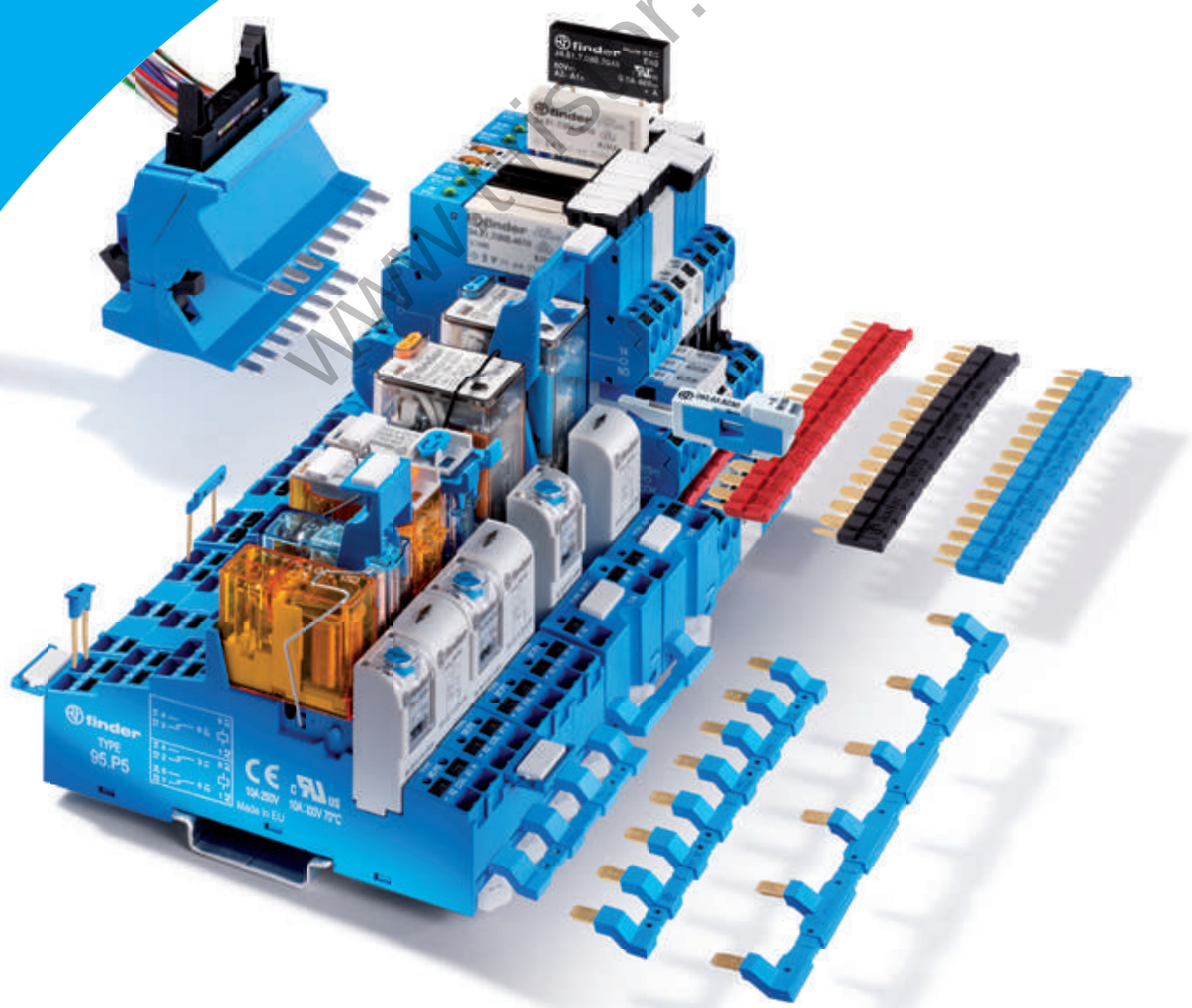
SELECTION GUIDE

MasterIN System

New sockets with Push-in technology

Spring terminal for faster wiring and better clamping performance under movement and vibration.

finder®
SWITCH TO THE FUTURE



finder®
SWITCH TO THE FUTURE

Finder MasterIN System with Push-in technology

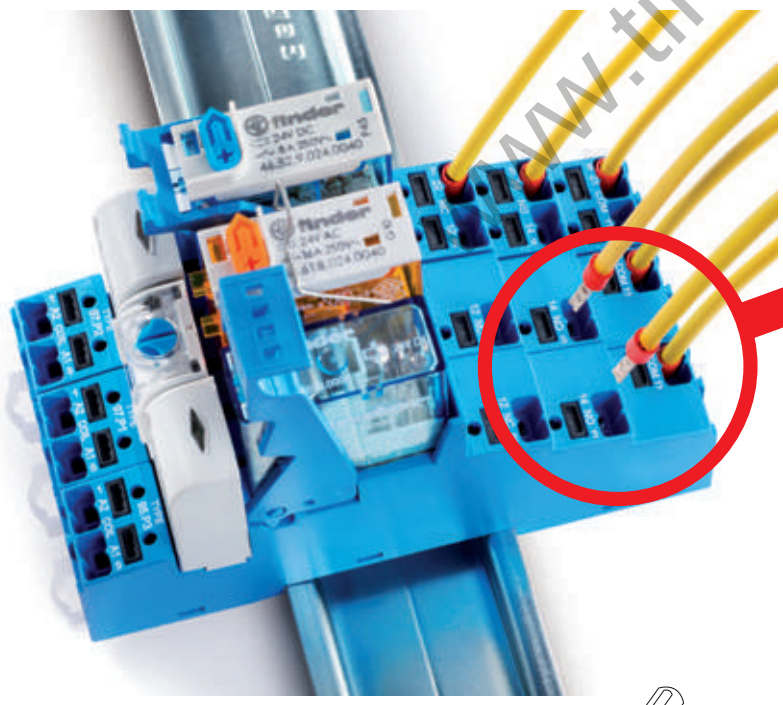
Finder presents its new **MasterIN System** Relay Interface Modules with Push-in terminals. The technology represents the latest evolution of the screwless 'spring' terminals, offering faster connection. Compared to screw terminals it brings better clamping performance under movement and vibration.

The MasterIN System incorporates the existing 39, 48, 4C and 58 Series Finder Relay Interface Modules, and caters for a wide range of applications including industrial automation and electrical panels. All new Types are identified by the letter "P" – for "Push-in" – in the product code.

The accessories for the MasterIN System are also new. Versatility, compatibility and integration were priorities for the Finder engineers in developing the new jumper links. Examples of this are the 2-way jumper links, which can be used for making interconnection between contacts of different types of sockets; and the 6-way and 8-way jumper links for the easy connection of the A1 / A2 terminals on the coil side. The marker tag holder – for tags that can be used with CEMBRE's thermal transfer printers – has also been redesigned for improved visibility and legibility.

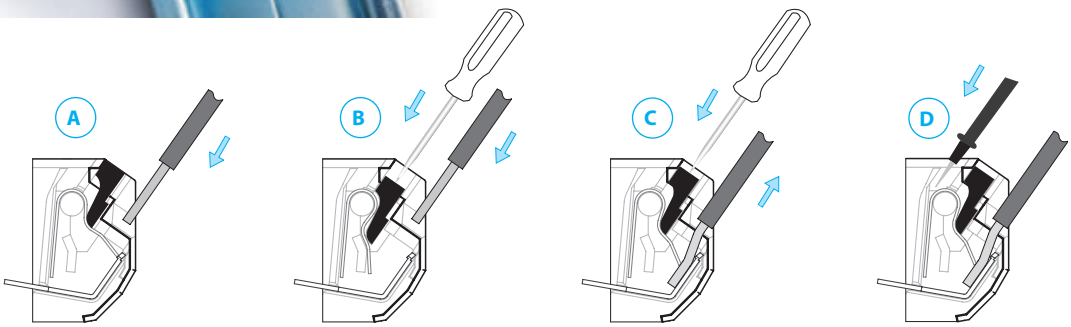
All Relay Interface Modules are available in either plastic retaining and release clip (SPA), or metal retaining clip (SMA) vesions.

Another new feature of this range is the test probe aperture near each Push-in terminal, which allows the technician to insert a multimeter probe and make precise measurements in complete safety.



Push-in connection technology

The push-in terminals permit the quick connection of solid wires or ferrules by their simple insertion into the terminal (A). It is possible to open the terminal to extract the wire by first pushing down on the push-button using a screwdriver (C). For stranded cable it is necessary to first open the terminal using the push button, both for the extraction (C) and insertion (B).
The terminals are equipped with a test hole to take a test probe (D).



Approvals (according to type)

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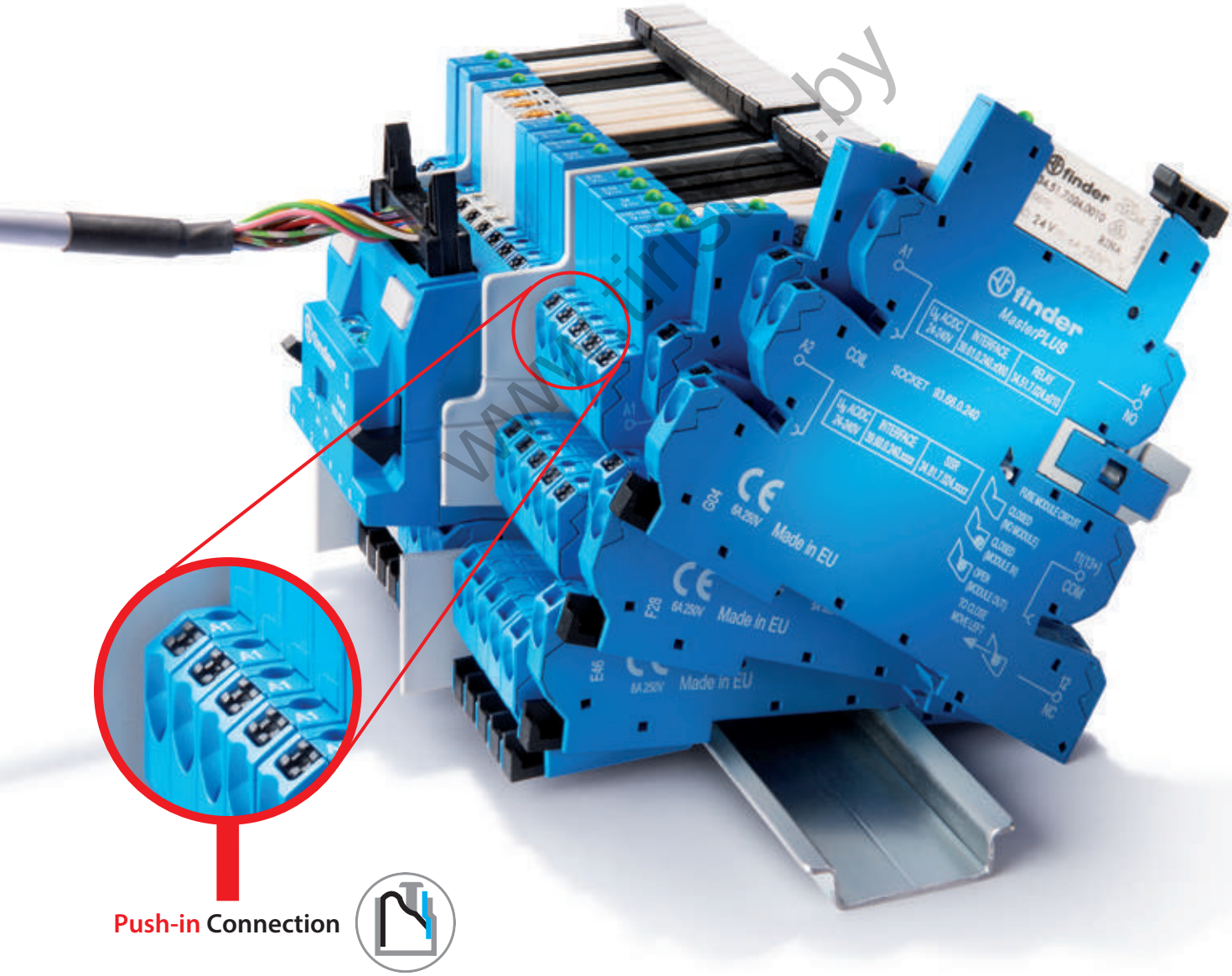
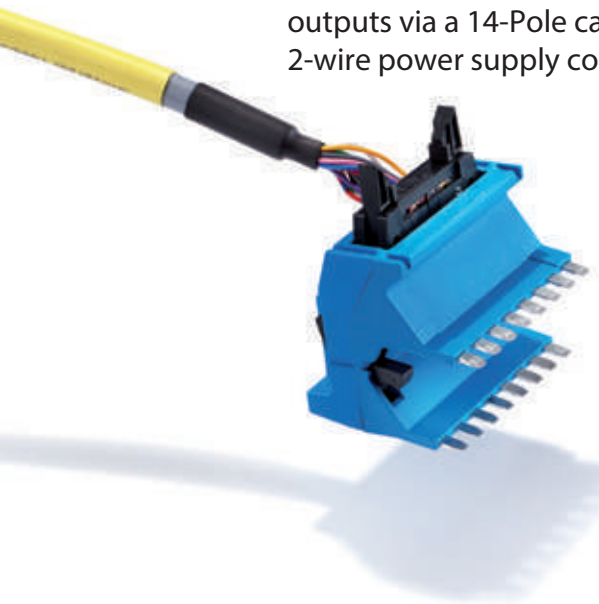
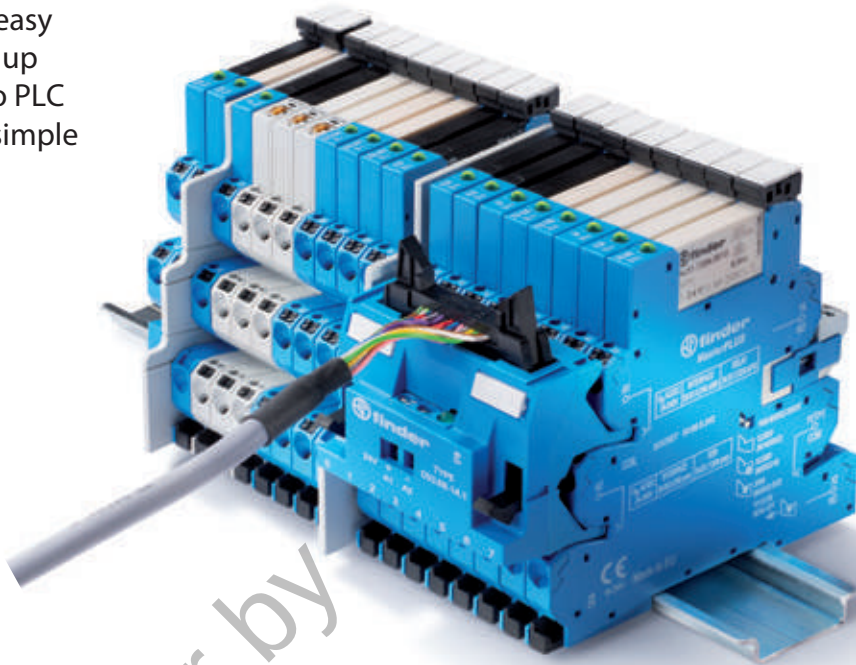
*Master**PLUS***
Type 39.61 (EMR)
Type 39.60 (SSR)

- DC coils & AC coils
- Nominal voltage: from 6 to 125 V AC/DC
  24...240 V AC/DC, 230 V AC
- Nominal contact rating: 1 CO 6 A (EMR); 1 NO up to 2 A (SSR) – 250 V AC1
- Marker tags: Type 060.48 for CEMBRE's thermal transfer printers
- 35 mm rail (EN 60715) mounting



*Master**ADAPTER***
Type 093.68.14.1
The *Master**ADAPTER*** permits the easy connection of A1/A2 terminals of up to 8 *Master**INTERFACE*** modules to PLC outputs via a 14-Pole cable, plus simple 2-wire power supply connection.





Output fuse module
- For 5 x 20 mm fuses up to 6 A 250 V
- Easy visibility of the fuse condition through the window
- Quick connection to socket

Output fuse module with LED status indicator
Type 093.63.0.024
Type 093.63.8.230

Output fuse module
Type 093.63

Multi-state fuse module

0. As delivered, the socket comes without a fuse module. The connection is protected by a special cap.

1. With fuse module inserted, the fuse is positioned electrically in series with the common output terminal of the interface module. This state is indicated by the peg/indicator.

2. If the fuse module is extracted the output circuit will be locked open, as this will generally be the "safe option". This state is indicated by the peg/indicator.

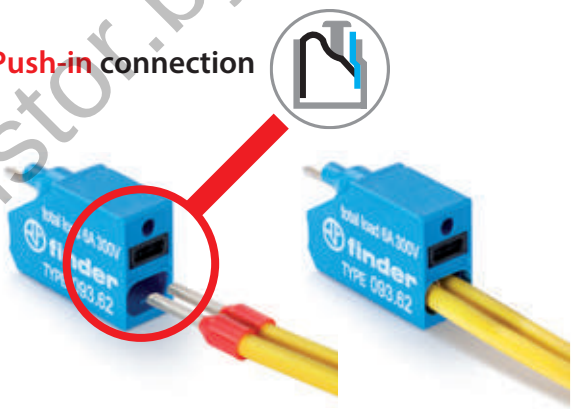
3. In order to reinstate the output circuit it is necessary to either re-insert the fuse module, or alternatively, return the peg/indicator to position **0**.

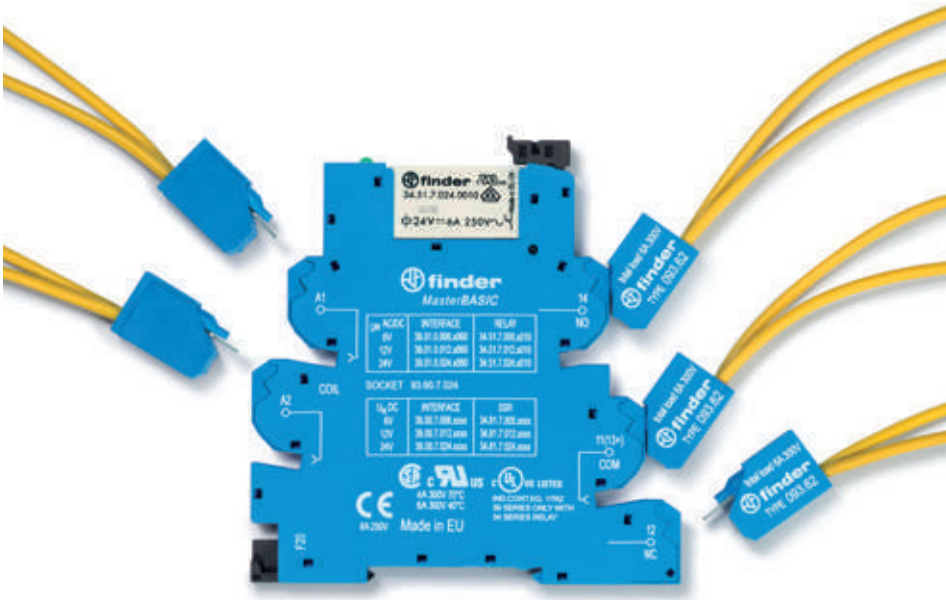
MULTI-VOLTAGE *MasterPLUS*

New multi-voltage versions
of Finder's relay interface
module range
from 24 to 240 V AC/DC.

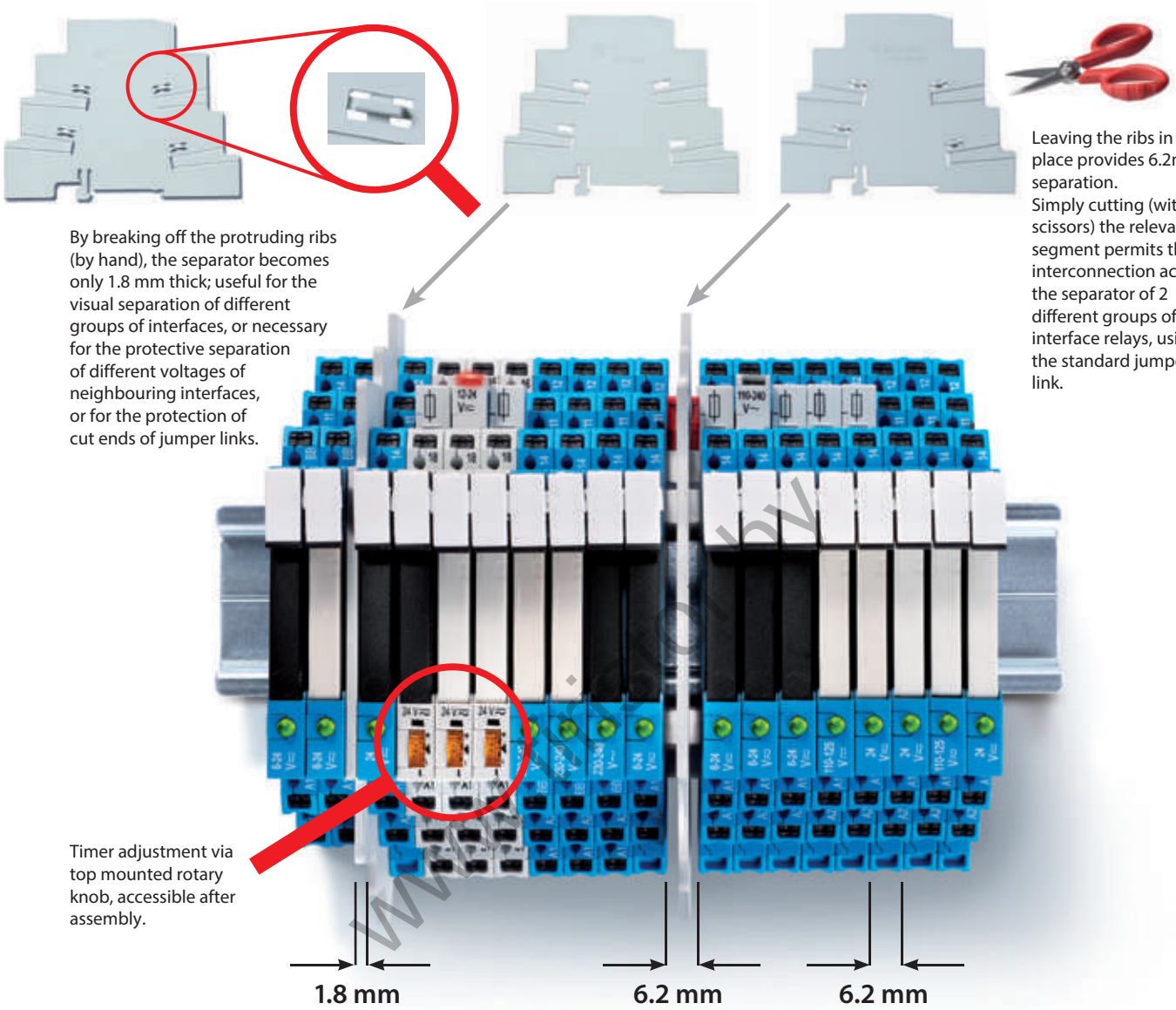
Terminal Doubler
Type 093.62
Fits all sockets with
39 Series
Push-in technology.

