1.2 times the average velocity.

Velocity at Impact:

$V = 1.2 \times$ Avg. Cyl. Velocity $= 1.2 \times 8$ in/s $= 9.6$ in/s $= 0.8$ ft/s

Kinetic Energy: E_1: $\frac{W \times V^2}{2g} = \frac{17 \text{ lbs} \times (0.8 \text{ ft/s})^2}{2 \times 32.2 \text{ ft/s}^2} = 0.17$ ft-lbs

Cylinder Thrust Force: $F = \frac{\pi}{4} \times D^2P = \frac{\pi}{4} \times (1.06 \text{ in})^2 \times 60$ psig $= 53$ lbs

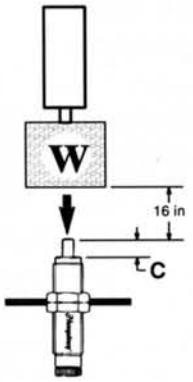
Thrust Force Energy:

$E_2 = (W + F)\, L_2 = (17 \text{ lbs} + 53 \text{ lbs}) \times 0.4$ in $= 28$ in-lbs $= 2.33$ ft-lbs

L_2 = Shock Absorber Stroke = 0.4 in

Total Load Energy: $E = E_1 + E_2 = 0.17$ ft-lbs $+ 2.33$ ft-lbs $= 2.5$ ft-lbs

Confirm that operating cycles do not exceed 30/min and select HKSH 8 × 10.

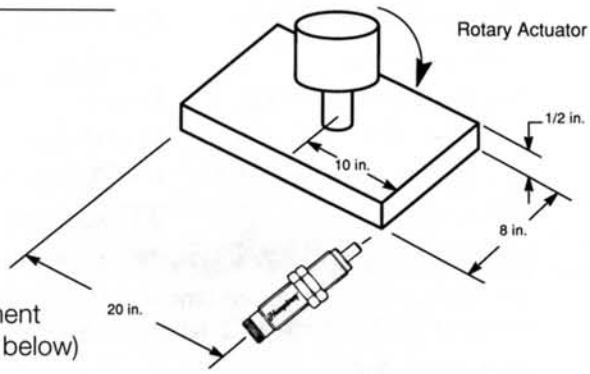


Vertical impact using cylinder

CODES		
W	Load weight	lbs
V	Load velocity at impact	ft/s
E	Total energy E_1: Kinetic energy E_2: Additional energy	ft-lbs ft-lbs ft-lbs
g	Acceleration due to gravity	32.2 ft/s^2
F	Cylinder thrust force $F = \pi/4 \times D^2 \times P^6$ D: Cylinder diameter P: Operating air pressure	lbs in psig (lb/in^2)
L_2	Shock absorber stroke	in
H	Height	in
T	Torque (Rotary)	ft-lbs
ω	Angular speed $\omega = 2\pi N/60$	rad/s
N	Rotating speed	rpm
R	Distance between rotation center and impact point	ft
B	Rotation angle $360° = 2\pi N/60$	
D	Cylinder diameter	in
t	Time	s

6. Load in Rotating Motion

Load Weight: W = 22 lbs
Rotation Angle: B = 90°
Rotary Actuator: T = 3.6 ft-lbs
Distance: (Center to Impact Point) R = 10 in
Operating Cycle: 30 cycles/min
Operating Time: t = 1 s



Load in rotating motion

Load Inertia Moment: $I' = W/g \times (a^2 + b^2)$ (See Mass Moment of Inertia Chart below)

$a = 20 \text{ in}/12 = 1.67 \text{ ft}$

$b = 8 \text{ in}/12 = 0.67 \text{ ft}$

$$I' = \frac{W(a^2 + b^2)}{12g} = \frac{22 \text{ lbs} \times (1.67^2 + 0.67^2) \text{ ft}^2}{12 \times 32.2 \text{ ft/s}^2}$$

$$= 0.18 \text{ ft-lbs-s}^2$$

Average Angular Speed = B/t = (90°/s) (2π/360°) = π/2 rad/s

Starting from 0, impact velocity should be 2 times the average velocity.

