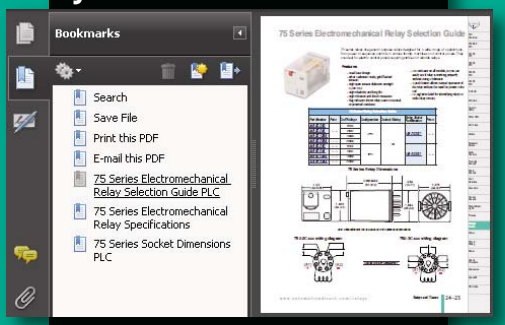
Relays & Timers

Section 27

In this interactive PDF you can:



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- **Click on part #s to link directly to our online store for current pricing, specs, stocking information and more**

Relays/Timers

A Full Lineup of Control Relays

Our general purpose industrial relays are a low-cost way of adding control and isolation relays to any application. Electromechanical relays are available in cube and card styles for a diverse range of installation requirements. Cube relays are available with standard linear or octal base connection patterns. Solid state relays available include DIN-rail mount and panel-mount styles.

All relays feature LED indicators for easy troubleshooting.

QL Series

Electromechanical Cube Relay

QL series relays are general purpose relays designed for a wide range of applications. Units plug into DIN-rail mountable relay sockets, with a 10A contact rating. Ideal for electric control panels requiring stable and reliable relays.

QM Series

Electromechanical Cube Relay

The QM series relays are general purpose relays with a 5A DPDT or 3A 4PDT contact rating, designed for use in applications from power to sequence controls in various factory machines and control panels.

78 Series

Electromechanical Cube Relay

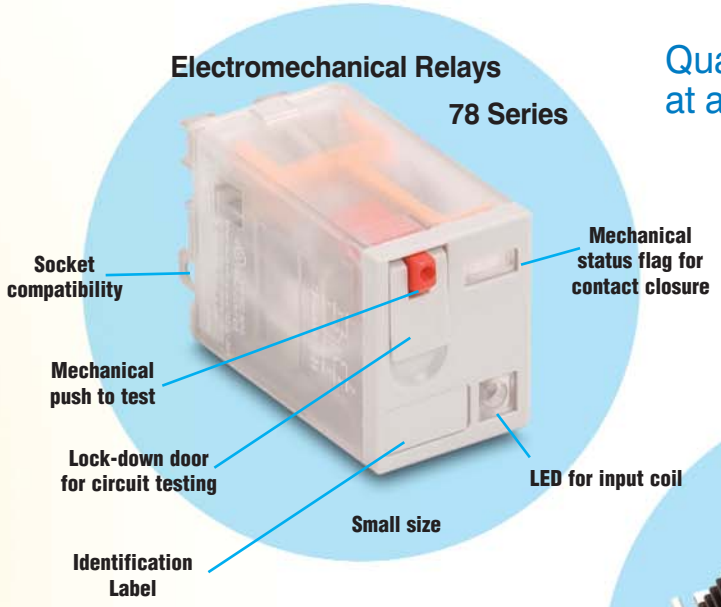
78 series cube relays, with a 15A contact rating, are ideal for applications demanding high power control in various factory machines and control panels. Available in 24 VAC, 120 VAC, 240 VAC and 24 VDC coil voltages.

755 Series

Electromechanical Latching Octal Cube Relay

755 series cube relays, with a 16A contact rating, are ideal for applications requiring a latching device. Permanent magnet maintains last position. Available in 120 VAC and 24 VDC coil voltages.

Electromechanical Relays
78 Series



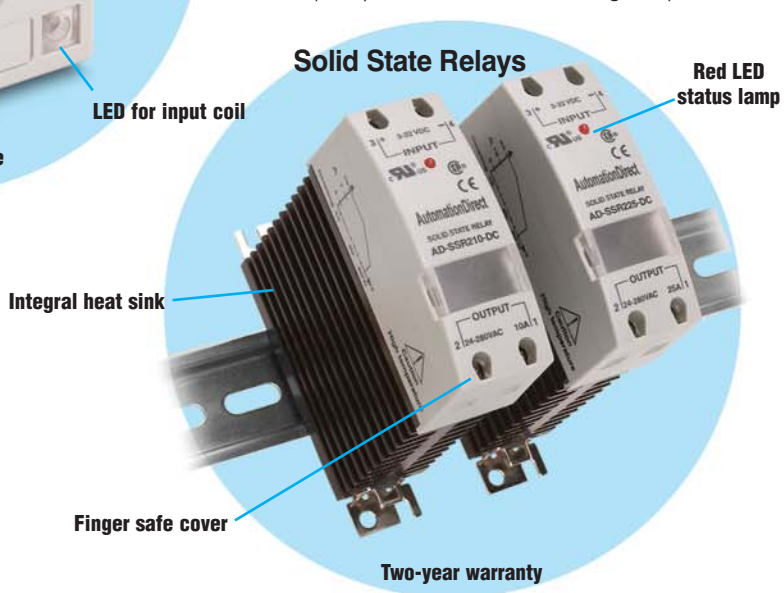
Quality built into every relay at an affordable price.

Low price combined with industry-demanded quality make our relays one of the best values in automation.

Our manufacturers ensure that nothing is spared in the design and production of our products. By offering them direct to you, AUTOMATIONDIRECT makes certain that you get the same or better quality than other brands at a great price.

Check the technical specifications on the following pages to choose the right relay for your application.

Solid State Relays



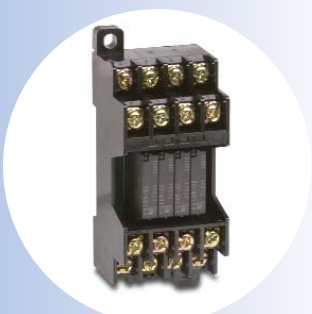
75 Series

Electromechanical Cube Relay

75 series cube relays with standard octal base design, offer high-current capability (12A) with compact design. Available in 24 VAC, 120 VAC, 240 VAC and 24 VDC coil voltages.

RS Series

Card Relay

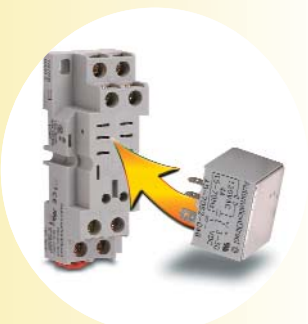


RS series relays are compact, space-saving, relay terminal modules containing four or six relays with one N.O. contact each.

These relay-and-terminal modules are ideal for interfacing electronic control devices with output devices.

AD-70S2 Series

Solid State Relays



These solid state relays, with 4A contact ratings, plug into a DIN-rail mountable relay socket or can be wired with the quick-connect terminals.

AD-SSR Series

Solid State Relays

The SSR series are solid state, 10A and 25A, relays with no moving parts, featuring integral heat sink, finger safe cover, and red LED status lamp to show that voltage is being applied to the input. DIN-rail or panel mountable, these quality-built, rugged relays come with a two-year warranty.

Electromechanical Relay Selection Guide

Specification	QL Series	QM Series	RS Series Card Relays
Coil Voltages	110/120VAC, 220VAC, 24VDC	110/120VAC, 220VAC, 24VDC	24VDC
Configuration	2PDT, 4PDT	2PDT, 4PDT	SPST (up to six relays)
Contact Rating	10A	5A DPDT ; 3A 4PDT	5A
Base Socket	8 or 14 pin spade terminal	8 or 14 pin spade terminal	-
Agency Approvals	UL Recognized (#E222847), CE Certified (9667186-9811), CSA Certified (218218)	UL Recognized (#E222847), CE Certified (9667186-9811), CSA Certified (218218)	UL Recognized (E44592), CSA (LR20479) TUV (R95551729)
Prices starting at	<--->	<--->	<--->

QL Series Electromechanical Relay Selection Guide

QL series relays are general purpose relays designed for a wide range of applications, from power to sequence controls in various factory machines and control panels. They are ideal for electric control panels requiring stable and reliable relays.

Features

- Small package design
- ARC Barrier equipped
- Silver Cadmium Oxide contact
- High dielectric strength (1,800 VAC)
- High reliability and long life
- Ultra-high sensitivity with quick response time (25 ms max.)
- High vibration and shock resistance
- LED indicator on all models, so you can easily see if relay is working properly without using a voltmeter
- Diode protection available on 24 VDC models, which protects contacts and electronic components from back EMF
- UL recognized, CE certified, CSA approval pending
- DPDT and 4PDT models

• *Order socket separately*

QL Series Selection Guide								
Part Number	*Price*	*Coil Voltage*	*Configuration*	*Contact Rating*	*Dimensions (see page 24-7)*	*Relay Socket Part Number*	*Price*	*Dimensions (see page 24-13)*
QL2N1-A120	<--->	110/120VAC	2PDT	10A	Figure 1	***SQL08D***	<--->	Figure 3
QL4N1-A120	<--->		4PDT	10A	Figure 2	***SQL14D***	<--->	Figure 4
QL2N1-A220	<--->	220VAC	2PDT	10A	Figure 1	***SQL08D***	<--->	Figure 3
QL4N1-A220	<--->		4PDT	10A	Figure 2	***SQL14D***	<--->	Figure 4
QL2N1-D24	<--->	24VDC	2PDT	10A	Figure 1	***SQL08D***	<--->	Figure 3
QL2X1-D24	<--->		2PDT	10A	Figure 1	***SQL08D***	<--->	Figure 3
QL4N1-D24	<--->		4PDT	10A	Figure 2	***SQL14D***	<--->	Figure 4
QL4X1-D24	<--->		4PDT	10A	Figure 2	***SQL14D***	<--->	Figure 4

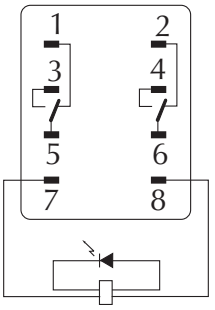
QL Series Electromechanical Relay Specifications

QL Series Specification Table								
Part Numbers	QL2N1-A120	QL2N1-A220	QL4N1-A120	QL4N1-A220	QL2N1-D24	QL2X1-D24	QL4N1-D24	QL4X1-D24
Contact Specifications								
Current Rating	10A							
Contact Type	DPDT		4PDT		DPDT		4PDT	
Terminal Type	Spade Plug-In Socket							
Rated Max. Resistive Load	10A@110VAC/10A@24VDC							
Rated Max. Inductive Load	7.5A@110VAC/ 5A@24VDC							
Minimum Recommended Load	1mA @ 5VDC							
Max. Switching Cap. (Resistive Load)	1,100VAC/240W							
Max. Switching Cap. (Inductive Load)	825VAC/120W							
Max. Contact Rating	250VAC/125VDC							
Coil Specifications								
Options	LED Indicator					LED Indicator/Diode Protection	LED Indicator	LED Indicator/Diode Protection
Coil Input Voltage	110/120VAC	220/240VAC	110/120VAC	220/240VAC	24VDC			
Rated Current at 50Hz	9.9 /10.8mA	6.2/6.8mA	17/19mA	11.5/13.1mA	36.9mA		69mA	
Rated Current at 60Hz	8.4/9.2mA	5.3/5.8mA	18/16.4mA	9.8/11.2mA	36.9mA		69mA	
Coil Resistance	4.43kΩ	12.95kΩ	2.2kΩ	6.7kΩ	650Ω		350Ω	
Power Consumption	Approx. 0.9W to 1.1W (at 60Hz)				Approx. 0.9W			
Dropout Voltage (% of rated voltage)	Min. 30%				Min. 10%			
Pick-Up Voltage (Must operate voltage)	Max. 80% of the rated coil voltage							
Max. Voltage (Max. continuous voltage)	110% of the rated coil voltage							
Min. Operating Voltage	80% of the rated coil voltage							
General Specifications								
Service Life	Mechanical: AC: Min. 50 million operations; DC: Min. 100 million operations (at operating frequency of 18,000 operations/hour)							
	Electrical: DPDT: Min. 500k operations; 4PDT: Min. 200k operations (at operating frequency of 1,800 operations/hour)							
Operate Time	25ms max							
Release Time	25ms max							
Ambient Temperature	-25° C to 70° C (-13° F to 158° F)							
Ambient Humidity	45% to 85% Relative Humidity							
Contact Material	Silver Cadmium Oxide							
Contact Resistance	50mΩ max.							
Operating Frequency	Mechanical 18,000 operations/hour; Electrical 1,800 operations/hour							
Vibration Resistance	10Hz to 55Hz at double amplitude of 1.0mm							
Shock Resistance	1,000m/s^2 (approx. 100G)							
Weight	35g (1.24oz.)							
Agency Approvals and Standards	UL Recognized (#E222847), CE Certified (9667186-9811), CSA Certified (218218)							

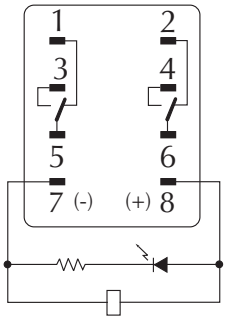
QL Series Wiring Diagrams and Derating Curves

Wiring Diagrams

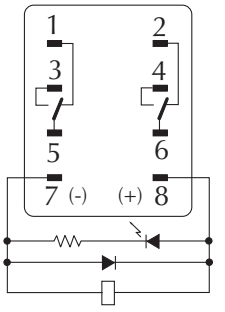
QL2N1-A120
QL2N1-A220



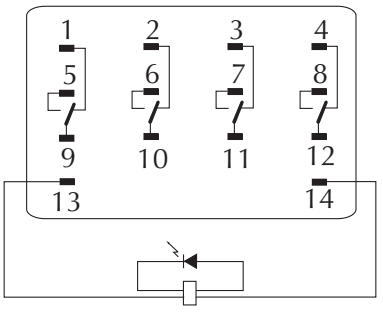
QL2N1-D24



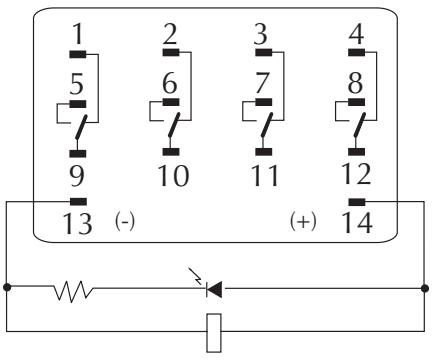
QL2X1-D24



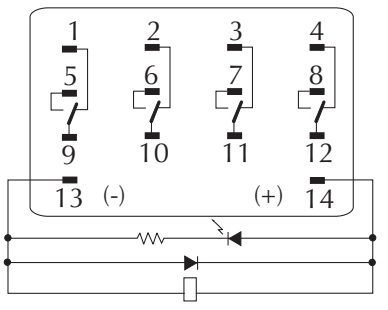
QL4N1-A120
QL4N1-A220



QL4N1-D24



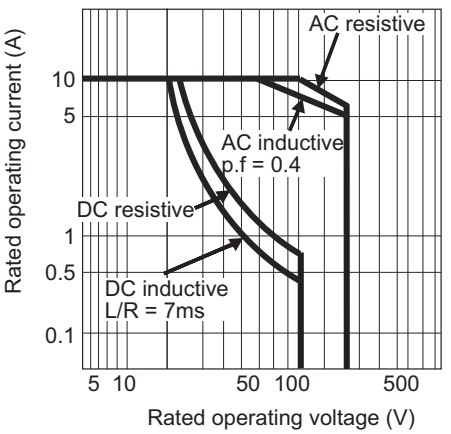
QL4X1-D24



Derating Curves

2PDT

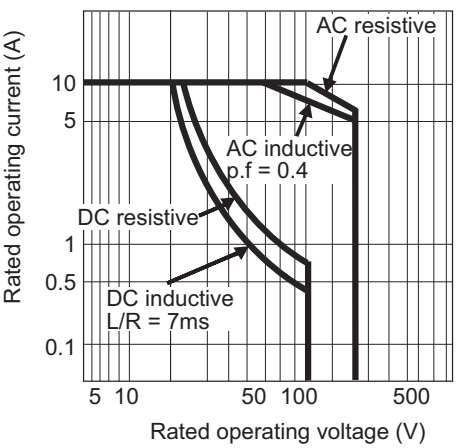
Max. Switching capacity



QL 2PDT

4PDT

Max. Switching capacity



QL 4PDT

QL Series Dimensional Drawings

Mounting dimensions (mm/in)

Figure 1
QL2 Dimensions

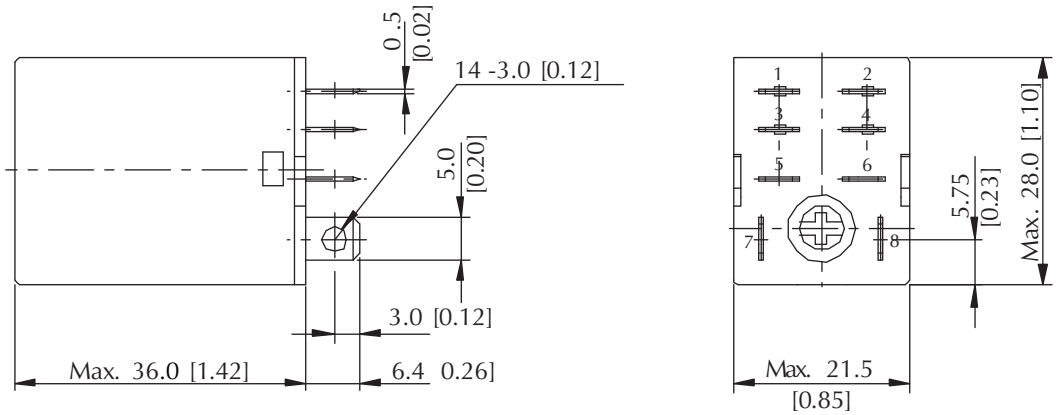
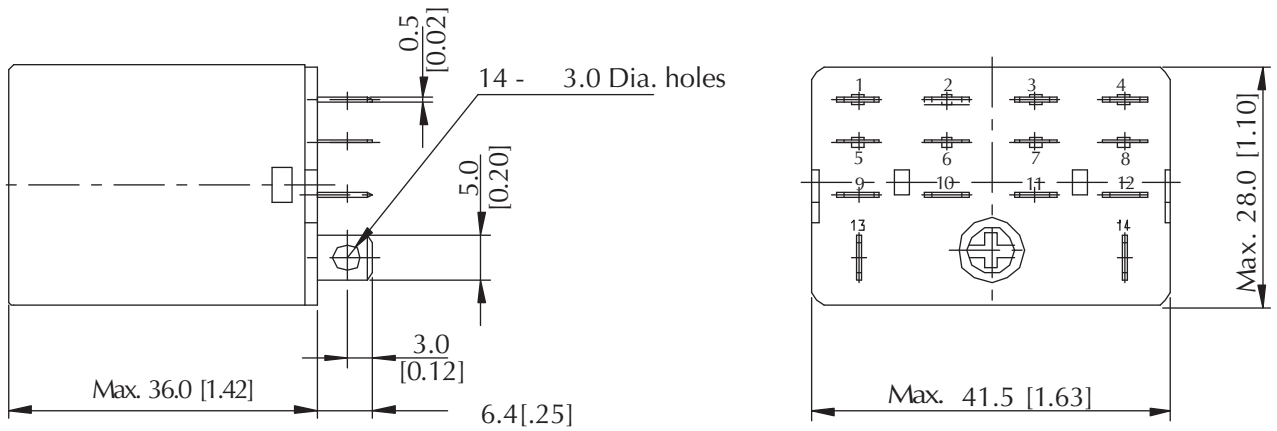


Figure 2
QL4 Dimensions



QM Series Electromechanical Relay Selection Guide

QM series relays are general purpose relays designed for a wide range of applications, from power to sequence controls in various factory machines and control panels. They are ideal for electric control panels requiring stable and reliable relays.