Push-in connection





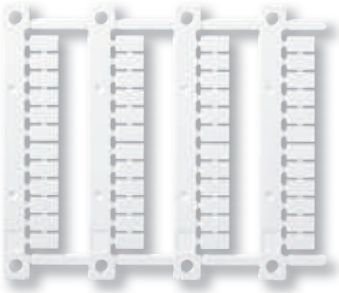
Dual-purpose plastic separator
type 093.60 (1.8 mm or 6.2 mm separation)



Marker tag

Type 060.48

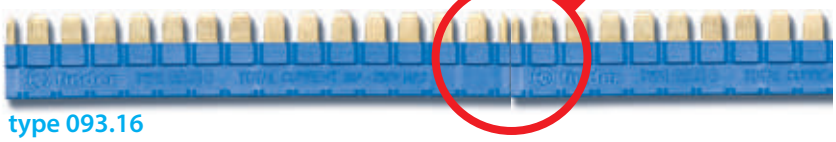
For CEMBRE's thermal transfer printers



16-way jumper link

type 093.16.1

type 093.16.0



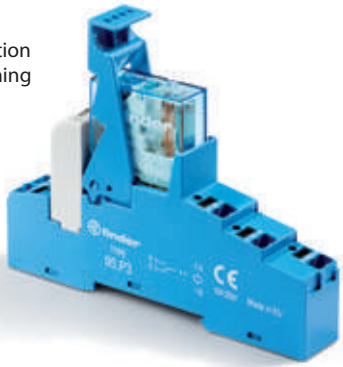
type 093.16

Possibility of multiple connection, side by side

Type 48.P3

- AC coils & DC coils
- Nominal voltage: 12 - 24 - 110 - 125 V DC
  12 - 24 - 110 - 230 V AC
- Nominal contact rating: 1 CO 10 A 250 V AC1
- Supply status indication and EMC coil suppression module
- 35 mm rail mounting (EN 60715)

available with instant ejection of relay using plastic retaining clip (packaging code SPA)

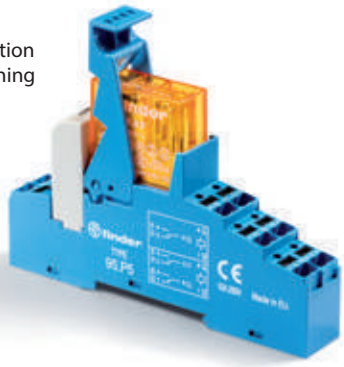


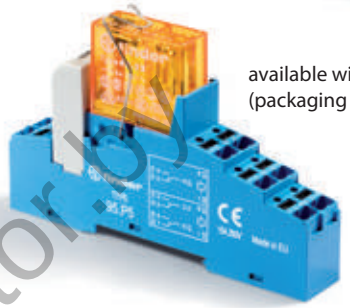
available with metal retaining clip (packaging code SMA)

Type 48.P5

- AC coils & DC coils
- Nominal voltage: 12 - 24 - 110 - 125 V DC
  12 - 24 - 110 - 230 V AC
- Nominal contact rating: 2 CO 8 A 250 V AC1
- Supply status indication and EMC coil suppression module
- 35 mm rail mounting (EN 60715)

available with instant ejection of relay using plastic retaining clip (packaging code SPA)



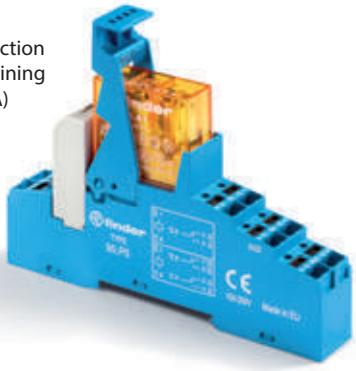


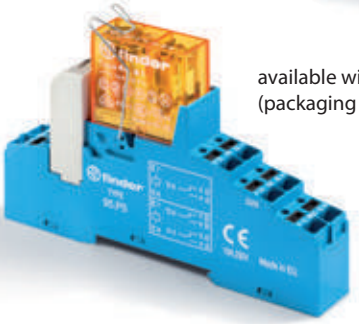
available with metal retaining clip (packaging code SMA)

Type 48.P6

- AC coils & DC coils
- Nominal voltage: 12 - 24 - 110 - 125 V DC
  12 - 24 - 110 - 230 V AC
- Nominal contact rating: 1 CO 16 A 250 V AC1
- Supply status indication and EMC coil suppression module
- 35 mm rail mounting (EN 60715)

available with instant ejection of relay using plastic retaining clip (packaging code SPA)



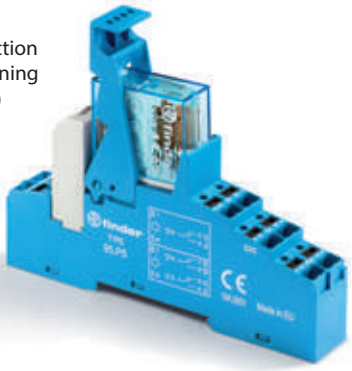


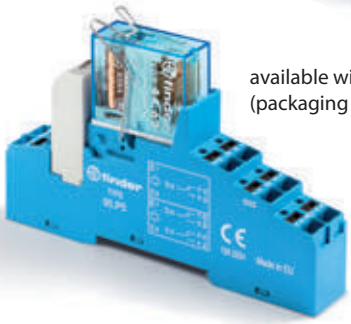
available with metal retaining clip (packaging code SMA)

Type 48.P8

- DC coils
- Nominal voltage: 12 - 24 - 110 - 125 V DC
- Nominal contact rating: 2 CO 10 A 250 V AC1
- Supply status indication and EMC coil suppression module
- 35 mm rail mounting (EN 60715)

available with instant ejection of relay using plastic retaining clip (packaging code SPA)





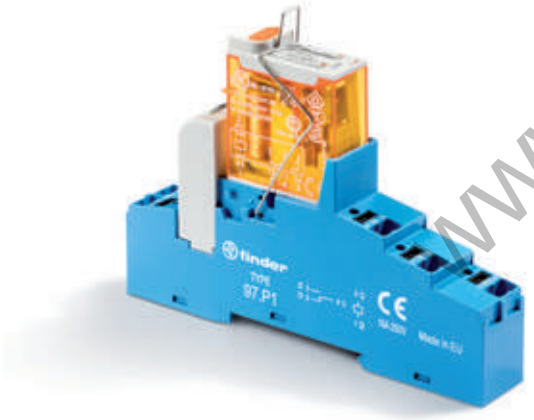
available with metal retaining clip (packaging code SMA)

Type 4C.P1

- AC coils & DC coils
- Nominal voltage: 12 - 24 - 110 - 125 V DC
  12 - 24 - 110 - 230 V AC
- Nominal contact rating: 1 CO 10 A 250 V AC1
- Supply status indication and EMC coil suppression module
- 35 mm rail mounting (EN 60715)

available with instant ejection of relay
using plastic retaining clip (packaging code SPA)

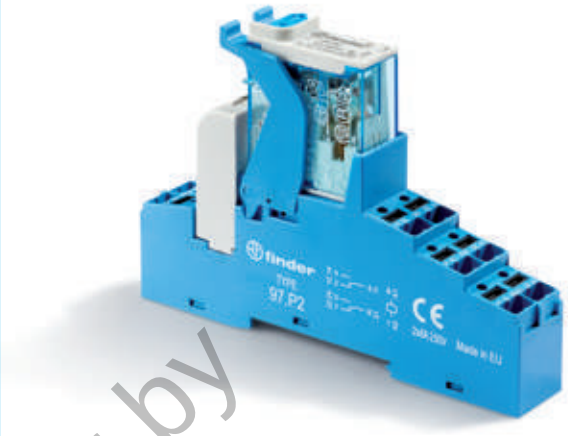
available with metal retaining clip
(packaging code SMA)



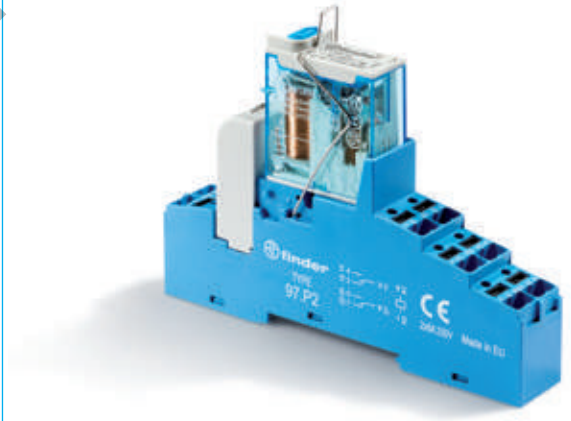
Type 4C.P2

- AC coils & DC coils
- Nominal voltage: 12 - 24 - 110 - 125 V DC
  12 - 24 - 110 - 230 V AC
- Nominal contact rating: 2 CO 8 A 250 V AC1
- Supply status indication and EMC coil suppression module
- 35 mm rail mounting (EN 60715)

available with instant ejection of relay
using plastic retaining clip (packaging code SPA)



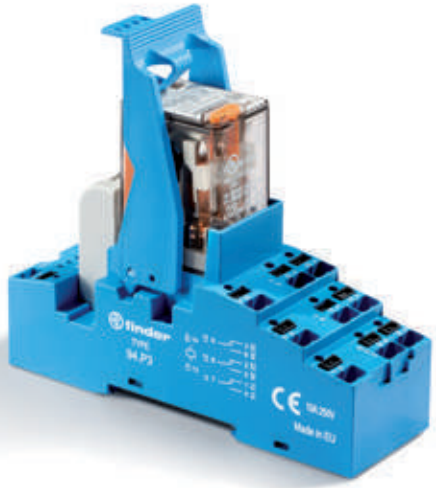
available with metal retaining clip
(packaging code SMA)



Type 58.P3

- AC coils & DC coils
- Nominal voltage: 12 - 24 - 110 - 125 V DC
  12 - 24 - 110 - 230 V AC
- Nominal contact rating: 3 CO 10 A 250 V AC1
- Supply status indication and EMC coil suppression module
- 35 mm rail mounting (EN 60715)

available with instant ejection of relay
using plastic retaining clip (packaging code SPA)



available with metal retaining clip
(packaging code SMA)

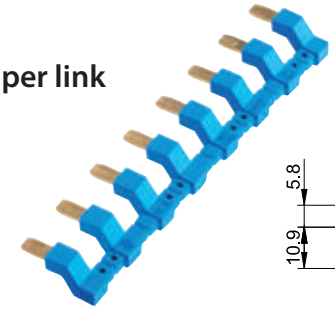
Type 58.P4

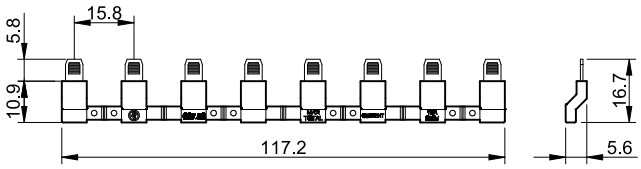
- AC coils & DC coils
- Nominal voltage: 12 - 24 - 110 - 125 V DC
  12 - 24 - 110 - 230 V AC
- Nominal contact rating: 4 CO 7 A 250 V AC1
- Supply status indication and EMC coil suppression module
- 35 mm rail mounting (EN 60715)

available with instant ejection of relay
using plastic retaining clip (packaging code SPA)

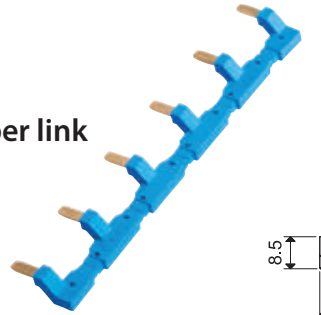
available with metal retaining clip
(packaging code SMA)

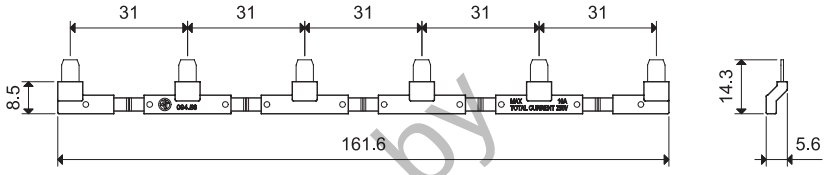
8-way jumper link
Type 097.58



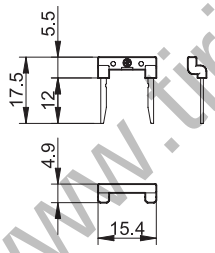


6-way jumper link
Type 094.56

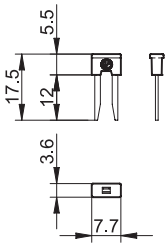




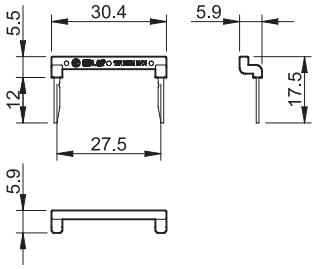
2-way jumper link
Type 097.52



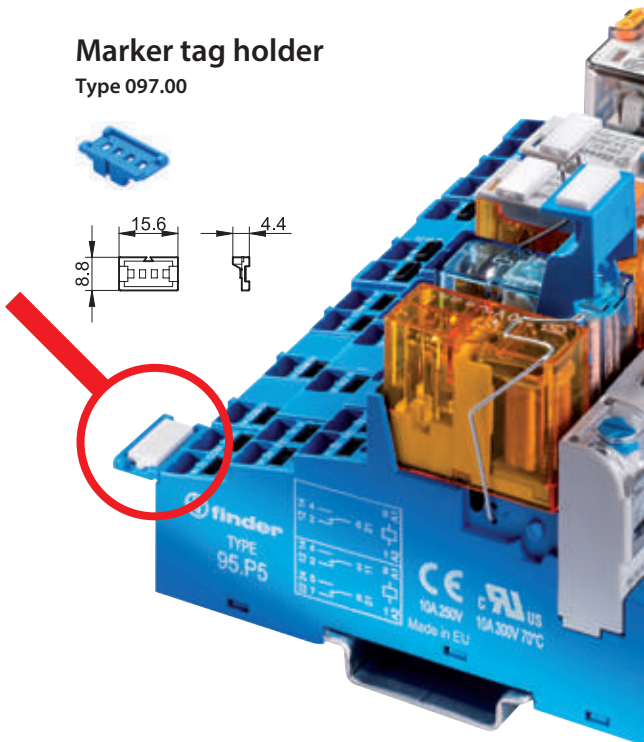
2-way jumper link
Type 097.42



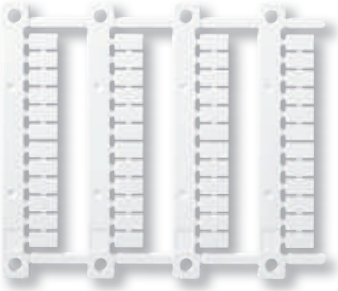
2-way jumper link
Type 094.52.1



Marker tag holder
Type 097.00



Marker tag
Type 060.48
For CEMBRE's thermal transfer printers



THE GLOBAL EXPERT IN SOLID STATE RELAY TECHNOLOGY

- Food Preparation Equipment

- Plastic Molding

- Lighting Control

CST
CUSTOM SENSORS & TECHNOLOGIES

crydom®

Dual Solid State Relays

crydom®

Crydom has a distinguished record of providing advanced, high quality products with timely delivery and competitive pricing. Your success in today's fastpaced global markets hinges on working with suppliers who respond quickly and appropriately to your every need.

In addition to an extensive selection of catalog off-the-shelf items, Crydom offers custom-designed solid state relays. Fact is we specialize in satisfying the most demanding environmental and performance requirements our customers can devise. Give us your specs, and watch us exceed your expectations!

At Crydom's custom-built **100,000 square foot manufacturing facility,** virtually everything is accomplished in-house to assure complete control over delivery, production, and above all quality. With design, development, manufacturing and management personnel under one roof, we're geared for fast response to your requirements.

In **Design Engineering**, we focus on pushing performance, reliability and quality standards ever higher. Working under a conservative design and rating philosophy, Crydom's seasoned engineering team makes extensive use of CAD to optimize design of mechanical parts.

As a result of these efforts, Crydom has acquired an impressive list of patents in solid state relay technology, while continuing to create new circuit and technology-related inventions as part of our ongoing R & D programs.

Once the design is solidified, **Production Engineering** is responsible for the engineering control of the techniques used throughout manufacturing. This department works closely with our design engineering group, establishes assembly processes, and oversees a comprehensive on-premises machine shop which fabricates our assembly fixtures.

As the work progresses, **Material and Production Control** employ our advanced computer system, upgraded with our customized software to keep manufacturing operations humming. The computer system employs integral MRP and MSP capabilities to generate detailed scheduling and planning information.

Ceramic Hybrid Manufacturing also is performed in-house. Crydom manufactures all metallized ceramic substrates used in our relays — a major factor in product performance and reliability, including direct bond copper substrates.

www.crydom.com

Quality Assurance conducts ongoing product reliability verification tests, gathering precise data on the quality of our power semiconductor vendors and the silicon chips they provide. Additional tests are performed to meet specific customer burn-in requirements.

Crydom tests are exhaustive, including **100% verification** at final test. After units are completely assembled, they must pass a complete set of electrical tests, which are performed twice, once prior to encapsulation and then again afterward.

Because of our dedication to quality, Crydom was one of the first American companies to achieve full certification to the demanding standards of ISO 9001. In addition, most Crydom products are approved by UL, CSA, VDE, TUV and carry the CE Mark signifying conformance with the latest European directives. Certain panel mount and din rail mount relays carry UL 508A SCCR ratings.

Learn how an alliance with the world leader in solid state relays can pay off for you. For details, call your authorized Crydom distributor today.

DUAL SOLID STATE RELAYS

Dual Output SSRs

For decades Crydom has manufactured top quality Dual Solid State Relays in addition to its standard single and three phase SSR lines. All Crydom **"D"** and **"H12"** series Dual SSRs have two totally independent AC output relays in a single standard panel mount package making them ideal for a wide variety of applications including Heating, Lighting and Motion Control.

Each Dual SSR has two outputs controlled by two independent inputs. This allows engineers using multiple Solid State Relays in a panel to save space in many applications. Fast-on termination suitable for rated load currents to 40 amps/ 530 VAC per channel are standard. Terminations for the input controls are either square pins or fast-on connectors Utilizing dual SCR's for the AC switch output with internal snubber, Crydom Dual SSRs provide greater protection against false triggering. Model choices include zero voltage or random turn-on switching.

Evolution Dual SSRs

Crydom has used innovation and technology to expand its line of Dual SSRs creating the **Evolution Dual** series. Evolving from Crydom's successful **"D"** and **"H12"** series of Dual SSRs, the **Evolution Duals** offer an improved mechanical and thermal design providing higher capacity outputs and significantly increased power density. Screw termination suitable for rated load currents to 50 amps/ 660 VAC per channel is standard in either "SSR" or "Contactor" output termination configurations. Each AC output channel features high power SCRs with high surge ratings and is available with either zero voltage or random turn on.

The new generation of Dual SSRs with four different input termination options (pin, locking connector, detachable barriers w/screws, and direct wire) are available with three different input voltage ratings including a wide range (4 to 32 VDC) current regulated version.

The new two channel relays are available with an innovative optional clear IP20 touch safe cover allowing a clear view of the power lead terminations while providing touch safe operation. Crydom's AC output **Evolution Dual Solid State Relays** also feature LED input status indicators for each channel.

Crydom Dual SSRs are UL and cUL recognized, TUV approved, RoHS compliant and CE certified.

Evolution Dual Relays

New

AC Output

25-50 Amp
280/660 VAC

- 25A & 50A Output rating per channel @ 40ºC
- 120/240 & 480VAC Operating voltage rating
- 4-15, 15-32 & 4-32VDC Control input options
- Four input termination options available
- Top-bottom or left-right output screw connections available
- Zero voltage or random turn-on available
- SCR output for heavy industrial loads
- Industry standard panel mount package
- IP20 Protective cover available
- Input status LED indicators for each channel
- CE & RoHS compliant, UL & cUL recognized

OUTPUT SPECIFICATIONS ①	CX2425XXXX	CX2450XXXX	CX4825XXXX	CX4850XXXX
Operating Voltage (47-63 Hz) [Vrms]	24-280	24-280	48-660	48-660
Load Current Range [Arms] ③	0.15-25	0.15-50	0.15-25	0.15-50
Maximum Surge Current (1 cycle) [Apk] @ 60 Hz	300	750	300	750
Maximum Surge Current (1 cycle) [Apk] @ 50 Hz	275	710	275	710
Transient Overvoltage [Vpk]	600	600	1200	1200
Maximum On-State Voltage Drop @ Rated Current [Vpk]	1.3	1.3	1.3	1.3
Thermal Resistance Junction to Case (RqJC) [ºC/W]	0.65	0.33	0.65	0.33
Maximum I²t for Fusing (8.3 msec.) [A²sec]	370	2320	370	2320
Maximum I²t for Fusing (10 msec.) [A²sec]	380	2520	380	2520
Minimum Off-State dv/dt @ Max. Rated Voltage [V/µsec] ②	500	500	500	500
Off-state leakage [mArms] (@ max. line voltage & Ta = 25ºC)	0.1	0.1	0.25	0.25
Maximum Turn-On Time ④	1/2 cycle	1/2 cycle	1/2 cycle	1/2 cycle
Maximum Turn-Off Time	1/2 cycle	1/2 cycle	1/2 cycle	1/2 cycle
Power Factor (Minimum) with Maximum Load	0.5	0.5	0.5	0.5

INPUT SPECIFICATIONS ①	CXXXDXXX	CXXXEXXX	CXXXWXXX
Control Voltage Range [VDC]	4-15	15-32	4-32
Minimum Turn-On Voltage [VDC]	4	15	4
Minimum Turn-Off Voltage [VDC]	1	1	1
Nominal Input Impedance [Ohms]	300	1500	See note 5
Typical Input Current [mA]	16 @ 5 VDC	18 @ 24 VDC	10 @ 12 VDC

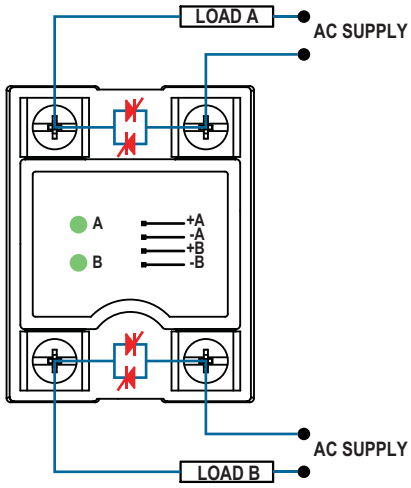
GENERAL SPECIFICATIONS	
Dielectric Strength 50/60Hz Input/Output [Vrms]	4000
Dielectric Strength 50/60Hz Input-Output/Baseplate [Vrms]	2500
Insulation Resistance (Min.) @ 500 VDC [Ohms]	10^9
Maximum Capacitance Input/Output [pF]	10
Ambient Operating Temperature Range [ºC]	- 40 to 80
Ambient Storage Temperature Range [ºC]	- 40 to 125

MECHANICAL SPECIFICATIONS	
Weight (Typical)	0.25 lb (100 grs)
Encapsulation	Thermally Conductive Epoxy
Terminals	Screw Type Output: 8-32
Maximum Torque (Output Terminals)	20 in lbs (2.2 Nm)
Maximum Wire Size (Output Terminals)	AWG #8 with terminals. AWG #10 Stranded

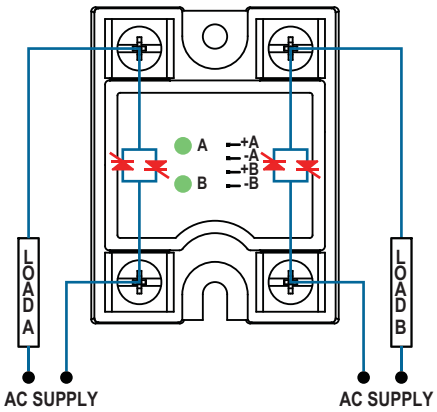
① All parameters at 25ºC and per channel unless otherwise specified.
② Off-State dv/dt test method per EIA/NARM standard RS-443, paragraph 13.11.1
③ Heat sinking required, see derating curves.
④ Turn-On time for random turn-on (R) versions is 0.1 msec.
⑤ Input circuit incorporates active current limitation.