Impact Velocity: $\omega = \pi/2 \times 2 = \pi$ rad/s

Kinetic Energy: E1: $\frac{I\omega^2}{2} = \frac{0.18 \text{ ft-lbs-s}^2 \times (\pi \text{ rad/s})^2}{2} = 0.89$ ft-lbs

Rotary Force Energy:

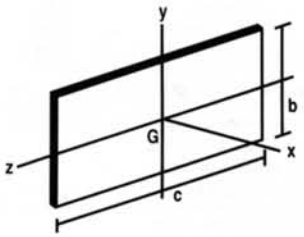
$$E_2 = \frac{TL_2}{R} = \frac{3.6 \text{ ft-lbs } (0.3/12) \text{ ft}}{(10/12) \text{ ft}} = 0.11 \text{ ft-lbs}$$

L_2 = Shock Absorber Stroke = 0.3 in

Total Energy: $E = E_1 + E_2 = 0.89 \text{ ft-lbs} + 0.11 \text{ ft-lbs} = 1.0 \text{ ft-lbs}$

Confirm that operating cycles do not exceed 60/min and select HKSHE 8 × 15.

NOTE: In this example the rotating axis and the center of gravity are the same. If the rotating center and the center of gravity are offset a distance from r', then $I'' = (I' + (W/g)) + r'^2$. Calculate using I" in place of I' in the above formula.



Mass Moment of Inertia
$\frac{1}{12}$ × mass × $(b^2 + c^2)$ about the x-axis
$\frac{1}{12}$ × mass × c^2 about the y-axis
$\frac{1}{12}$ × mass × b^2 about the z-axis

CODES		
W	Load weight	lbs
V	Load velocity at impact	ft/s
E	Total energy E_1: Kinetic energy E_2: Additional energy	ft-lbs ft-lbs ft-lbs
g	Acceleration due to gravity	32.2 ft/s²
F	Cylinder thrust force $F = \pi/4 \times D^2 \times P^6$ D: Cylinder diameter P: Operating air pressure	lbs in psig (lb/in²)
L_2	Shock absorber stroke	in
H	Height	in
T	Torque (Rotary)	ft-lbs
ω	Angular speed $\omega = 2\pi N/60$	rad/s
N	Rotating speed	rpm
R	Distance between rotation center and impact point	ft
B	Rotation angle $360° = 2\pi N/60$	
D	Cylinder diameter	in
t	Time	s

HUMPHREY SHOCK ABSORBERS – FLEXIBLE ABSORPTION CAPACITY

SPECIFICATIONS

Multi orifice type

Item	Model				
	HKSHE 5x8	HKSHE 6x10	HKSHE 8x15	HKSHE 10x20	HKSHE 12x22
Maximum absorption – ft·lb (kgf·m)	1.08 (0.15)	2.17 (0.3)	7.23 (1.0)	10.85 (1.5)	21.70 (3.0)
Absorption stroke – (mm)	(8)	(10)	(15)	(20)	(22)
Maximum speed impact – ft./sec. (m/s)	4.92 (1.5)				
Maximum repeatability – cycle/min.	60				
Spring return force – lb (kgf)	1.26 (0.57)	2.07 (0.94)	2.40 (1.09)	3.24 (1.47)	3.66 (1.66)
Angle variation	Less than 3°				
Temperature range – °F (°C)	32 ~ 140 (0 ~ 60)				

Single orifice type

Item	Model				
	HKSH 5x8	HKSH 6x10	HKSH 8x10	HKSH 10x15	HKSH 12x22
Maximum absorption – ft·lb (kgf·m)	1.08 (0.15)	2.17 (0.3)	4.34 (0.6)	7.23 (1.0)	18.08 (2.5)
Absorption stroke – (mm)	(8)	(10)	(10)	(15)	(22)
Maximum speed impact – ft./sec. (m/s)	3.28 (1.0)				
Maximum repeatability – cycle/min.	30				
Spring return force – lb (kgf)	1.26 (0.57)	2.07 (0.94)	3.53 (1.60)	3.73 (1.69)	8.33 (3.78)
Angle variation	Less than 3°				
Temperature range – °F (°C)	32 ~ 140 (0 ~ 60)				

WEIGHT oz. (gf)

Models	Items				
	Body weight	Added weight			
		Side mount bracket	Flange mount bracket	Stopper nuts	With cap
HKSHE 5x8, HKSH 5x8	0.9 (24)	0.5 (15)	0.6 (16)	0.3 (7)	0.04 (1)
HKSHE 6x10, HKSH 6x10	1.5 (43)	0.8 (22)	0.5 (15)	0.3 (8)	0.04 (1)
HKSH 8x10	3.2 (90)	2.4 (68)	1.0 (28)	0.7 (19)	0.07 (2)
HKSHE 8x15	3.6 (102)				0.14 (4)
HKSH 10x15	4.6 (130)	3.9 (110)	2.0 (57)	1.2 (34)	0.14 (4)
HKSHE 10x20	5.1 (144)				0.18 (5)
HKSHE 12x22	6.8 (192)	5.0 (140)	1.9 (54)	1.6 (46)	0.28 (8)
HKSH 12x22	7.1 (200)				0.21 (6)