Features

- Small package design
- DPDT has a fine silver contact with 5A capability
- 4PDT has a gold-plated silver contact with 3A capability
- High dielectric strength (1,800 VAC)
- High reliability and long life
- Ultra-high sensitivity with quick response time (20 ms max.)
- High vibration and shock resistance
- LED indicator on all models, so you can easily see if relay is working properly without using a voltmeter
- Diode protection on some 24 VDC models protects contacts and electronic components from back EMF
- UL recognized, CE certified, CSA certified (218218)

• *ORDER SOCKET SEPARATELY*

QM Series Selection Guide								
Part Number	***Price***	***Coil Voltage***	***Configuration***	***Contact Rating***	***Dimensions (see page 24-11)***	***Relay Socket Part Number***	***Price***	***Dimensions (see page 24-13)***
QM2N1-A120	<--->	110/120VAC	2PDT	5A	Figure 1	***SQM08D***	<--->	Figure 5
QM4N1-A120	<--->		4PDT	3A	Figure 2	***SQM14D***	<--->	Figure 6
QM2N1-A220	<--->	220VAC	2PDT	5A	Figure 1	***SQM08D***	<--->	Figure 5
QM4N1-A220	<--->		4PDT	3A	Figure 2	***SQM14D***	<--->	Figure 6
QM2N1-D24	<--->	24VDC	2PDT	5A	Figure 1	***SQM08D***	<--->	Figure 5
QM2X1-D24	<--->		2PDT	5A	Figure 1	***SQM08D***	<--->	Figure 5
QM4N1-D24	<--->		4PDT	3A	Figure 2	***SQM14D***	<--->	Figure 6
QM4X1-D24	<--->		4PDT	3A	Figure 2	***SQM14D***	<--->	Figure 6

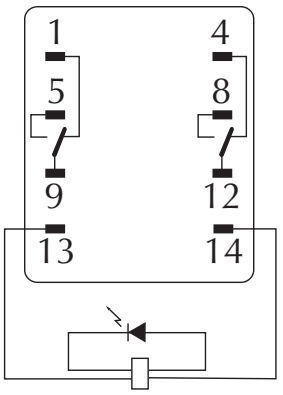
QM Series Electromechanical Relay Specifications

QM Series Specification Table								
Part Numbers	QM2N1-A120	QM2N1-A220	QM4N1-A120	QM4N1-A220	QM2N1-D24	QM2X1-D24	QM4N1-D24	QM4X1-D24
Contact Specifications								
Current Rating	5A		3A		5A		3A	
Contact Type	DPDT		4PDT		DPDT		4PDT	
Terminal Type	Spade plug-in socket							
Rated Max. Resistive Load	5A @ 220VAC/5A @ 24VDC		3A @ 220VAC/3A @ 24VDC		5A @ 220VAC/5A @ 24VDC		3A @ 220VAC/3A @ 24VDC	
Rated Max. Inductive Load	2A @ 220VAC/2A @ 24VDC		1.5A @ 220VAC/0.8A @ 24VDC		2A @ 220VAC/2A @ 24VDC		1.5A @ 220VAC/0.8A @ 24VDC	
Minimum Recommended Load	1mA @ 1VDC							
Max. Switching Cap. (Resistive Load)	1,100VA/120W		660VA/72W		1,100VA/120W		660VA/72W	
Max. Switching Cap. (Inductive Load)	440VA/48W		176VA/36W		440VA/48W		176VA/36W	
Max. Contact Rating	250VAC/125VDC				250VAC/125VDC			
Coil Specifications								
Options	LED Indicator					LED Indicator/Diode Protection	LED Indicator	LED Indicator/Diode Protection
Coil Input Voltage	110/120VAC	220/240VAC	110/120VAC	220/240VAC	24VDC			
Rated Current at 50Hz	9.9 /10.8mA	6.2/6.8mA	9.9/10.8mA	6.2/6.8mA	36.9mA			
Rated Current at 60Hz	8.4/ 9.2mA	5.3/5.8mA	8.4/9.2mA	5.3/5.8mA				
Coil Resistance	4.43kΩ	12.95kΩ	4.43kΩ	12.95kΩ	650Ω			
Power Consumption	Approx. 0.9W to 1.1W (at 60Hz)				Approx. 0.9W			
Dropout Voltage (% of rated voltage)	Min. 30%				Min. 10%			
Pick-Up Voltage (Must operate voltage)	Max. 80% of the rated coil voltage							
Max. Voltage (Max. continuous voltage)	110% of the rated coil voltage							
Min. Operating Voltage	80% of the rated coil voltage							
General Specifications								
Service Life	Mechanical: AC: Min. 50 million operations; DC: Min. 100 million operations (at operating frequency of 18,000 operations/hour)							
	Electrical: DPDT: Min. 500k operations; 4PDT: Min. 200k operations (at operating frequency of 1,800 operations/hour)							
Operate Time	20ms max							
Release Time	20ms max							
Ambient Temperature	-25° C to 75° C (-13° F to 167° F)							
Ambient Humidity	45% RH to 85% RH							
Contact Material	Fine Silver		Gold-plated Silver		Fine Silver		Gold-plated Silver	
Contact Resistance	50mΩ max							
Operating Frequency	Mechanical: 18,000 operations/hour; Electrical: 1,800 operations/hour							
Vibration Resistance	10Hz to 55Hz at double amplitude of 1.0mm							
Shock Resistance	1,000m/s² (approx. 100G)							
Weight	35g (1.24oz.)							
Agency Approvals and Standards	UL Recognized (#E222847), CE Certified (9667186-9811), CSA Certified (218218)							

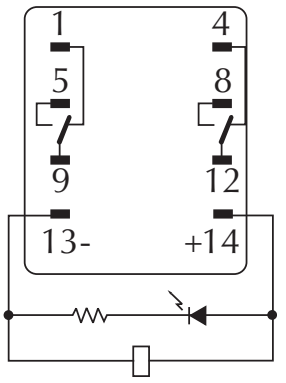
QM Series Wiring Diagrams and Derating Curves

Wiring diagrams

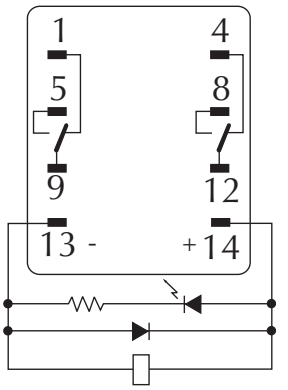
QM2N1-A120
QM2N1-A220



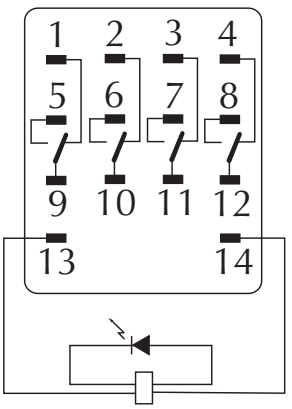
QM2N1-D24



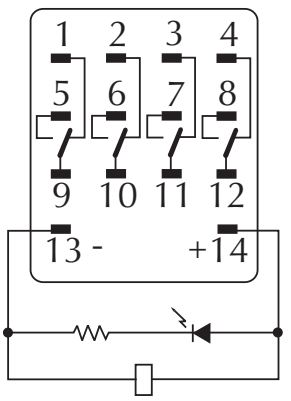
QM2X1-D24



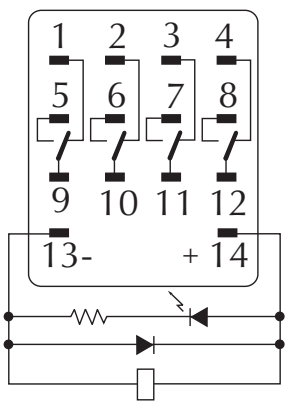
QM4N1-A120
QM4N1-A220



QM4N1-D24



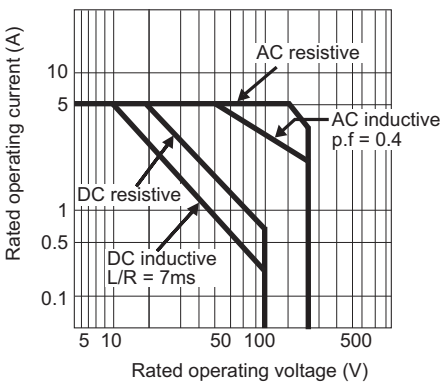
QM4X1-D24



Derating curves

DPDT

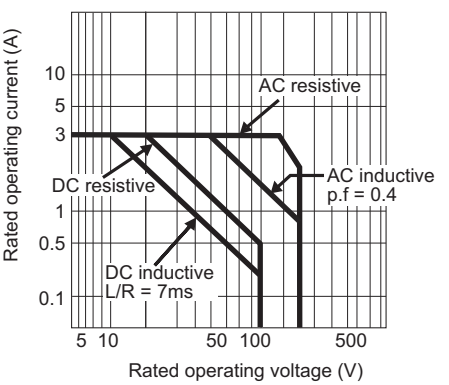
Max. Switching capacity



QM DPDT

4PDT

Max. Switching capacity



QM 4PDT

QM Series Dimensional Drawings

Mounting dimensions (mm/in)

Figure 1
QM2 Series Dimensions

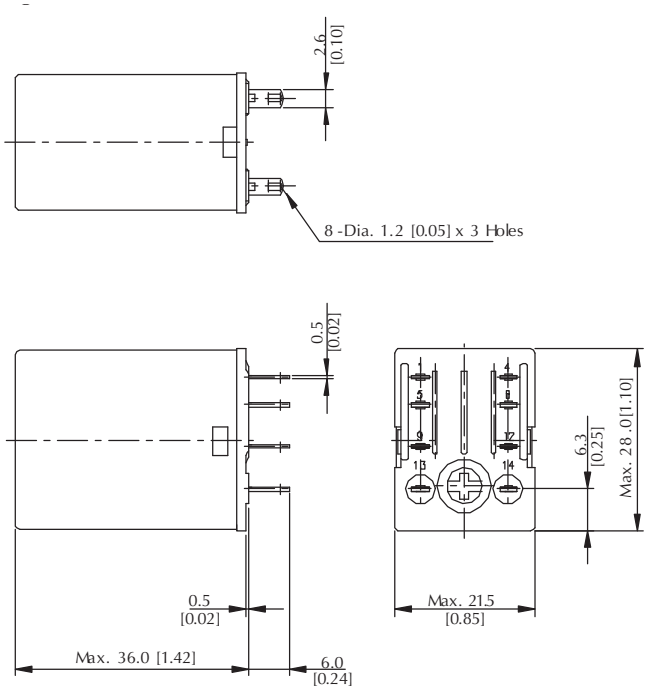
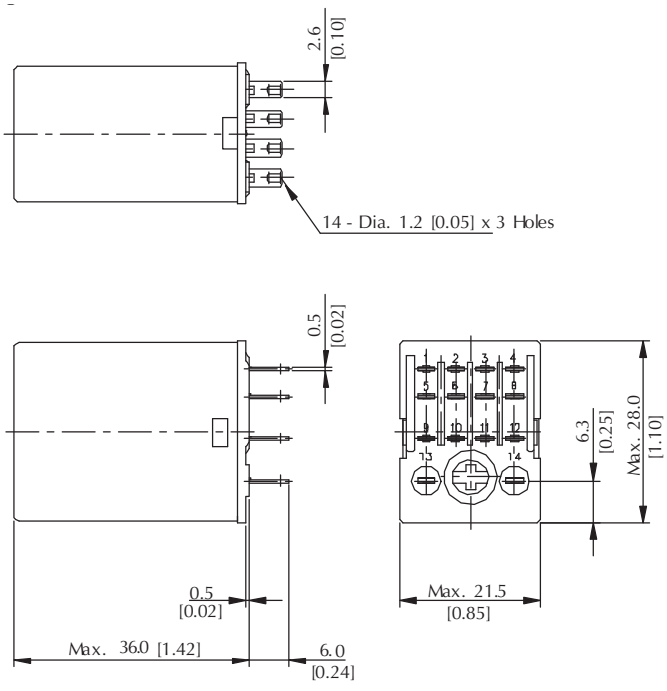


Figure 2
QM4 Series Dimensions



Sockets for QL/QM Series Relays

SQL08D

Din-rail mounting, DPDT, for use with QL2 series relays

<---->

SQL14D

Din-rail mounting, 4PDT, for use with QL4 series relays

<---->

SQM08D

Din-rail mounting, DPDT, for use with QM2 series relays

<---->

SQM14D

Din-rail mounting, 4PDT, for use with QM4 series relays

<---->

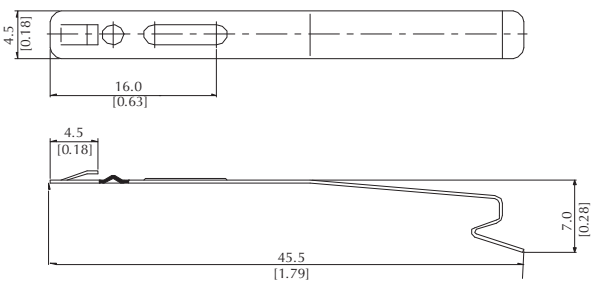
Holding Clips

Holding clips for the QL2, QL4, QM2 and QM4 series relays can be removed by pushing the side of the inserting hole with a sharp object.

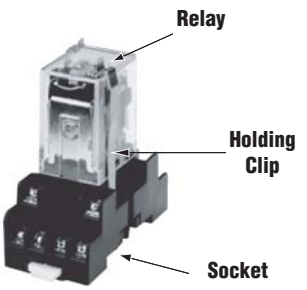
Note: Order sockets separately; holding clips are included with sockets.

Holding Clip Dimensions

Holding clip for QL4 series relays is included with SQL14D sockets.

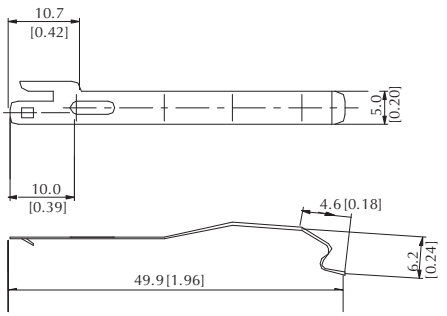


Insert holding clip into the slots provided on the socket.



Holding Clip Dimensions

Holding clip for QL2, QM2 and QM4 series relays is included with SQL08D, SQM08D and SQM14D sockets.