Wiring Diagrams

SSR Output Configuration
"U" Option Top-Bottom
Line/Load Connections



Contactor Output Configuration
"V" Option Left-Right
Line/Load Connections



Questions? Call or e-mail **Americas** +1 (877) 502 5500 **sales@crydom.com**
Europe +44 (0) 1202 606030 **sales-europe@crydom.com**

Part Number Nomenclature

Cover Option
C: IP20
D: IP00 (No cover)

Output Current Rating per Channel
25: 25 Amps rms
50: 50 Amps rms @ Ta= 40ºC

Input Connector Options
1, 2, 3, or 4

Options
Blank: Zero Turn On
R: Random Turn On
H: TP- 01 thermal pad installed on relay

Required for valid part number
For options only and not required for valid part number

C D 24 25 D 1 V R

Evolution Dual Series

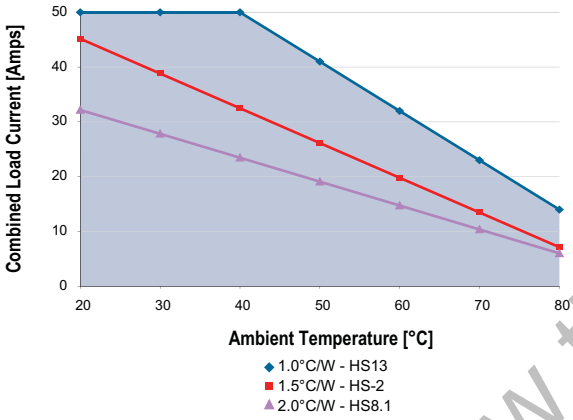
Output Voltage @ 50/60 Hz
24: 24-280 VAC
48: 48-660 VAC

Input Control
D: 4-15 VDC
E: 15-32 VDC
W: 4-32 VDC

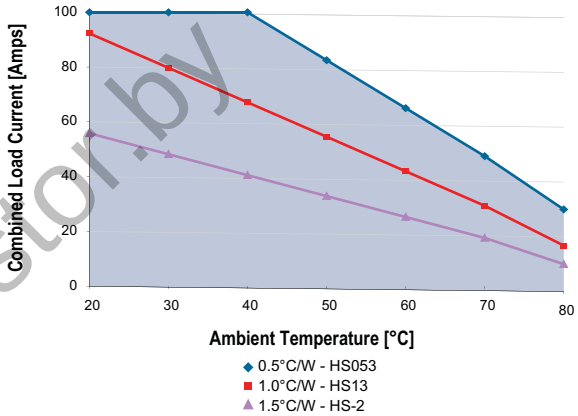
Output Terminal Orientation
U: A channel on top/ B on bottom (SSR output configurations)
V: A channel on left/ B on right (Contactor output configurations)
(See wiring diagrams)

Derating Curves

CXXX**25**XXXX
(25 Amps per Channel)



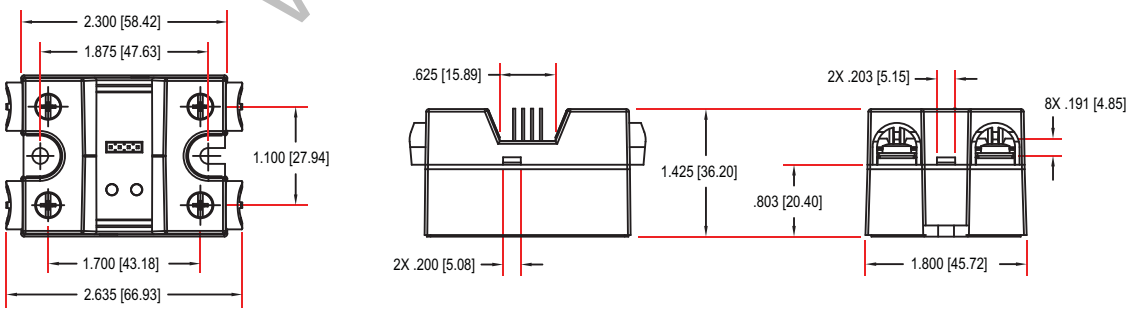
CXXX**50**XXXX
(50 Amps per Channel)



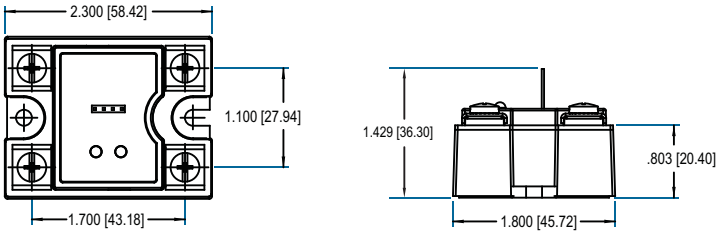
Mechanical Dimensions

Tolerances: ± 0.02 in / 0.5 m
All dimensions are in: inches [millimeters]

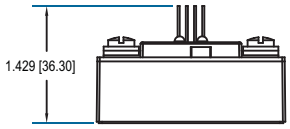
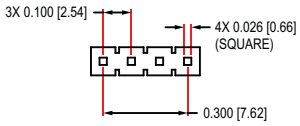
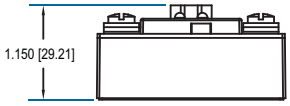
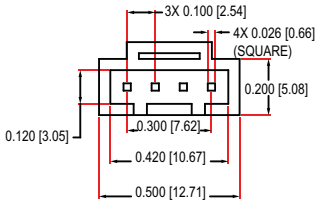
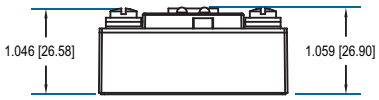
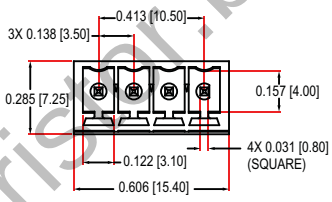
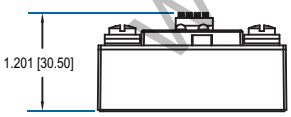
IP20



IP00

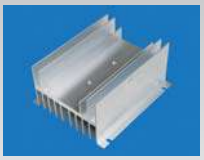


Available Input Connector Options

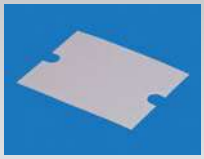
	MECHANICAL DIMENSIONS (shown without IP20 cover)	INPUT CONNECTOR DIMENSIONS	SUGGESTED MATING CONNECTORS/PLUGS
 **Four Pin Standard**	 INPUT CONNECTOR **OPTION 1**		**Pin Connector** TYCO 3-640440-4 Accepts wires: AWG #22
 **Locking Connector**	 INPUT CONNECTOR **OPTION 2**		**Crimp Housing, Positive Latch** Molex 050579404 Accepts wires: AWG #24, 0.2 mm²
 **Detachable Barriers w/Screws**	 INPUT CONNECTOR **OPTION 3**		**Vertical Plug, Top Wire entry** Molex 039500-0004 Phoenix 1840382 Dinkle EC350V-04P **Vertical Plug, Rear Wire entry** Molex 39503-2004 Phoenix 1862878 Dinkle EC350RL-04P **Vertical Plug, Front Wire entry** Molex 39503-3004 Phoenix 1863178 Dinkle EC350R-04P **Vertical Spring Cage Plug, top Wire E** Phoenix 1939934 Dinkle 0221-2004 All 4 options accept wires: AWG #16 to 24
 **Direct Wire**	 INPUT CONNECTOR **OPTION 4**	**N/A**	Accepts wires: AWG #16 to 24

Accessories

- A large variety of **Heat Sinks** rated from .25 to 5.0 C/W specially engineered to match the heat dissipation requirements of Crydom SSRs.
- **Heat Transfer Pads** (Thermal Pads) for single, dual and 3 phase SSRs to maximize thermal conductivity.
- **Assemblies** of Crydom SSRs on Crydom heat sinks are also available.
- SSR mounting **Hardware Kits (English and Metric threads)**.



Heat Sinks



Heat Transfer Pads

Assemblies

For more information about these and other accessories please ask your Crydom authorized distributor or visit ***www.crydom.com/en/accessories***

Questions? Call or e-mail **Americas** +1 (877) 502 5500 **sales@crydom.com**
Europe +44 (0) 1202 606030 **sales-europe@crydom.com**

Dual Relays
AC Output

25-40 Amp
120/240/480 VAC

- 25A & 40A Output rating per channel
- 120/240 & 480VAC Operating voltage rating
- 4-15 & 15-32 VDC Control input options
- Internal output snubber standard
- SCR output for heavy industrial loads
- Industry standard panel mount package
- 0.25 inch Faston output connectors
- Zero voltage or random turn-on available
- CE & RoHS compliant, UL & cUL recognized & VDE approved*

OUTPUT SPECIFICATIONS ①	D2425D D2425DE	D2440D D2440DE	H12D4825D H12D4825DE	H12D4840D H12D4840DE
Operating Voltage (47-63 Hz) [Vrms]	24-280	24-280	48-530	48-530
Transient Overvoltage [Vpk]	600	600	1200	1200
Maximum Off-State Leakage Current @ Rated Voltage [mArms]	10	10	10	10
Minimum Off-State dv/dt @ Maximum Rated Voltage [V/µsec] ②	500	500	500	500
Maximum Load Current [Arms] ③	25	40	25	40
Minimum Load Current [Arms]	0.15	0.15	0.15	0.15
Maximum Surge Current (16.6ms) [Apk] @ 60 Hz	250	625	250	625
Maximum Surge Current (20.0ms) [Apk] @ 50 Hz	240	600	240	600
Maximum On-State Voltage Drop @ Rated Current [Vpk]	1.6	1.6	1.6	1.6
Thermal Resistance Junction to Case (Rjc) [°C/W]	1.02	0.63	1.02	0.63
Maximum I²t for Fusing (8.3 msec) [A²sec]	260	1620	260	1620
Maximum I²t for Fusing (10 msec) [A²sec]	285	1780	285	1780
Minimum Power Factor (with Maximum Load)	0.5	0.5	0.5	0.5

INPUT SPECIFICATIONS ①	D24XXD	H12D48XXD	DE-SUFFIX
Control Voltage Range [VDC]	4-15	4-15	15-32
Minimum Turn-On Voltage [VDC]	4.0	4.0	15.0
Minimum Turn-Off Voltage [VDC]	1.0	1.0	1.0
Typical Input Current @ 5 VDC (@ 24 VDC for E-Suffix) [mA]	13	13	15
Nominal Input Impedance [Ohm]	300	240	1500
Maximum Turn-On Time ④	1/2 cycle	1/2 cycle	1/2 cycle
Maximum Turn-Off Time	1/2 cycle	1/2 cycle	1/2 cycle

GENERAL SPECIFICATIONS	
Dielectric Strength 50/60 Hz Input/Output [Vrms]	4000
Dielectric Strength 50/60 Hz Input-Output/Baseplate [Vrms]	2500
Minimum Insulation Resistance (@ 500 V DC) [Ohm]	10^9
Maximum Capacitance, Input/Output [pF]	10
Ambient Operating Temperature Range [°C]	-40 to 80
Ambient Storage Temperature Range [°C]	-40 to 125
Weight (typical)	3.0 oz (86.5g)
Encapsulation	Thermally conductive Epoxy
Terminals (Output / Input)	0.25" Fastons / 0.025" Square Pins

* D2425D & D2440D Models are also CSA approved.
① All parameters at 25°C and per channel unless otherwise specified.
② Off-State dv/dt test method pes EIA/NARM standard RS-443, paragraph 13.11.1
③ Heat sinking required, see derating curves.
④ Turn-on time for random turn-on (-10) versions is 0.1msec.

Part Number Nomenclature

SERIES **H12D48** **25** **D** **-10**

Output Voltage @ 50/60 Hz
D24: 24-280 VAC
H12D48: 48-530 VAC

Output Current per Channel
25: 25 Amps
40: 40 Amps

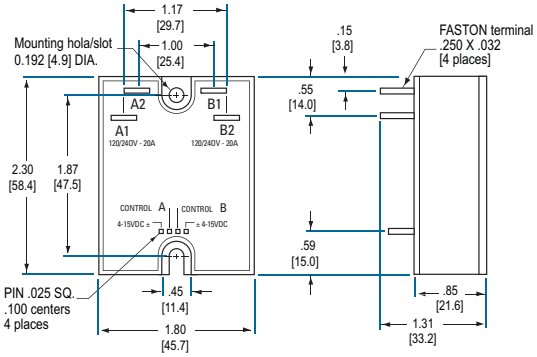
Control Voltage
D: 4-15 VDC
DE: 15-32 VDC

Output Function
Blank: Zero-Crossing
-10: Random Turn-On

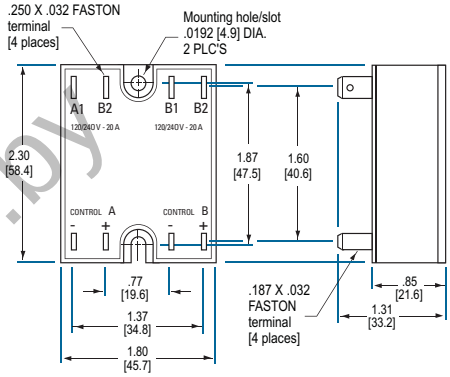
Mechanical Dimensions

Tolerances: ± 0.02 in / 0.5 m
All dimensions are in: inches [millimeters]

120/240V Model

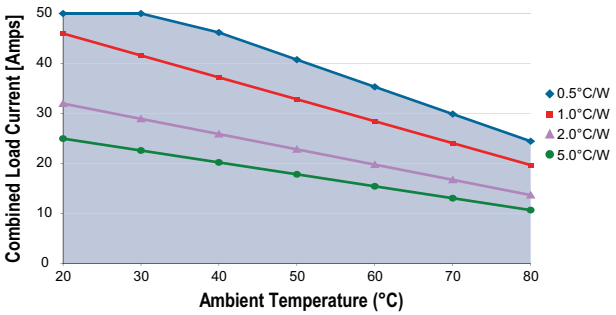


480V Model

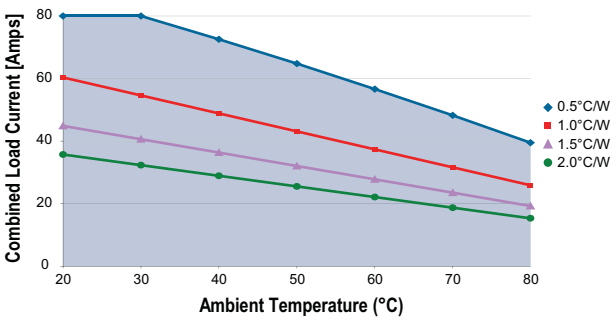


Derating Curves

D24**25**XX, H12D48**25**XX
(25 Amps per Channel)

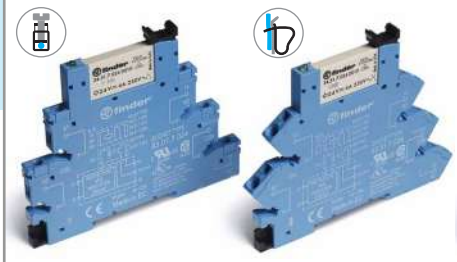
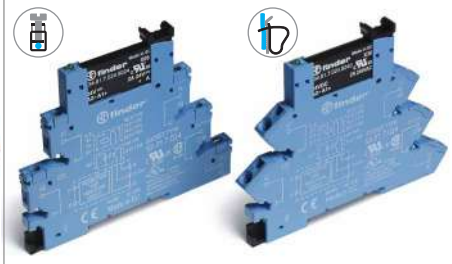
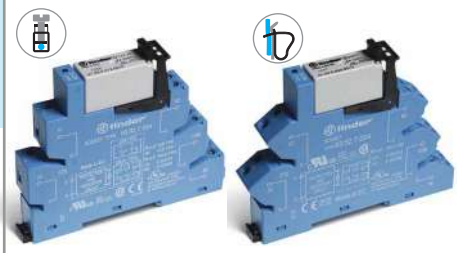
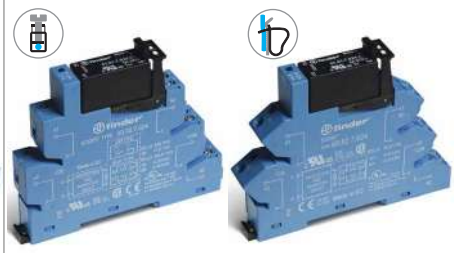


D24**40**XX, H12D48**40**XX
(40 Amps per Channel)



Common features

- Instant ejection of relay by plastic retaining clip
- Integral coil indication and protection circuit
- 35 mm rail (EN 60715) mounting

	EMR Electromechanical Relays	SSR Solid State Relays
6.2 mm wide • **EMR - DC, AC or AC/DC coil versions** • **SSR - DC or AC/DC input versions** • Screw and Screwless terminal options	**38.51/38.61**  • **1 CO - 6 A 250VAC** **Page 1**	**38.81/38.91**  • Single solid state output: Options **0.1A 48VDC, 2A 24VDC, 2A 240VAC** • Silent, high speed switching • Long electrical life **Page 2**
6.2 mm wide • **Special coil / input leakage current suppression types** • **EMR - AC or AC/DC coil versions** • **SSR - AC or AC/DC input versions** • Screw and Screwless terminal options	**38.51.3... - 38.61.3...**  • **1 CO - 6 A 250VAC** **Page 1**	**38.81.3... - 38.91.3...**  • Single solid state output: Options **0.1A 48VDC, 2A 24VDC, 2A 240VAC** • Silent, high speed switching • Long electrical life **Page 2**
6.2 mm wide • **Timed Interface module** • **4 functions & 4 time scales 0.1s ... 6h** • **EMR - AC/DC (12 or 24V) supply versions** • **SSR - AC/DC (24V) supply** • Screw terminals	**38.21**  • **1 CO - 6 A 250VAC** **Page 3**	**38.21...9024-8240**  • Single solid state output: Options **2A 24VDC, 2A 240VAC** • Silent, high speed switching • Long electrical life **Page 3**
14 mm wide • **2 pole 8 A or 1 pole 16 A** • **EMR - DC or AC/DC coil versions** • **SSR - DC input versions** • Screw and Screwless terminal options	**38.01/38.52/38.11/38.62**  • **1 CO - 16 A 250VAC** • **2 CO - 8 A 250VAC** **Page 4**	**38.31/38.41**  • Single solid state output: Options **5A 24VDC, 3A 240VAC** • Silent, high speed switching • Long electrical life **Page 5**

Features

1 Pole - 6 A electromechanical relay interface modules, 6.2 mm wide.

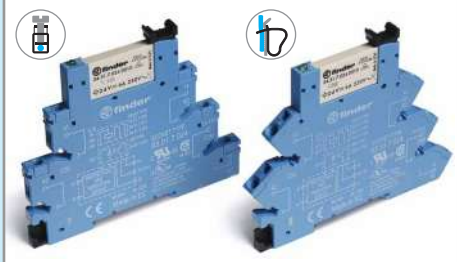
Ideal interface for PLC and electronic systems

- Sensitive DC coil or AC/DC coil versions
- Integral coil indication and protection circuit
- Instant ejection of relay using plastic retaining clip
- UL Listing (certain relay/socket combinations)
- 35 mm rail (EN 60715) mounting

38.51 / 38.51.3
Screw terminal

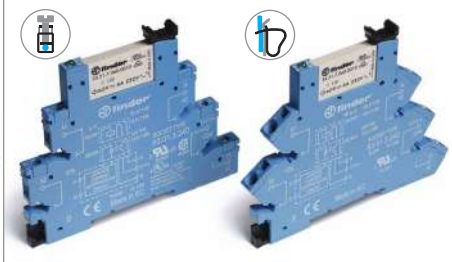
38.61 / 38.61.3
Screwless terminal

38.51/61

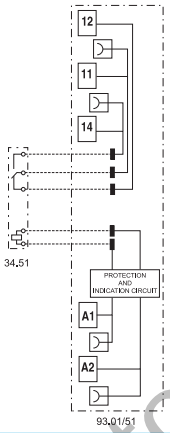


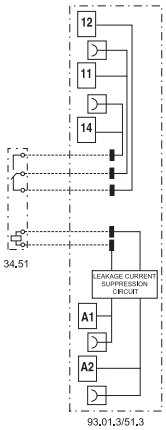
- 1 pole electromechanical relay
- Screw terminal and screwless terminal
- 35 mm rail (EN 60715) mounting

38.51.3 / 38.61.3



- Leakage current suppression
- 1 pole electromechanical relay
- Screw terminal and screwless terminal
- 35 mm rail (EN 60715) mounting





* Special version for max ambient temperature +70°C.

For outline drawing see page 12

Contact specification				
Contact configuration		1 CO (SPDT)	1 CO (SPDT)	
Rated current/Maximum peak current	A	6/10	6/10	
Rated voltage/Maximum switching voltage	V AC	250/400	250/400	
Rated load AC1	VA	1,500	1,500	
Rated load AC15 (230 V AC)	VA	300	300	
Single phase motor rating (230 V AC)	kW	0.185	0.185	
Breaking capacity DC1: 30/110/220 V	A	6/0.2/0.12	6/0.2/0.12	
Minimum switching load	mW (V/mA)	500 (12/10)	500 (12/10)	
Standard contact material		AgNi	AgNi	
Coil specification				
Nominal voltage (U_N)	V AC/DC	12 - 24 - 48 - 60 - (110...125) - (220...240)	(110...125)	—
	V AC	(230...240)*	—	(230...240)
	V DC	6 - 12 - 24 - 48 - 60 (non polarized)	—	—
Rated power AC/DC	VA (50 Hz)/W	See page 9	1/1	0.5/—
Operating range	AC/DC	(0.8...1.1)U_N	(94...138)V	—
	AC	(184...264)V	—	(184...264)V
	DC	(0.8...1.2)U_N	—	
Holding voltage	AC/DC	0.6 U_N / 0.6 U_N	0.6 U_N / 0.6 U_N	
Must drop-out voltage	AC/DC	0.1 U_N / 0.05 U_N	44 V	72 V
Technical data				
Mechanical life AC/DC	cycles	$10 \cdot 10^6$	$10 \cdot 10^6$	
Electrical life at rated load AC1	cycles	$60 \cdot 10^3$	$60 \cdot 10^3$	
Operate/release time	ms	5/6	5/6	
Insulation between coil and contacts (1.2/50 µs)	kV	6 (8 mm)	6 (8 mm)	
Dielectric strength between open contacts	V AC	1,000	1,000	
Ambient temperature range ($U_N \leq$ 60 V/>60V)	°C	–40...+70/–40...+55	—/–40...+55	
Protection category		IP 20	IP 20	
Approvals relay (according to type)		CE SP EAC PG RINA cULus		

Features

Single output - solid state relay interface modules, 6.2 mm wide.

Ideal interface for PLC and electronic systems

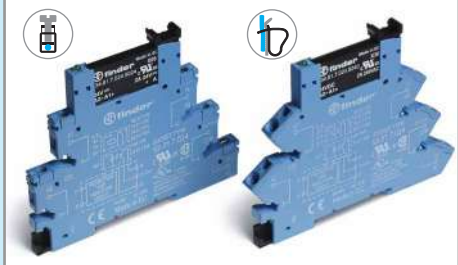
- DC, AC or AC/DC input versions
- Supplied with integral coil indication and protection circuit
- Silent, high switching speed and long electrical life
- Instant ejection of relay using plastic retaining clip
- UL Listing (certain relay/socket combinations)
- 35 mm rail (EN 60715) mounting

B

38.81 / 38.81.3
Screw terminal

38.91 / 38.91.3
Screwless terminal

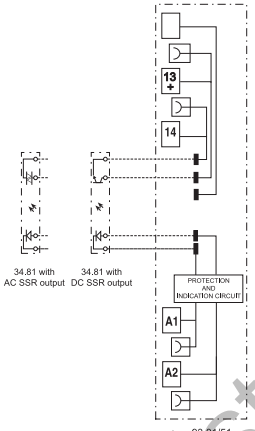
38.81/38.91

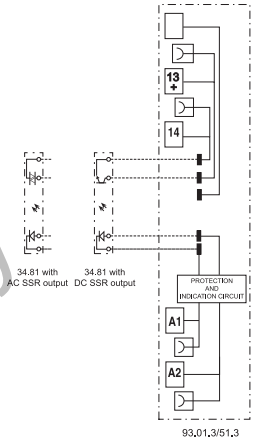


- AC or DC output switching
- SSR relay - DC input voltage
- Screw terminal and screwless terminal
- 35 mm rail (EN 60715) mounting

38.81.3/38.91.3

- Leakage current suppression
- AC or DC output
- SSR relay - AC or AC/DC input voltage
- Screw terminal and screwless terminal
- 35 mm rail (EN 60715) mounting





For outline drawing see page 12

Output specification						
Contact configuration	1 NO (SPST-NO)			1 NO (SPST-NO)		
Rated current/Maximum peak current (10 ms) A	2/20	0.1/0.5	2/40	2/20	0.1/0.5	2/40
Rated voltage/Maximum blocking voltage V	24/33 DC	48/60 DC	240/— AC	24/33 DC	48/60 DC	240/— AC
Switching voltage range V	(1.5...24)DC	(1.5...48)DC	(12...275)AC	(1.5...24)DC	(1.5...48)DC	(12...275)AC
Repetitive peak off-state voltage V_{pk}	—	—	600	—	—	600
Minimum switching current mA	1	0.05	22	1	0.05	22
Max. "OFF-state" leakage current mA	0.001	0.001	1.5	0.001	0.001	1.5
Max. "ON-state" voltage drop V	0.12	1	1.6	0.12	1	1.6
Input specification						
Nominal voltage (U_N) V AC	—			230...240		
Nominal voltage (U_N) V DC	6 - 24 - 60			—		
Nominal voltage (U_N) V AC/DC	(110...125) - (220...240)			110...125		
Operating range V DC	See page 10			See page 10		
Control current mA	See page 10			See page 10		
Release voltage V DC	See page 10			See page 10		
Technical data						
Operate/release time: ON/OFF (DC input) ms	0.2/0.6	0.04/0.11	12/12	0.2/0.6	0.04/0.11	12/12
Dielectric strength between input/output V AC	2,500			2,500		
Ambient temperature range °C	–20...+55			–20...+55		
Environmental protection	IP20			IP20		
Approvals relay (according to type)	CE SP EAC PG RINA cULus					

Features

Slim timed interface module, 6.2 mm wide.
1 pole, 6 A - electromechanical relay
1 output, 2 A DC or AC - solid state relay

- Electromechanical or solid state output
- Multi-functions timer
- AC/DC supply
- 4 time scales from 0.1s to 6h
- Instant ejection of relay using plastic retaining clip
- 6.2 mm wide, 35 mm rail (EN 60715) mounting

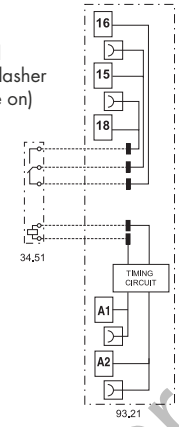
38.21
Screw terminal

For outline drawing see page 12

38.21

- 1 pole electromechanical output relay
- 12 or 24 V AC/DC supply
- Screw terminal
- 35 mm rail (EN 60715) mounting