ORDER EXAMPLE

HKSHE **8 × 15** □ – □ – □

Stopper nut
Blank — No nut
S — With nut

Mounting
Blank — Nose mount
2 — Side mount
3 — Flange mount

Rod End
Blank — No rod end cap
C — With cap

Shock Absorber Model

Nominal Bore Size / **Actual Bore Size × Stroke in. (mm)**

HKSHE — Multi Orifice
- 3/16" — 0.197 (5) ×0.315 (8)
- 1/4" — 0.236 (6) × 0.394 (10)
- 5/16" — 0.315 (8) × 0.591 (15)
- 3/8" — 0.394 (10) × 0.787 (20)
- 1/2" — 0.472 (12) × 0.866 (22)

HKSH — Single Orifice
- 3/16" — 0.197 (5) × 0.315 (8)
- 1/4" — 0.236 (6) × 0.394 (10)
- 5/16" — 0.315 (8) × 0.394 (10)
- 3/8" — 0.394 (10) × 0.591 (15)
- 1/2" — 0.472 (12) × 0.866 (22)

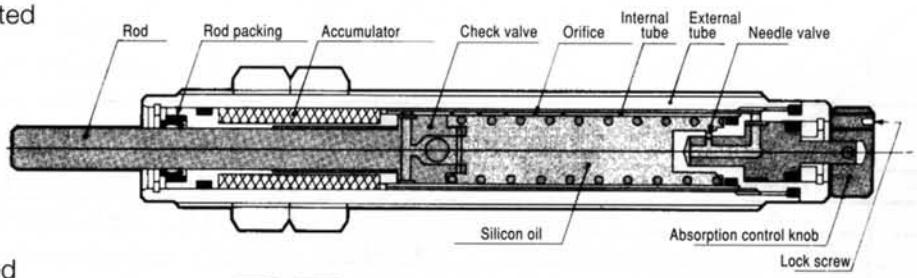
Nose mount shipped with two mounting nuts.