Socket Dimensions for QL/QM Series Relays

Figure 3
SQL08D (for QL2 Series Relays)

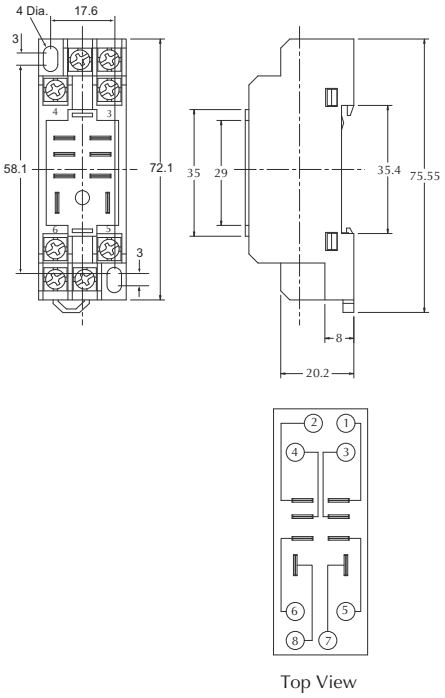


Figure 4
SQL14D (for QL4 Series Relays)

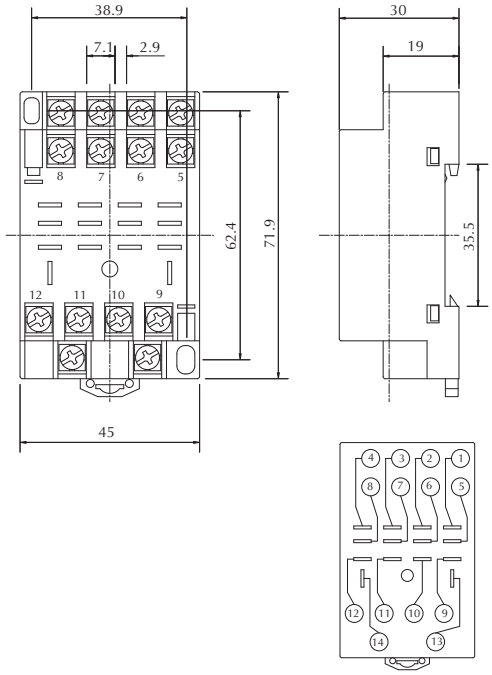


Figure 5
SQM08D (for QM2 Series Relays)

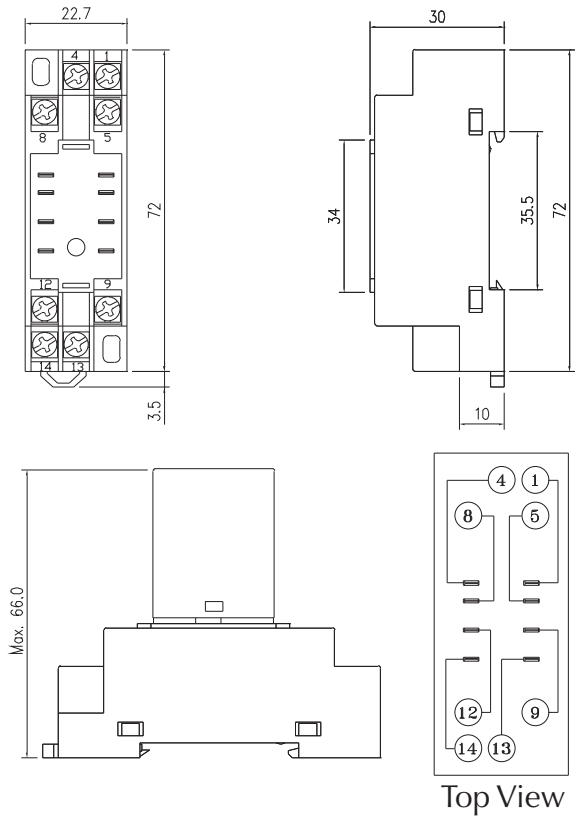
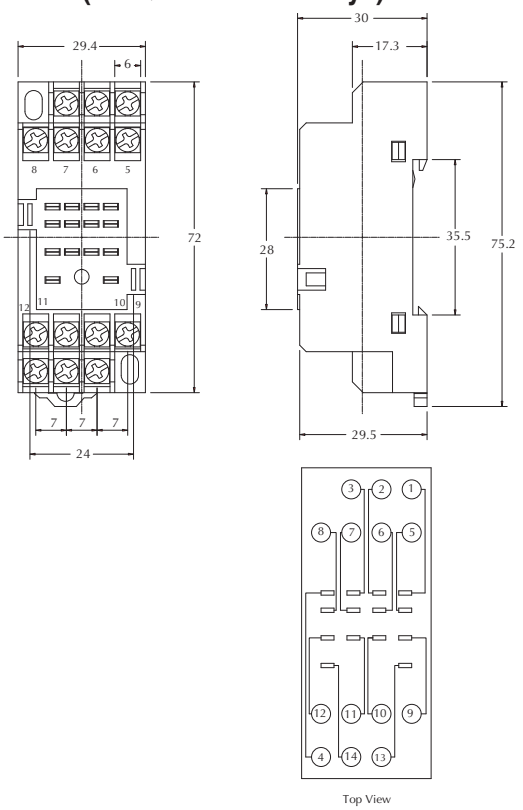
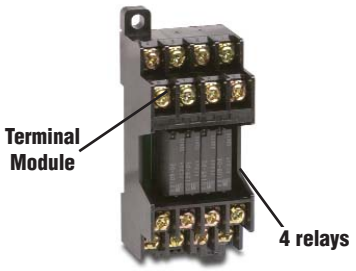


Figure 6
SQM14D (for QM4 Series Relays)



RS Series Electromechanical Relay Selection Guide



RS4N-DE

RB105-DE

TY3

RZ4N

RS Series Card Relay Selection Guide			
Part Number	***Price***	***Description***	***Dimensions and Wiring Diagrams (see pages 24-17 and 24-18)***
RS4N-DE	<--->	Card relay (4 relays included; 4 commons), mounted in socket, 24VDC coil, SPST, 5A rating. TY3 included; (can only be wired one way for proper operation of LEDs)	Figure 3
RS6N-DE	<--->	Card relay (6 relays included; 2 commons; 3 relays per common), mounted in socket, 24VDC coil, SPST, 5A rating. TY3 included.	Figure 4
RB105-DE	<--->	Spare relays (package of 10) for the RS series Relays. 24V DC coil, SPST, 5A rating.	Figure 1
TY3	<--->	Relay remover for RS series relays. Package of 10.	-
RZ4N	<--->	Terminal guard for RS series relays. Package of 10.	Figure 2

RS Series Relay Specifications

RS6N-DE

RS series relays are compact, space-saving relay terminal modules containing four or six card relays with one normally open contact each. These relay-and-terminal modules are ideal for interfacing electronic control devices (such as PLCs or photoelectric sensors) with output devices.

Features:

- Compact size of 34 mm wide by 69 mm long, including screw terminals
- Input terminals are located in the upper part and output terminals in the lower part of the module to separate them from each other, making wiring easy
- RB105 plug-in relays and TP04 sockets make maintenance easy
- Built-in coil surge-suppression diodes and operation indicator LEDs simplify circuit design and maintenance
- The module is easily-mounted on a 35 mm DIN rail
- The RS4N module includes two standard accessory jumper plates, which are convenient for common wiring of terminals

RS4N-DE and RS6N-DE Series Card Relay Specifications Table

Contact		1 NO / SPST			
Contact Resistance		30mΩ or less (before use)			
Contact Material		Silver alloy (gold-plated)			
Min. Operating Voltage and Current		0.1VDC, 1mA			
Rated Thermal Current		5A			
Max. Make/Break Current (Resistive Load)		250VAC, 5A 30VDC, 5A			
Operating Time		10ms or less at rated voltage			
Release Time		10ms or less at rated voltage			
Insulation Resistance		100MΩ (at 500VDC megger)			
Dielectric Strength	***Between Contact and Coil***	2000VAC 1 minute			
	Between Contacts of Same Pole	750VAC 1 minute			
	Between Contacts of Different Pole	2000VAC 1 minute			
	Between Coils of Different Pole	500VAC 1 minute			
Vibration	***Malfunction Durability***	10 to 55Hz, 1mm double amplitude			
	Mechanical Durability	10 to 55Hz, 1.5mm double amplitude			
Shock	***Malfunction Durability***	100m/s^2			
	Mechanical Durability	1000m/s^2			
Life Expectancy	***Mechanical***	20 million operations			
	Electrical	***Voltage***	***Make Current (A)***	***Break Current (A)***	***Operations***
		220VAC (inductive load) 220VAC (resistive load) 24VDC (inductive load) 24VDC (resistive load)	2 (cos ø = 0.7) 3 (cos ø = 1.0) 1 (T = 15ms) 5 (T = 1ms or less)	2 (cos ø = 0.3 - 0.4) 3 (cos ø = 1.0) 1 (T = 15ms) 5 (T = 1ms or less)	100,000 130,000 150,000 100,000
Ambient Temperature		-25 to + 55° C (no icing)			

Electromechanical Relay RB105-DE Specifications

RB105-DE

These spare relays are for replacement in RS4N-DE and RS6N-DE relay modules (5 mm). Bifurcated contacts ensure high contact reliability, allowing use in low-level circuits.

Features

- Narrow, miniature size and light weight reduces space on the DIN rail
- UL, CSA, CE, and TUV approved
- Low power consumption
- Can be operated with a non-polarity magnet
- Flux-tight construction

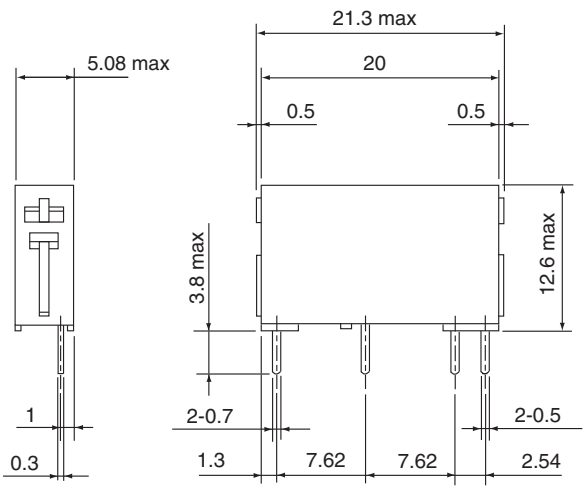
RB105-DE Card Relay Specification Table		
Operating Time		10ms or less at rated voltage
Release Time		5ms or less at rated voltage
Insulation Resistance		100MΩ (at 500VDC megger)
Dielectric Strength		750VAC 1 minute between open contacts 2000VAC 1 minute between contact and coil
Impulse		4,500V or more 1.2 x 50μs between contact and coil
Electrical Life Expectancy		AC: 100,000 operations at 220VAC 2A, inductive load 130,000 operations at 220VAC 3A, resistive load DC: 150,000 operations at 24VDC 1A, inductive load 100,000 operations at 24VDC 5A, resistive load
Mechanical Life Expectancy		20 million operations
Ambient Temperature		-40° C to +70° C (no icing)
Thermal Current		5A
Make and Break Current (Resistive Load)		250VAC, 5A 30VDC, 5A
Operating Coil	***Rated voltage***	24VDC
	Pick-up voltage	70% of rated coil voltage
	Drop-out voltage	5% of rated coil voltage
	Power consumption	200mW
	Coil resistance	2880Ω

RS Series Relay Remover and Protective Cover

Relay remover, TY3

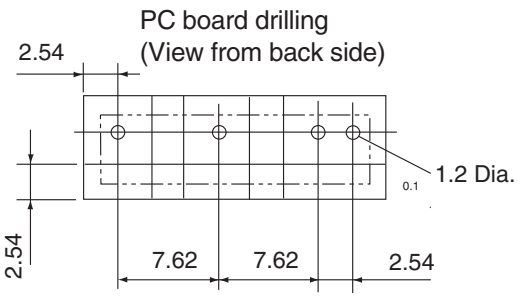
To remove a relay from the terminal module, use the TY3 relay remover. RS4N-DE and RS6N-DE modules include a TY3 relay remover. Pull the relay in a direction perpendicular to the terminal module surface. Incorrectly removing or mounting a relay may damage the relay pins and pin jacks of the module.

Figure 1 (Dimensions, mm)
RB105-DE



Optional protective cover, RZ4N

A protective cover fits over the RS4N-DE or RS6N-DE module and protects the terminals.



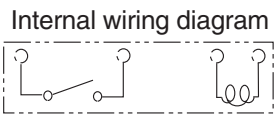
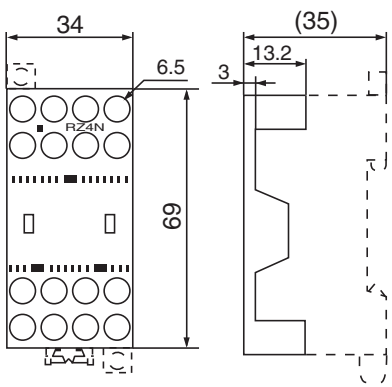
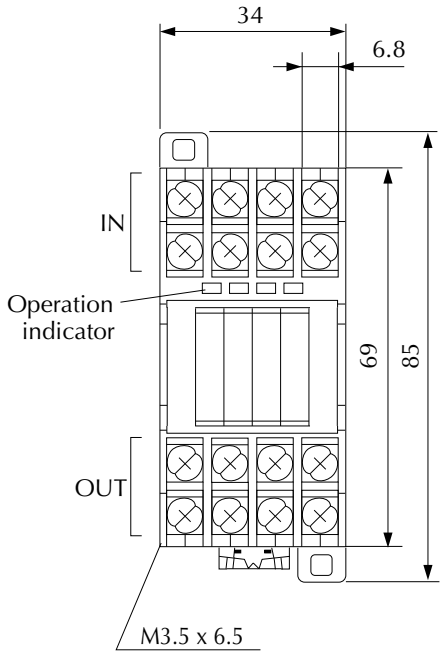


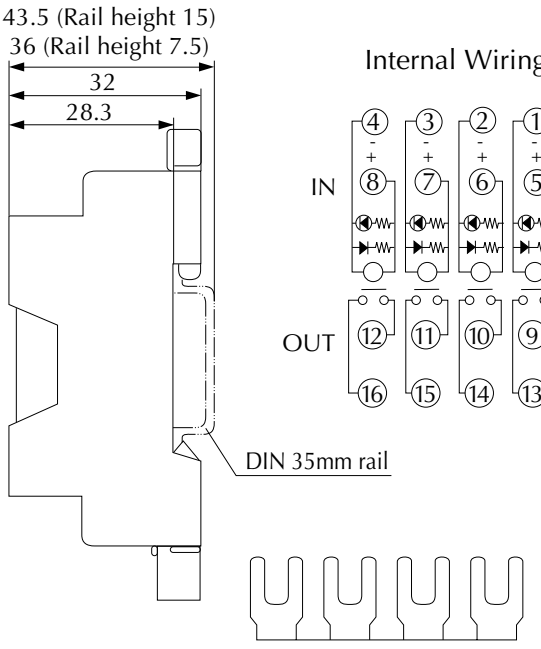
Figure 2 (Dimensions, mm)
RZ4N (Terminal guard for RS Series)



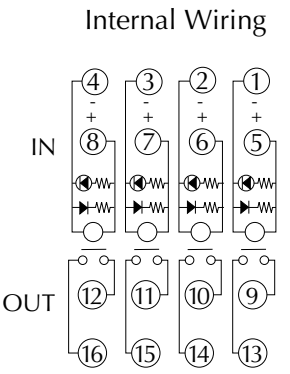
RS Series Relay Dimensions and Wiring Diagrams

Figure 3 Dimensions (mm)
RS4N-DE



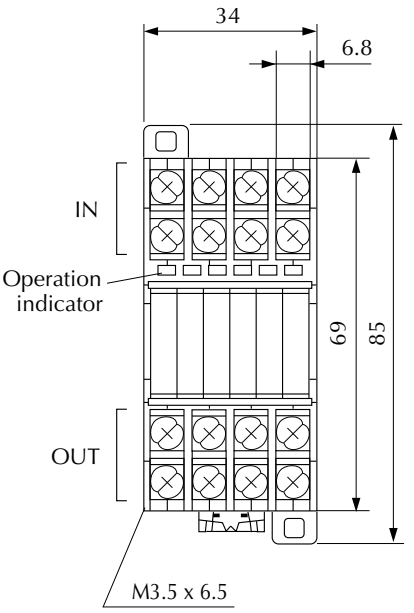


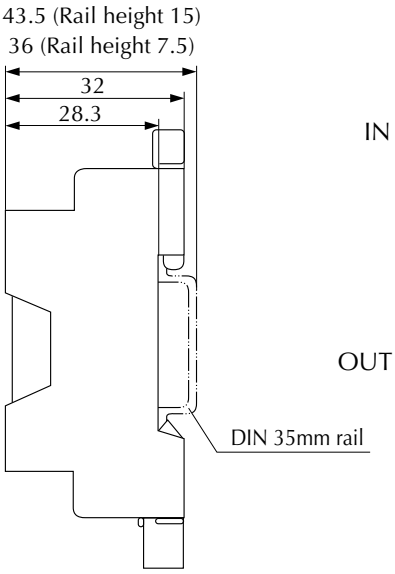
Wiring diagram
RS4N-DE



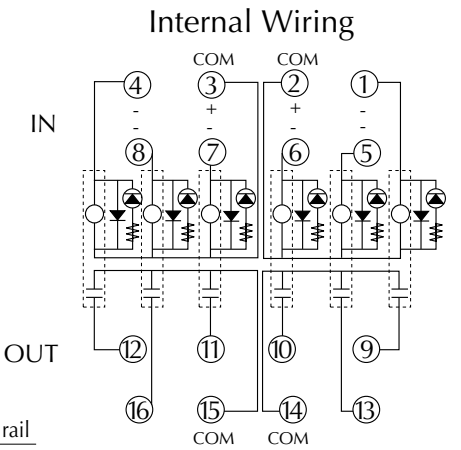
Jumper - included only with RS4N-DE

Figure 4 Dimensions (mm)
RS6N-DE





Wiring diagram
RS6N-DE



78 Series Electromechanical Relay Selection Guide




Specification	781 Series	782 Series	783 Series	784 Series
Coil Voltages	110/120VAC, 220VAC, 24VAC, 24VDC	110/120VAC, 220VAC, 24VAC, 24VDC	110/120VAC, 220VAC, 24VAC, 24VDC	110/120VAC, 220VAC, 24VAC, 24VDC
Configuration	1PDT	2PDT	3PDT	4PDT
Contact Rating	15A	15A	15A	15A
Base Socket	5 pin spade terminal	8 pin spade terminal	11 pin spade terminal	14 pin spade terminal
Agency Approvals	UL Recognized (E191059), CE Approval pending, CSA 97899	UL Recognized (E191059), CE Approval pending, CSA Approval pending	UL Recognized (E191059), CE Approval IEC Std 947-4-1 and 947-5-1, CSA 40787	UL Recognized (E191059), CE Approval pending, CSA Approval pending
Prices starting at	<--->	<--->	<--->	<--->

The ice cube style relays are power relays designed for applications demanding high power control in various factory machines and control panels. They are ideal for electric control panels requiring stable and reliable relays.

Features

- Small package design
- Silver Cadmium Oxide gold flashed contact
- High open contact dielectric strength (1,000 VAC)
- High reliability and long life
- High vibration and shock resistance
- LED indicator on all models, so you can easily see if the relay is working properly without using a voltmeter
- Flag indicator shows relay status in manual or powered condition
- A pushbutton allows manual operation of the relay without the need for power to the coil
- Lock-Down door, when activated, holds push button and contacts in the operate position allowing circuits to be analyzed. **This feature is not available on 781 series.**
- SPDT, 2PDT, 3PDT and 4PDT models
- Finger grip cover allows easier removal of relays from sockets than conventional relays
- I.D. tag/write labels for identifying relays in multi-relay circuits

78 Series Relays Selection Guide

NOTE: Not recommended for low current switching. Find contacts' Minimum Switching Requirement on page 24-20. For low current switching, please see the QM4N1 and QM4X1 series on page 24-8.