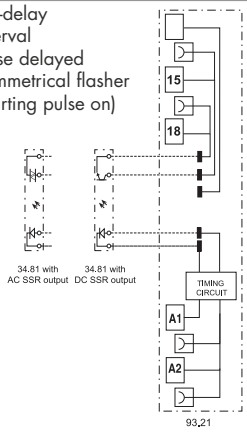
AI: On-delay
DI: Interval
GI: Pulse delayed
SW: Symmetrical flasher (starting pulse on)



38.21...9024-8240

- DC or AC solid state output relays
- 24V AC/DC supply voltage
- Screw terminal
- 35 mm rail (EN 60715) mounting

AI: On-delay
DI: Interval
GI: Pulse delayed
SW: Symmetrical flasher (starting pulse on)



		38.21	38.21...9024-8240	
Contact specification				
Contact configuration		1 CO (SPDT)	—	
Rated current/Maximum peak current	A	6/10	—	
Rated voltage/Maximum switching voltage	V AC	250/400	—	
Rated load AC1	VA	1,500	—	
Breaking capacity DC1: 30/110/220 V	A	6/0.2/0.12	—	
Minimum switching load	mW (V/mA)	500 (12/10)	—	
Standard contact material		AgNi	—	
Output specification			**DC output (...9024)**	**AC output (...8240)**
Output configuration		—	1 NO (SPST-NO)	1 NO (SPST-NO)
Rated current/Maximum peak current	A	—	2/20	2/40
Rated voltage/Maximum blocking voltage	V	—	(24/33)DC	(240/—)AC
Switching voltage range	V	—	(1.5...24)DC	(12...275)AC
Repetitive peak off-state voltage	V_{pk}	—	—	600
Minimum switching current	mA	—	1	22
Max. "OFF-state" leakage current	mA	—	0.001	1.5
Max. "ON-state" voltage drop	V	—	0.12	1.6
Supply specification				
Nominal voltage (U_N)	V AC (50/60Hz)/DC	12 - 24	24	
Rated power	VA/W	0.5	0.5	
Operating range	AC	(0.8...1.1)U_N	(0.8...1.1)U_N	
	DC	(0.8...1.1)U_N	(0.8...1.1)U_N	
Technical data				
Specified time range		(0.1...3)s, (3...60)s, (1...20)min, (0.3...6)h		
Repeatability	%	± 1		
Recovery time	ms	≤ 50		
Setting accuracy-full range	%	5%		
Ambient temperature	°C	–40...+70	–20...+55	
Protection category		IP 20		
Approvals relay (according to type)		CE EAC PG cULus		

38 Series - Relay interface modules - 1 Pole 16A and 2 Pole 8A EMR

finder

Features

Electromechanical relay interface modules, 14 mm wide.
38.01 and 38.11 - 1 Pole 16 A
38.52 and 38.62 - 2 Pole 8 A

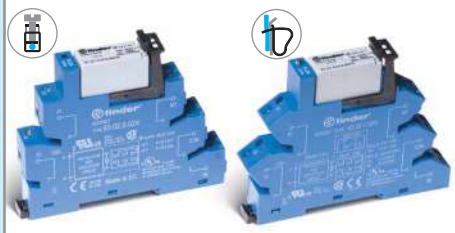
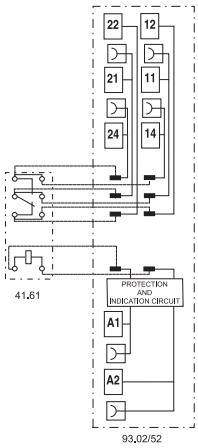
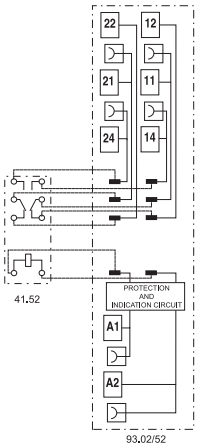
Ideal interface for PLC and electronic systems

- Sensitive DC coil or AC/DC coil versions
- Integral coil indication and protection circuit
- Instant ejection of relay using plastic retaining clip
- UL Listing (certain relay/socket combinations)
- 35 mm rail (EN 60715) mounting

B

38.01/52
Screw terminal

38.11/62
Screwless terminal

	38.01/38.11	38.52/38.62
		
	• Screw terminal and screwless terminal • 1 pole electromechanical relay • 35 mm rail (EN 60715) mounting	• Screw terminal and screwless terminal • 2 pole electromechanical relay • 35 mm rail (EN 60715) mounting
		

* For currents >10 A, contact terminals must be connected in parallel (21 with 11, 24 with 14, 22 with 12).

For outline drawing see page 12

		38.01/38.11	38.52/38.62
Contact specification			
Contact configuration		1 CO (DPDT)	2 CO (DPDT)
Rated current/Maximum peak current	A	16*/30	8/15
Rated voltage/Maximum switching voltage	V AC	250/400	250/400
Rated load AC1	VA	4,000	2,000
Rated load AC15 (230 V AC)	VA	750	400
Single phase motor rating (230 V AC)	kW	0.5	0.3
Breaking capacity DC1: 30/110/220 V	A	16/0.3/0.12	8/0.3/0.12
Minimum switching load	mW (V/mA)	300 (5/5)	300 (5/5)
Standard contact material		AgNi	AgNi
Coil specification			
Nominal voltage (U_N)	V AC/DC	24 - 60 - (110...125) - (220...240)	24 - 60 - (110...125) - (220...240)
	V AC	230...240	230...240
	V DC	12 - 24 - 60	12 - 24 - 60
Rated power AC/DC	VA (50 Hz)/W	See page 9	See page 9
Operating range	AC/DC	0.8...1.1	0.8...1.1
	DC	(0.8...1.2)U_N	(0.8...1.2)U_N
Holding voltage	AC/DC	0.6 / 0.6 U_N	0.6 / 0.6 U_N
Must drop-out voltage	AC/DC	0.1 / 0.05 U_N	0.1 / 0.05 U_N
Technical data			
Mechanical life AC/DC	cycles	$10 \cdot 10^6$	$10 \cdot 10^6$
Electrical life at rated load AC1	cycles	$50 \cdot 10^3$	$60 \cdot 10^3$
Operate/release time	ms	8 / 10	8 / 10
Insulation between coil and contacts (1.2/50 µs)	kV	6 (8 mm)	6 (8 mm)
Dielectric strength between open contacts	V AC	1,000	1,000
Ambient temperature range ($U_N \leq$ 60 V/>60V)	°C	–40...+70 / –40...+55	–40...+70 / –40...+55
Protection category		IP 20	IP 20
Approvals relay (according to type)		CE SP EAC PG RINA cULus	

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Features

Single output - solid state relay interface modules, 14 mm wide.

Ideal interface for PLC and electronic systems

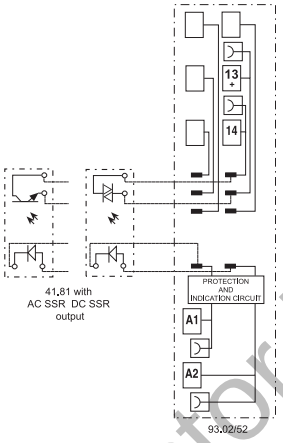
- DC input versions
- Supplied with integral coil indication and protection circuit
- Silent, high switching speed and long electrical life
- Instant ejection of relay using plastic retaining clip
- UL Listing (certain relay/socket combinations)
- 35 mm rail (EN 60715) mounting

38.31
Screw terminal

38.41
Screwless terminal

38.31/38.41

- Screw terminal and screwless terminal
- AC or DC output switching
- SSR relay - DC input voltage
- 35 mm rail (EN 60715) mounting



For outline drawing see page 12

Output specification			
Contact configuration		1 NO (SPST-NO)	1 NO (SPST-NO)
Rated current/Maximum peak current (10 ms)	A	5/40	3/40
Rated voltage/Maximum blocking voltage	V	(24/35)DC	(240/—)AC
Switching voltage range	V	(1.5...24)DC	(12...275)AC
Repetitive peak off-state voltage	V_{pk}	—	600
Minimum switching current	mA	1	50
Max. "OFF-state" leakage current	mA	0.01	1
Max. "ON-state" voltage drop	V	0.3	1.1
Input specification			
Nominal voltage (U_N)	V AC/DC	24	
	V DC	12 - 24	
Operating range	V DC	See page 10	
Control current	mA	See page 10	
Release voltage	V DC	See page 10	
Technical data			
Operate/release time: ON/OFF (DC input)	ms	0.05/0.25	12/12
Dielectric strength between input/output	V AC	2,500	
Ambient temperature range	°C	–20...+55	
Environmental protection		IP20	
Approvals relay (according to type)		CE SP EAC PG RINA cULus	

B

Ordering information

Electromechanical relay - 1 or 2 Pole

Example: 38 series screw terminal relay interface module, 1 CO (SPDT), sensitive 12 V DC coil.

3 8	.	5	1	.	7	.	0 1 2	.	0 (A)	0 (B)	5 (C)	0 (D)

Series

Type
0 = Electromechanical 16 A relay, with screw terminal
1 = Electromechanical 16 A relay, with screwless terminal
2 = Timer multifunction (AI, DI, GI, SW), with screw terminal
5 = Electromechanical relay, with screw terminal
6 = Electromechanical relay, with screwless terminal

No. of poles
1 = 1 pole, 6 or 16 A
2 = 2 pole, 8 A

Coil version
0 = AC (50/60 Hz)/ DC
3 = Leakage current suppression for (110...125)V AC/DC - (230...240)V AC
7 = Sensitive DC, (6, 12, 24, 48, 60)V only
8 = AC (50/60 Hz)

Coil voltage
See coil specifications

D: Special versions
0 = Standard

C: Options
5 = Standard DC
6 = Standard AC or AC/DC

B: Contact circuit
0 = CO (nPDT)

A: Contact material
0 = AgNi Standard
4 = $AgSnO_2$
5 = AgNi + Au

Selecting features and options: only combinations in the same row are possible.

Type	Coil version	A	B	C	D
38.01/11	7	0 - 4	0	5	0
38.01/11	0 - 8	0 - 4	0	6	0
38.51/61	7	0 - 4 - 5	0	5	0
38.51/61	0 - 3 - 8	0 - 4 - 5	0	6	0
38.52/62	7	0 - 5	0	5	0
38.52/62	0 - 8	0 - 5	0	6	0
38.21	0	0	0	6	0

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Ordering information

Solid state relay - Single output - 6.2 & 14 mm wide

Example: 38 series screw terminal SSR relay interface module, 6.2 mm wide, 2 A output, 24 V DC input.

3 8 . 8 1 . 7 . 0 2 4 . 9 0 2 4

Series

Type
21 = Timer SSR 6.2mm wide, with screw terminal
31 = SSR 14mm wide, with screw terminal
41 = SSR 14mm wide, with screwless terminal
81 = SSR 6.2mm wide, with screw terminal
91 = SSR 6.2mm wide, with screwless terminal

Input version
0 = AC/DC
3 = Leakage current suppression for (110...125)V AC/DC and (230...240)V AC SSR only
7 = DC, (6, 24, 60)V SSR only

Input voltage
See input specifications

Output version
9024 = 2 A - 24 V DC (38.21, 38.81 & 38.91)
9024 = 5 A - 24 V DC (38.31 & 38.41)
7048 = 0.1 A - 48 V DC (38.81 & 38.91)
8240 = 2 A - 240 V AC (38.21, 38.81 & 38.91)
8240 = 3 A - 240 V AC (38.31 & 38.41)

Selecting features and options: only combinations in the same row are possible.

Type	Input version	Output version
38.81/91	7	9024 - 7048 - 8240
38.81/91	0 - 3	9024 - 7048 - 8240
38.31/41	0 - 7	9024 - 8240
38.21	0	9024 - 8240

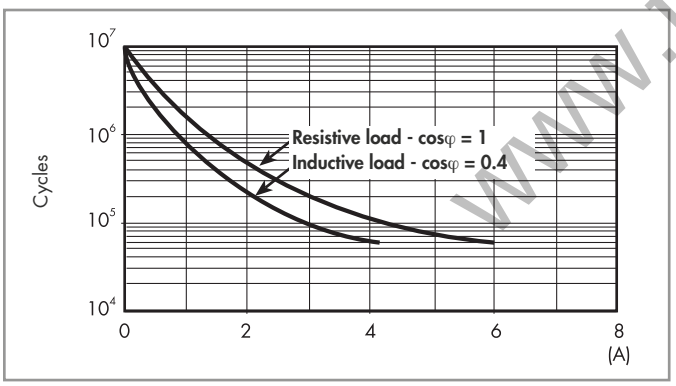
B

Technical data - 1 & 2 Pole Electromechanical Relays

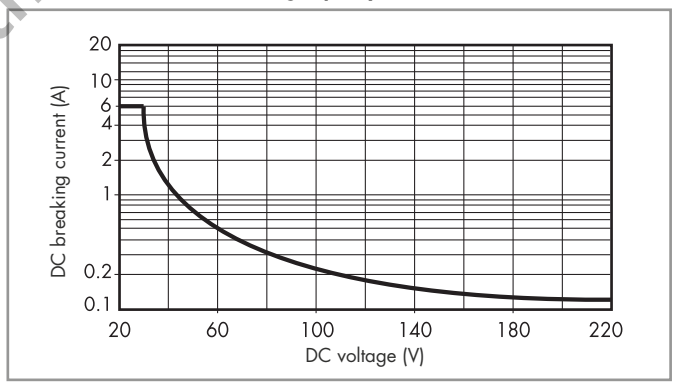
Insulation						
Insulation according to EN 61810-1	insulation rated voltage	V	250		400	
	rated impulse withstand voltage	kV	4		4	
	pollution degree		3		2	
	overvoltage category		III		III	
Insulation between coil and contacts (1.2/50 µs)		kV	6 (8 mm)			
Dielectric strength between open contacts		V AC	1,000			
Conducted disturbance immunity						
Burst (5...50)ns, 5 kHz, on A1 - A2			EN 61000-4-4		level 4 (4 kV)	
Surge (1.2/50 µs) on A1 - A2 (differential mode)			EN 61000-4-5		level 3 (2 kV)	
Other data			**1 Pole 6 A**		**1 Pole 16 A - 2 Pole 8 A**	
Bounce time: NO/NC		ms	1/6		2/5	
Vibration resistance (10...55)Hz: NO/NC		g	10/5		15/2	
Power lost to the environment	without contact current	W	0.2 (12 V) - 0.9 (240 V)		0.5 (24 V) - 0.9 (240 V)	
	with rated current	W	0.5 (12 V) - 1.5 (240 V)		1.3 (24 V) - 1.7 (240 V)	
Terminals			**38.21 / 38.51**		**38.61**	
Wire strip length		mm	10		10	
⊖ Screw torque		Nm	0.5		—	
Max. wire size			solid cable	stranded cable	solid cable	stranded cable
		mm²	1x2.5/2x1.5	1x2.5/2x1.5	1x2.5	1x2.5
		AWG	1x14/2x16	1x14/2x16	1x14	1x14
			38.01 / 38.52		**38.11 / 38.62**	
Wire strip length		mm	10		10	
⊖ Screw torque		Nm	0.5		—	
Max. wire size			solid cable	stranded cable	solid cable	stranded cable
		mm²	1x2.5/2x1.5	1x2.5/2x1.5	1x2.5	1x2.5
		AWG	1x14/2x16	1x14/2x16	1x14	1x14

Contact specification - 1 & 2 Pole Electromagnetic Relays

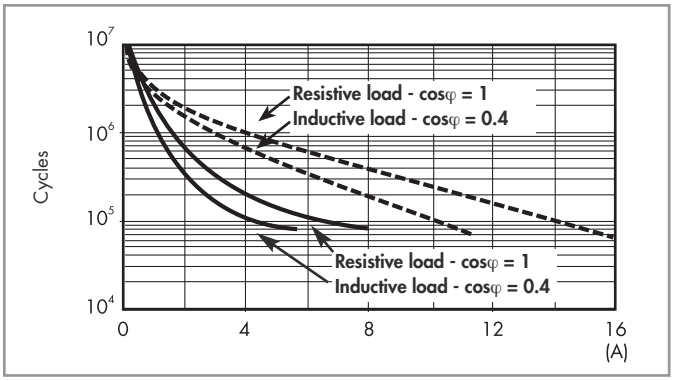
F 38 - Electrical life (AC) v contact current, 1 Pole 6 A



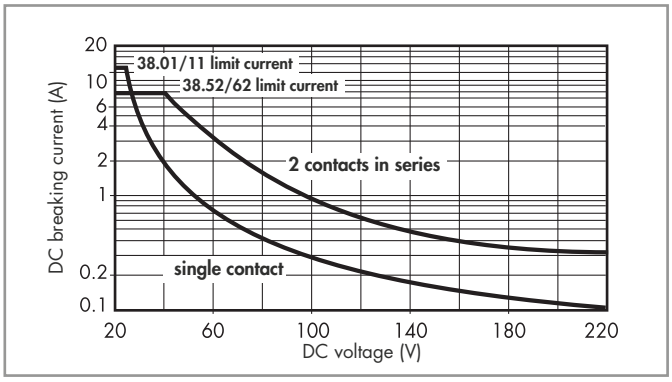
H 38 - Maximum DC1 breaking capacity, 1 Pole 6 A



F 38 - Electrical life (AC) v contact current, 1 Pole 16 A and 2 Pole 8 A



H 38 - Maximum DC1 breaking capacity, 1 Pole 16 A and 2 Pole 8 A



——— : 2 Pole 8 A
- - - - - : 1 Pole 16 A

- When switching a resistive load (DC1) having voltage and current values under the curve, an electrical life of ≥ 60·10³ (1 Pole) or ≥ 80·10³ (2 Pole) can be expected.
- In the case of DC13 loads, the connection of a diode in parallel with the load will permit a similar electrical life as for a DC1 load. Note: the release time for the load will be increased.

Coil specifications - 1 Pole 6 A Electromechanical Relay

Coil data sensitive DC, 1 Pole

Nominal voltage U_N	Coil code	Operating range U_{min}	Operating range U_{max}	Rated coil consumption I at U_N	Power consumption P at U_N
V		V	V	mA	W
6	**7**.006	4.8	7.2	35	0.2
12	**7**.012	9.6	14.4	15.2	0.2
24	**7**.024	19.2	28.8	10.4	0.3
48	**7**.048	38.4	57.6	6.3	0.3
60	**7**.060	48	72	7	0.4

Coil data AC/DC, 1 Pole

Nominal voltage U_N	Coil code	Operating range U_{min}	Operating range U_{max}	Rated coil consumption I at U_N	Power consumption P at U_N
V		V	V	mA	VA/W
12	**0**.012	9.6	13.2	16	0.2/0.2
24	**0**.024	19.2	26.4	12	0.3/0.2
48	**0**.048	38.4	52.8	6.9	0.3/0.3
60	**0**.060	48	66	7	0.5/0.5
110...125	**0**.125	88	138	5(*)	0.6/0.6(*)
220...240	**0**.240	176	264	4(*)	1/0.9(*)

(*) Rated coil consumption and power consumption values relate to U_N = 125 and 240 V.

Coil data AC, 1 Pole (indicated for max ambient temperature +70°C)

Nominal voltage U_N	Coil code	Operating range U_{min}	Operating range U_{max}	Rated coil consumption I at U_N	Power consumption P at U_N
V		V	V	mA	VA/W
(230...240) AC	**8**.240	184	264	3	0.7/0.3

Coil data, leakage current suppression types, 1 Pole

Nominal voltage U_N	Coil code	Operating range U_{min}	Operating range U_{max}	Rated coil consumption I at U_N	Power consumption P at U_N
V		V	V	mA	VA/W
(110...125) AC/DC	**3**.125	94	138	8(*)	1/1(*)
(230...240) AC	**3**.240	184	264	7(*)	1.7/0.5(*)

(*) Rated coil consumption and power consumption values relate to U_N = 125 and 240 V.

The 38 Series interface modules (supply version 3) have built-in leakage current suppression to address industry concerns of the contacts not dropping-out when there is residual current in the circuit; at (110...125)V AC and (230...240)V AC.

This problem can occur, for example, when connecting the interface modules to PLC,s with triac outputs or when connecting via relatively long cables.

Coil specifications - 1 Pole 16 A and 2 Pole 8 A Electromechanical Relay

Coil data sensitive DC, 1 Pole 16 A and 2 Pole 8 A

Nominal voltage U_N	Coil code	Operating range U_{min}	Operating range U_{max}	Rated coil consumption I at U_N	Power consumption P at U_N
V		V	V	mA	W
12	**7**.012	9.6	14.4	41	0.5
24	**7**.024	19.2	28.8	19.5	0.5
60	**7**.060	48	72	8	0.5

Coil data AC/DC, 1 Pole 16 A and 2 Pole 8 A

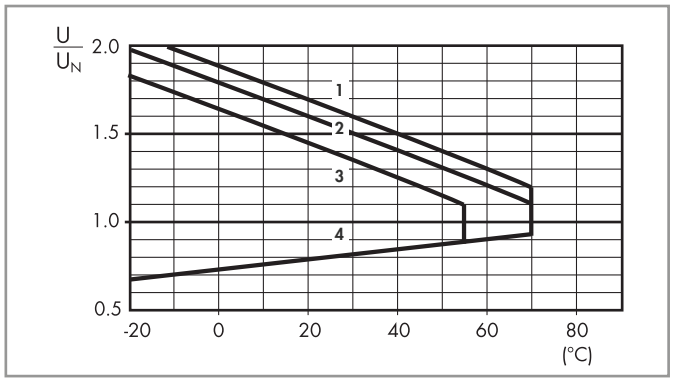
Nominal voltage U_N	Coil code	Operating range U_{min}	Operating range U_{max}	Rated coil consumption I at U_N	Power consumption P at U_N
V		V	V	mA	VA/W
24	**0**.024	19.2	26.4	20	0.5/0.5
60	**0**.060	48	66	7.1	0.5/0.5
110...125	**0**.125	88	138	4.6	0.6/0.6
220...240	**0**.240	184	264	3.8	0.9/0.9

Coil data AC, 1 Pole 16 A and 2 Pole 8 A

Nominal voltage U_N	Coil code	Operating range U_{min}	Operating range U_{max}	Rated coil consumption I at U_N	Power consumption P at U_N
V		V	V	mA	VA/W
230...240	**8**.230	184	264	5.3	1.2/0.6

Coil specification - 1 & 2 Pole Electromagnetic Relays

R 38 - DC coil operating range v ambient temperature
1 Pole and 2 Pole



1 - Max. permitted coil voltage at nominal load (DC coil).
2 - Max. permitted coil voltage at nominal load (AC/DC coils U ≤ 60 V).
3 - Max. permitted coil voltage at nominal load (AC/DC coils U > 60 V).
4 - Min pick-up voltage with coil at ambient temperature.

B

Technical data - Solid State Relays

Other data			38.81/38.91		38.31/38.41	
Power lost to the environment	without output current	W	0.25 (24 V DC)		0.5	
	with rated current	W	0.4		2.2 (DC output) / 3 (AC output)	
Terminals			**38.81**		**38.91**	
Wire strip length		mm	10		10	
⊖ Screw torque		Nm	0.5		—	
Max. wire size			solid cable	stranded cable	solid cable	stranded cable
		mm²	1x2.5 / 2x1.5	1x2.5 / 2x1.5	1x2.5	1x2.5
		AWG	1x14 / 2x16	1x14 / 2x16	1x14	1x14
			38.31		**38.41**	
Wire strip length		mm	10		10	
⊖ Screw torque		Nm	0.5		—	
Max. wire size			solid cable	stranded cable	solid cable	stranded cable
		mm²	1x2.5 / 2x1.5	1x2.5 / 2x1.5	1x2.5	1x2.5
		AWG	1x14 / 2x16	1x14 / 2x16	1x14	1x14

Input specifications - Solid State Relays type 38.81 and 38.91 - 6.2 mm wide

Input data DC

Nominal voltage U_N	Supply code	Operating range U_{min}	Operating range U_{max}	Release voltage U	Rated coil consumption I at U_N	Power consumption P
V		V	V	V	mA	W
6	**7**.006	5	7.2	2.4	7	0.2
24	**7**.024	16.8	30	10	10.5	0.3
60	**7**.060	35.6	72	20	6.5	0.4

Input data AC/DC

Nominal voltage U_N	Supply code	Operating range U_{min}	Operating range U_{max}	Release voltage U	Rated coil consumption I at U_N	Power consumption P
V		V	V	V	mA	VA/W
110...125	**0**.125	88	138	22	5.5*	0.7/0.7
220...240	**0**.240	184	264	44	3.5*	1/0.9

(*) Rated coil consumption and power consumption values relate to U_N = 125 and 240 V.