PART NAMES AND INTERNAL CONFIGURATION

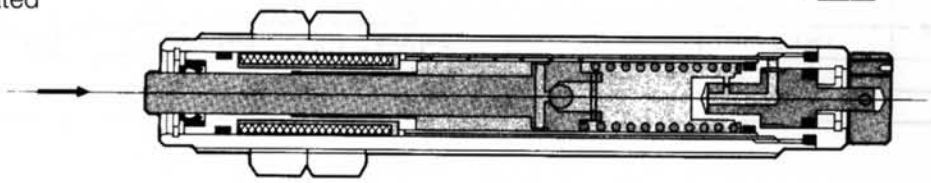
Multi orifice type

HKSHE

Inactivated



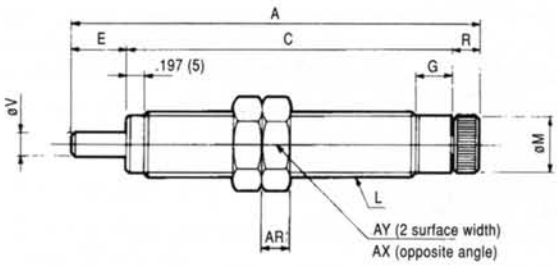
Activated



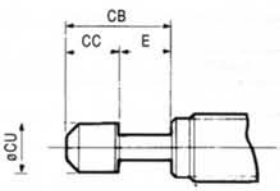
DIMENSIONS

Nose mount

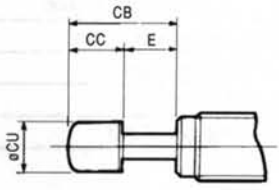
HKSHE□ × □, HKSH□ × □



HKSHE□ × □C



HKSH□ × □C



Models	Item – in. (mm)						
	A	C	E	G	L	M	R
HKSHE 5x8□, HKSH 5x8□NOTE	2.697 (68.5)	2.165 (55)	0.315 (8)	0.157 (4)	M10x1	0.354 (9)	0.217 (5.5)
HKSHE 6x10□, HKSH 6x10□NOTE	3.091 (78.5)	2.402 (61)	0.394 (10)	0.394 (10)	M12x1	0.433 (11)	0.295 (7.5)
HKSH 8x10□NOTE	3.642 (92.5)	2.953 (75)	0.394 (10)	0.394 (10)	M16x1.5	0.512 (13)	0.295 (7.5)
HKSHE 8x15□	4.016 (102)	3.130 (79.5)	0.591 (15)	0.394 (10)	M16x1.5	0.512 (13)	0.295 (7.5)
HKSH 10x15□NOTE	4.508 (114.5)	3.622 (92)	0.591 (15)	0.394 (10)	M18x1.5	0.591 (15)	0.295 (7.5)
HKSHE 10x20□	4.528 (115)	3.465 (88)	0.787 (20)	0.394 (10)	M18x1.5	0.591 (15)	0.276 (7)
HKSHE 12x22□	4.724 (120)	3.583 (91)	0.866 (22)	0.394 (10)	M20x1.5	0.669 (17)	0.276 (7)
HKSH 12x22□NOTE	5.807 (147.5)	4.646 (118)	0.866 (22)	0.394 (10)	M20x1.5	0.669 (17)	0.295 (7.5)

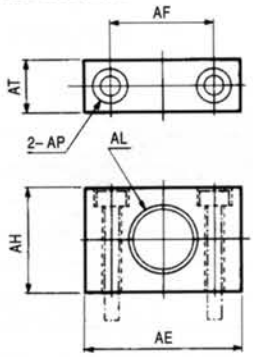
Models	Item – in. (mm)						
	V	AR	AX	AY	CB	CC	CU
HKSHE 5x8□, HKSH 5x8□NOTE	0.118 (3)	0.118 (3)	0.547 (13.9)	0.472 (12)	0.630 (16)	0.315 (8)	0.315 (8)
HKSHE 6x10□, HKSH 6x10□NOTE	0.118 (3)	0.157 (4)	0.638 (16.2)	0.551 (14)	0.787 (20)	0.394 (10)	0.394 (10)
HKSH 8x10□NOTE	0.197 (5)	0.276 (7)	0.862 (21.9)	0.748 (19)	0.984 (25)	0.591 (15)	0.472 (12)
HKSHE 8x15□	0.197 (5)	0.276 (7)	0.862 (21.9)	0.748 (19)	1.201 (30.5)	0.610 (15.5)	0.512 (13)
HKSH 10x15□NOTE	0.236 (6)	0.315 (8)	1.000 (25.4)	0.866 (22)	1.181 (30)	0.591 (15)	0.551 (14)
HKSHE 10x20□	0.197 (5)	0.315 (8)	1.000 (25.4)	0.866 (22)	1.398 (35.5)	0.610 (15.5)	0.591 (15)
HKSHE 12x22□	0.197 (5)	0.394 (10)	1.091 (27.7)	0.945 (24)	1.575 (40)	0.709 (18)	0.630 (16)
HKSH 12x22□NOTE	0.236 (6)	0.394 (10)	1.091 (27.7)	0.945 (24)	1.575 (40)	0.709 (18)	0.630 (16)

NOTE: Model HKSH is single orifice only.

MOUNTING BRACKET DIMENSIONS

Side mount bracket

Order code is 2

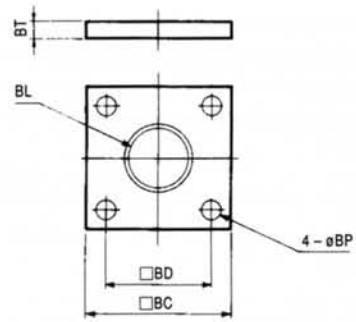


Model	Item – in. (mm)			
	AE	AF	AH	AL
HKSHE 5x8□, HKSH 5x8□	0.866 (22)	0.551 (14)	0.551 (14)	M10x1 counterbore: ø10.2, depth: 2
HKSHE 6x10□, HKSH 6x10□	0.984 (25)	0.630 (16)	0.709 (18)	M12x1 counterbore: ø12.2, depth: 2
HKSHE 8x15□, HKSH 8x10□	1.496 (38)	0.984 (25)	0.984 (25)	M16x1.5
HKSHE 10x20□, HKSH 10x15□	1.969 (50)	1.339 (34)	1.181 (30)	M18x1.5
HKSHE 12x22□, HKSH 12x22□	1.969 (50)	1.339 (34)	1.181 (30)	M20x1.5