Part Number	*Price*	*Coil Voltage*	*Configuration*	*Contact Rating*	*Dimensions*	*Relay Socket Part Number*	*Price*	*Dimensions*
781-1C-24D	<--->	24VDC	SPDT	15A	Figure 1	***781-1C-SKT***	<--->	Figure 5
781-1C-24A	<--->	24VAC						
781-1C-120A	<--->	120VAC						
781-1C-240A	<--->	240VAC		12A				
782-2C-24D	<--->	24VDC	DPDT	15A	Figure 2	***782-2C-SKT***	<--->	Figure 6
782-2C-24A	<--->	24VAC						
782-2C-120A	<--->	120VAC						
782-2C-240A	<--->	240VAC						
783-3C-24D	<--->	24VDC	3PDT	15A	Figure 3	***783-3C-SKT***	<--->	Figure 7
783-3C-24A	<--->	24VAC						
783-3C-120A	<--->	120VAC						
783-3C-240A	<--->	240VAC		12A				
784-4C-24D	<--->	24VDC	4PDT	15A	Figure 4	***784-4C-SKT-1***	<--->	Figure 8
784-4C-24A	<--->	24VAC						
784-4C-120A	<--->	120VAC						
784-4C-240A	<--->	240VAC		12A				

78 Series Electromechanical Relay Specifications

78 Series Relay Specification Table																
Part Numbers	781-1C-24D	781-1C-24A	781-1C-120A	781-1C-240A	782-2C-24D	782-2C-24A	782-2C-120A	782-2C-240A	783-3C-24D	783-3C-24A	783-3C-120A	783-3C-240A	784-4C-24D	784-4C-24A	784-4C-120A	784-4C-240A
General Specifications																
***Service Life: Electrical Operations at Rated Resistive Load**	Mechanical: 10,000,000 operations @ rated resistive load															
	100,000				200,000				150,000							
Operating Temperature	-40°C to 70°C (-40°F to 158°F)															
Ambient Humidity	45% RH to 85% RH															
Vibration Resistance	6 G's, 10 to 55Hz (0.6mm double amplitude)															
Shock Resistance	10 G's															
Weight	29g (1.02 oz.)				36g (1.27 oz.)				62g (2.19 oz.)				80g (2.82 oz.)			
Agency Approvals and Standards	UL Rec.**, CE Certified, CSA												UL Listed**, CE Certified.CSA.			
NEMA B300 Pilot Duty Rated	No	Yes			No	Yes			No	Yes			No	Yes		
Coil Specifications																
Standard	LED Indicator															
Coil Input Voltage	24VDC	24VAC	120VAC	240VAC	24VDC	24VAC	120VAC	240VAC	24VDC	24VAC	120VAC	240VAC	24VDC	24VAC	120VAC	240VAC
Coil Resistance	750Ω	180Ω	4.43kΩ	15.72kΩ	650Ω	180Ω	4.43kΩ	15.7kΩ	400Ω	103Ω	2.77kΩ	12.1kΩ	388Ω	84.5Ω	2.22kΩ	9.12kΩ
Power Consumption	0.7W DC, 0.9VA @ 60Hz AC @ 25°C				0.9W DC, 1.2VA@ 60Hz AC @ 25°C				1.7W DC, 1.2VA @ 60Hz AC @ 25°C				2.0W DC, 1.5VA @ 60Hz AC @ 25°C			
Dropout Voltage (% of nominal voltage or more)	Min. 10%	Min. 30%			Min. 10%	Min. 30%			10%	10%			Min. 10%	Min. 30%		
Pull-in Voltage (% of nominal voltage or less)	75%	80%			75%	80%			80%	85%			75%	80%		
Max. Voltage (Max. continuous voltage)	110% of the rated coil voltage															
Contact Specifications																
Contact Type	SPDT				DPDT				3PDT				4PDT			
Contact Material	Silver cadmium oxide, gold flashed															
Contact Resistance	N/A												0.050Ω max. initial resistance			
Minimum Switching Requirement	100mA @ 5VDC															
Max. Contact Rating	Refer to Contact Ratings charts on following page															

Note: These devices are rated for 1,000 cycles when applied to a motor application. (Per Table 45.1, UL 508).

****Note: UL listed when used with sockets 781-1C-SKT, 782-2C-SKT, 783-3C-SKT, 784-4C-SKT, or 784-4C-SKT-1. Current limited to rating of relay or socket, whichever is less.***

NEMA Mechanical Switching Ratings and Test Values for AC Control Circuit Contacts											
Contact Rating Designation	**Thermal Continuous Test Current (A)**	**Maximum AC Current, 50/60Hz (A)**								**Voltamperes**	
		120 Volts		**240 Volts**		**480 Volts**		**600 Volts**			
		Make	**Break**	**Make**	**Break**	**Make**	**Break**	**Make**	**Break**	**Make**	**Break**
B300	5	30	3.00	15	1.50	---	---	---	---	3600	360

This chart is provided as a guideline only, and the ratings and values are not guaranteed to be accurate. It is the users' responsibility to properly size their control circuit devices. The chart values are from NEMA Standard ICS 5-2000, Table 1-4-1.

78 Series Electromechanical Relay Specifications

781 Series Contact Ratings (current)				
Resistive				**Motor Load*
Voltage	***Nominal***	***UL***	***CSA***	***UL***
28VDC	15A	15A	15A	---
110VAC	15A	15A	15A	1/2Hp
120VAC	15A	15A	15A	1/2Hp
220VAC	12A	12A	10A	1/2Hp
250VAC	12A	12A	10A	1Hp

782 Series Contact Ratings (current)				
Resistive				**Motor Load*
Voltage	***Nominal***	***UL***	***CSA***	***UL***
28VDC	12A	12A	12A	---
110VAC	15A	15A	15A	1/2Hp
120VAC	15A	15A	15A	1/2Hp
220VAC	12A	12A	10A	1Hp
250VAC	12A	12A	10A	1Hp

783 Series Contact Ratings (current)				
Resistive				**Motor Load*
Voltage	***Nominal***	***UL***	***CSA***	***UL***
28VDC	12A	12A	12A	---
110VAC	15A	15A	15A	1/2Hp
120VAC	15A	15A	15A	1/2Hp
220VAC	12A	12A	10A	3/4Hp
250VAC	12A	12A	10A	3/4Hp

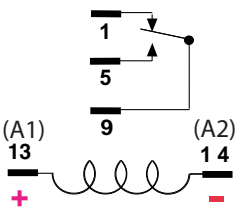
784 Series Contact Ratings (current)				
Resistive				**Motor Load*
Voltage	***Nominal***	***UL***	***CSA***	***UL***
28VDC	12A	12A	12A	---
110VAC	15A	15A	15A	1/2Hp
120VAC	15A	15A	15A	1/2Hp
220VAC	12A	12A	12A	1/2Hp
250VAC	12A	12A	12A	3/4Hp

Note: These devices are rated for 1,000 cycles when applied to a motor application. (Per Table 46.1` UL 508)

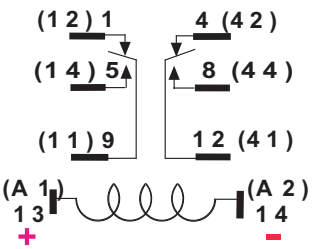
78 Series Wiring Diagrams and Dimensions

Wiring Diagrams (viewed from pin end)

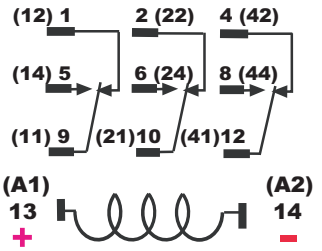
781-1C-XXX



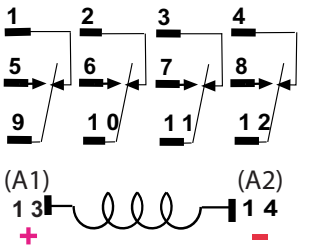
782-2C-XXX



783-3C-XXX



784-4C-XXX



ALTERNATE NEMA OR IEC ( ) NUMBERS, VIEWED FROM PIN SIDE

Dimension Drawings

Dimensions: inches/mm

Figure 1: 781-1C Dimensions

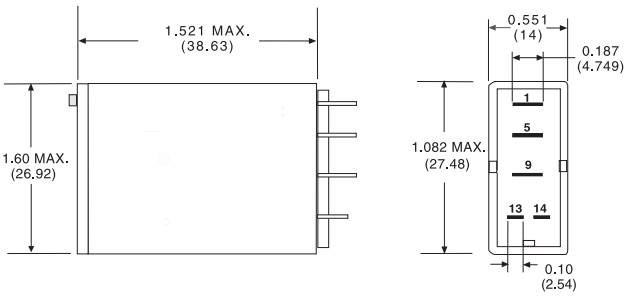


Figure 2: 782-2C Dimensions

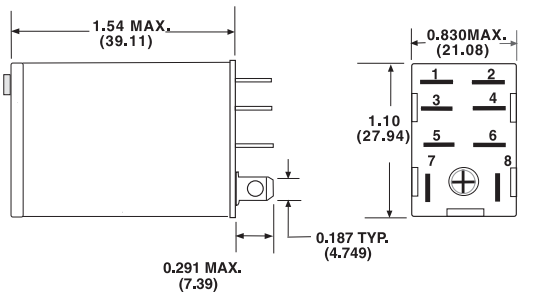


Figure 3: 783-3C Dimensions

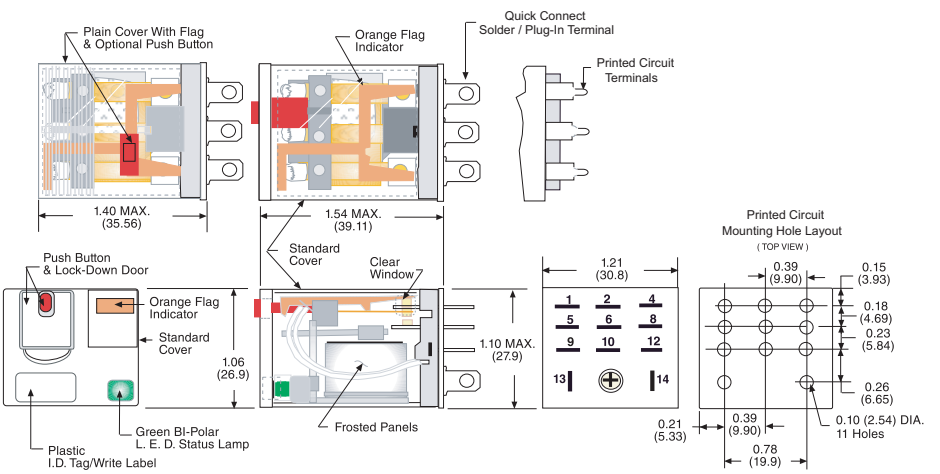
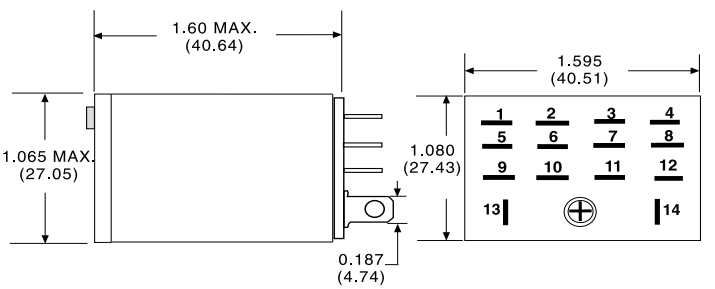


Figure 4: 784-4C Dimensions

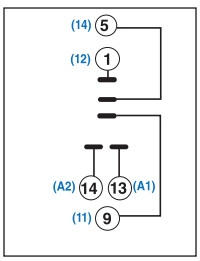


78 Series Relay Socket Dimensions

Figure 5: 781-1C-SKT Dimensions

DIN-rail mounting, SPDT, for use with 781 series relays

Note: See Table on page 27-24 for Maximum Screw Torques and wire sizes



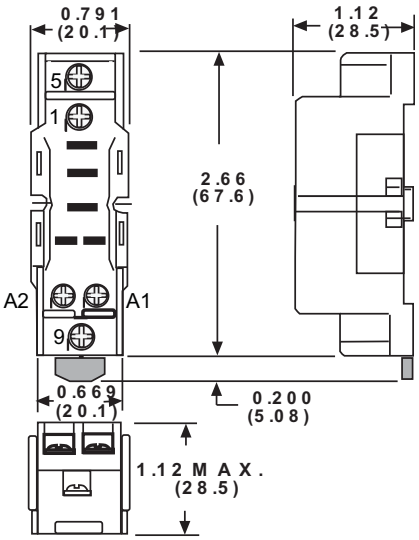
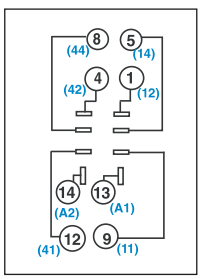


Figure 6: 782-2C-SKT Dimensions

DIN-rail mounting, DPDT, for use with 782 series and AD-70S2 relays

Note: See Table on page 27-24 for Maximum Screw Torques and wire sizes



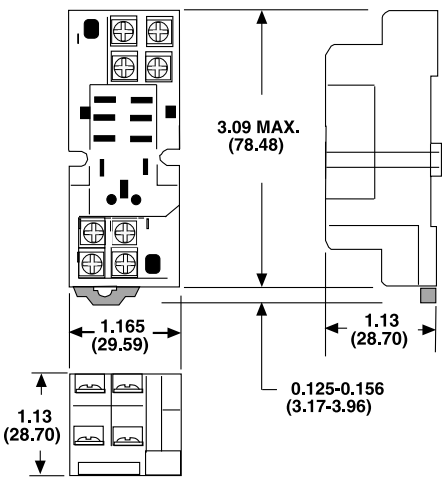
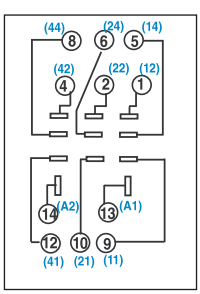


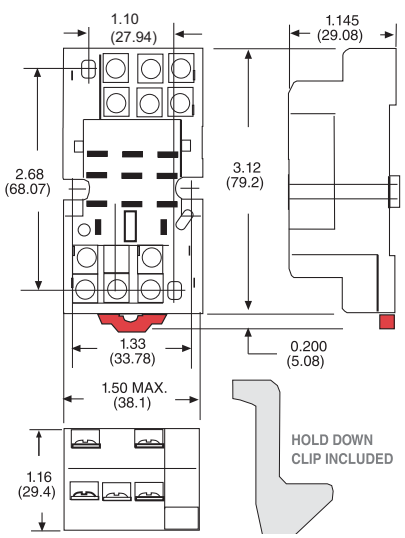
Figure 7: 783-3C-SKT Dimensions

DIN-rail mounting, 3PDT, for use with 783 series relays.

Note: See Table on page 27-24 for Maximum Screw Torques and wire sizes



Dimensions: inches/mm



Note: Order sockets separately; holding clips are included with sockets.

78 Series Relay Socket Dimensions

Figure 8: 784-4C-SKT-1 Dimensions

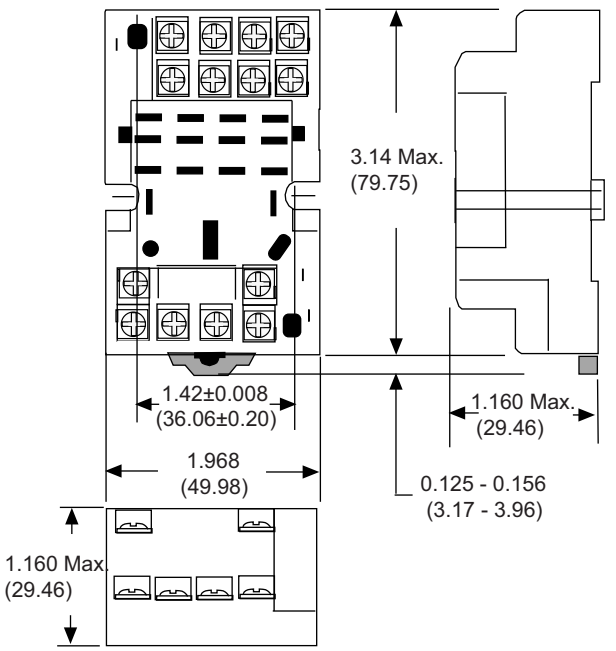
DIN-rail mounting, 4PDT, for use with 784 series relays.

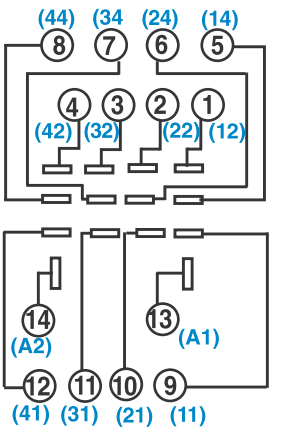
Note: Order sockets separately; holding clips are included with sockets.

Note: See Table below for Maximum Screw Torques and wire sizes

Figure 8

Dimensions: inches/mm





Part Number	Maximum Screw Torques	Maximum Wire Sizes
781-1C-SKT	Terminals 13, 14: 7 in-lbs/0.8Nm Terminals 1, 5, 9: 9 in-lbs/1.0Nm	Terminals 13, 14: 18-20AWG, solid or stranded, one or two identical wires Terminals 1, 5, 9: 12-20AWG, solid or stranded, one or two identical wires
782-2C-SKT	All terminals: 9 in-lbs/1.0Nm	All terminals: 12-20AWG, solid or stranded, one or two identical wires
783-3C-SKT		
784-4C-SKT-1		

75 Series Electromechanical Relay Selection Guide

75 series relays are general purpose relays designed for a wide range of applications, from power to sequence controls in various factory machines and control panels. They are ideal for electric control panels requiring stable and reliable relays.