Input data - Leakage current suppression types

Nominal voltage U_N	Supply code	Operating range U_{min}	Operating range U_{max}	Release voltage U	Rated coil consumption I at U_N	Power consumption P at U_N
V		V	V		mA	W
110...125 AC/DC	**3**.125	94	138	44	8(*)	1/1(*)
230...240 AC	**3**.240	184	264	72	6.5(*)	1.6/0.6(*)

(*) Rated coil consumption and power consumption values relate to U_N = 125 and 240 V.

The 38 Series interface modules (supply version 3) have built-in leakage current suppression to address industry concerns of the contacts not dropping-out when there is residual current in the circuit; at (110...125)V AC and (230...240)V AC.

This problem can occur, for example, when connecting the interface modules to PLC,s with triac outputs or when connecting via relatively long cables.

Input specification - Solid State Relay types 38.31 and 38.41 - 14 mm wide

Input data DC

Nominal voltage U_N	Supply code	Operating range U_{min}	Operating range U_{max}	Release voltage U	Rated coil consumption I at U_N	Power consumption P
V		V	V	V	mA	W
12	**7**.012	9.6	18	5	9	0.2
24	**7**.024	16.8	30	5	12	0.3

Input data AC/DC

Nominal voltage U_N	Supply code	Operating range U_{min}	Operating range U_{max}	Release voltage U	Rated coil consumption I at U_N	Power consumption P
V		V	V	V	mA	W
24	**0**.024	16.8	30	9	16.5	0.3

Additional technical data - Timed Interface Module

EMC specifications			
Type of test		**Reference standard**	
Electrostatic discharge	contact discharge	EN 61000-4-2	4 kV
	air discharge	EN 61000-4-2	8 kV
Radio-frequency electromagnetic field (80 ÷ 1,000 MHz)		EN 61000-4-3	10 V/m
Fast transients (burst) (5-50 ns, 5 kHz) on Supply terminals		EN 61000-4-4	4 kV
Surges (1.2/50 µs) on Supply terminals	common mode	EN 61000-4-5	4 kV
	differential mode	EN 61000-4-5	4 kV
Radio-frequency common mode (0.15 ÷ 80 MHz) on Supply terminals		EN 61000-4-6	10 V
Radiated and conducted emission		EN 55022	class B
Other data		**EMR**	**SSR**
Power lost to the environment	without contact current W	0.1	0.1
	with rated current W	0.6	0.5
Terminals		**38.21**	
Wire strip length	mm	10	
Screw torque	Nm	0.5	
Max. wire size		solid cable	stranded cable
	mm²	1x2.5 / 2x1.5	1x2.5 / 2x1.5
	AWG	1x14 / 2x16	1x14 / 2x16

B

Times scales

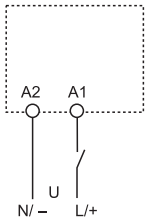
(0.1...3)s (3...60)s (1...20)min (0.3...6)h

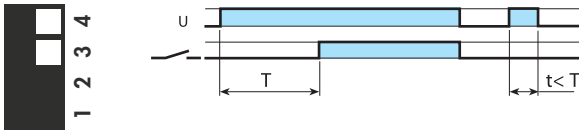
Functions

LED	Supply voltage	NO contact/output
	OFF	Open
	ON	Open (time in progress)
	ON	Closed

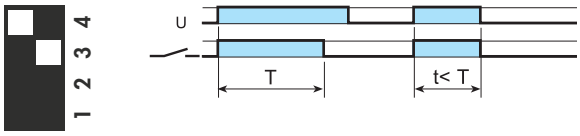
Wiring diagram

U = Supply voltage = Output contact

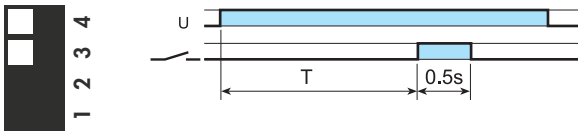




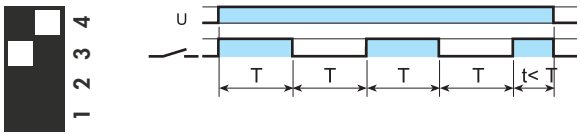
(AI) On-delay.
Apply power to timer.
Output contacts transfer after preset time has elapsed.
Reset occurs when power is removed.



(DI) Interval.
Apply power to timer.
Output contacts transfer immediately.
After the preset time has elapsed, contacts reset.



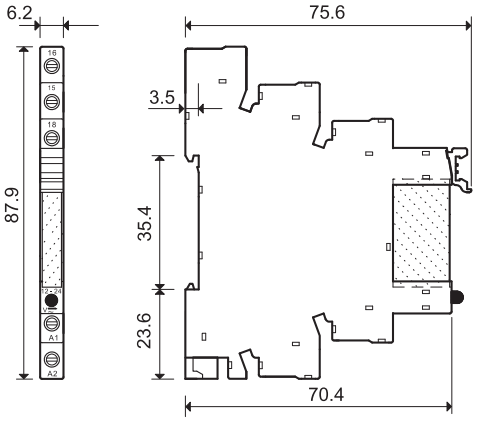
(GI) Pulse delayed.
Apply power to timer. Output contacts transfer after preset time has elapsed. Reset occurs after a fixed time of 0.5s.



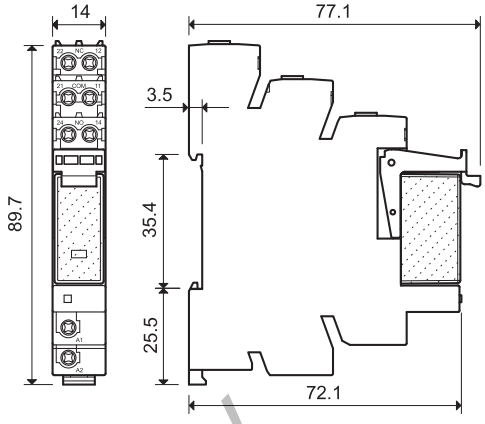
(SW) Symmetrical flasher (starting pulse on).
Apply power to timer.
Output contacts transfer immediately and cycle between ON and OFF for as long as power is applied.
The ratio is 1:1 (time on = time off).

Outline drawings

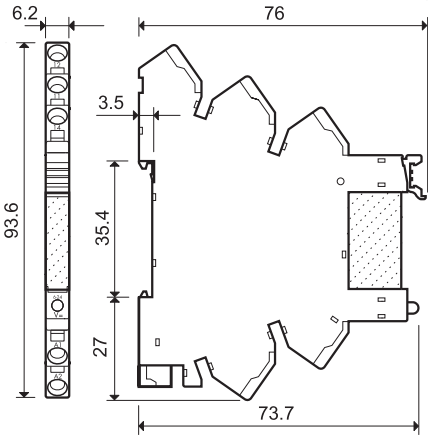
38.21
38.51 / 38.51.3
38.81 / 38.81.3
Screw terminal



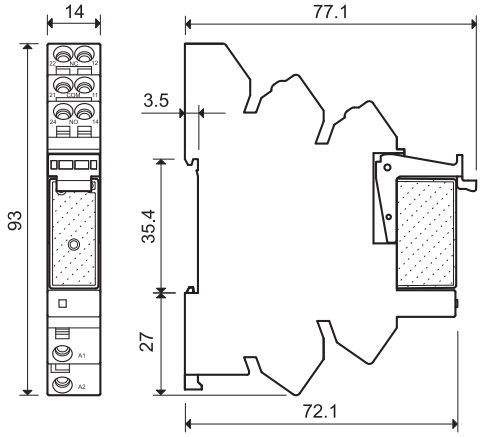
38.01
38.31
38.52
Screw terminal



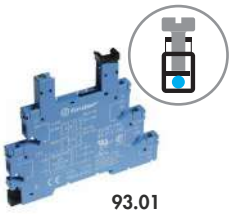
38.61 / 38.61.3
38.91 / 38.91.3
Screwless terminal



38.11
38.41
38.62
Screwless terminal



Electromechanical Relay & Socket Combinations


93.01

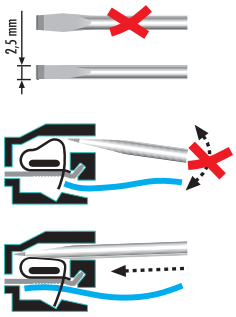

93.51


93.02


93.52

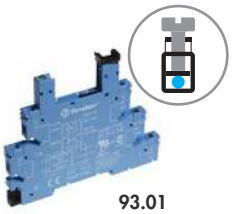
Approvals (according to type):

Certain relay/socket combinations

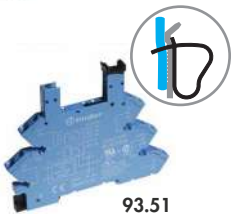


Screw terminal - 1 Pole relay 6 A			
Interface Module Code	**Coil voltage**	**Relay**	**Socket**
38.51.0.012.0060	12 V AC/DC	34.51.7.012.0010	93.01.0.024
38.51.0.024.0060	24 V AC/DC	34.51.7.024.0010	93.01.0.024
38.51.0.048.0060	48 V AC/DC	34.51.7.048.0010	93.01.0.060
38.51.0.060.0060	60 V AC/DC	34.51.7.060.0010	93.01.0.060
38.51.0.125.0060	(110...125)V AC/DC	34.51.7.060.0010	93.01.0.125
38.51.0.240.0060	(220...240)V AC/DC	34.51.7.060.0010	93.01.0.240
38.51.3.125.0060	(110...125)V AC/DC	34.51.7.060.0010	93.01.3.125
38.51.3.240.0060	(230...240)V AC	34.51.7.060.0010	93.01.3.240
38.51.7.006.0050	6 V DC	34.51.7.005.0010	93.01.7.024
38.51.7.012.0050	12 V DC	34.51.7.012.0010	93.01.7.024
38.51.7.024.0050	24 V DC	34.51.7.024.0010	93.01.7.024
38.51.7.048.0050	48 V DC	34.51.7.048.0010	93.01.7.060
38.51.7.060.0050	60 V DC	34.51.7.060.0010	93.01.7.060
38.51.8.240.0060	(230...240)V AC	34.51.7.060.0010	93.01.8.240
Screwless terminal - 1 Pole relay 6 A			
Interface Module Code	**Coil voltage**	**Relay**	**Socket**
38.61.0.012.0060	12 V AC/DC	34.51.7.012.0010	93.51.0.024
38.61.0.024.0060	24 V AC/DC	34.51.7.024.0010	93.51.0.024
38.61.0.125.0060	(110...125)V AC/DC	34.51.7.060.0010	93.51.0.125
38.61.0.240.0060	(220...240)V AC/DC	34.51.7.060.0010	93.51.0.240
38.61.3.125.0060	(110...125)V AC/DC	34.51.7.060.0010	93.51.3.125
38.61.3.240.0060	(230...240)V AC	34.51.7.060.0010	93.51.3.240
38.61.7.012.0050	12 V DC	34.51.7.012.0010	93.51.7.024
38.61.7.024.0050	24 V DC	34.51.7.024.0010	93.51.7.024
38.61.8.240.0060	(230...240)V AC	34.51.7.060.0010	93.51.8.240
Screw terminal - 1 Pole relay 16 A			
Interface Module Code	**Coil voltage**	**Relay**	**Socket**
38.01.7.012.0050	12 V DC	41.61.9.012.0010	93.02.7.024
38.01.7.024.0050	24 V DC	41.61.9.024.0010	93.02.7.024
38.01.7.060.0050	60 V DC	41.61.9.060.0010	93.02.7.060
38.01.0.024.0060	24 V AC/DC	41.61.9.024.0010	93.02.0.024
38.01.0.060.0060	60 V AC/DC	41.61.9.060.0010	93.02.0.060
38.01.0.125.0060	125 V AC/DC	41.61.9.110.0010	93.02.0.125
38.01.0.240.0060	240 V AC/DC	41.61.9.110.0010	93.02.0.240
38.01.8.230.0060	230 V AC	41.61.9.110.0010	93.02.8.230
Screwless terminal - 1 Pole relay 16 A			
Interface Module Code	**Coil voltage**	**Relay**	**Socket**
38.11.7.012.0050	12 V DC	41.61.9.012.0010	93.52.7.024
38.11.7.024.0050	24 V DC	41.61.9.024.0010	93.52.7.024
38.11.7.060.0050	60 V DC	41.61.9.060.0010	93.52.7.060
38.11.0.024.0060	24 V AC/DC	41.61.9.024.0010	93.52.0.024
38.11.0.060.0060	60 V AC/DC	41.61.9.060.0010	93.52.0.060
38.11.0.125.0060	125 V AC/DC	41.61.9.110.0010	93.52.0.125
38.11.0.240.0060	240 V AC/DC	41.61.9.110.0010	93.52.0.240
38.11.8.230.0060	230 V AC	41.61.9.110.0010	93.52.8.230
Screw terminal - 2 Pole relay 8 A			
Interface Module Code	**Coil voltage**	**Relay**	**Socket**
38.52.0.024.0060	24 V AC/DC	41.52.9.024.0010	93.02.0.024
38.52.0.060.0060	60 V AC/DC	41.52.9.060.0010	93.02.0.060
38.52.0.125.0060	(110...125)V AC/DC	41.52.9.110.0010	93.02.0.125
38.52.0.240.0060	(220...240)V AC/DC	41.52.9.110.0010	93.02.0.240
38.52.7.012.0050	12 V DC	41.52.9.012.0010	93.02.7.024
38.52.7.024.0050	24 V DC	41.52.9.024.0010	93.02.7.024
38.52.7.060.0050	60 V DC	41.52.9.060.0010	93.02.7.060
38.52.8.230.0060	(230...240)V AC	41.52.9.110.0010	93.02.8.230
Screwless terminal - 2 Pole relay 8 A			
Interface Module Code	**Coil voltage**	**Relay**	**Socket**
38.62.0.024.0060	24 V AC/DC	41.52.9.024.0010	93.52.0.024
38.62.0.060.0060	60 V AC/DC	41.52.9.060.0010	93.52.0.060
38.62.0.125.0060	(110...125)V AC/DC	41.52.9.110.0010	93.52.0.125
38.62.0.240.0060	(220...240)V AC/DC	41.52.9.110.0010	93.52.0.240
38.62.7.012.0050	12 V DC	41.52.9.012.0010	93.52.7.024
38.62.7.024.0050	24 V DC	41.52.9.024.0010	93.52.7.024
38.62.7.060.0050	60 V DC	41.52.9.060.0010	93.52.7.060
38.62.8.230.0060	(230...240)V AC	41.52.9.110.0010	93.52.8.230

B



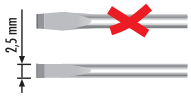
93.01



93.51

Approvals (according to type):

Certain relay/socket combinations



Solid State Relay & Socket Combinations - 6.2 mm wide

Screw terminal			
Interface Module Code	**Input voltage**	**Relay**	**Socket**
38.81.7.006.xxxx	6 V DC	34.81.7.005.xxxx	93.01.7.024
38.81.7.024.xxxx	24 V DC	34.81.7.024.xxxx	93.01.7.024
38.81.7.060.xxxx	60 V DC	34.81.7.060.xxxx	93.01.7.060
38.81.0.125.xxxx	(110...125)V AC/DC	34.81.7.060.xxxx	93.01.0.125
38.81.0.240.xxxx	(220...240)V AC/DC	34.81.7.060.xxxx	93.01.0.240
38.81.3.125.xxxx	(110...125)V AC/DC	34.81.7.060.xxxx	93.01.3.125
38.81.3.240.xxxx	(230...240)V AC	34.81.7.060.xxxx	93.01.3.240
Screwless terminal			
Interface Module Code	**Input voltage**	**Relay**	**Socket**
38.91.7.006.xxxx	6 V DC	34.81.7.005.xxxx	93.51.7.024
38.91.7.024.xxxx	24 V DC	34.81.7.024.xxxx	93.51.7.024
38.91.7.060.xxxx	60 V DC	34.81.7.060.xxxx	93.51.7.060
38.91.0.125.xxxx	(110...125)V AC/DC	34.81.7.060.xxxx	93.51.0.125
38.91.0.240.xxxx	(220...240)V AC/DC	34.81.7.060.xxxx	93.51.0.240
38.91.3.125.xxxx	(110...125)V AC/DC	34.81.7.060.xxxx	93.51.3.125
38.91.3.240.xxxx	(230...240)V AC	34.81.7.060.xxxx	93.51.3.240

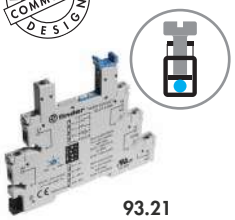
Example: .xxxx
.9024
.7048
.8240

93.52

Approvals (according to type):

Solid State Relay & Socket Combinations - 14 mm wide

Screw terminal			
Interface Module Code	**Input voltage**	**Relay**	**Socket**
38.31.0.024.xxxx	24 V AC/DC	41.81.7.024.xxxx	93.02.0.024
38.31.7.012.xxxx	12 V DC	41.81.7.012.xxxx	93.02.7.024
38.31.7.024.xxxx	24 V DC	41.81.7.024.xxxx	93.02.7.024
Screwless terminal			
Interface Module Code	**Input voltage**	**Relay**	**Socket**
38.41.0.024.xxxx	24 V AC/DC	41.81.7.024.xxxx	93.52.0.024
38.41.7.012.xxxx	12 V DC	41.81.7.012.xxxx	93.52.7.024
38.41.7.024.xxxx	24 V DC	41.81.7.024.xxxx	93.52.7.024



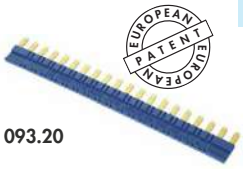
93.21

Approvals (according to type):

SSR / EMR & Timer Socket Combinations

Screw terminal			
Interface Module Code	**Input / Coil voltage**	**Relay**	**Socket**
38.21.0.012.0060	12 V AC/DC	34.51.7.012.0010	93.21.0.024
38.21.0.024.0060	24 V AC/DC	34.51.7.024.0010	93.21.0.024
38.21.0.024.xxxx	24 V AC/DC	34.81.7.024.xxxx	93.21.0.024

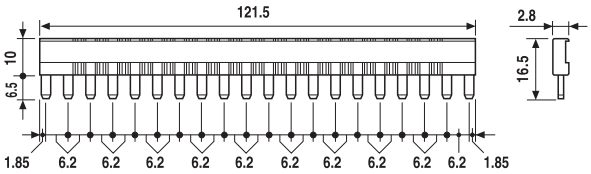
Accessories



093.20

Approvals (according to type):

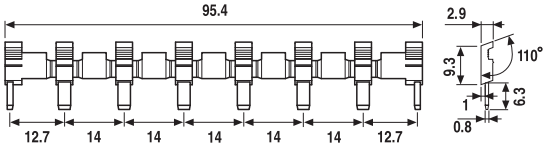
20-way jumper link for 38.21/51/61/81/91	093.20 (blue)	093.20.0 (black)	093.20.1 (red)
Rated values	36 A - 250 V		



093.08

Approvals (according to type):

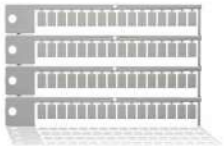
8-way jumper link for 38.01/11/31/41/52/62	093.08 (blue)	093.08.0 (black)	093.08.1 (red)
Rated values	10 A - 250 V		



093.01

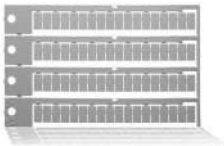
Plastic separator	093.01

Thickness 2 mm, required at the start and the end of a group of interfaces.
Can be used for visual separation group, must be used for:
- protective separation of different voltages of neighbouring PLC interfaces according to VDE 0106-101
- protection of cut jumper links



093.64

Sheet of marker tags for 38.21/51/61/81/91, plastic, 64 tags, 6x10 mm	093.64



060.72

Sheet of marker tags for 38.01/11/31/41/52/62, plastic, 72 tags, 6x12 mm	060.72

Solid-State Relays

Features

- Rugged, epoxy encapsulation construction
- 4,000 volts of optical isolation
- Subjected to full load test and six times the rated current surge before and after encapsulation
- Unique heat-spreader technology
- UL and CSA recognized*

Opto 22 Power Series SSR

Overview

In 1974, Opto 22 introduced the first liquid epoxy-filled line of power solid-state relays (SSR). This innovation in SSR design greatly improved the reliability and reduced the cost of manufacturing. At that time, we also incorporated into our manufacturing process 100% testing under full load conditions of every relay we produced.

By 1978, Opto 22 had gained such a reputation for reliability that we were recognized as the world's leading manufacturer of solid-state relays. Through continuous manufacturing improvements and the same 100% testing policy established over 30 years ago, Opto 22 is still recognized today for the very high quality and reliability of all our solid-state relays.

Description

Opto 22 offers a complete line of SSRs, from the rugged 120/240/380-volt AC Series to the small footprint MP Series, designed for mounting on printed circuit boards. All Opto 22 SSRs feature 4,000 volts of optical isolation and are UL and CSA recognized.* The innovative use of room-temperature liquid epoxy encapsulation, coupled with Opto 22's unique heat-spreader technology, are key to mass producing the world's most reliable solid state relays.

Every Opto 22 solid state relay is subjected to full load test and six times the rated current surge both before and after encapsulation. This double testing of every part before it leaves the factory means you can rely on Opto 22 solid state relays. All Opto 22 SSRs are guaranteed for life.

Part Numbers

Part	Description
120A10	120 VAC, 10 Amp, AC Control
120A25	120 VAC, 25 Amp, AC Control
240A10	240 VAC, 10 Amp, AC Control
240A25	240 VAC, 25 Amp, AC Control
240A45	240 VAC, 45 Amp, AC Control
120D3	120 VAC, 3 Amp, DC Control
120D10	120 VAC, 10 Amp, DC Control
120D25	120 VAC, 25 Amp, DC Control
120D45	120 VAC, 45 Amp, DC Control
240D3	240 VAC, 3 Amp, DC Control
240D10	240 VAC, 10 Amp, DC Control
240Di10	240 VAC, 10 Amp, DC Control, with LED Indicators
240D25	240 VAC, 25 Amp, DC Control
240Di25	240 VAC, 25 Amp, DC Control, with LED Indicators
240D45	240 VAC, 45 Amp, DC Control
240Di45	240 VAC, 45 Amp, DC Control, with LED Indicators
380D25	380 VAC, 25 Amp, DC Control
380D45	380 VAC, 45 Amp, DC Control

Part	Description
480D10-12	480 VAC, 10 Amp, DC Control, Transient Proof
480D15-12	480 VAC, 15 Amp, DC Control, Transient Proof
480D25-12	480 VAC, 25 Amp, DC Control, Transient Proof
480D45-12	480 VAC, 45 Amp, DC Control, Transient Proof
575D15-12	575 VAC, 15 Amp, DC Control, Transient Proof
575D45-12	575 VAC, 45 Amp, DC Control, Transient Proof
575Di45-12	575 VAC, 45 Amp, DC Control, Transient Proof, with LED Indicators
Z120D10	Z Model, 120 VAC, 10 Amp, DC Control
Z240D10	Z Model, 240 VAC, 10 Amp, DC Control
MP120D2 or P120D2	120 VAC, 2 Amp, DC Control. P model is low profile.
MP120D4 or P120D4	120 VAC, 4 Amp, DC Control. P model is low profile.
MP240D2 or P240D2	240 VAC, 2 Amp, DC. P model is low profile.
MP240D4 or P240D4	240 VAC, 4 Amp, DC. P model is low profile.
MP380D4	380 VAC, 4 Amp, DC

***UL recognition is pending for Power Series SSRs with LED indicators. Contact Opto 22 Product Support for current UL information.**

Power Series SSRs

Opto 22 provides a full range of Power Series relays with a wide variety of voltage (120–575 volts) and current options (3–45 amps). All Power Series relays feature 4,000 volts of optical isolation and have a high PRV rating. Some Power Series relays include built-in LEDs to indicate operation.

DC Series

The DC Series delivers isolated DC control to large OEM customers worldwide.

AC Series

The AC Series offers the ultimate in solid state reliability. All AC Power Series relays feature a built-in snubber and zero voltage turn on. Transient-proof models offer self protection for noisy electrical environments.

Z Series SSRs

The Z Series employs a unique heat transfer system that makes it possible for Opto 22 to deliver a low-cost, 10-amp, solid state relay in an all-plastic case. The push-on, tool-free quick-connect terminals make the Z Series ideal for high-volume OEM applications.

Printed Circuit Series SSRs

Opto 22's Printed Circuit Series allows OEMs to easily deploy solid state relays on printed circuit boards. Two unique packages are available, both of which will switch loads up to four amps.

MP Series

The MP Series packaging is designed with a minimum footprint to allow maximum relay density on the printed circuit board.