Model	Item – in. (mm)	
	AP	AT
HKSHE 5x8□, HKSH 5x8□	ø3.4, counterbore: ø6.2, depth: 3.3	0.354 (9)
HKSHE 6x10□, HKSH 6x10□	ø3.4, counterbore: ø6.2, depth: 3.3	0.354 (9)
HKSHE 8x15□, HKSH 8x10□	ø4.5, counterbore: ø8.0, depth: 4.4	0.472 (12)
HKSHE 10x20□, HKSH 10x15□	ø6.5, counterbore: ø11, depth: 6.5	0.472 (12)
HKSHE 12x22□, HKSH 12x22□	ø9, counterbore: ø14, depth: 8.6	0.630 (16)

Flange mount bracket

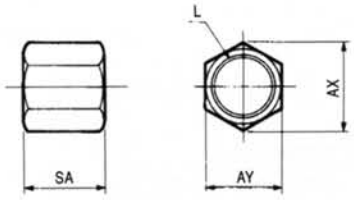
Order code is 3



Model	Item – in. (mm)				
	BC	BD	BL	BP	BT
HKSHE 5x8□, HKSH 5x8□	0.984 (25)	0.709 (18)	M10x1 counterbore: ø10.2, depth: 1.7	0.126 (3.2)	0.157 (4)
HKSHE 6x10□, HKSH 6x10□	0.984 (25)	0.709 (18)	M12x1 counterbore: ø12.2, depth: 1.7	0.126 (3.2)	0.157 (4)
HKSHE 8x15□, HKSH 8x10□	1.339 (34)	0.945 (24)	M16x1.5	0.177 (4.5)	0.157 (4)
HKSHE 10x20□, HKSH 10x15□	1.575 (40)	1.102 (28)	M18x1.5	0.256 (6.5)	0.236 (6)
HKSHE 12x22□, HKSH 12x22□	1.575 (40)	1.102 (28)	M20x1.5	0.256 (6.5)	0.236 (6)

Stopper nuts

Order code is S



Model	Item – in. (mm)			
	L	AX	AY	SA
HKSHE 5x8, HKSH 5x8	M10x1	0.547 (13.9)	0.472 (12)	0.669 (17)
HKSHE 5x8C, HKSH 5x8C				
HKSHE 6x10, HKSH 6x10	M12x1	0.638 (16.2)	0.551 (14)	0.669 (17)
HKSHE 6x10C, HKSH 6x10C				0.984 (25)
HKSHE 8x15, HKSH 8x10	M16x1.5	0.862 (21.9)	0.748 (19)	0.787 (20)
HKSHE 8x15C, HKSH 8x10C				1.260 (32)
HKSHE 10x20, HKSH 10x15	M18x1.5	1.000 (25.4)	0.866 (22)	0.984 (25)
HKSHE 10x20C, HKSH 10x15C				1.457 (37)
HKSHE 12x22, HKSH 12x22	M20x1.5	1.091 (27.7)	0.945 (24)	1.181 (30)
HKSHE 12x22C, HKSH 12x22C				1.772 (45)

HUMPHREY SHOCK ABSORBERS – FIXED ABSORPTION CAPACITY

SPECIFICATIONS

HKSHA Series

Item	Model			
	HKSHA 6x5□-A	HKSHA 6x5□-B	HKSHA 6x5□-D	HKSHA 6x5□-DE
Maximum absorption – ft·lb (kgf·m)	0.07 (0.01)	0.22 (0.03)	0.72 (0.10)	1.08 (0.15)
Absorption stroke – (mm)	(5)			
Maximum speed impact – ft./sec. (m/s)	3.28 (1.0)			
Maximum repeatability – cycle/min.	60			
Spring return force – lb (kgf)	0.90 (0.41)			
Angle variation	Less than 1°			
Temperature range – °F (°C)	32 ~ 140 (0 ~ 60)			

Item	Model				
	HKSHA 6x8□-D	HKSHA 6x8□-E	HKSHA 6x8□-F	HKSHA 7x8□-G	HKSHA 7x8□-K
Maximum absorption – ft·lb (kgf·m)	0.72 (0.1)	1.45 (0.2)	2.17 (0.3)	2.89 (0.4)	4.34 (0.6)
Absorption stroke – (mm)	(8)				
Maximum speed impact – ft./sec. (m/s)	3.28 (1.0)				
Maximum repeatability – cycle/min.	30				
Spring return force – lb (kgf)	1.46 (0.66)				
Angle variation	Less than 3°				
Temperature range – °F (°C)	32 ~ 140 (0 ~ 60)				

WEIGHT

oz. (gf)