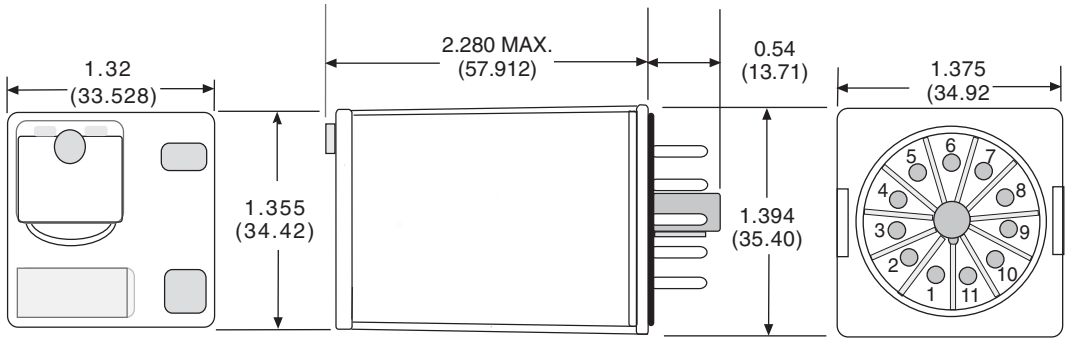
Features

- Octal base design
- Silver Cadmium Oxide, gold flashed contacts
- High open contact dielectric strength (1,500 VAC)
- High reliability and long life
- High vibration and shock resistance
- Flag indicator shows relay status in manual or powered condition
- LED indicator on all models, so you can easily see if relay is working properly without using a voltmeter
- A push button allows manual operation of the relay without the need for power to the coil
- I.D. tag/write label for identifying relays in multi-relay circuits

75 Series Relay Selection Guide

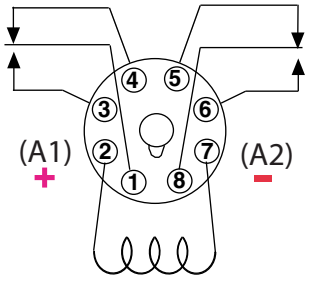
Part Number	Price	Coil Voltage	Configuration	Contact Rating	Relay Socket Part Number	Price
750-2C-24D		24VDC				
750-2C-24A	<--->	24VAC	DPDT		750-2C-SKT	<--->
750-2C-120A		120VAC				
750-2C-240A	<--->	220VAC		12A		
750-3C-24D	<--->	24VDC				
750-3C-24A	<--->	24VAC	3PDT		750-3C-SKT	<--->
750-3C-120A	<--->	120VAC				
750-3C-240A	<--->	240VAC				

75 Series Relay Dimensions



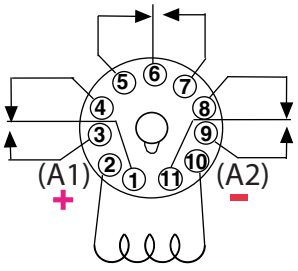
Note: Dimensions for the 750-2C-xxx are the same as shown above.

750-2C-xxx wiring diagram



ORDER SOCKET SEPARATELY

750-3C-xxx wiring diagram



75 Series Electromechanical Relay Specifications

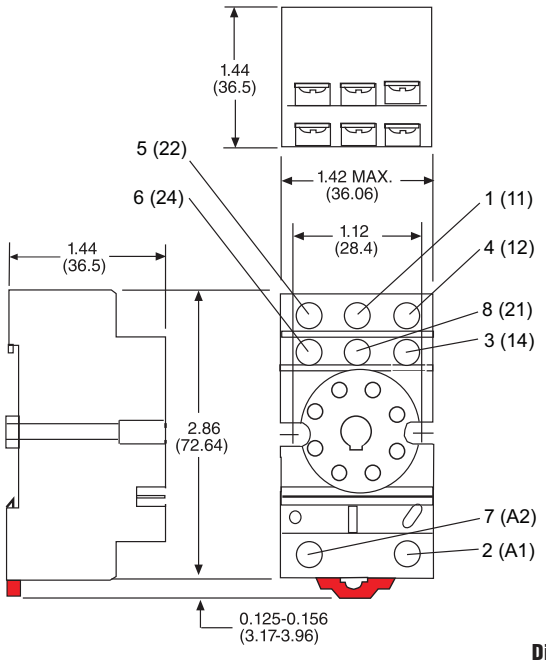
75 Series Specification Table								
Part Numbers	750-2C-24A	750-2C-120A	750-2C-240A	750-3C-24A	750-3C-120A	750-3C-240A	750-2C-24D	750-3C-24D
Contact Specifications								
Contact Type	DPDT			3PDT			DPDT	3PDT
Contact Material	Silver cadmium oxide, gold flashed							
Contact Rating	12A @ 120/240VAC 50/60Hz, 12A @ 28VDC 1/3Hp 120VAC, 1/2Hp 240VAC							
Minimum Switching Requirement	100mA @ 5VDC							
Contact Resistance	0.050Ω max. @ 10A, 120VAC or 24VDC Contacts conditioned for 50 make and break operations @ 1 sec. ON and 1 sec. OFF.							
Coil Specifications								
Standard	LED Indicator							
Coil Input Voltage	24VAC	120VAC	240VAC	24VAC	120VAC	240VAC	24VDC	24VDC
Coil Resistance	72Ω	1.7kΩ	9.1kΩ	72Ω	1.7kΩ	9.1kΩ	470Ω	
Power Consumption	2VA to 3.55VA (60Hz) AC						3.0 watts DC	
Dropout Voltage (% of rated voltage)	Min. 30%						Min. 10%	
Pull-in Voltage	Max. 85% of nominal voltage or less						Max. 80% of nominal voltage or less	
Max. Voltage (Max. continuous voltage)	110% of the rated coil voltage							
General Specifications								
Service Life	Mechanical: 5 million operations							
	Electrical: 200,000 operations @ rated resistive load							
Operating Temperature	-40°C to 50°C (-40°F to 122°F)						-40°C to 65°C (-40°F to 149°F)	
Weight	88g (3.1oz.)							
Agency Approvals and Standards	UL Recognized (E191059)*, CE Certified (9667186-9811), CSA Certified							

Note: UL listed when used with sockets 781-1C-SKT, 782-2C-SKT, 783-3C-SKT, 784-4C-SKT, or 784-4C-SKT-1. Current limited to rating of relay or socket, whichever is less.

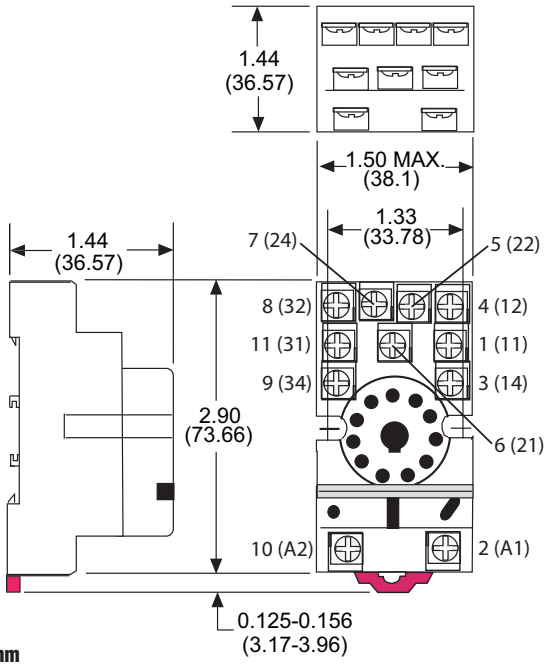
75 Series Contact Ratings (current)				
Resistive				**Motor Load**
Voltage	**Nominal**	**UL**	**CSA**	**UL**
28VDC	12A	12A	12A	---
120VAC	12A	12A	12A	1/3Hp
240VAC	12A	12A	12A	1/2Hp

75 Series Socket Dimensions

750-2C-SKT Dimensions

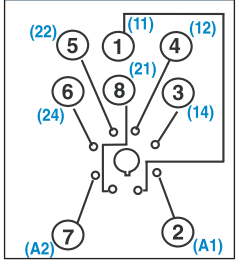


750-3C-SKT Dimensions

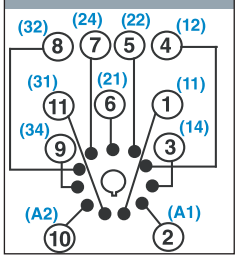


Dimensions: in./mm

Wiring Diagram
Top View



Wiring Diagram
Top View



Bus Connector

Accessory		
Part Number	***Description***	***Price***
33-796-1	Coil bus connector used to connect multiple relays in parallel. Package includes 5 pairs of bus bars to connect up to 5 relays together.	<--->

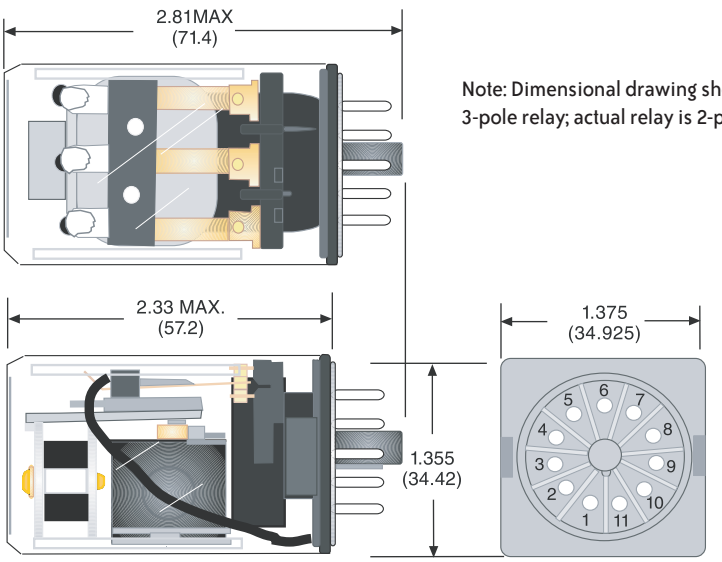
755 Series Octal Base Magnetic Latching Relay Selection Guide

Features

- 11-pin octal base (use 750-3C-SKT) installs easily
- 16 amp contact rating handles most control circuit loads
- Permanent magnet latching mechanism holds last set position

755 Series Relay Selection Guide						
Part Number	***Price***	***Coil Voltage***	***Configuration***	***Contact Rating***	***Relay Socket Part***	***Price***
755-2C-120A	<--->	120VAC	DPDT	16A	***750-3C-SKT***	<--->
755-2C-240A	<--->	240VAC				
755-2CD-24D	<--->	24VDC				

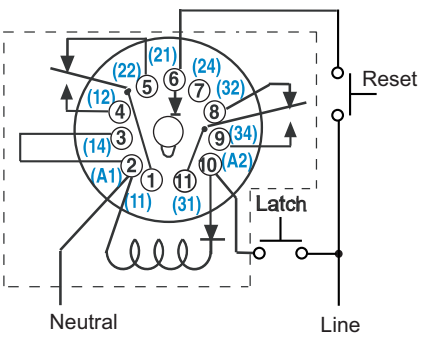
755 Series Relay Dimensions



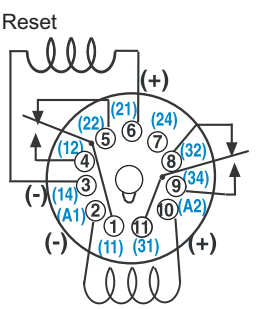
Note: Dimensional drawing shows 3-pole relay; actual relay is 2-pole.

Uses 11 Pin Octal base (750-3C-SKT, not shown)

755 Series Wiring Diagrams



AC Operation



DC Operation

755 Series Octal Base Magnetic Latching Relay Specifications

755 Series Specifications (@ 25°C)			
Part Numbers	***755-2C-120A (single coil)***	***755-2C-240A (single coil)***	***755-2CD-24D (double coil)***
Contact Specifications			
Contact Type	DPDT		
Contact Material	Silver cadmium oxide, gold flashed		
Contact Rating	16A @ 120/240VAC 50/60Hz, 16A @ 28VDC		
Minimum Switching Requirement	100mA @ 5VDC or 0.5W		
Contact Resistance	50mΩ		
Coil Specifications			
Standard	LED Indicator		
Coil Input Voltage	120VAC	240VAC	24VDC
Coil Resistance	10kΩ	3.6kΩ	350Ω
Power Consumption	2VA to 3.55VA (60Hz) AC		
Dropout Voltage (% of rated voltage)	N/A		
Pull-in Voltage	AC: Max. 85% of nominal voltage or less DC: Max 80% of nominal voltage or less		
Max. Voltage (Max. instantaneous voltage)	115% of the rated coil voltage		
General Specifications			
Service Life	Mechanical @ no load: 10 million operations		
	Electrical: 100,000 operations @ rated resistive load (AC1)		
Operating Temperature	AC: -30°C to 70°C (- 22°F to 158°F) DC: -30°C to 75°C (- 22°F to 167°F)		
Weight	170 g (6 oz.)		
Agency Approvals and Standards	UL Listed* (#E43641), CE Pending		

**** UL Listed when used with sockets 750-2C-SKT and 750-3C-SKT. Current limited to rating of relay or socket, whichever is less.***

Packaged M.O.V.s and Diodes

Overview

Metal Oxide Varistors (MOV) and Diode circuits are offered as convenient plug-in modules. Plugging a module into the relay socket connects the circuit in parallel with the relay coil. No additional wiring is required.

Modules fit within the maximum dimensions of the relay and socket.

Features

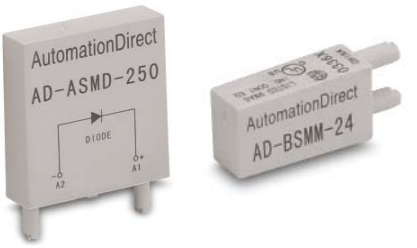
- MOVs protect by shunting potentially damaging electrical spikes away from the relay coil. Ideal for AC and DC applications.
- Diodes protect external drive circuitry from inductive voltages generated when removing coil voltage. Ideal for DC applications. Polarity sensitive.

Application

Many PLC systems control one or more inductive load devices. These inductive loads (devices with a coil) generate transient voltages when they are de-energized with a relay contact. When a relay contact is closed it "bounces", which causes the coil to energize and de-energize until the "bouncing" stops. The transient voltage which is generated is much larger in amplitude than the supply voltage, especially with a DC supply voltage.

When switching a DC-supplied inductive load the full supply voltage is always present when the relay contact opens (or "bounces"). When switching an AC-supplied inductive load, if the voltage is not zero when the relay contact opens, there is energy stored in the inductor that is released when the voltage to the inductor is suddenly removed. This release of energy is what produces transient voltages.

When inductive load devices (motors, motor starters, interposing relays, solenoids, valves, etc.) are controlled with



relay contacts, it is recommended that a surge suppression device be connected directly across the coil of the field device. If the inductive device has plug-type connectors, the suppression device can be installed on the terminal block of the relay output.

Metal oxide varistors (MOV) and diodes are devices which provide good surge and transient suppression of AC and DC powered coils.

Protection Device Selection Guide

Part Number	Price	Description	Nominal Input Voltage	Dimensions & Package	Mating Socket
AD-ASMD-250	<--->	Protection diode module for 784 and 75 series relays. Plug-in modules come in package of 5.	6-250VDC	Figure 1	783-3C-SKT 784-4C-SKT-1 750-2C-SKT 750-3C-SKT
AD-ASMM-24		MOV module for 784 and 75 series relays that operate at 24VAC coil voltage. Package includes 5 modules.	24VAC/VDC		
AD-ASMM-120		MOV module for 784 and 75 series relays that operate at 120VAC coil voltage. Package includes 5 modules.	120VAC/VDC		
AD-ASMM-240		MOV module for 784 and 75 series relays that operate at 240VAC coil voltage. Package includes 5 modules.	240VAC/VDC		
AD-BSMD-250	<--->	Protection diode module for 782 series relays. Plug-in modules come in package of 5.	6-250VDC	Figure 2	782-2C-SKT
AD-BSMM-24		MOV module for 782 series relays that operate at 24VAC coil voltage. Package includes 5 modules.	24VAC/VDC		
AD-BSMM-120		MOV module for 782 series relays that operate at 120VAC coil voltage. Package includes 5 modules.	120VAC/VDC		
AD-BSMM-240		MOV module for 782 series relays that operate at 240VAC coil voltage. Package includes 5 modules.	240VAC/VDC		

Accessory dimensions

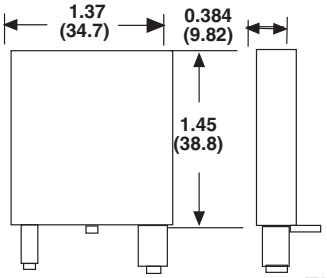


Figure 1

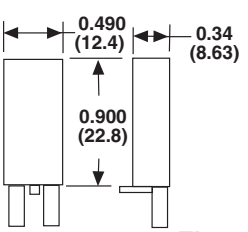
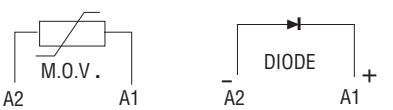


Figure 2



AD Series Solid State Relays

AD-SSRxxx-xx

AD-70S2-xxx

A solid state relay is a relay with isolated input and output, whose functions are achieved by means of electronic components without the use of moving parts, as found in electromechanical relays.

Operation:

Solid state relays are similar to electromechanical relays, in that both use a control circuit and a separate circuit for switching the load. When voltage is applied to the input of the SSR, the relay is energized by a light-emitting diode. The light from the diode is beamed into a light sensitive semiconductor which, in the case of zero voltage crossover relays, conditions the control circuit to turn on the output of the solid state switch at the next zero voltage crossover.