P Series

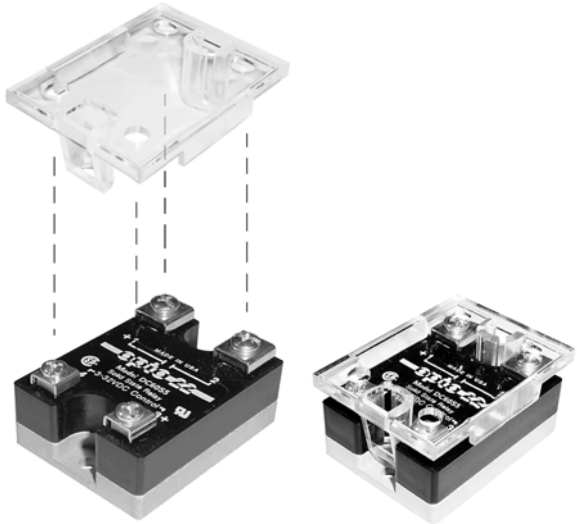
The P Series power relays provide low-profile [0.5 in. (12.7 mm)] center mounting on printed circuit boards.

Specifications (all Power Series models)

- 4,000 V optical isolation, input to output
- Zero voltage turn-on
- Turn-on time: 0.5 cycle maximum
- Turn-off time: 0.5 cycle maximum
- Operating frequency: 25 to 65 Hz (operates at 400 Hz with six times off-state leakage)
- Coupling capacitance, input to output: 8 pF maximum
- Hermetically sealed
- DV/DT Off-state: 200 volts per microsecond
- DV/DT commutating: snubbed for rated current at 0.5 power factor
- UL recognized*
- CSA certified
- CE component
- Torque specs for screws: Control terminals, 6 in/lb
Field terminals, 18 in/lb

Safety Cover for Power Series SSRs

A plastic safety cover (Opto 22 part number SAFETY COVER) is optionally available for Opto 22 Power Series SSRs. The safety cover reduces the chance of accidental contact with relay terminals, while providing access holes for test instrumentation.



An optional plastic safety cover can be installed on a Power Series SSR.

***UL recognition is pending for Power Series SSRs with LED indicators. Contact Opto 22 Product Support for current UL information.**

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AC Power Series Specifications

Opto 22 provides a full range of Power Series relays with a wide variety of voltage (120–575) and current options (3–45 amps). All Power Series relays feature 4,000 volts of optical isolation and have a high PRV rating.

120/240/380 Volt

Model Number	Nominal AC Line Voltage	Nominal Current Rating (Amps)	1 cycle Surge (Amps) Peak	Nominal Signal Input Resistance (Ohms)	Signal Pick-up Voltage	Signal Drop-out Voltage	Peak Repetitive Voltage Maximum	Maximum Output Voltage Drop	Off-State Leakage (mA) Maximum**	Operating Voltage Range (Volts AC)	I^2t Rating t=8.3 (ms)	Isolation Voltage	θjc* (°C/Watt)	Dissipation (Watts/ Amp)
120D3	120	3	85	1000	3VDC (32V allowed)	1 VDC	600	1.6 volts	2.5mA	12–140	30	$4,000V_{RMS}$	11	1.7
120D10	120	10	110	1000	3VDC (32V allowed)	1 VDC	600	1.6 volts	7 mA	12–140	50	$4,000V_{RMS}$	1.3	1.6
120D25	120	25	250	1000	3VDC (32V allowed)	1 VDC	600	1.6 volts	7 mA	12–140	250	$4,000V_{RMS}$	1.2	1.3
120D45	120	45	650	1000	3VDC (32V allowed)	1 VDC	600	1.6 volts	7 mA	12–140	1750	$4,000V_{RMS}$	0.67	0.9
240D3	240	3	85	1000	3VDC (32V allowed)	1 VDC	600	1.6 volts	5 mA	24–280	30	$4,000V_{RMS}$	11	1.7
240D10	240	10	110	1000	3VDC (32V allowed)	1 VDC	600	1.6 volts	14 mA	24–280	50	$4,000V_{RMS}$	1.3	1.6
240Di10	240	10	110	730	3VDC (32V allowed)	1 VDC	600	1.6 volts	14 mA	24–280	50	$4,000V_{RMS}$	1.3	1.6
240D25	240	25	250	1000	3VDC (32V allowed)	1 VDC	600	1.6 volts	14 mA	24–280	250	$4,000V_{RMS}$	1.2	1.3
240Di25	240	25	250	730	3VDC (32V allowed)	1 VDC	600	1.6 volts	14 mA	12–280	250	$4,000V_{RMS}$	1.2	1.3
240D45	240	45	650	1000	3VDC (32V allowed)	1 VDC	600	1.6 volts	14 mA	24–280	1750	$4,000V_{RMS}$	0.67	0.9
240Di45	240	45	650	730	3VDC (32V allowed)	1 VDC	600	1.6 volts	14 mA	24–280	1750	$4,000V_{RMS}$	0.67	0.9
380D25	380	25	250	1000	3VDC (32V allowed)	1 VDC	800	1.6 volts	12 mA	24–420	250	$4,000V_{RMS}$	1.2	1.3
380D45	380	45	650	1000	3VDC (32V allowed)	1 VDC	800	1.6 volts	12 mA	24–420	1750	$4,000V_{RMS}$	0.67	0.9
120A10	120	10	110	33K	85VAC (280V allowed)	10 VAC	600	1.6 volts	7 mA	12–140	50	$4,000V_{RMS}$	1.3	1.6
120A25	120	25	250	33K	85VAC (280V allowed)	10 VAC	600	1.6 volts	7 mA	12–140	250	$4,000V_{RMS}$	1.2	1.3
240A10	240	10	110	33K	85VAC (280V allowed)	10 VAC	600	1.6 volts	14 mA	24–280	50	$4,000V_{RMS}$	1.3	1.6
240A25	240	25	250	33K	85VAC (280V allowed)	10 VAC	600	1.6 volts	14 mA	24–280	250	$4,000V_{RMS}$	1.2	1.3
240A45	240	45	650	33K	85VAC (280V allowed)	10 VAC	600	1.6 volts	14 mA	24–280	1750	$4,000V_{RMS}$	0.67	0.9

Note: θjc* = Thermal resistance junction to base. Maximum junction temperature is 110 °C.
** Operating Frequency: 25 to 65 Hz (operates at 400 Hz with 6 times the offstate leakage)

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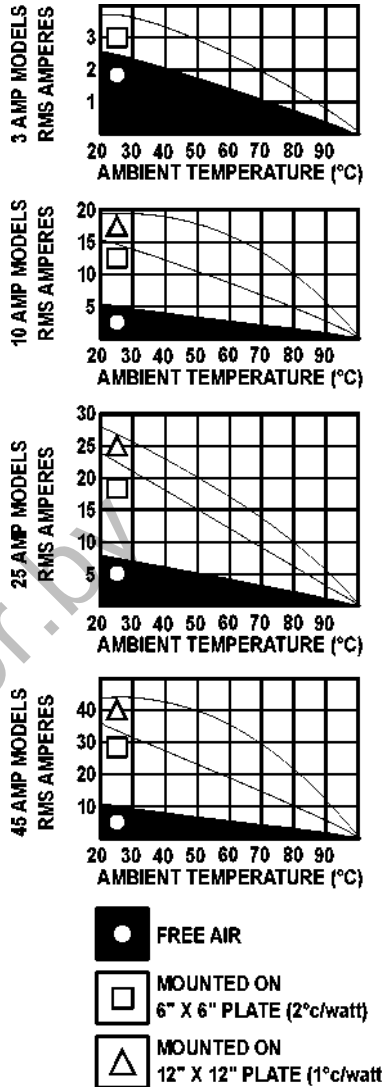
120/240/380 Volt (cont.)

Surge Current Data

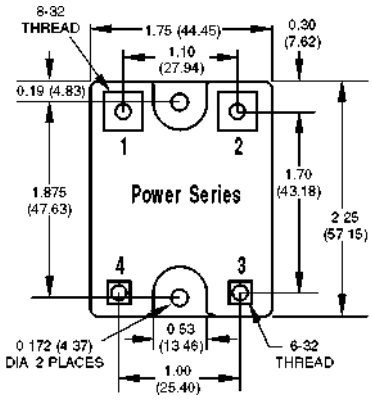
Time (Seconds)	Time* (Cycles)	3-Amp Peak Amps	10-Amp Peak Amps	25-Amp Peak Amps	45-Amp Peak Amps
0.017	1	85	110	250	650
0.050	3	66	85	175	420
0.100	6	53	70	140	320
0.200	12	45	60	112	245
0.500	30	37	50	80	175
1	60	31	40	67	134
2	120	28	33	53	119
3	180	27	32	49	98
4	240	26	31	47	95
5	300	25	30	45	91
10	600	24	28	42	84

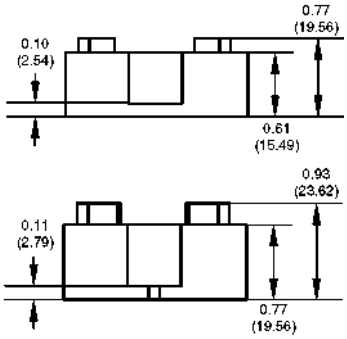
Note: *60 Hz.

Thermal Ratings



Dimensional Drawings





Side view: Part numbers DC60S3, 120D3, and 240D3 only

Side view: All other part numbers

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Solid-State Relays

480/575 Volt

Model Number	Nominal AC Line Voltage	Nominal Current Rating (Amps)	1 cycle Surge (Amps) Peak	Nominal Signal Input Resistance (Ohms)	Signal Pick-up Voltage	Signal Drop-out Voltage	Peak Repetitive Voltage Maximum	Maximum Output Voltage Drop	Off-State Leakage (mA) Maximum**	Operating Voltage Range (Volts AC)	I^2t Rating t=8.3 (ms)	Isolation Voltage	θjc* (°C/Watt)	Dissipation (Watts/Amp)
480D10-12	480	10	110	1000	3VDC (32V allowed)	1 VDC	1200	3.2 volts	11 mA	100–530	50	$4,000V_{RMS}$	1.2	2.5
480D15-12	480	15	150	1000	3VDC (32V allowed)	1 VDC	1200	3.2 volts	11 mA	100–530	50	$4,000V_{RMS}$	1.2	2.5
480D25-12	480	25	250	1000	3VDC (32V allowed)	1 VDC	1000	1.6 volts	11 mA	100–530	250	$4,000V_{RMS}$	1.3	1.3
480D45-12	480	45	650	1000	3VDC (32V allowed)	1 VDC	1000	1.6 volts	11 mA	100–530	1750	$4,000V_{RMS}$	0.67	0.9
575D15-12	575	15	150	1000	3VDC (32V allowed)	1 VDC	1200	3.2 volts	15 mA	100–600	90	$4,000V_{RMS}$	1.2	2.5
575D45-12	575	45	650	1000	3VDC (32V allowed)	1 VDC	1000	1.6 volts	15 mA	100–600	1750	$4,000V_{RMS}$	0.67	0.9
575Di45-12	575	45	650	730	3VDC (32V allowed)	1 VDC	1000	1.6 volts	15 mA	100–600	1750	$4,000V_{RMS}$	0.67	0.9

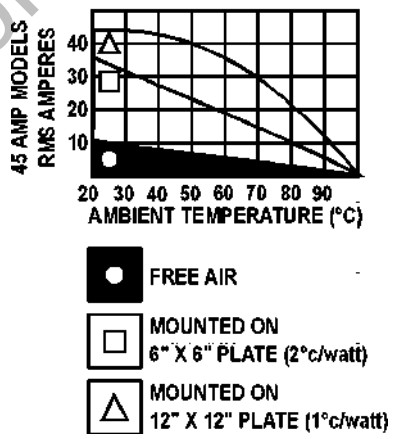
Note: θjc* = Thermal resistance junction to base. Maximum junction temperature is 110 °C.
** Operating Frequency: 25 to 65 Hz (operates at 400 Hz with 6 times the offstate leakage)

Surge Current Data

Time Second	Time*** (Cycles)	10-Amp Peak Amps	15-Amp Peak Amps	25-Amp Peak Amps	45-Amp Peak Amps
0.017	1	110	150	250	650
0.050	3	85	140	175	420
0.100	6	70	110	140	320
0.200	12	60	90	112	245
0.500	30	50	70	80	175
1	60	40	55	67	134
2	120	33	49	53	119
3	180	32	47	49	98
4	240	31	43	47	95
5	300	30	40	45	91
10	600	28	35	42	84

Note: ***60 Hz

Thermal Ratings



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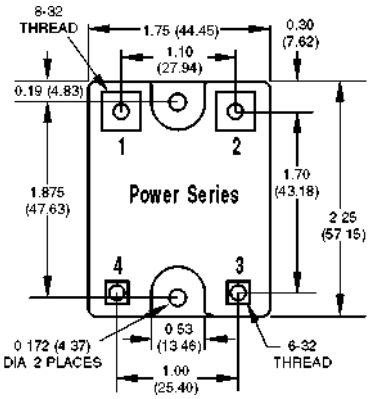
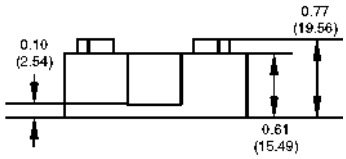
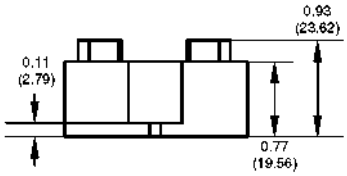
480/575 Volt (cont)

Dimensional Drawings





Side view: Part numbers DC60S3, 120D3, and 240D3 only



Side view: All other part numbers

Z Series Specifications

AC Power: 120/240 Volt

The Z Series employs a unique heat transfer system that makes it possible for Opto 22 to deliver a low-cost, 10-amp, solid-state relay in an all-plastic case. The push-on tool-free quick-connect terminals make the Z Series ideal for high-volume OEM applications.

Model Number	Nominal AC Line Voltage	Nominal Current Rating (Amps)	1 cycle Surge (Amps) Peak	Nominal Signal Input Resistance (Ohms)	Signal Pick-up Voltage	Signal Drop-out Voltage	Peak Repetitive Voltage Maximum	Maximum Output Voltage Drop	Off-State Leakage (mA) Maximum **	Operating Voltage Range (Volts AC)	I^2t Rating t=8.3 (ms)	Isolation Voltage	θjc* (°C/Watt)	Dissipation (Watts/Amp)
Z120D10	120	10	110	1000	3VDC (32V allowed)	1 VDC	600	1.6 volts	6 mA	12-140	50	4,000 V_{RMS}	4	1
Z240D10	240	10	110	1000	3VDC (32V allowed)	1 VDC	600	1.6 volts	12 mA	24-280	50	4,000 V_{RMS}	4	1

Notes: θjc* = Thermal resistance junction to base. Maximum junction temperature is 110°C.
**** Operating Frequency: 25 to 65 Hz (operates at 400 Hz with 6 times the offstate leakage)**

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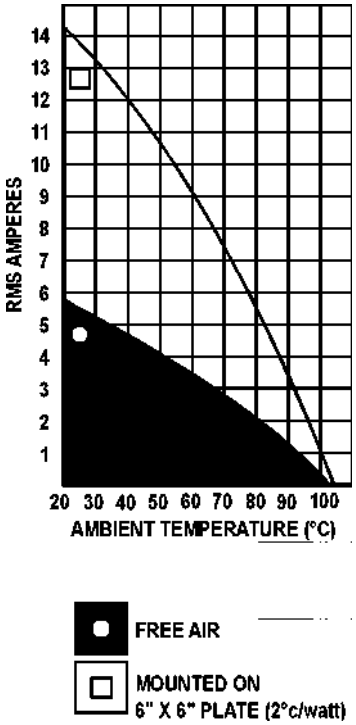
AC Power: 120/240 Volt (cont.)

Current vs. Ambient Ratings

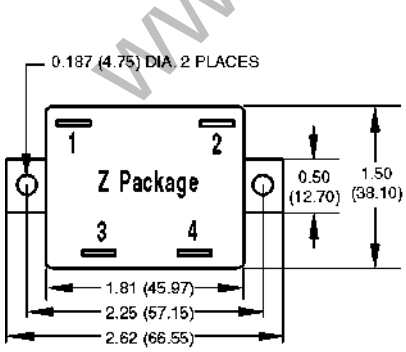


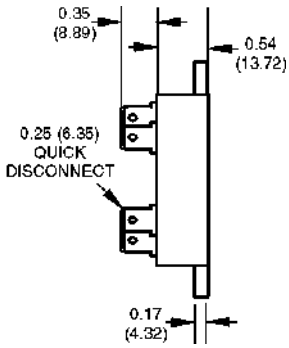
Surge Current Data

Time Second	Time*** (Cycles)	Peak Amps
0.017	1	110
0.050	3	85
0.100	6	70
0.200	12	60
0.500	30	50
1	60	40
2	120	33
3	180	32
4	240	31
5	300	30
10	600	28

Note: ***60 Hz

Dimensional Drawings





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Printed Circuit Series Specifications

AC Power: MP and P Series

The MP Series packaging is designed with a minimum footprint to allow maximum relay density on the printed circuit board. The P Series power relays provide low-profile for 0.5-inch (12.7 mm) center mounting on printed circuit boards.

Model Number	Nominal AC Line Voltage	Nominal Current Rating (Amps)	1 cycle Surge (Amps) Peak	Nominal Signal Input Resistance (Ohms)	Signal Pick-up Voltage	Signal Drop-out Voltage	Peak Repetitive Voltage Maximum	Maximum Output Voltage Drop	Off-State Leakage (mA) Maximum [1]	Operating Voltage Range (Volts AC)	I^2t Rating t=8.3 (ms)	Isolation Voltage	θ_{jc} [2] (°C/Watt)	Dissipation (Watts/Amp)
MP120D2 or P20D2	120	2	20	1000	3VDC [3] (24V allowed)	1 VDC	600	1.6 volts	5 mA	12–140	2	4,000V_{RMS}	20	1.2
MP120D4 or P120D4	120	4	85	1000	3VDC [3] (24V allowed)	1 VDC	600	1.6 volts	5 mA	12–140	30	4,000V_{RMS}	6.5	1.2
MP240D2 or P240D2	240	2	20	1000	3VDC [3] (24V allowed)	1 VDC	600	1.6 volts	5 mA	24–280	2	4,000V_{RMS}	20	1.2
MP240D4 or P240D4	240	4	85	1000	3VDC [3] (24V allowed)	1 VDC	600	1.6 volts	5 mA	24–280	30	4,000V_{RMS}	6.5	1.2
MP380D4	380	4	85	1000	3VDC [3] (24V allowed)	1 VDC	800	1.6 volts	5 mA	24–420	30	4,000V_{RMS}	6.5	1.2

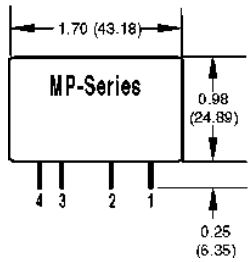
1) Operating Frequency: 25 to 65 Hz (operates at 400 Hz with 6 times the offstate leakage)
2) θ_{jc}* = thermal resistance junction to base. Maximum junction temperature is 110 °C.
3) P Series: 32 V maximum

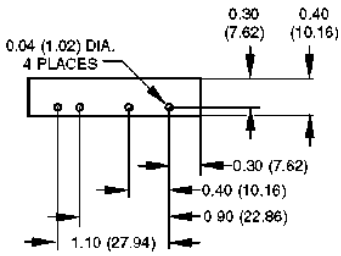
Surge Current Data

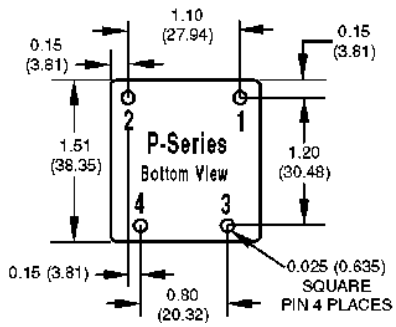
Time Second	Time* (Cycles)	Peak Amps	Peak Amps
0.017	1	20	85
0.050	3	18	66
0.100	6	15	53
0.200	12	11	45
0.500	30	9	37
1	60	8.5	31
2	120	8	28
3	180	7.5	27
4	240	7	26
5	300	6.5	25
10	600	6	24

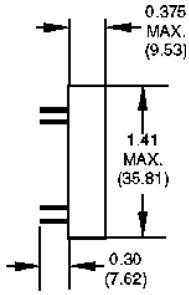
Note: *60 Hz

Dimensional Drawings









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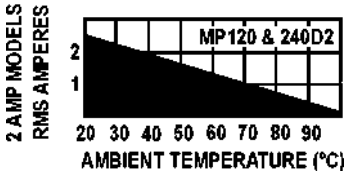
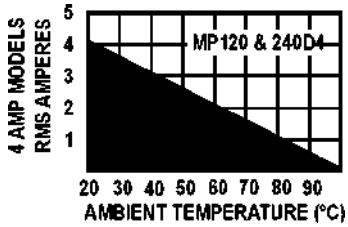
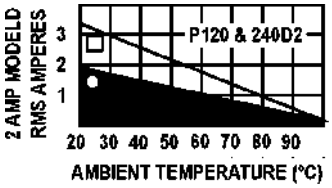
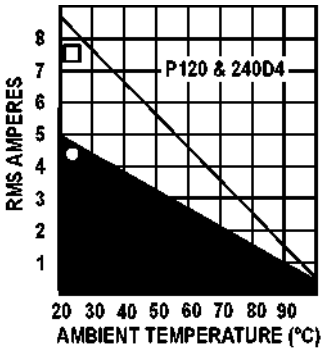
AC Power: P and MP Series (cont.)

Thermal Ratings









FREE AIR

MOUNTED ON 6" X 6" PLATE (2° C/WATT)

Surge Current Data

Time Second	Time* (Cycles)	Peak Amps	Peak Amps
0.017	1	20	85
0.050	3	18	66
0.100	6	15	53
0.200	12	11	45
0.500	30	9	37
1	60	8.5	31
2	120	8	28
3	180	7.5	27
4	240	7	26
5	300	6.5	25
10	600	6	24

Note: *60 Hz

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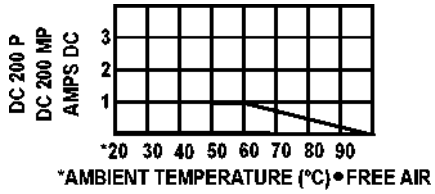
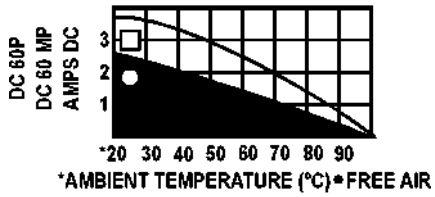
DC Switching Series Specifications

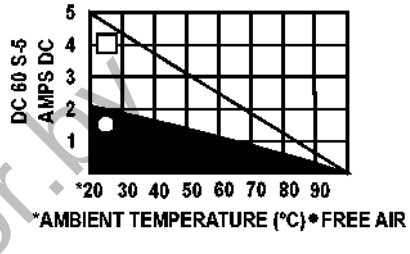
	DC60P or DC60MP	DC200P or DC200MP	DC60S-3	DC60S-5
Operating Voltage Range	5-60 VDC	5-200 VDC	5-60 VDC	5-60 VDC
Forward Voltage Drop	1.5 volts	1.5 volts at 1 amp	1.5 volts at 3 amps	1.5 volts at 5 amps
Nominal Current Rating	3 amps	1 amp	3 amps	5 amps
Off-State Blocking	60 VDC	250 VDC	60 VDC	60 VDC
Signal Pickup Voltage	3 VDC 32 Volts* allowed	3 VDC 32 Volts* allowed	3 VDC 32 Volts allowed	3 VDC 32 Volts allowed
Signal Dropout Voltage	1 VDC	1 VDC	1 VDC	1 VDC
Signal Input Impedance	1,000 ohms	1,000 ohms	1,000 ohms	1,000 ohms
1 Second Surge	5 amps	2 amps	5 amps	10 amps
Operating Temp. Range	-40° C to 100° C	-40° C to 100° C	-40° C to 100° C	-40° C to 100° C
Isolation Voltage	4,000 VRMS	4,000 VRMS	4,000 VRMS	4,000 VRMS
Off-state Leakage	1 mA maximum	1 mA maximum	1 mA maximum	1 mA maximum
Package Type	P/MP series	P/MP series	Power series	Power series
Turn-On Time	100 µsec	100 µsec	100 µsec	100 µsec
Turn-Off Time	750 µsec	750 µsec	750 µsec	750 µsec

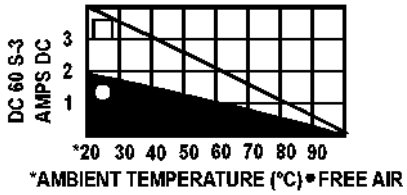
Note: *MP series maximum allowed control signal 24 VDC.