Model	Body weight		Added weight			
	Nose mount	Insert mount	Side mount bracket	Flange mount bracket	Stopper nuts	With cap
HKSHA 6x5	0.4 (10)	–	0.5 (15)	0.6 (16)	0.3 (7)	0.04 (1)
HKSHA 6x8	0.7 (20)	0.7 (20)	0.5 (15)	0.6 (16)	0.3 (7)	0.04 (1)
HKSHA 7x8	1.0 (28)	1.0 (28)	0.8 (22)	0.5 (15)	0.3 (8)	0.04 (1)

ORDER EXAMPLE

HKSHA **6 × 8** □ – □ – □ – □ – □

Shock Absorber Model

Nominal Bore Size / **Actual Bore Size × Stroke in. (mm)**

- 1/4" — 0.236 (6) × 0.197 (5)
- 1/4" — 0.236 (6) × 0.315 (8)
- 5/16" — 0.276 (7) × 0.315 (8)

Absorption capacity ft·lb (kgf·m)

- **A** — 0.07 (0.01)
- **B** — 0.22 (0.03)
- **D** — 0.72 (0.1)
- **DE** — 1.08 (0.15)
- **D** — 0.72 (0.1)
- **E** — 1.45 (0.2)
- **F** — 2.17 (0.3)
- **G** — 2.89 (0.4)
- **K** — 4.34 (0.6)

Rod end

Blank — No rod end cap
C — With cap

Mounting

Blank — Nose mount
X — Insert mount (not for HKSHA 6 × 5)

Mounting bracket

Blank — No bracket
2 — Side mount
3 — Flange mount

Stopper nut

Blank — No nut
S — With nut

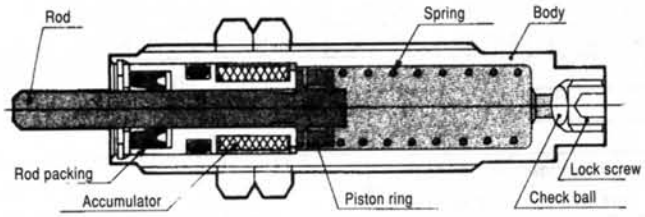
Cannot be used on insert mount.

Nose mount shipped with two mounting nuts.
Insert mount shipped with one mounting nut.

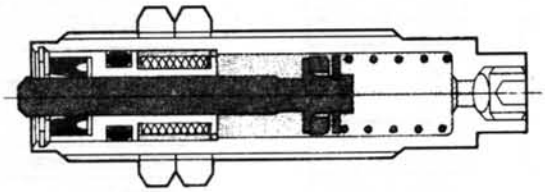
PART NAMES AND INTERNAL CONFIGURATION

Single orifice type

Inactivated



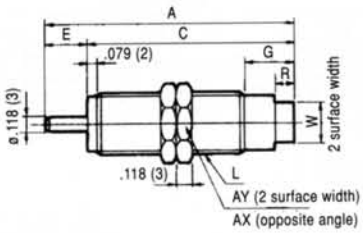
Activated



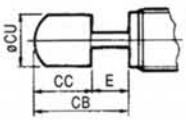
DIMENSIONS

Nose mount

HKSHA□ × □



HKSHA□ × □C

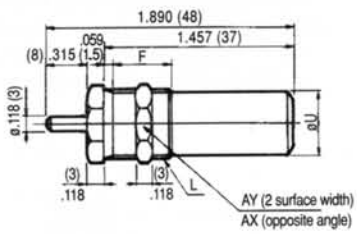


Models	Item – in. (mm)						
	A	C	E	G	L	R	W
HKSHA 6x5□	1.201 (30.5)	1.004 (25.5)	0.197 (5)	0.276 (7)	M10x1	0.138 (3.5)	0.236 (6)
HKSHA 6x8□	1.890 (48)	1.575 (40)	0.315 (8)	0.394 (10)	M10x1	0.157 (4)	0.236 (6)
HKSHA 7x8□	1.890 (48)	1.575 (40)	0.315 (8)	0.394 (10)	M12x1	0.157 (4)	0.315 (8)

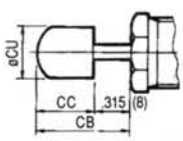
Models	Item – in. (mm)				
	AX	AY	CB	CC	CU
HKSHA 6x5□	0.547 (13.9)	0.472 (12)	0.512 (13)	0.315 (8)	0.315 (8)
HKSHA 6x8□	0.547 (13.9)	0.472 (12)	0.630 (16)	0.315 (8)	0.315 (8)
HKSHA 7x8□	0.638 (16.2)	0.551 (14)	0.709 (18)	0.394 (10)	0.394 (10)