Features:

Solid state relays have features which electromechanical relays do not, such as:

- Long life
- Shock and vibration resistant
- No generation of RFI, EMI
- No contact bounce
- Arcless switching
- No acoustic noise
- Zero crossing
- IC compatibility
- Immunity to humidity, salt spray and dirt
- UL # E222847

AD-SSR Features:

- AC & DC input
- AC output
- 10 or 25 amp loads
- Photo isolated zero voltage switching
- 4000V rms isolation input to output
- Internal RC (snubber) network
- RFI suppression
- Integral safety cover and heatsink
- DIN-rail mounting or panel-mount

AD-70S2 Features:

- DC input
- AC output
- Up to 4 amp loads
- Optically isolated
- Quick connect terminal, or panel mount when inserted into DIN-rail mountable socket

Solid State Relay Selection Guide

Part Number	Price	Description	Dimensions & Derating Charts	Relay Socket Part Number	Price	Socket Dimensions
AD-SSR210-AC	<--->	Solid state DIN-rail mount relay with 10A contact rating. Coil voltage 90-280VAC. Load voltage is 24-280VAC. Finger-safe design and LED status lamp.	Figure 7	N/A	N/A	N/A
AD-SSR225-AC	<--->	Solid state DIN-rail mount relay with 25A contact rating. Coil voltage 90-280VAC. Load voltage is 24-280VAC. Finger-safe design and LED status lamp.				
AD-SSR210-DC	<--->	Solid state DIN-rail mount relay with 10A contact rating. Coil voltage 3-32VDC. Load voltage is 24-280VAC. Finger-safe design and LED status lamp.				
AD-SSR225-DC	<--->	Solid state DIN-rail mount relay with 25A contact rating. Coil voltage 3-32VDC. Load voltage is 24-280VAC. Finger-safe design and LED status lamp.				
AD-70S2-04B	<--->	Solid state plug-in relay with 4A contact rating. Coil voltage is 3-30VDC. Load voltage is 24-140VAC.	Figure 8	782-2C-SKT (see wiring diagram on next page)	<--->	Figure 6 *
AD-70S2-04C	<--->	Solid state plug-in relay with 4A contact rating. Coil voltage is 3-30VDC. Load voltage is 24-280VAC.				
AD-70S2-04D	<--->	Solid state plug-in relay with 4A contact rating. Coil voltage is 3-30VDC. Load voltage is 8-50VAC.				

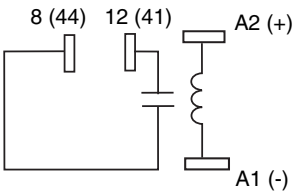
*NOTE: See page 27-23

Solid State Relay Specifications

Specifications							
Part Number	***AD-SSR210-DC***	***AD-SSR210-AC***	***AD-SSR225-DC***	***AD-SSR225-AC***	***AD-70S2-04B***	***AD-70S2-04C***	***AD-70S2-04D***
Input Characteristics							
Control Voltage Range	3-32 VDC	90-280 VAC	3-32 VDC	90-280 VAC	3-30 VDC		
Typical Input Current	16 mA	12 mA	16 mA	12 mA	1-17 mA		
Must Release Voltage	1 VDC	10 VAC	1 VDC	10 VAC	1.0 VDC		
Reverse Polarity Protection	Yes	N/A	Yes	N/A	No		
Maximum Reverse Control Voltage	N/A				5 VDC		
Power Indicator	Red LED Status Lamp				N/A		
Output Characteristics							
Load Voltage Range	24-280VAC				24-140 VAC	24-280 VAC	8-50 VAC
Rated Load Current	10 A		25 A		4 A	4 A	4 A
Maximum Off-State Voltage dv/dt	200 μs		500 μs		3000 V / μs Typical		
Minimum Load Current	50 mA		120 mA		75 mA		
Non-Repetitive Surge Current (1 Cycle)	83 A		800 A		60 A Peak Max. @ 25°C		
Maximum Off State Leakage current (RMS)	10 mA				6 mA		3 mA
Typical On-State Voltage Drop (RMS)	1.25 VAC		1.35 VAC		1.6 VAC		
Maximum I^2T for Fusing (A^2Sec)	83		3700		N/A		
Maximum Peak Blocking Voltage	N/A				400 V	600 V	200 V
Operating Frequency Range	25 Hz to 70 Hz						
Maximum Turn-On Time	10ms	40ms	10ms	40ms	8.3 ms		
Maximum Turn-Off Time	10ms	80ms	10ms	80ms	8.3 ms		
General Characteristics							
Dielectric Strength (Input-to)Output Isolation	4000 V rms				3000 V rms		
Insulation Resistance	$10^{10}\Omega$ Min.						
Operating Temperature Range	-30°C to +80°C				-40°C to +100°C		
Storage Temperature Range	-40°C to +100°C				-40°C to +125°C		
Weight	12.35 oz. (350 g) approx.				1.4 oz. (40 g) Approx.		

AD-SSRxxx-xx wiring diagram

AD-70S2-xx wiring diagram

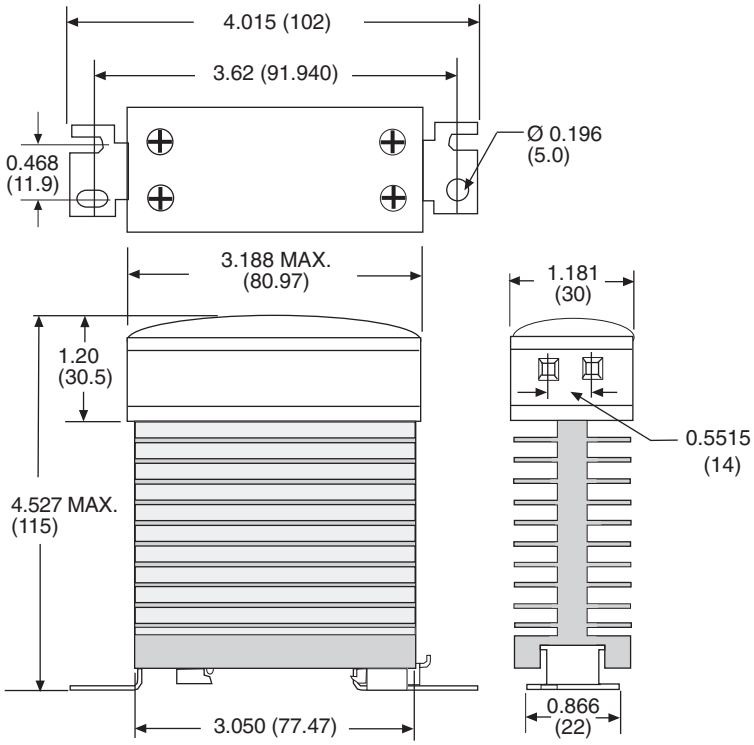


SSR Series Dimensions & Derating Charts

AD-SSR Series Dimensions

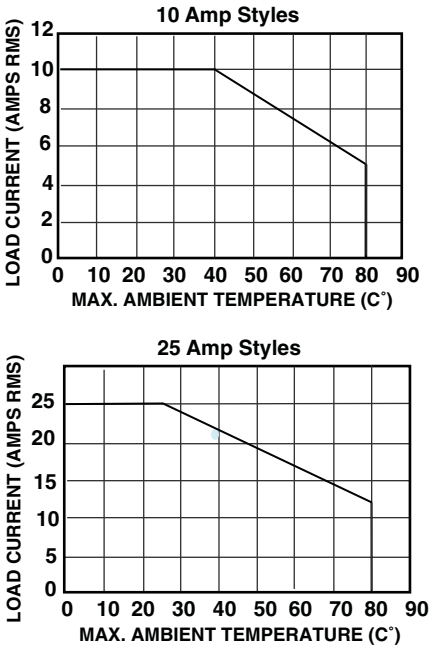
Figure 7

(in./mm)



Note: Recommended spacing between multiple SSRs is 0.75 inch.

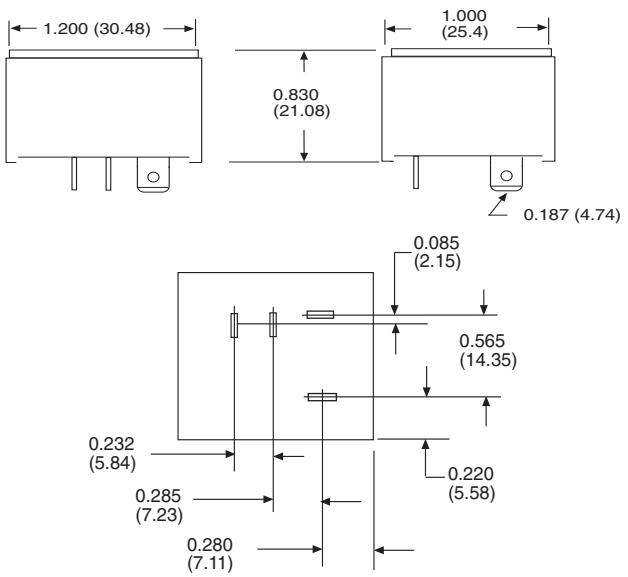
AD-SSR Series derating charts



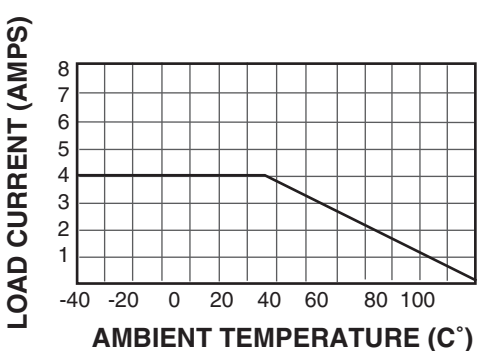
AD-70S2 Series Dimensions

Figure 8

(in./mm)



AD-70S2 Series derating charts



Timers for all Applications

AUTOMATIONDIRECT offers solid-state timers from two leaders in the industry, Fuji and Koyo.

Fuji Electric has been in business since 1923 and has been selling timers in the U.S. since 1970. All Fuji products are produced under ISO9001 and ISO14000 criteria. Koyo has been selling timers for over 30 years. All timers meet UL and CE conformity. Whether you need a miniature DIN timer, a 1/16 DIN timer, or a full-blown 1/16 DIN digital timer, and need to time in seconds or hours, AUTOMATIONDIRECT can supply a timer that fits your needs.

Fuji multi-mode timers feature:

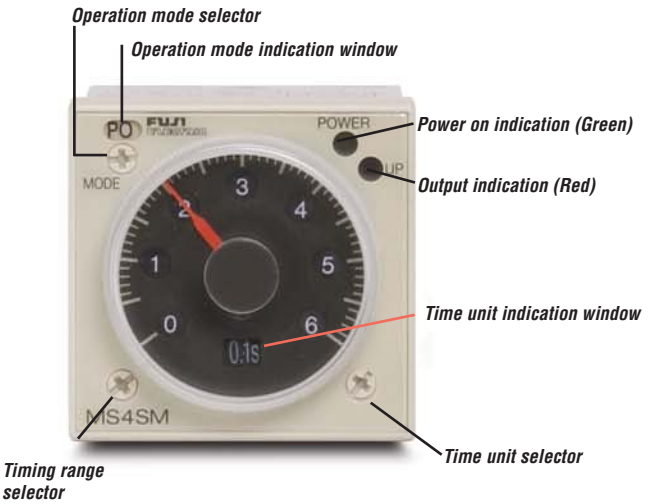
Ease of use: How many times have you had to perform a math test just to determine your time range? In our unit, as the time range is adjusted, the corresponding display changes. This feature makes it very easy for the operator to set and read.

Full functionality: Up to four output modes can be selected simply with the turn of a screw. All outputs contain 5A, DPDT relays. This power allows you to minimize your inventory and maximize your flexibility.

LED indicators: Simply by looking at the face panel, you can tell if the timer is working properly.

Startup ease: When the dial is set to zero, the output turns on automatically. This feature allows for quick troubleshooting.

FUJI multi-mode timers with full features



Miniature DIN timers are small and accurate

Small size: Measuring under one inch wide, these timers will save you much needed room in your enclosure. DIN rail mounting makes for easy installation.

Easy operation: A simple dial allows easy setup for the operator. With the indicating LEDs, an operator can easily check for proper operation.

Accuracy: The timer will perform its timing function, over and over again, with repeatable accuracy of +/- 1% of the setting.

Koyo digital timers: powerful but easy to use

This full-function timer has all the bells and whistles, including full programmability:

Timing ranges and modes: Seconds to hours time ranges with decimal selection and up and down timing modes accommodate a wide range of applications.

Output modes: Five output modes, from on-delay to one-shot, use a reliable 2A relay to operate the controlled device.

Tamper-proof: Key protection can be set for individual keys to prevent unintentional changes by the operator.

Applications

Timers are used to perform a repeatable and predictable sequence of events. They can stand alone and control devices based on the timer setting and other operator selections, or they can receive commands remotely from other devices such as PLCs. Examples of time-based applications include an automated car wash sequence, a batch operation that adds and mixes ingredients based on time periods, or a paint process that uses the position of an object for a start signal, then operates a paint sprayer for a set time span.

	ST7P Series	MS4S Series	KT-V4S Series
			
Display	Manual dial Time setting Output LED indicator	Manual dial Time setting Power LED indicator Output LED indicator Output mode setting	4-digit green LED display for time setting 4-Digit red LED display for current time Output LED indicator Programming indicators
Input Power	100-120 VAC or 24 VDC	100-240 VAC or 24 VDC/AC	85-260 VAC or 10-26 VDC
Inputs	Timed signal	Reset signal Start signal Gate signal Timed signal	Start signal Reset signal Timed signal
Outputs	Normally-open DPDT Normally-closed DPDT	Normally-open DPDT Normally-closed DPDT	1 SPDT DC NPN transistor
Contact Rating	3 A @ 240 VAC (resistive load)	5 A @ 250 VAC (resistive load)	Mechanical: 2 A @ 220 VAC Transistor: 100 mA @ 24 VDC
Output Modes	On-delay	On-delay Flicker One shot Off-delay	On-delay Flicker One shot Off-delay Accumulation
Time Ranges	0.4 seconds to 60 minutes	0.05 seconds to 60 hours	0.001 seconds to 999.9 hours
Enclosure Rating	NEMA 1	NEMA 1	IP65 - faceplate
Agency Approvals	UL/CSA/CE/TUV	UL/CSA/CE/TUV	UL/CSA/CE
Price	starting at <--->	starting at <--->	starting at <--->

Fuji 1/16 DIN Super Timers

Overview

The MS4S series super timers are 1/16 DIN style timing relays designed for process control, machine tool control, safety control and many other types of applications. The timers are plug-in 8-pin or 11-pin surface/DIN-rail mountable with up to four selectable modes of operation and four selectable timing ranges.

Features

MS4SM

- Multi-mode timer with mode indication. On-delay (PO), flicker (FL), one-shot (OS), or signal off-delay (SF)
- 11-pin plug-in with start, reset and gate (interrupt) input signals and a DPDT contact output
- Timing range from 0.05 seconds to 60 hours
- Timer scale with selectable ranges of 0-6, 0-12, 0-30 and 0-60
- Timing units in selectable ranges of 0.1s, sec, min and hrs
- Power on LED indicator (green) flickers during timing operation, UP (red) LED is on when normally open contact is closed

MS4SA

- On-delay timer
- 8-pin plug-in with a DPDT contact output
- Timing range from 0.05 seconds to 60 hours
- Timer scale with selectable ranges of 0-6, 0-12, 0-30 and 0-60
- Timing units in selectable ranges of 0.1s, sec, min and hrs
- Power on LED indicator (green) flickers during timing operation, UP (red) LED is on when normally open contact is closed

MS4SC

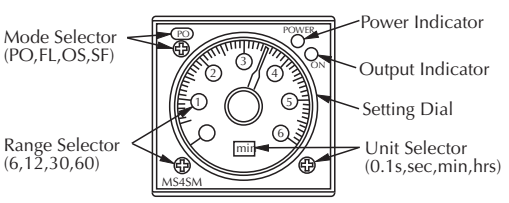
- On-delay timer
- 8-pin plug-in with a SPDT timed contact output and a SPDT instantaneous contact output
- Timing range from 0.05 seconds to 60 hours
- Timer scale with selectable ranges of 0-6, 0-12, 0-30 and 0-60
- Timing units in selectable ranges of 0.1s, sec, min and hrs
- Power on LED indicator (green) flickers during timing operation, UP (red) LED is on when normally open contact is closed

Product Selection Guide

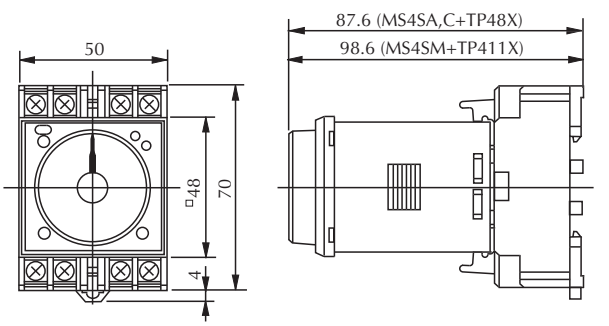
Part Number	Description	Voltage	Time Range	Price
MS4SM-AP-ADC	Multi-mode timer with selectable timing range from 0.05s to 60 hours. Input power is 100 - 240 VAC. DPDT relay output. 11-pin connection. UL, CSA , TÜV approved. *Note*: Socket mounts must be purchased separately	100-240 VAC	0.05 seconds to 60 hours	<--->
MS4SA-AP-ADC	On-delay timer with selectable timing range from 0.05s to 60 hours. Input power is 100 - 240 VAC. DPDT relay output. 8-pin connection. UL, CSA, TÜV approved. Note: Socket mounts must be purchased separately		0.05 seconds to 60 hours	<--->
MS4SC-AP-ADC	On-delay timer with selectable timing range from 0.05s to 60 hours. Input power is 100 - 240 VAC. SPDT timed relay output and SPDT instantaneous relay output. 8-pin connection. UL, CSA, TÜV approved		0.05 seconds to 60 hours	<--->
MS4SM-CE-ADC	Multi-mode timer with selectable timing range from 0.05s to 60 hours. Input power is 24 VDC/AC DPDT relay output. 11-pin connection. UL, CSA , TÜV approved. *Note*: Socket mounts must be purchased separately	24 VDC/AC	0.05 seconds to 60 hours	<--->
MS4SA-CE-ADC	On-delay timer with selectable timing range from 0.05s to 60 hours. Input power is 24 VDC/AC. DPDT relay output. 8-pin connection. UL, CSA, TÜV approved. *Note*: Socket mounts must be purchased separately		0.05 seconds to 60 hours	<--->
MS4SC-CE-ADC	On-delay timer with selectable timing range from 0.05s to 60 hours. Input power is 24 VDC/AC. SPDT timed relay output and SPDT instantaneous relay output. 8-pin connection. UL, CSA, TÜV approved. *Note*: Socket mounts must be purchased separately		0.05 seconds to 60 hours	<--->
TP411X	Surface mount socket for MS4SM series timers. UL, CSA, TÜV approved	N/A	N/A	<--->
TP411SBA	Flush mount socket for MS4SM series timers. UL, CSA, TÜV approved, requires PANEL-16*			<--->
TP48X	Surface mount socket for MS4SA and MS4SC series timers. UL, CSA, TÜV approved			<--->
TP48SB	Flush mount socket for MS4SA and MS4SC series timers. UL, CSA, TÜV approved, requires PANEL-16*			<--->

Panel clips for mounting through a door are optional and must be purchased seperately. See part# PANEL-16 on page 26-43.