Thermal Ratings









FREE AIR

2° C/WATT HEAT SINK (6" X 6" PLATE)

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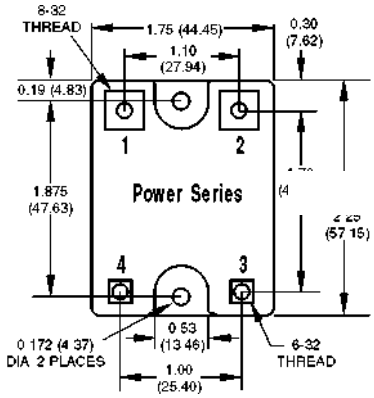
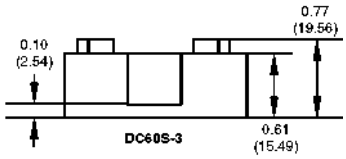
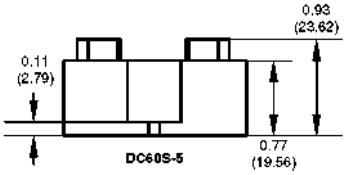
Dimensional Drawings

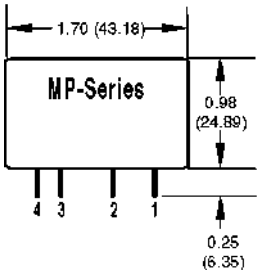


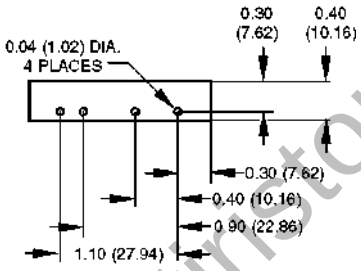


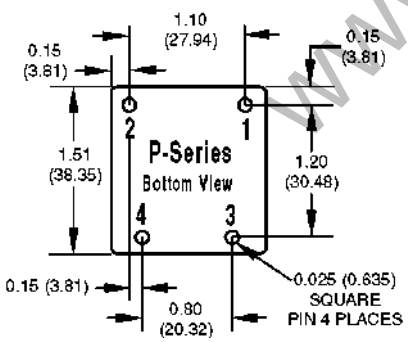
Side view: Part numbers DC60S3, 120D3, and 240D3 only

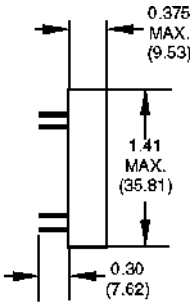


Side view: All other part numbers









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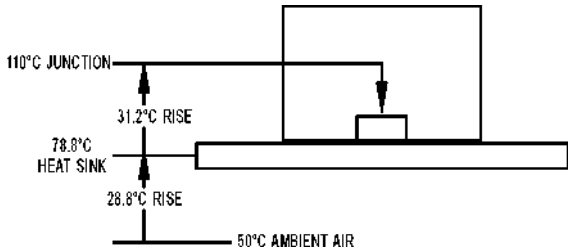
Applications: Tips

Heat Sink Calculation

Like all semiconductor devices, SSR current ratings must be based on maximum junction temperature. All Opto 22 SSRs operate conservatively at maximum junction temperatures of 110 °C. Determining an adequate heat sink for a given SSR conducting a given current is very simple.

IMPORTANT: Thermally conductive grease must be used between the relay base and the heat sink.



Sample Calculation 1

120-volt, 20-amp load; 50 °C ambient air temperature

Model: 120D25 SSR.

See the last two columns of the table on page 3 for *dissipation* and *thermal resistance* values for the 120D25. Also, see the note at the bottom of the table.

Dissipation: 1.3 watts/amp
Thermal resistance: 1.2 °C/watt
Maximum junction temperature: 110 °C

The calculation would be as follows:

Heat dissipation:	**20 amps x 1.3 watts/amp = 26.0 watts**
Temperature rise, junction to SSR base:	**26.0 watts x 1.2 °C/watt = 31.2 °C**
Allowable temperature of heat sink:	**110 C - 31.2 C = 78.8 °C**
Allowable temperature rise on heat sink:	**78.8 C - 50 C = 28.8 °C**
Heat sink thermal resistance limit:	**(28.8 C)/(26.0 W) = 1.1 °C/watt**

This means that you should select a heat sink with a thermal resistance of less than 1.1 °C/watt.

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Sample Calculation 2

240-volt,18-amp load, 25 °C ambient air temperature

Model: 240D45

See the last two columns of the table on page 3 for dissipation and thermal resistance values for the 240D45. Also, see the note at the bottom of the table.

Dissipation: 0.9 watts/amp
Thermal resistance: 0.67 °C/watt
Maximum junction temperature: 110 °C

The calculation would be as follows:

Heat dissipation:	**18 amps x 0.9 watts/amp = 16.2 watts**
Temperature rise, junction to SSR base:	**16.2 W x 0.67 C/W = 10.9 °C**
Allowable temperature of heat sink:	**110 C - 10.9 C = 99.1 °C**
Allowable temperature rise on heat sink:	**99.1 C - 25 C = 74.1 °C**
Heat sink thermal resistance limit:	**(74.1 C)/(16.2 W) = 4.6 °C/watt**

This means that you should select a heat sink with a thermal resistance of less than 4.6 °C/watt.

Duty Cycle Calculation

When solid-state relays are operated in an on/off mode, it may be advantageous to calculate the RMS value of the current through the SSR for heat sinking or determining the proper current rating of the SSR for the given application.

I_{RMS} = RMS value of load or SSR

T_1 = Time current is on

T_2 = Time current is off

I_{ON} = RMS value of load current during on period

$$I_{RMS} = \sqrt{\frac{(I_{ON})^2 \times T_1}{T_1 + T_2}}$$

Transformer Loads

Careful consideration should be given to the selection of the proper SSR for driving a given transformer. Transformers are driven from positive saturation of the iron core to negative saturation of the core each half cycle of the alternating voltage. Large inrush currents can occur during the first half cycle of line voltage if a zero-voltage SSR happens to turn on during the positive half cycle of voltage when the core is already in positive saturation. Inrush currents greater than 10 times rated transformer current can easily occur. The following table provides a guide for selecting the proper SSR for a given transformer rating.

120-Volt Transformers	
SSR MODEL	TRANSFORMER
P or MP 120D2	100 VA
Z120D10	500 VA
120D3	100 VA
P or MP 120D4	250 VA
120D10 or 120A10	500 VA
120D25 or 120A25	1 KVA
120D45	2 KVA
240-Volt Transformers	
P or MP240D2	200 VA
7240D10	1 KVA
120D3	200 VA
P or MP240D4	500 VA
240D10 or 240A10	1 KVA
240D25 or 240A25	2 KVA
240D45	4 KVA
480-Volt Transformers	
SSR MODEL	TRANSFORMER
480D10-12	5-Amp Primary
480D15-12	5-Amp Primary

Solenoid Valve and Contactor Loads

All Opto 22 SSRs are designed to drive inductive loads such as solenoid valves and electromechanical contactors. The built-in snubber in each SSR assures proper operation into inductive loads. The following table is a guide in selecting an SSR to drive a solenoid or contactor.

120-Volt Coils		
SSR CURRENT RATING	SOLENOID	CONTACTOR
2-Amp	1-Amp	NEMA Size 4
4-Amp	3-Amp	NEMA Size 7
240-Volt Coils		
SSR CURRENT RATING	SOLENOID	CONTACTOR
2-Amp	1-Amp	NEMA Size 7
4-Amp	3-Amp	NEMA Size 7

Control Current Calculation

All Opto 22 DC-controlled SSRs have a control circuit consisting of 1000 ohms in series with an LED. The LED will drop 1 volt, so the voltage across the internal resistor will be 1 volt less than the control voltage.

The control current (I_C) can be calculated from the control voltage (V_C) as follows:

$I_C = (V_C - 1)/1000$

Examples:

3 VDC control voltage:
$I_C = (3 - 1)/1000 = 0.002$ A (2 mA)

32 VDC control voltage:
$I_C = (32 - 1)/1000 = 0.031$ A (31 mA)

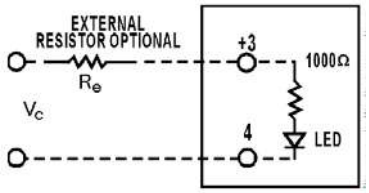
For control voltages above 32 VDC, an external resistor can be added in series with the SSR to limit the control current. Also, if the device driving the control current to the SSR is limited, you can limit the control current by using an external resistor (R_e).

$I_C = (V_C - 1)/ (R_e + 1000)$

$R_e = [(V_C - 1)/(I_C)] - 1000$

To limit the control current to 2 mA, this simplifies to:

$R_e = 500 (V_C - 3)$



Opto 22 SSRs for controlling single-phase motors are shown in the following tables:

120-Volt Single-Phase Non-Reversing Motors	
SSR Model	MOTOR RATING
P or MP120D2	1 Amp
Z120D10	1/4 HP
120D3	1-1/2 Amp
P or MP120D4	1-1/2 Amp
120D10 or 120A10	1/4 HP
120D25 or 120A25	1/3 HP
120D45	3/4 HP

240-Volt Single Phase Non-Reversing Motors	
SSR Model	MOTOR RATING
P or MP240D2	1 Amp
Z240D10	1/4 HP
240D3	1-1/2 Amp
P or MP240D4	1-1/2 Amp
240D10 or 240A10	1/3 HP
240D25 or 120A25	1/2 HP
240D45	1-1/2 HP

120-Volt Single-Phase Reversing Motors	
SSR Model	MOTOR RATING
P or MP240D2	1 Amp
Z240D10	1/4 HP
240D3	1-1/2 Amp
P or MP240D4	1-1/2 Amp
240D10 or 240A10	1/4 HP
240D25 or 120A25	1/3 HP
240D45	3/4 HP

240-Volt Single-Phase Reversing Motors	
SSR Model	MOTOR RATING
480D10-12	1/4 HP
480D15-12	1/4 HP

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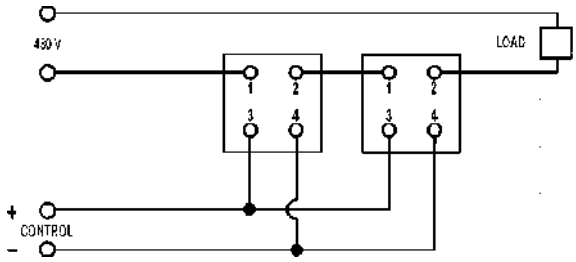
Solid-State Relays

Solid-State Relays in Series

In applications requiring greater current rating at higher voltage, two Opto 22 SSRs may be operated in series for double the voltage rating. The built-in snubber in each SSR assures proper voltage sharing of the two SSRs in series. In the following diagram, two 240-volt, 45-amp SSRs are connected in series for operation on a 480-volt line. The control is shown with a parallel hook-up but it should be noted that a serial connection can also be implemented.



Lamp Loads

Since all Opto 22 SSRs are zero-voltage switching, they are ideal for driving incandescent lamps, because the initial inrush current into a cold filament is reduced. The life of the lamp is increased when switched by a zero-voltage turn-on SSR. The following table is a guide to selecting an Opto 22 SSR for switching a given incandescent lamp.

120 Volt Lamps	
SSR CURRENT RATING	LAMP RATING
2-Amp	100 Watt
4-Amp	400 Watt
10-Amp	1 Kilowatt
25-Amp	2 Kilowatt
45-Amp	3 Kilowatt
240 Volt Rating	
SSR CURRENT RATING	LAMP RATING
2-Amp	200 Watt
4-Amp	800 Watt
10-Amp	2 Kilowatt
25-Amp	4 Kilowatt
45-Amp	6 Kilowatt

Heater Loads

Care should be taken in selecting a SSR for driving a heater load if the load is cycled on and off in a continuous manner as might occur in a temperature control application. Constant cycling can cause thermal fatigue in the thyristor chip at the point where the chip bonds to the lead frame. Opto 22 employs a thick copper lead frame for mounting the SCR chips in the power series SSRs to eliminate thermal fatigue failures. In addition, Opto 22 recommends operating any SSR at 75% rated current for cycling heater loads to ensure complete reliability.

The following table is a guide to selecting the proper SSR for a given heater load.

Nominal SSR Current Rating	Maximum Recommended Heater Current
2-Amp	1½-Amp
4-Amp	2½-Amp
10-Amp	7½-Amp
25-Amp	18-Amp
45-Amp	35-Amp
10 480V	8-Amp
10 480V	8-Amp

Single-Phase Reversing Motor Control

The circuit diagram below illustrates a typical 1 Ø motor winding inductance and the phase shift capacitor can cause twice-line voltage to appear across the open SSR. A 240-volt SSR should be used for a 120-volt line. During the transition period when one SSR is turned on and the other SSR is going off, both SSRs may be on. In this case, the capacitor may discharge through the two SSRs, causing large currents to flow, which may destroy the SSRs. The addition of RL as shown will protect the SSRs from the short circuit capacitor discharge current.

CALCULATE RL as: $RL = \dfrac{1.4\ EAC}{10 \times \text{SSR full load rating}}$

EXAMPLE: **10 amp SSR**
120 V AC Line

$$RL = \frac{1.4 \times 120}{10 \times 10} = 1.7\ \text{ohm}$$

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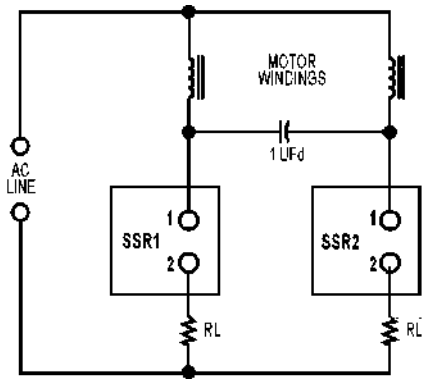
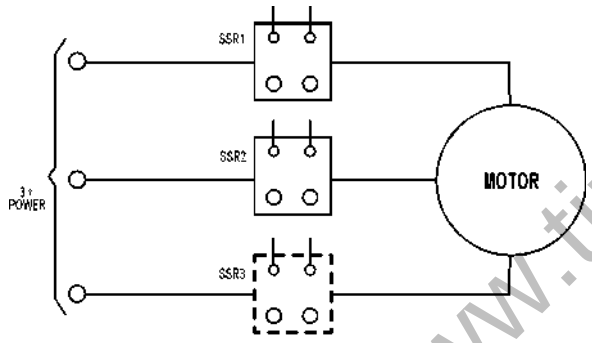
Single-Phase Reversing Motor Control (cont.)



The resistors are unnecessary if the control circuit is designed to ensure that one SSR is off before the other SSR is on.

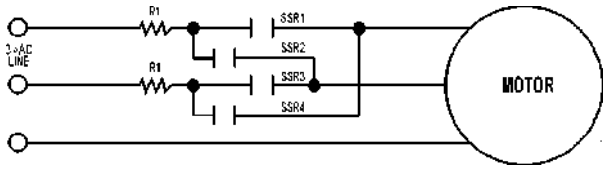
Three-Phase Motor Control



Three-phase motors may be controlled by solid-state relays as shown. A third SSR as shown is optional, but not necessary. The control windings may be connected in series or parallel. Care should be taken to ensure that the surge current drawn by the motor does not exceed the surge current rating of the SSR.

240 Volt Three-Phase Motor	
SSR MODEL	MOTOR
Z240D25	1/3 HP
Z240D10	3/4 HP
240D10	3/4 HP
240A10	3/4 HP
240D25	2 HP
240A25	2 HP
240D45	3 HP
480 Volt Three-Phase Motors	
SSR MODEL	MOTOR
480D10-12	1-½ HP
480D15-12	1-½ HP

Three-Phase Reversing Motor Control



Three-phase reversing motor control can be implemented with four SSRs as shown in the connection diagram. The SSRs work in pairs with SSR1 and SSR3 operated for rotation in one direction and SSR2 and SSR4 operated for rotation in the reverse direction. The resistor R1 as shown in the connection diagram protects against line-to-line shorts if SSR1 and SSR4 or SSR3 and SSR2 are on at the same time during the reversing transition period. Use the following table as a guide to the proper selection of an SSR for this application.

Opto 22 Relay	Motor Full Load Rating	Resistor for 120V line	Resistor for 240V line
3-Amp	1.25-Amp	4 ohm 50 W	8 ohm 50 W
10-Amp	5-Amp	1 ohm 100 W	2 ohm 100 W
25-Amp	8-Amp	.5 ohm 100 W	1 ohm 100 W
45-Amp	16-Amp	.25 ohm 150 W	.5 ohm 150 W
15-Amp	5-Amp	1 ohm 100 W	2 ohm 100 W

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FAQ: SSR Applications

Q : What is a solid-state relay?

A: A solid-state relay (SSR) is a semiconductor device that can be used in place of a mechanical relay to switch electricity to a load in many applications. Solid-state relays are purely electronic, normally composed of a low current "control" side (equivalent to the coil on an electromechanical relay) and a high-current load side (equivalent to the contact on a conventional relay). SSRs typically also feature electrical isolation to several thousand volts between the control and load sides. Because of this isolation, the load side of the relay is actually powered by the switched line; both line voltage and a load (not to mention a control signal) must be present for the relay to operate.

Q : What are the advantages of using an SSR over a mechanical relay?

A: There are many applications that require a moderate amount of power (W to kW) to be switched on and off fairly rapidly. A good example would be the operation of a heater element in a controlled-temperature system. Typically, the amount of heat put into the system is regulated using pulse-width modulation turning a fixed-power heating element on and off for time periods ranging from seconds to minutes. Mechanical relays have a finite cycle life, as their components tend to wear out over thousands to millions of cycles. SSRs do not have this problem; in the proper application, they could be operated almost infinitely.

Q : What are the limitations of using an SSR?

A: SSRs have a few limitations when compared to the capabilities of their mechanical counterparts. First, because the relay is semiconductor-based, it will never turn all the way on, nor off. This means that in the "on" state, the relay still has some internal resistance to the flow of electricity, causing it to get hot. When in the "off" state, the relay will exhibit a small amount of leakage current, typically a few mA. This leakage can conspire to keep some loads, especially ones with a high impedance, from turning off! Additionally, SSRs are more sensitive to voltage transients; while Opto 22 relays are very well transient-protected, if a relay gets hit hard enough a sufficient number of times, it will die or degrade. This makes SSRs less ideal for driving highly inductive electromechanical loads, such as some solenoids or motors. SSRs should also never be used for applications such as safety power disconnects, because even in the off state, leakage current is present. Leakage current through an SSR also implies the presence of a potentially high voltage. Even though the relay is not conducting a large amount of current, the switched terminal will still be "hot," and thus dangerous.

Q : Do you make multi-pole or multi-throw SSRs?

A: Opto 22 manufactures only single-pole, single-throw SSRs. If multi-phase operation is required, just use a relay on each phase. Because of the limitations on semiconductor devices of the type used in SSRs, it is not practical to build single-device multi-throw SSRs. However, an alternative to multi-throw operation may be accomplished with multiple relays.

Q : Can I hook up SSRs in parallel to achieve a higher current rating?

A: No. There is no way to guarantee that two or more relays will turn on simultaneously when operated in parallel. Each relay requires a minimum voltage across the output terminals to function; because of the optical isolation feature, the "contact" part of the SSR is actually powered by the line it switches. One relay turning on before the other will cause the second relay to lose its turn-on voltage, and it won't ever turn on, or at least not until the first relay fails from carrying too much current.

Q : What does a "zero-crossing" turn-on circuit refer to?

A: "Zero-crossing" turn-on and turn-off refer to the point on the AC wave form when the voltage is zero. It is at this point that an AC SSR will turn on or off. All Opto 22 AC relays are designed with a zero-crossing turn-on and turn-off circuit. When the AC circuit voltage is at zero, no current is flowing. This makes it much easier and safer for the semiconductor device in the relay to be turned on or off. It also generates much less electrical EMI/RFI noise.

Q : Can I use an AC SSR to switch DC?

A: No. Because of the zero-crossing circuit described above, the relay will most likely never turn on, and even if it is on, it will likely not be able to be turned off, as DC voltage typically never drops to zero.

Q : Can I use a DC SSR to switch AC?

A: No. The semiconductor device used in Opto 22's DC SSRs is polarized. It may break down and conduct for the portion of the waveform that is reversed in polarity.

Q : Can a DC SSR be used to switch an analog signal?

A: This is not recommended at all. First, the voltage drop across the relay will cause signal loss. Second, the conduction characteristics of the SSR are very non-linear at low operating voltages and currents. Use a mechanical relay; it will work much better.

Q : What agency approvals do your SSRs carry?

A: In general, Opto 22 relays carry UL, CSA, and CE approval. See **http://support.opto22.com.** Additionally, some SSRs contain VDE-approved optocouplers; contact Opto 22 for more information.

***UL recognition is pending for Power Series SSRs with LED indicators. Contact Opto 22 Product Support for current UL information.**

FAQ: SSR Troubleshooting

Q : My SSR does not function anymore. What may have happened?

A: There is no "normal" mode of failure for SSRs. They just stop working, by refusing to turn on or off. An improper installation is often to blame for an SSR failure, as these are very simple, reliable devices. If you have a failed SSR, it is important to look at the normal operating parameters of that relay within the larger system to make sure that the relay being used is appropriate to the application, and that the relay is being properly installed in the system. The three most common causes of SSR failure are as follows:

- **SSR improperly matched to load.** The relay was destroyed by overheating from carrying too much current too long.
- **SSR insufficiently protected.** Remember, a semiconductor is less tough than a simple metal contact. Reverse voltages exceeding the PRV rating of the relay will cause damage. Voltage spikes on the switched line, perhaps from inductive kick-back, may have destroyed one or more of the internal switching devices. Remember to use snubbers, transorbs, MOVs, and/or commutating diodes on highly inductive loads.
- **SSR improperly installed.** The SSR was not mounted to a large enough heat sink, or no thermal compound was used, causing the relay to overheat. Also, insufficient tightening of the load terminals can cause arcing and ohmic heating of the relay. Opto 22 recommends 18 inch-pounds of torque on the load screw terminals. Similar failures have also been attributed to the use of crimp-on terminal lugs or spades; make sure such terminals are tightly crimped, and even drip some solder into the joint to ensure good electrical contact and protection from corrosion.

Q : How can I test my SSR?

A: It is not possible to test an SSR by the same methods used to test mechanical relays; a typical SSR will always show an infinite impedance to a resistance meter placed across the output terminals. There are a few reasons for this. First, the SSR requires a small amount of power to operate, derived from whatever voltage source is placed on the load terminals. A typical multimeter will not supply sufficient voltage to cause the relay to change state. Second, AC SSRs contain a zero-crossing circuit, which will not allow them to change state unless zero voltage is applied. Most test equipment will supply a DC voltage to the relay, and the relay will thus never see the zero it requires to change state. To test an SSR, it is best to operate it at the actual line voltage it will be used at, driving a load such as a large light bulb.

Q : I have an SSR driving a load. The load turns on okay, but never seems to turn off, unless I remove power from the relay entirely. What might be happening?

A: This is normally a problem when using an SSR with a high-impedance load, such as a neon lamp or a small solenoid. Loads like these often have relatively large initial currents, but relatively small "hold in" currents. The result is that the off-state leakage current through the relay (see previous section) is insufficient to cause the load to turn on to start with, but sufficient to keep it on, once started. The solution is to place a power resistor, sized for 8–10 times the rated maximum leakage current for the SSR in parallel with the load. Make sure that this resistor has a high enough power rating for the application. For example, for a 5 mA leakage current at 120 VAC, a resistor drawing 50 mA would be desirable. Using Ohm's Law, the resistor value becomes 2,400 ohms. This resistor will dissipate 6 watts, so a 7.5 or 10-watt size power resistor should be used.

Q : I have a new AC SSR driving a solenoid. It turns on okay once, but will not turn on again. What is going on?

A: Some solenoids, some types of halogen lights, and some types of strobe lights incorporate a diode in series with the coil or filament. This causes the light to behave as a half-wave rectifier. Opto 22 SSRs have a built-in R-C snubber circuit in parallel with the output. The capacitor in this circuit charges up but cannot discharge through the series diode, causing a voltage to appear across the SSR terminals. Because the SSR must see a zero voltage across the terminals to come on, it can't turn on again in this situation. The solution here would be to put a high-value resistor (several tens of Kohms) across the terminals of the relay, to allow the capacitor to drain its charge.

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More About Opto 22

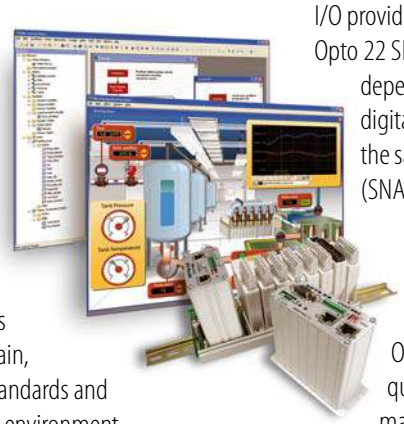
Products

Opto 22 develops and manufactures reliable, flexible, easy-to-use hardware and software products for industrial automation, remote monitoring, and data acquisition applications.