Insert mount

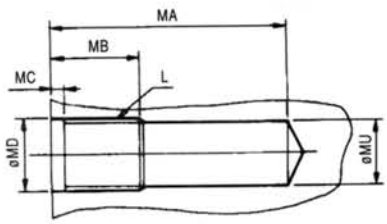
HKSHA□ × □ – X (Without cap)



HKSHA□ × □ – X (With cap)



Insert mount mounting hole



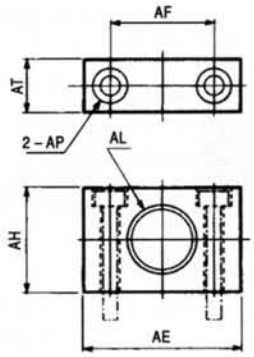
Models	Item – in. (mm)							
	F	L	U	AX	AY	CB	CC	CU
HKSHA 6x8□ -X	0.143 (10.5)	M10x1	0.335 (8.5)	0.547 (13.9)	0.472 (12)	0.630 (16)	0.315 (8)	0.315 (8)
HKSHA 7x8□ -X	0.492 (12.5)	M12x1	0.413 (10.5)	0.638 (16.2)	0.551 (14)	0.709 (18)	0.394 (10)	0.394 (10)

Models	Item – in. (mm)				
	MA	MB	MC	MD	MU
HKSHA 6x8□ -X	over 1.496 (38)	over 0.512 (13)	0.079 (2)	$0.394^{+0.020}_{+0.004}$ ($10^{+0.5}_{+0.1}$)	0.354 (9)
HKSHA 7x8□ -X	over 1.496 (38)	over 0.512 (13)	0.079 (2)	$0.472^{+0.020}_{+0.004}$ ($12^{+0.5}_{+0.1}$)	0.433 (11)

MOUNTING BRACKET DIMENSIONS

Side mount bracket

Order code is 2

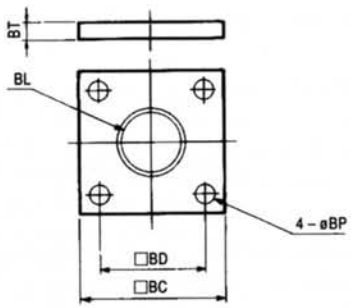


Model	Item – in. (mm)			
	AE	AF	AH	AL
HKSHA 6x5□, HKSHA 6x8□	0.866 (22)	0.551 (14)	0.551 (14)	M10x1 counterbore: ø10.2, depth: 2
HKSHA 7x8□	0.984 (25)	0.630 (16)	0.709 (18)	M12x1 counterbore: ø12.2, depth: 2

Model	Item – in. (mm)	
	AP	AT
HKSHA 6x5□, HKSHA 6x8□	ø3.4, counterbore: ø6.2, depth: 3.3	0.354 (9)
HKSHA 7x8□	ø3.4, counterbore: ø6.2, depth: 3.3	0.354 (9)

Flange mount bracket

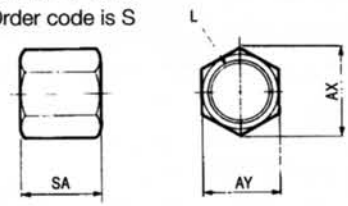
Order code is 3



Model	Item – in. (mm)				
	BC	BD	BL	BP	BT
HKSHA 6x5□, HKSHA 6x8□	0.984 (25)	0.709 (18)	M10x1 counterbore: ø10.2, depth: 1.7	0.126 (3.2)	0.157 (4)
HKSHA 7x8□	0.984 (25)	0.709 (18)	M12x1 counterbore: ø12.2, depth: 1.7	0.126 (3.2)	0.157 (4)

Stopper nuts

Order code is S



Model	Item – in. (mm)			
	L	AX	AY	SA
HKSHA 6x5	M10x1	0.547 (13.9)	0.472 (12)	0.315 (8)
HKSHA 6x5C, HKSHA 6x8□	M10x1	0.547 (13.9)	0.472 (12)	0.669 (17)
HKSHA 7x8□	M12x1	0.638 (16.2)	0.551 (14)	0.669 (17)

INSTALLATION AND PRECAUTIONS

REGULATING SHOCK ABSORPTION CAPACITY

HKSHE SERIES/HKSH SERIES: FLEXIBLE ABSORPTION CAPACITY

1. Turn the shock-absorbing capacity adjusting knob so that the white mark on the knob is between 2 and 3.

2. When the shock is too great at end of stroke, turn adjusting knob toward 6. When the shock is mild and the rod stops before the preset stroke end, turn the adjusting knob toward 0.