Control



Dimensions (timer and socket shown attached)



Fuji 1/16 DIN Super Timers

MS4SM-AP-ADC
MS4SM-CE-ADC

MS4SA-AP-ADC
MS4SA-CE-ADC

MS4SC-AP-ADC
MS4SC-CE-ADC

TP411X

TP411SBA*

TP48X

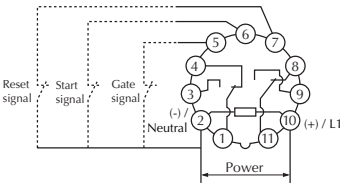
TP48SB*

Specifications		
Approvals	UL file no.: E44592, CSA file no.: LR20479, TÜV license no: R9551800	
Repeat Accuracy	±0.3% at maximum setting time	
Reset Time	0.1 second or less	
Operating Voltage Range	85-264 VAC MS4SM-AP-ADC MS4SA-AP-ADC MS4SC-AP-ADC	20.4-26.4 VDC/AC MS4SM-CE-ADC MS4SA-CE-ADC MS4SC-CE-ADC
Operating Temperature Range	-10 to +55°C (14 to 131°F) (no icing)	
Humidity	35 to 85% (no condensation)	
Contact Ratings	5 A at 30 VDC resistive load, 1 A @ 30 VDC inductive load, 5 A @ 250 VAC resistive load, 2.5 A @ 120 VAC inductive load	
Power Consumption	Approx. 10 VA for AC; 1 W at 24 VDC	
Insulation Resistance	100MΩ at 500 VDC insulation tested	
Dielectric Strength	2000 VAC 1 min. between current carrying part and non-current carrying part 2000 VAC 1 min. between output contact and control circuit 1000 VAC 1 min. between open contacts	
Vibration	Malfunction durability: 10 to 55Hz, 0.5mm double amplitude Mechanical durability: 10 to 55Hz, 0.75mm double amplitude	
Shock	Malfunction durability: 100m/s^2 Mechanical durability: 500m/s^2	
Life Expectancy	Mechanical: 20 million operations (No load operation cycle: 1800/hr.) Electrical: 100,000 operations at 250 VAC 5 A resistive load (operation cycle: 1800/hr.)	
Weight	Approx. 100g (3.527 oz.)	

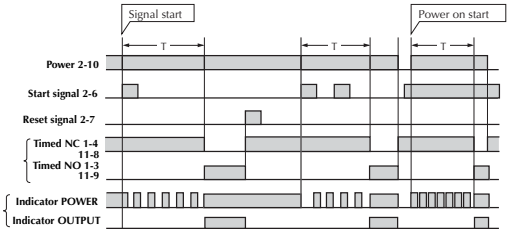
When using flush mount sockets TP411SBA and TP48SB, panel mounting clip PANEL-16 is required and must be purchsed seperately. See page 27-43

Fuji 1/16 DIN Timers Timing and Wiring Diagrams

MS4SM

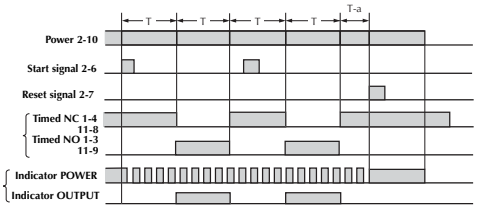


1. On-delay PO



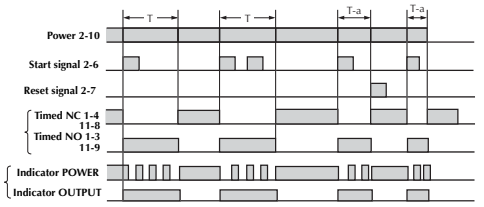
- With power off turn the mode selector until PO is displayed.
- When power is on, applying the start signal turns the timed N.O. (normally open) contact on after the set time has elapsed.
- When using a power-on start, pins 2 and 6 (start signal) must be jumpered together

2. Flicker FL



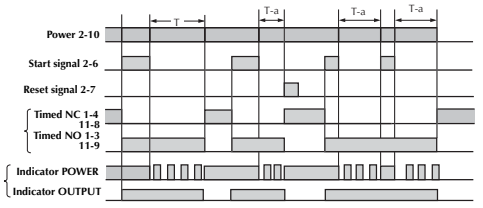
- With power off, turn the mode selector until FL is displayed.
- When power is on, applying the start signal turns the timed contact on and off repeatedly at the set time intervals.

3. One-shot OS



- With power off, turn the mode selector until OS is displayed
- When power is on, applying the start signal instantly turns the timed N.O. contact on and turns it off after the set time has elapsed.

4. Signal off-delay SF



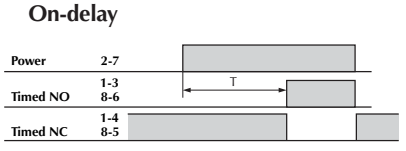
- With power off, turn the mode selector until SF is displayed.
- When power is on, applying the start signal instantly turns the timed N.O. contact on. Removing the start signal turns the contact off after the set time has elapsed.

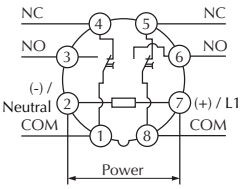
Notes:

1. ***T= set time. t = time period within set time.***
2. ***The gate signal is used to interrupt the timing operation.***

MS4SA

On-delay

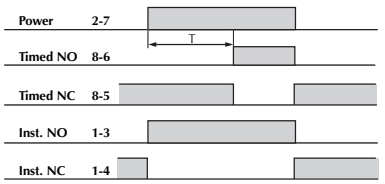


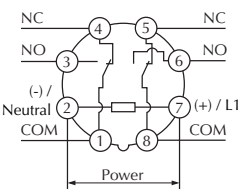


- When power is applied, the timed N.O. contacts make after the set time has elapsed.
- When power is removed, the contacts reset.

MS4SC

On-delay

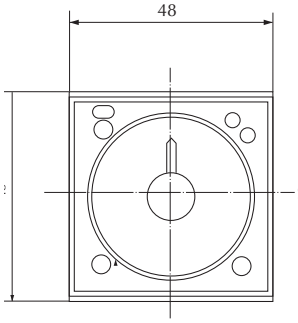




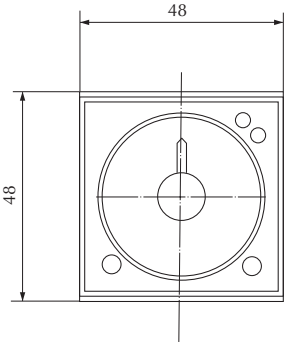
- Timed contact
  When power is applied, the N.O. contact makes after the set time has elapsed. When power is removed, the contacts reset.
- Instantaneous contact
  When power is applied, the N.O. contact makes instantly. When power is removed, the contacts reset.

Fuji 1/16 DIN Super Timers Dimensions

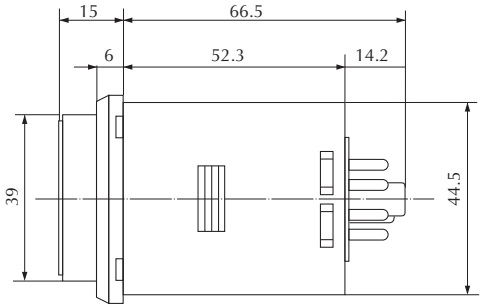
MS4SM



MS4SA and MS4SC



Side View

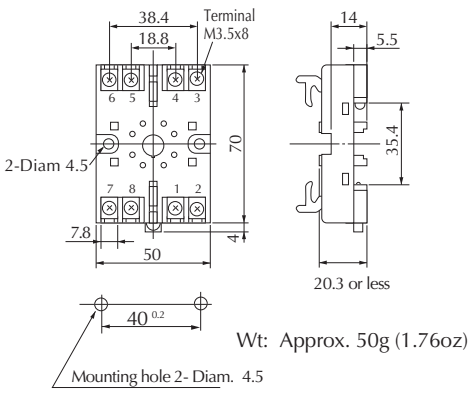


Wt : Approx. 100g (3.53oz)

All dimensions in mm

Socket for MS4SA, MS4SC (8-pin)

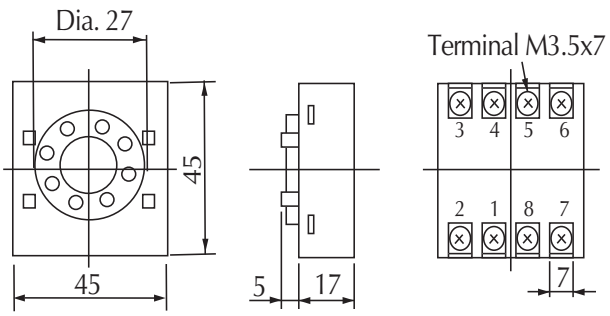
TP48X



Wt: Approx. 50g (1.76oz)

Socket for MS4SA, MS4SC (8-pin)

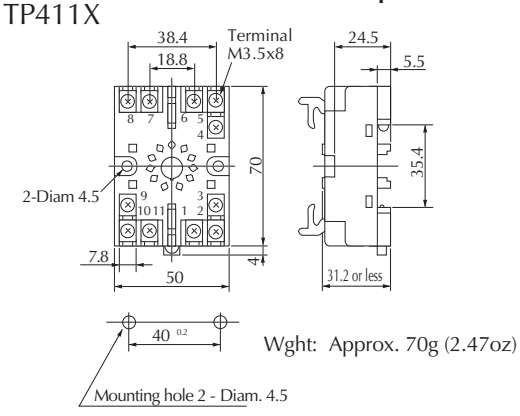
TP48SB



Wght : Approx. 40g (1.41oz)

Socket for MS4SM (11-pin)

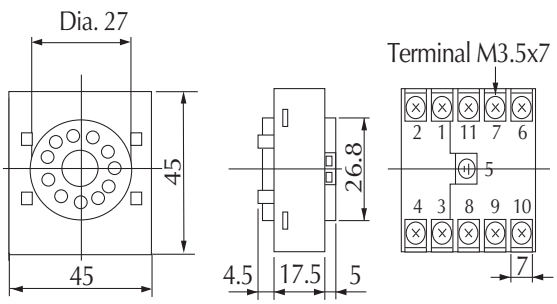
TP411X



Wght: Approx. 70g (2.47oz)

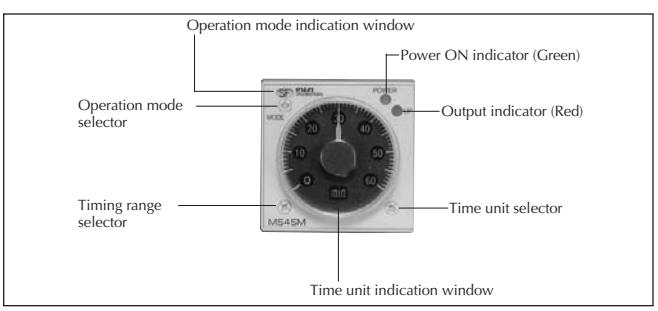
Socket for MS4SM (11-pin)

TP411SBA



Wght : Approx. 45g (1.59oz)

Using the super timer



Fuji Miniature DIN Super Timers

Overview

The ST7P is a compact and highly accurate timer. It is an on-delay operation type with a single timing range. These timers are designed to optimize mounting space in small areas. Mounting is by DIN rail or by securing directly to a panel with a fastener.

Features

- Highly accurate, with a repeat accuracy within ±1% at maximum setting time
- ST7P models offer a number of timing ranges. Please see Selection Guide below
- Large dial makes time setting easy
- LED indicators make it easy to monitor timer operation
- ST7P series meets UL and CSA standards

ST7P Miniature Super Timer with TP88X2 Socket

Product Selection Guide

Part Number	Description	Voltage	Time Range	Price
ST7P-2A15S-ADC	Mini-DIN on-delay timer with timing range of 0.4s to 5s. Input power is 100-120 VAC. DPDT relay output. UL, CSA, TÜV approved	100-120VAC	0.4 seconds to 5 seconds	<--->
ST7P-2A13T-ADC	Mini-DIN on-delay timer with timing range of 2s to 30s. Input power is 100-120 VAC. DPDT relay output. UL, CSA, TÜV approved		2 seconds to 30 seconds	<--->
ST7P-2A16T-ADC	Mini-DIN on-delay timer with timing range of 4s to 60s. Input power is 100-120 VAC. DPDT relay output. UL, CSA, TÜV approved		4 seconds to 60 seconds	<--->
ST7P-2A11N-ADC	Mini-DIN on-delay timer with timing range of 1 min. to 10 min. Input power is 100-120 VAC. DPDT relay output. UL, CSA, TÜV approved		1 minute to 10 minutes	<--->
ST7P-2A16N-ADC	Mini-DIN on-delay timer with timing range of 4 min. to 60 min. Input power is 100-120 VAC. DPDT relay output. UL, CSA, TÜV approved		4 minutes to 60 minutes	<--->
ST7P-2DE5S-ADC	Mini-DIN on-delay timer with timing range of 0.4s to 5s. Input power is 24 VDC. DPDT relay output. UL, CSA, TÜV approved	24VDC	0.4 seconds to 5 seconds	<--->
ST7P-2DE3T-ADC	Mini-DIN on-delay timer with timing range of 2s to 30s. Input power is 24 VDC. DPDT relay output. UL, CSA, TÜV approved		2 seconds to 30 seconds	<--->
ST7P-2DE6T-ADC	Mini-DIN on-delay timer with timing range of 4s to 60s. Input power is 24 VDC. DPDT relay output. UL, CSA, TÜV approved		4 seconds to 60 seconds	<--->
ST7P-2DE1N-ADC	Mini-DIN on-delay timer with timing range of 1 min. to 10 min. Input power is 24 VDC. DPDT relay output. UL, CSA, TÜV approved		1 minute to 10 minutes	<--->
ST7P-2DE6N-ADC	Mini-DIN on-delay timer with timing range of 4 min. to 60 min. Input power is 24 VDC. DPDT relay output. UL, CSA, TÜV approved		4 minutes to 60 minutes	<--->
TP88X2	Socket for ST7P series timers. UL, CSA, TÜV approved	N/A	N/A	<--->

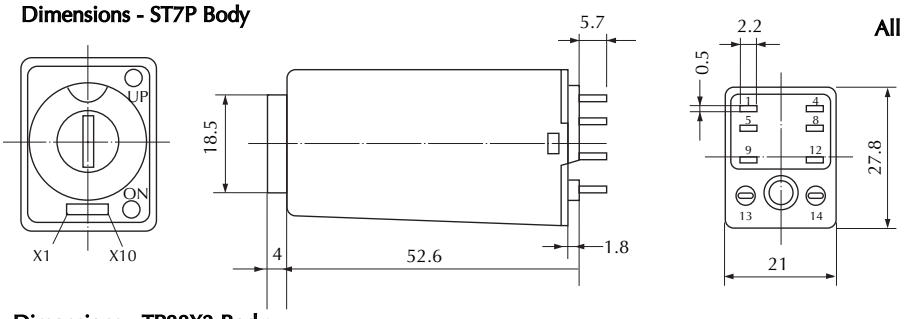
Fuji Miniature DIN Super Timer Specifications

Specifications		
Approvals	UL file no.: Body - E44592, Socket - E90265; CSA file no.: LR20479; TÜV license no: R9551799	
Repeat Accuracy	±01% at maximum setting time	
Reset Time	0.1 second or less	
Maximum Operating Cycle	1800 cycles/hour	
Operating Voltage Range	85-132 VAC ST7P-2A15S-ADC ST7P-2A13T-ADC ST7P-2A16T-ADC ST7P-2A11N-ADC ST7P-2A16N-ADC	20.4-26.4 VDC ST7P-2DE5S-ADC ST7P-2DE3T-ADC ST7P-2DE6T-ADC ST7P-2DE1N-ADC ST7P-2DE6N-ADC
Operating Temperature Range	-10 to +50°C (14 to 122°F)	
Humidity	35 to 85% (no condensation)	
Contact Ratings	3 A @ 240 VAC resistive load, 1 A @120 VAC inductive load; 3 A @ 30 VDC resistive load, 0.5 A @ 30 VDC inductive load	
Power Consumption	Approx. 1.2 VA at 100 VAC, approx. 1.5 VA at 200 VAC, 1.1 W at 24 VDC.	
Insulation Resistance	100MΩ at 500 VDC insulation tested	
Surge Voltage*	3000 Volts	
Dielectric Strength	2000 VAC 1 min. between current carrying part and non-current carrying part 2000 VAC 1 min. between output contact and control circuit 1000 VAC 1 min. between open contacts	
Vibration	Malfunction durability: 10 to 55Hz, 0.5mm double amplitude Mechanical durability: 10 to 55Hz, 0.7mm double amplitude	
Shock	Malfunction durability: 50m/s^2 Mechanical durability: 1000m/s^2	
Life Expectancy	Mechanical: 50 million operations (No load; operation cycle 1800/hr.) Electrical: 500,000 operations (3 A @ 220 VAC, resistive load; operation cycle 1800/hr.)	
Weight	36.288g (1.28 oz.)	