3. After completing adjustment, set knob by tightening lock screw.

4. HKSHE Series is self-regulating (biggest shock absorbed at stroke end). Operate using full stroke.

HKSHA SERIES: FIXED ABSORPTION CAPACITY

Absorption capacity cannot be adjusted. Select model with desired absorption capacity. Refer Shock Absorber Selection Guide in this catalog.

INSTALLATION

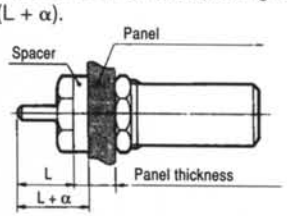
1. Install shock absorber so rod is horizontal or straight up. If shock absorber is mounted with rod facing down, operational life may be shortened.

2. Protect shock absorbers when used in contaminated conditions such as excessive dust or where exposed to water or oil particles. Penetration of this material may adversely affect operation.

INSTALLING HKSHA □ x □ □ -X

1. Adjustment of the rod tip position after installation of an insert type shock absorber is not required when referencing from the inside face of the hex head (dimension L).

The rod tip can be adjusted by using a spacer (L + α).



α: Spacer thickness

2. See Insert Mount Mounting Hole Dimension Chart in this catalog for mounting hole dimensions.

3. Refer to the following chart for maximum panel thickness when panel mounting.

in. (mm)

Shock absorber model	Maximum panel thickness
HKSHA 6x8 □ - X	0.315 (8)
HKSHA 7x8 □ - X	0.394 (10)

CAUTION

1. Avoid off-center loads on the shock absorber. Off-center loading may break or bend rod.

2. Do not attempt to increase the shock absorbing capacity by installing two or more shock absorbers in parallel. Use larger capacity shock absorber.

HKSHA SERIES: FIXED ABSORPTION CAPACITY

1. Do not use the end of the shock absorber as a stopper. Use stopper nut (Code -S) or external stopper (except Insert Mount).

2. When using stopper nut, adjust so that stopper nut protrudes at least .020 in. (0.5mm) HKSHE Series and .039 in. (1mm) – .059 (1.5mm) HKSH Series past the shock absorber body end face.

3. When the direction of impact varies, the direction must be below 1° of the rod axis for HKSHA 6x5□ and below 3° of the rod axis for other models.

4. Do not loosen or remove lock screw at the end of the shock absorber. Oil will leak out and shock absorber will fail.

HUMPHREY PNEUMATIC ACCESSORIES

ORDERS: All orders are subject to final approval by the Factory. QUOTATIONS: All quotations will expire sixty (60) calendar days from date of issue. CREDIT: Written consent from Factory must be obtained on all credits. Include purchase order number used when goods were ordered. A handling charge will be made. Additional charges may be made dependent on age, and resalability of returned merchandise, etc. CANCELLATIONS: Written consent from the Factory must be obtained on all cancellations, and a cancellation charge may be made covering expenses incurred at time cancellation is authorized. SHIPMENTS: The Factory will ship all goods via the most economical route unless otherwise instructed. DAMAGED GOODS: The Factory shall not be liable for delays, damage or loss of goods in transit. BONDS OR SPECIAL WARRANTIES, ETC.: The Buyer agrees to pay all costs in obtaining same. CHANGES: The Factory reserves the right to make changes in specifications and design, etc., and is not liable for any inconvenience whatsoever caused by such design and specification changes. DIES, JIGS and FIXTURES, ETC.: All dies, jigs and fixtures, etc., shall be the property of the Factory. PRICES: The Factory reserves the right to change prices as necessary. PRODUCT WARRANTY: Humphrey Products warrants its products to be free from defects in workmanship or material for one (1) year from date of shipment from factory. Humphrey Products shall have no liability under this warranty if: 1) The product is used other than in accordance with current operating specifications; 2) the product is subjected to any abuse or abnormal or unintended use; 3) a claim in writing under this Warranty is not presented to Humphrey Products, Kilgore at Sprinkle Rd., P.O. Box 2008, Kalamazoo, Michigan 49003, on or before ninety (90) days after the date any alleged defect was first known or could reasonably have been known; or 4) the product is not returned unaltered to Manufacturer within such ninety (90) day period for inspection. At its option, Manufacturer's liability shall be limited to replacement or repair of the product, F.O.B. point of manufacturing. Any Warranty extends only to the first user of the product. Manufacturer shall not be liable for consequential damages.

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