**** Note: If surge voltage exceeds 3000V, use surge suppressors.***

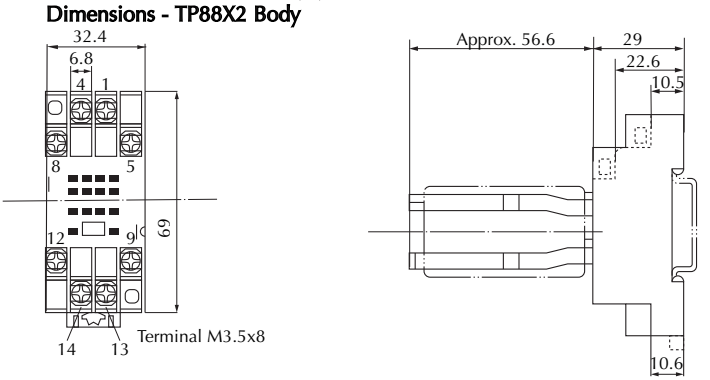
Fuji Miniature DIN Timers Timing and Wiring

Dimensions - ST7P Body

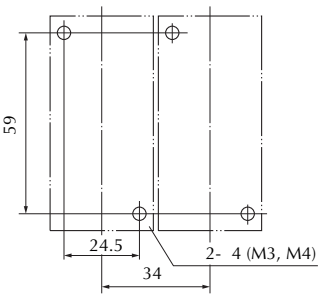


All dimensions in mm

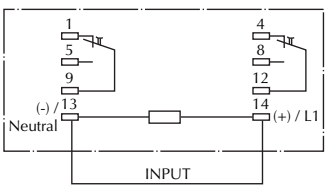
Dimensions - TP88X2 Body



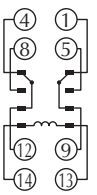
Panel Drilling



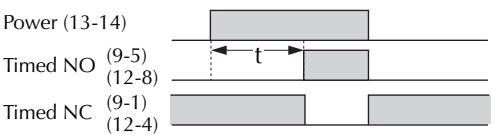
Wiring Diagram



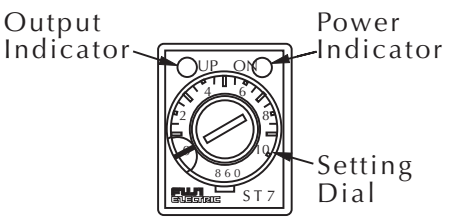
Sockets/Screw Terminal and Rail Mounting



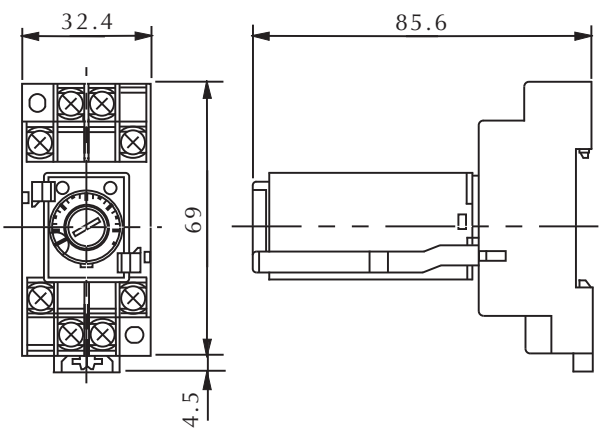
Timing Diagram



Control



Dimensions (Timer and Socket Attached)



Koyo Digital Timers

Overview

Koyo digital timers offer flexible features at a great price. A large, easy to read display is offered in a small 1/16 DIN size. The large, bright red LED display has a 12 mm character display height which allows it to be seen easily from a distance and at an angle. In addition, set values use a green LED display to differentiate from timing values. Basic function settings are made with digital switches. Detailed settings are selected with digital keys, so operation is easy.

Features

- Tamper-proof: key protection can be set for individual keys to prevent a malfunction or tampering
- Battery-less memory retention: EEPROM is used to retain values in memory, so there is no need for battery maintenance
- Maintenance has been reduced via removable terminals. After wiring, the terminal cover provides a safe barrier for worry-free use
- Power source for a DC sensor: you can source the power for the sensor from the built-in power source which supplies 60 mA at 24 VDC
- Wide operating AC voltage range of 85-264 VAC
- Various types of time ranges: covers ten types of time ranges with times of 0.001 second to 999.9 hours
- Five types of operating modes: settings of on-delay, off-delay, one-shot, accumulation and flicker
- Flush door/panel mounting
- Display of elapsed time/remaining time
- IP65 protective structure: front cover panel is made of a clear membrane, so operation with wet or dirty hands can be worry-free
- Fully CE and UL compliant

KT-V4S-D

KT-V4S-C-D

Product Selection Guide					
Part Number	**Description**	**Number of Digits**	**Source Voltage**	**Time Range**	**Price**
KT-V4S-D*	Digital timer with 10 types of time ranges (see specifications). Input power is 100-240 VAC. UL and CSA approved.	4	100-240 VAC	0.001 second to 999.9 hours	<--->
KT-V4S-C-D*	Digital timer with 10 types of time ranges (see specifications). Input power is 12-24 VDC. UL and CSA approved		12-24 VDC		<--->
Accessories					
Part Number	**Description**				**Price**
PANEL-16	Mounting clip for 1/16th DIN timers and temperature/process controllers, for door (flush) mounting. 5 clips per package				<--->

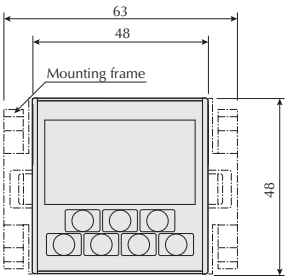
**** Units ship with a PANEL-16 mounting clip for door (flush) mounting, only one required.***

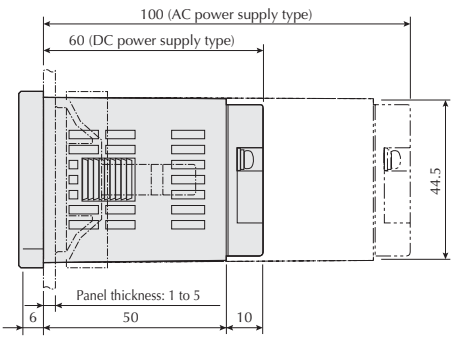
Koyo Digital Timers Specifications

General Specifications			
Power		***AC Power***	***DC Power***
Part Number		KT-V4S-D	KT-V4S-C-D
Approvals		UL listed, CSA listed	UL recognized only with Class II power supply; CSA: EN61010-1 and EMI: EN55-11, EMS: EN50082-2. If product has DC power supply, an EMI/EMC filter must be installed on the power supply.
Source Voltage		100-240 VAC	12-24 VDC
Permitted Power Fluctuation		85-264 VAC	10-26.4 VDC
Power Consumption		Approx. 11 VA	Approx. 4 W
Sensor Power		24 VDC (20-28 V) 60 mA (less than 10%p-p ripple noise)	N/A
Memory Backup upon Power Failure		EEPROM writing up to 100,000 times; Memory duration: 10 years	
Ambient Temperature		-10-50°C (14 to 122°F)	
Storage Temperature		-20-70°C (-4 to 158°F) (with no icing)	
Ambient Humidity		35-85% RH non-condensing	
Withstand Voltage		2 kVAC for one minute	
Vibration Resistance		Durability: Displacement amplitude 0.5mm 10-55 Hz along three axes Operating vibration: Displacement amplitude 0.35mm 10-55 Hz along three axes	
Impact Resistance		Durability: 490 m/s^2 along three axes Operating impact: 98 m/s^2 along three axes	
Noise Resistance		AC power between terminals ±1.5 kV (pulse width 1μs and rise time 1ns)	DC power between terminals ± 1.0 kV (pulse width 1 μ s and rise time 1 ns)
Protective Structure		IP65 (front panel only) when mounted in appropriate enclosure	
Weight		Approx. 150 grams (5.291 oz.)	Approx. 110 grams (3.88 oz.)
Terminals	***Conforming wiring***	0.25-1.65 mm^2 24 to 16 gauge	
	Permitted Torque	0.5 Nm (.369 ft./lbs.)	

Performance Specification	
Category	Timer
Operational Format	On-delay, off-delay, one-shot, accumulator, and flicker (with alarm output)
Number of Digits	4 digits
Display	Current values: red LED, character height 12 mm; Preset value: green LED, character height: 7mm
Time Range	0.001s-9.999s/0.01s-99.99s/0.1s-999.9 s/1s-9999 s/1 s-99 min 59 s/1 min-9999 min/1 h-9999 h/1 min-99 h 59 min/0.1 min-999.9 min/0.1h-999.9 h
Display	Elapsed time/remaining time
Timer Precision	0.013% or ±15 ms (using large values)
Input	Input logic: negative logic (no voltage input) positive logic (voltage input)
	Input resistance: positive logic 15 kΩ; negative logic 3.3 kΩ (AC power)/1.8 kΩ (DC power)
	Input voltage: "L" 0-3V "H" 7-30 V
Start Input Response	Less than 15 ms/5 ms/1 ms
External Reset	Min. signal amplitude 5 ms
Output	DC output: NPN open collector output/24 V 100 mA. Withstand voltage 35 V. Residual voltage less than 1.5 V
	Relay output: 1 SPDT 220 VAC 2 A (resistive load)
Output Duration (flicker)	10-9990 ms variable every 10 ms
Installation	1/16 DIN flush door/panel mount

Dimensions (mm)





	Depth dimension
DC power supply type	66mm
AC power supply type	106mm

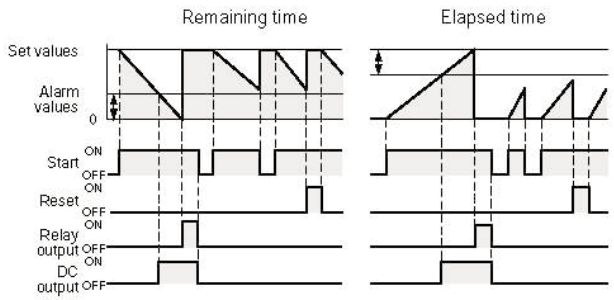
Note: Depth dimension includes front panel

Koyo Digital Timers Timing and Wiring Diagrams

On-delay

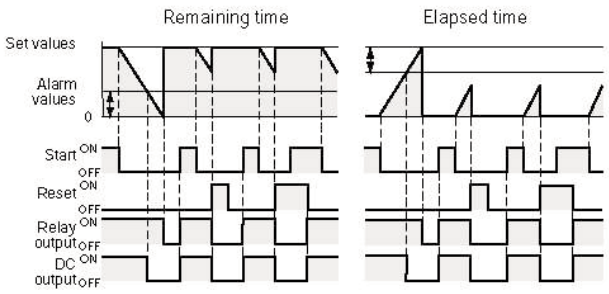
: Alarm setting

SW 1 2
OFF OFF



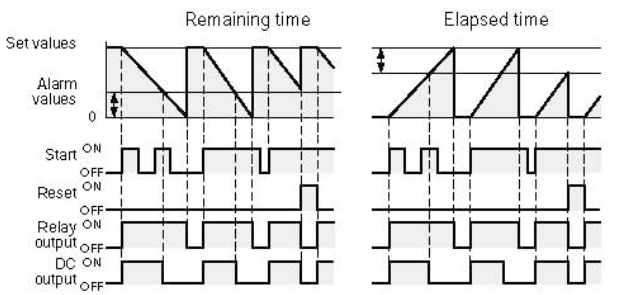
Off-delay

SW 1 2
OFF ON



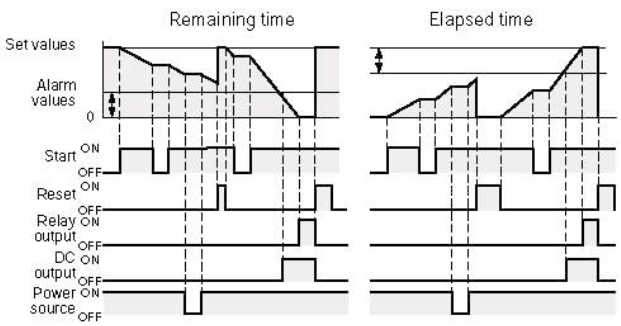
One-shot

SW 1 2
ON OFF



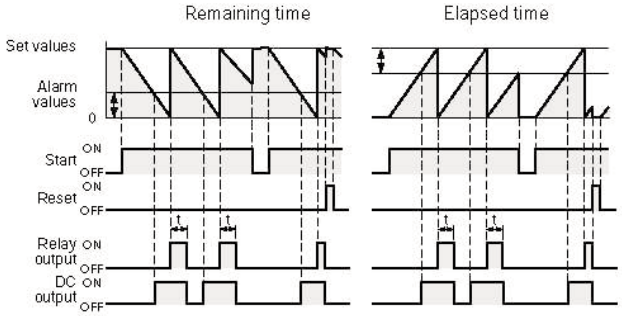
Accumulation

SW 1 2
ON ON



Flicker

(in Setup mode)



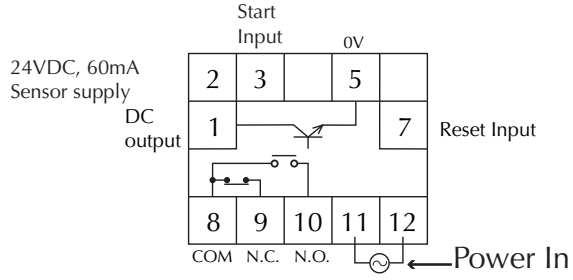
Note: Output duration is variable from 0-9990 ms. (Default: 100 ms)

: Alarm settings

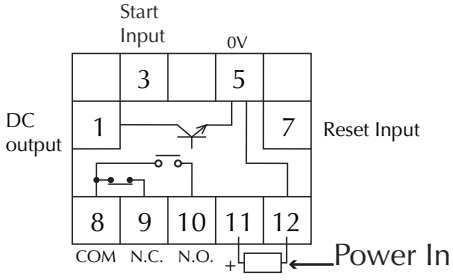
When alarm settings are 0, the DC output is the same as the output operations for a relay output.

Note: Alarm settings should be less than preset values. Using alarm settings with values that exceed preset values will result in measurement values of 0 and the alarm output (DC output) will come ON.

KT-V4S-D



KT-V4S-C-D



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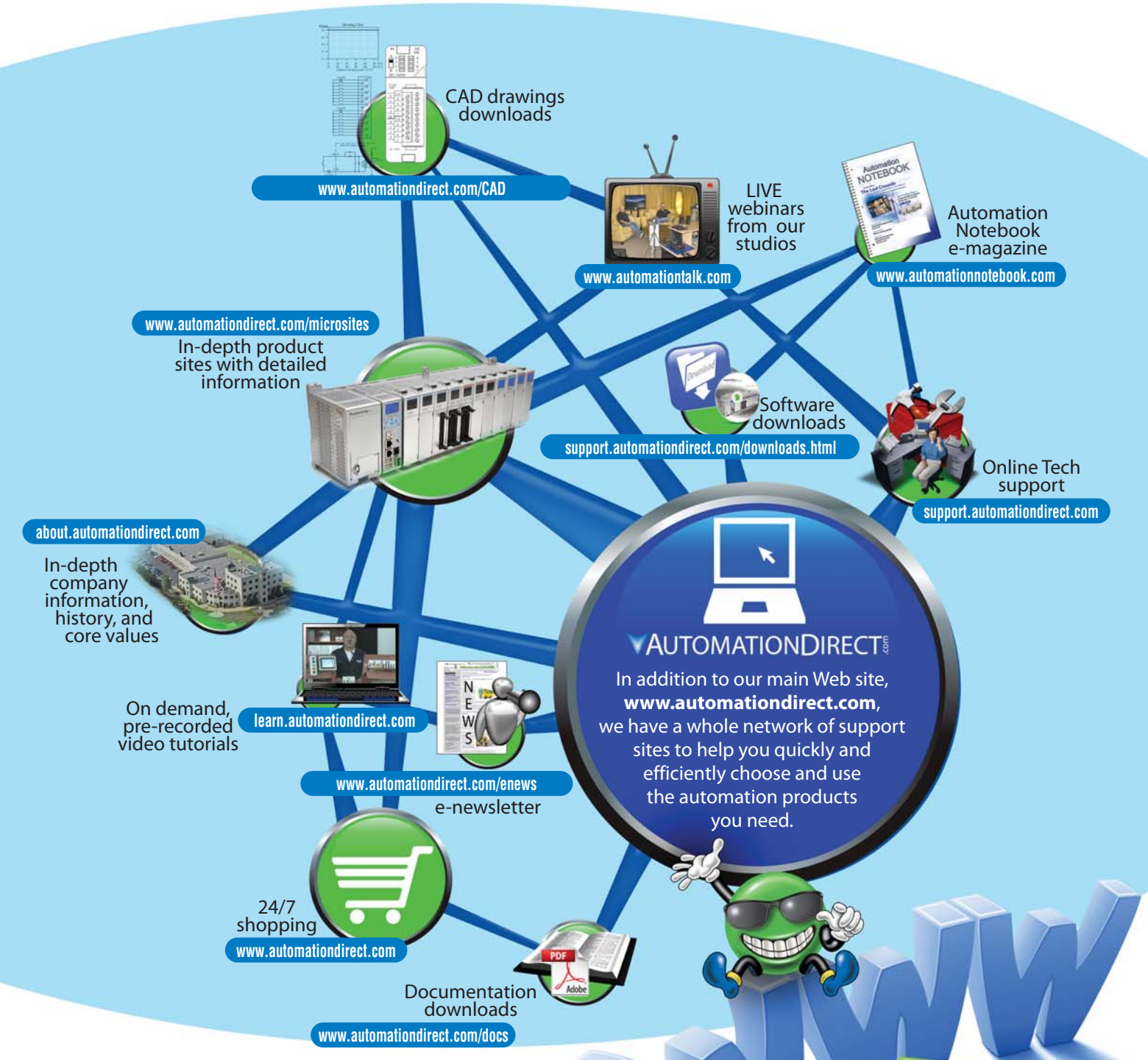

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