SNAP PAC System

Designed to simplify the typically complex process of understanding, selecting, buying, and applying an automation system, the SNAP PAC System consists of four integrated components:

- SNAP PAC controllers
- PAC Project™ Software Suite
- SNAP PAC brains
- SNAP I/O™



SNAP PAC Controllers

Programmable automation controllers (PACs) are multifunctional, multidomain, modular controllers based on open standards and providing an integrated development environment.

Opto 22 has been manufacturing PACs for many years. The latest models include the standalone SNAP PAC S-series and the rack-mounted SNAP PAC R-series. Both handle a wide range of digital, analog, and serial functions and are equally suited to data collection, remote monitoring, process control, and discrete and hybrid manufacturing.

SNAP PACs are based on open Ethernet and Internet Protocol (IP) standards, so you can build or extend a system without the expense and limitations of proprietary networks and protocols.

PAC Project Software Suite

Opto 22's PAC Project Software Suite provides full-featured and cost-effective control programming, HMI (human machine interface) development and runtime, OPC server, and database connectivity software to power your SNAP PAC System.

These fully integrated software applications share a single tagname database, so the data points you configure in PAC Control™ are immediately available for use in PAC Display™, OptoOPCServer™, and OptoDataLink™. Commands are in plain English; variables and I/O point names are fully descriptive.

PAC Project Basic offers control and HMI tools and is free for download on our website, www.opto22.com. PAC Project Professional, available for separate purchase, adds OptoOPCServer, OptoDataLink, options for Ethernet link redundancy or segmented networking, and support for legacy Opto 22 serial *mistic*™ I/O units.

SNAP PAC Brains

While SNAP PAC controllers provide central control and data distribution, SNAP PAC brains provide distributed intelligence for I/O processing and communications. Brains offer analog, digital, and serial functions, including thermocouple linearization; PID loop control; and optional high-speed digital counting (up to 20 kHz), quadrature counting, TPO, and pulse generation and measurement.

SNAP I/O

I/O provides the local connection to sensors and equipment. Opto 22 SNAP I/O offers 1 to 32 points of reliable I/O per module, depending on the type of module and your needs. Analog, digital, serial, and special-purpose modules are all mixed on the same mounting rack and controlled by the same processor (SNAP PAC brain or rack-mounted controller).

Quality

Founded in 1974 and with over 85 million devices sold, Opto 22 has established a worldwide reputation for high-quality products. All are made in the U.S.A. at our manufacturing facility in Temecula, California. Because we do no statistical testing and each part is tested twice before leaving our factory, we can guarantee most solid-state relays and optically isolated I/O modules for life.

Free Product Support

Opto 22's Product Support Group offers free, comprehensive technical support for Opto 22 products. Our staff of support engineers represents decades of training and experience. Product support is available in English and Spanish, by phone or email, Monday through Friday, 7 a.m. to 5 p.m. PST.

Free Customer Training

Hands-on training classes for the SNAP PAC System are offered at our headquarters in Temecula, California. Each student has his or her own learning station; classes are limited to nine students. Registration for the free training class is on a first-come, first-served basis. See our website, www.opto22.com, for more information or email training@opto22.com.

Purchasing Opto 22 Products

Opto 22 products are sold directly and through a worldwide network of distributors, partners, and system integrators. For more information, contact Opto 22 headquarters at 800-321-6786 or 951-695-3000, or visit our website at www.opto22.com.

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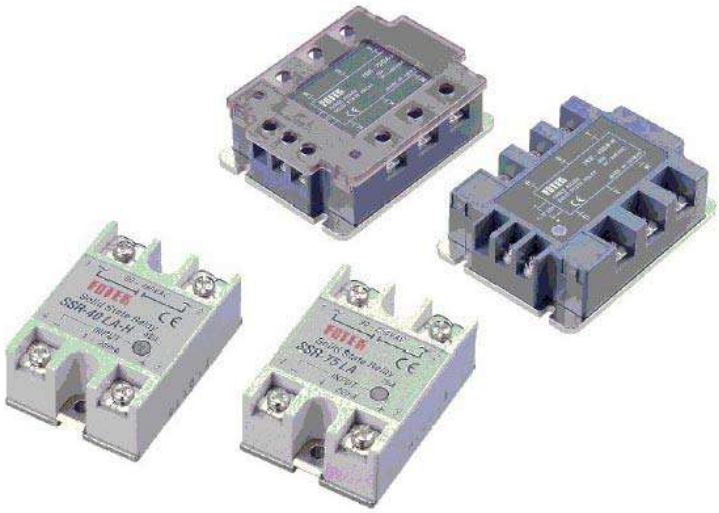
Твердотельные реле

одно- и трехфазные (ток нагрузки 10…75А).



1. Особенности

- сопротивление изоляции - более 50 МОм при 500В;
- электрическая прочность изоляции вход/выход – 2,5 кВ;
- маленькая мощность управления - 7,5мА * 12В;
- низкий уровень излучения электромагнитных помех, обеспечиваемый примененным методом коммутации при переходе тока через ноль;
- высокая перегрузочная способность по току ($10I_{ном}$ в течение 1-го периода) и по напряжению (с демпфирующей схемой).

2. Структура обозначения при заказе

SSR – 40 D A -H

1 2 3 4 5

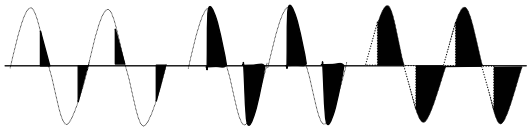
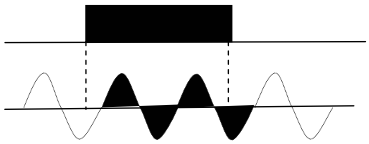
1 серия: SSR: однофазное твердотельное реле;
TSR: трехфазное твердотельное реле.

2 ток нагрузки: 10 = 10А; 25 = 25А; 40 = 40А; 50 = 50А; 75 = 75А.

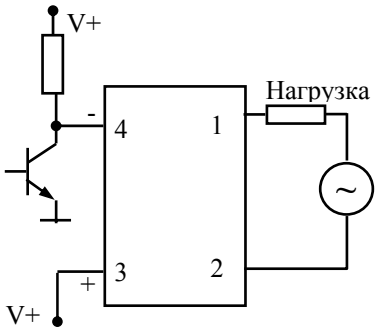
3 входной сигнал: D: DC 3…32В (вкл/выкл реле);
A: AC 80…250В (вкл/выкл реле);
L: 4…20 мА (аналоговый вход);
V: переменный резистор.

4 выходное напряжение: A: AC (переменное) напряжение;
D: DC (постоянное) напряжение.

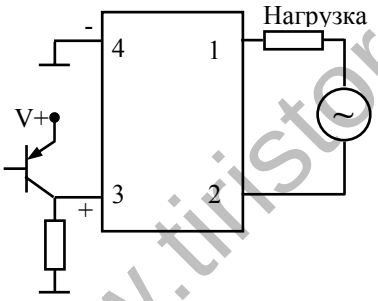
5 диапазон вых. напряжения: H: 90…480В AC;
нет: 24…380В AC.

	Фазовое управление	**Управление с коммутацией при переходе тока через ноль.**
Выходной сигнал по току в нагрузке	Uвых = 10% Uвых = 50% Uвых = 90% 	Вход  Выход
Преимущества и недостатки	Преимущества: – подходит для любых типов нагрузки; – плавность и непрерывность выходного сигнала; Недостатки: – помехи при переключении.	Преимущества: – нет помех создающихся третей гармоникой при включении. Недостатки: – применяется только с резистивной, емкостной нагрузкой и нельзя с высоко индуктивной;

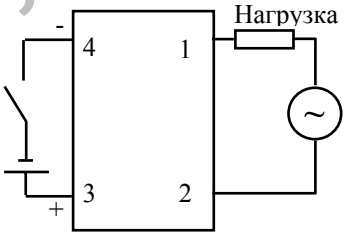
NPN, нормально-разомкнутый



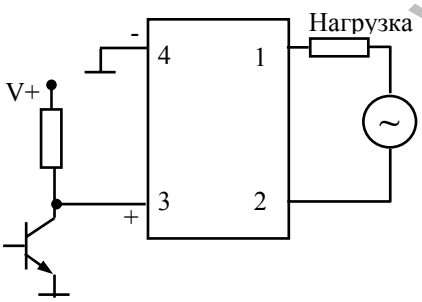
PNP, нормально-разомкнутый



Реле, нормально-разомкнутый



NPN, нормально-замкнутый



PNP, нормально-замкнутый

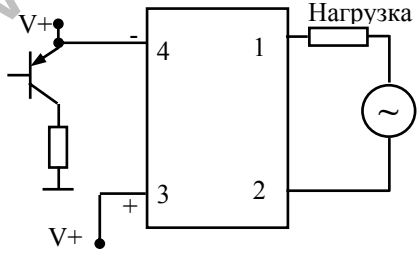
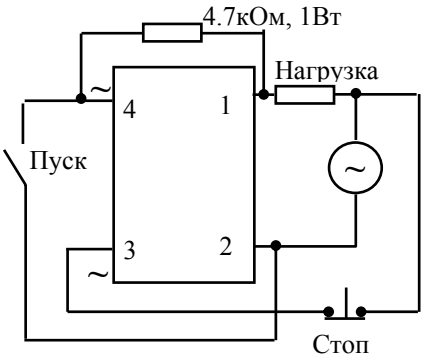


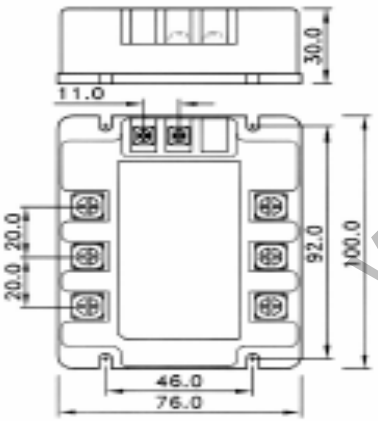
Схема с самоблокировкой (АС-АС)



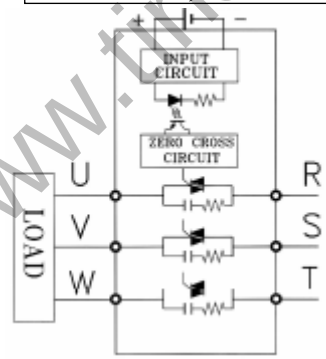
характеристики

(TSR серия)

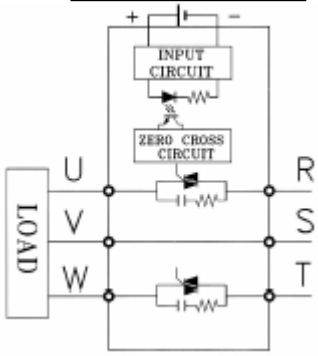
Модель	**TSR-25DA (-H)**	**TSR-40DA (-H)**	**TSR-75DA (-H)**	**TSR-25AA (-H)**	**TSR-40AA (-H)**	**TSR-75AA (-H)**
Тип	(DC-AC)			(AC-AC)		
Ном. управляющее напряжение	4…32В постоянного тока			80…250В переменного тока		
Напряжение включения/ выключения	вкл > 3.6В / выкл < 2.4В			вкл > 45В / выкл < 35В		
Ток срабатывания	7.5мА/12В			5мА/110В		
Метод управления	Коммутация при переходе тока через ноль					
Ном. напряжение нагрузки	24…380В AC 90…480В AC ("H" в обозначении)			24…380В AC 90…480В AC ("H" в обозначении)		
Пиковое напряжение	более 1200В					
Ном. ток нагрузки	25A	40A	75A	25A	40A	75A
Макс. кратковременный ток (в течение 1 периода)	275A	410A	820A	275A	410A	820A
Ток утечки	12.5 мА при 380В 15.5 мА при 440В					
Время отклика	на входной сигнал - менее 20 мс					
Диэлектрическая прочность	более 2.5 кВ AC / 1мин					
Сопротивление изоляции	более 50 МОм / 500В DC					
Диапазон раб. температур	-20°C…+80°C					
Масса	390г					



TSR-25DA, TSR-40DA

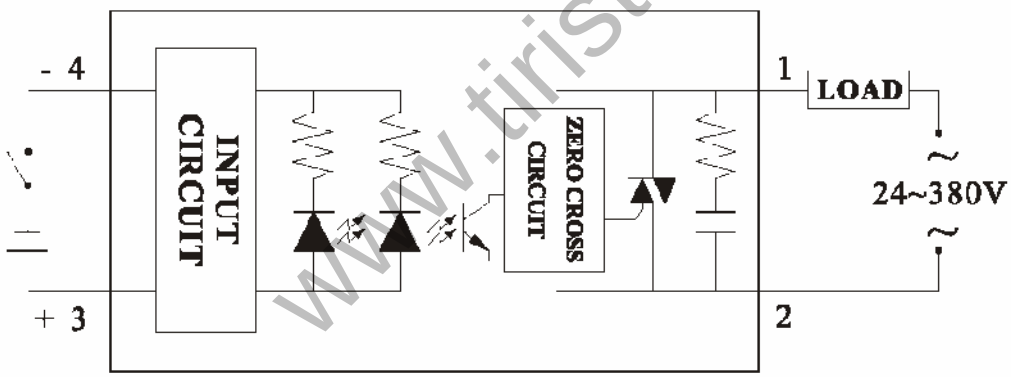


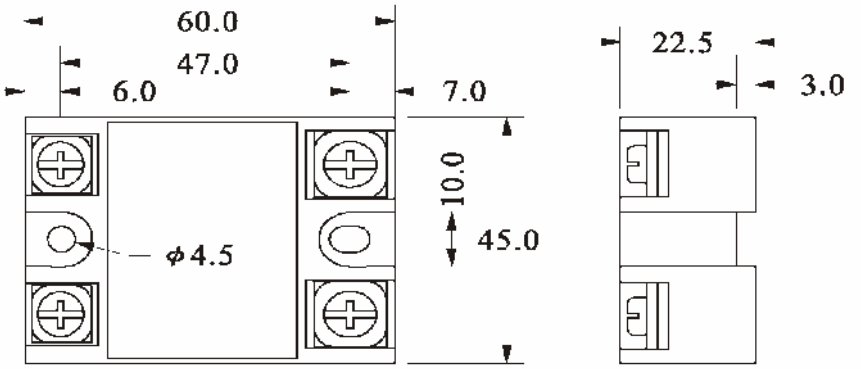
TSR-75DA



Однофазные рел

Модель	**SSR-10DA**	**SSR-25DA (-H)**	**SSR-40DA (-H)**	**SSR-50DA (-H)**	**SSR-75DA (-H)**
Тип	(DC-AC)				
Ном. управляющее напряжение	3…32В постоянного тока				
Напряжение включения/ выключения	вкл > 2.4В / выкл < 1 В				
Ток срабатывания	7.5мА/12В				
Метод управления	Коммутация при переходе тока через ноль				
Ном. напряжение нагрузки	24…380В переменного тока 90…480В переменного тока ("H" в обозначении)				
Падение напряжения	1.6В / 25^{0}C				
Ном. ток нагрузки	10А	25А	40А	50А	75А
Макс. кратковременный ток	135А	275А	410А	550А	820А
Ток утечки	3 мА	3 мА	3 мА	6 мА	6 мА
Время отклика на входной сигнал	менее 10 мс				
Диэлектрическая прочность	более 2.5 кВ AC / 1мин				
Сопротивление изоляции	более 50 МОм / 500В DC				
Диапазон рабочих температур	-20°C…+80°C				
Масса	105г			125г	

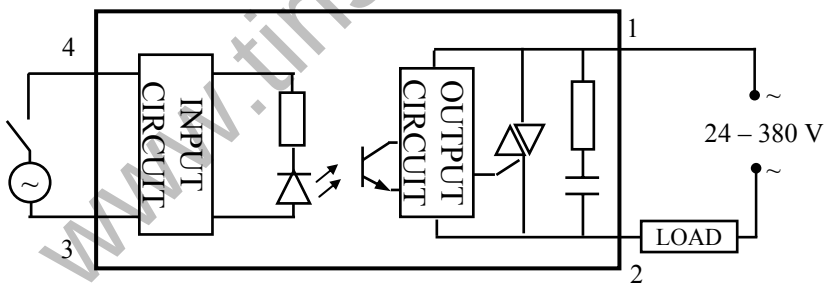




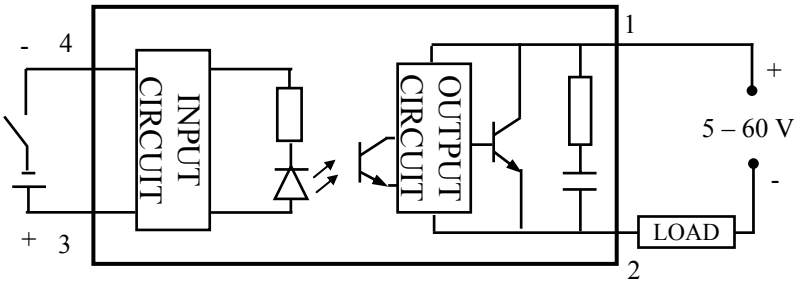
зные реле -AC и DC-D типа (SSR рия)

Модель	**SSR-10AA**	**SSR-25AA (-H)**	**SSR-40AA (-H)**	**SSR-05DD**	**SSR-10DD (-H)**
Тип	(AC-AC)			(DC-DC)	
Ном. управляющее напряжение	80…250В переменного тока 50/60 Гц			3…32В постоянного тока	
Напряжение включения/ выключения	вкл > 45В / выкл < 35			вкл > 2.4В / выкл < 1В	
Ток срабатывания	5 мА/110 В			7.5мА/12В	
Метод управления	Коммутация при переходе тока через ноль			Оптрон	
Ном. напряжение нагрузки	24…380В переменного тока 90…480В AC ("H" в обозначении)			5…60В постоянного тока 5…200В DC ("H" в обозначении)	
Падение напряжения	1.6В / 25^{0}C				
Ном. ток нагрузки	10A	25A	40A	5A	10A
Макс. кратковременный ток	135A	275A	410A	15A	30A
Ток утечки	3 мА	3 мА	3 мА	0.8 мА	0.8 мА
Время отклика на входной сигнал	менее 20 мс			1 мс	
Диэлектрическая прочность	более 2.5 кВ AC / 1мин				
Сопротивление изоляции	более 50 МОм / 500В DC				
Диапазон раб. температур	-20°C…+80°C				
Масса	110г			105г	

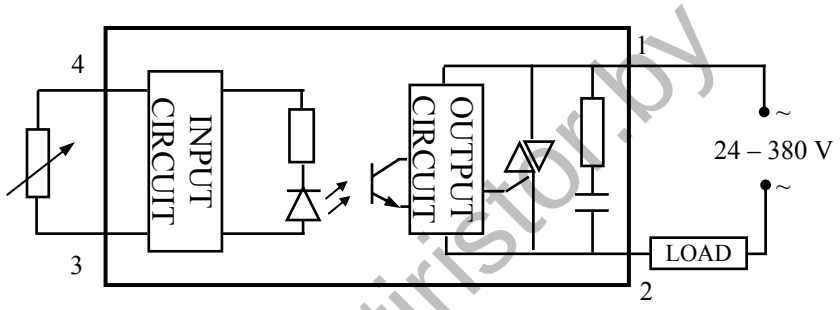
(AC-AC)



(DC-DC)

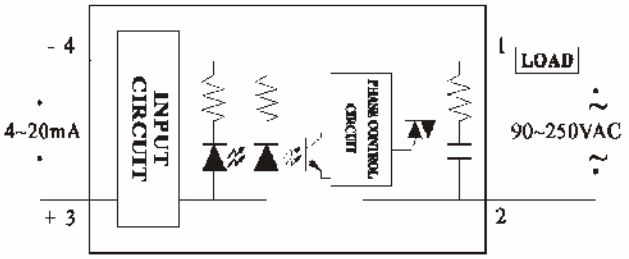


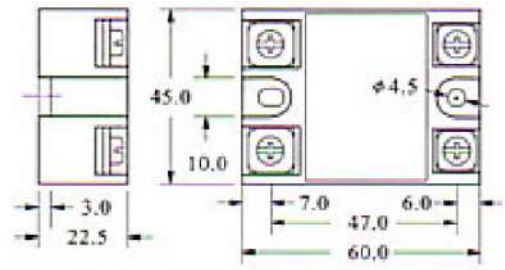
Модель	**SSR-10VA**	**SSR-25VA**	**SSR-40VA**
Тип	(VR-AC)		
Ном. управляющее напряжение	Переменный резистор 250кОм/110В, 500кОм/220В, 1МОм/380В		
Метод управления	Фазовое управление		
Ном. напряжение нагрузки	24…380В переменного тока		
Падение напряжения	1.6В / 25^{0}С		
Ном. ток нагрузки	10А	25А	40А
Макс. кратковременный ток	135А	275А	410А
Ток утечки	5 мА		
Диэлектрическая прочность	более 2.5 кВ AC / 1мин		
Сопротивление изоляции	более 50 МОм / 500В DC		
Диапазон рабочих температур	-20°С…+80°С		
Масса	105г		



Линейные однофазные реле с регулировкой выходного напряжения (SSR-LA серия)

Модель	**SSR-25LA(H)**	**SSR-40LA(H)**	**SSR-50LA(H)**	**SSR-75LA(H)**
Управляющий сигнал	4…20 мА			
Входное сопротивление	≈ 1.2 кОм			
Метод управления	Фазовое управление			
Ном. напряжение нагрузки	90…250В переменного тока 250…480В переменного тока ("H" в обозначении)			
Пиковое напряжение	более 1200В			
Ном. ток нагрузки	25А	40А	50А	75А
Макс. кратковременный ток	275А	410А	550А	820А
Ток утечки	< 0. 5 % при полной нагрузке			
Диэлектрическая прочность	более 2.5 кВ AC / 1мин			
Сопротивление изоляции	более 50 МОм / 500В DC			
Диапазон рабочих температур	-20°С…+80°С			
Масса	105г		110г	





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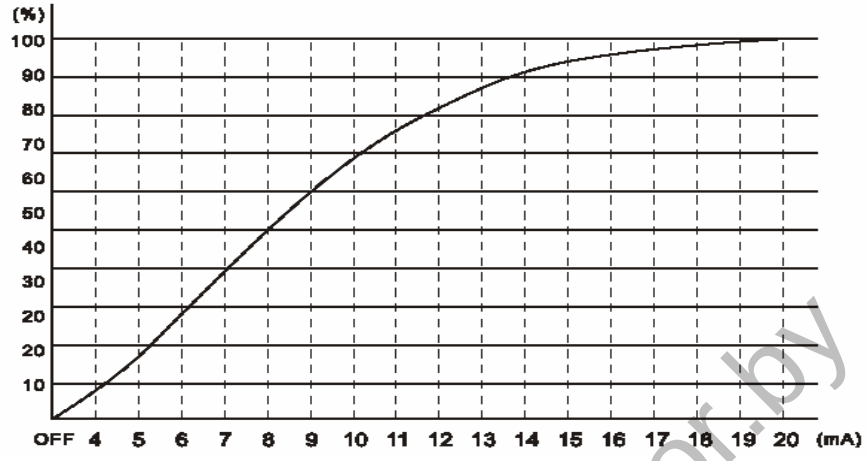
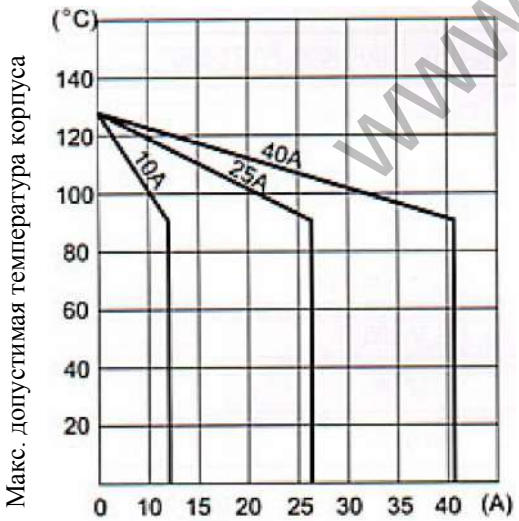
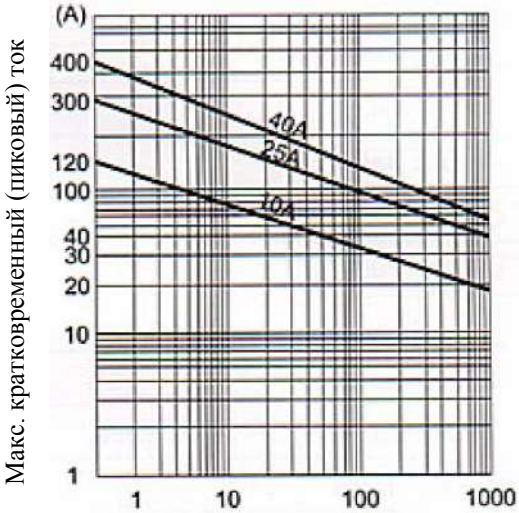


Эксплуатационные диаграммы



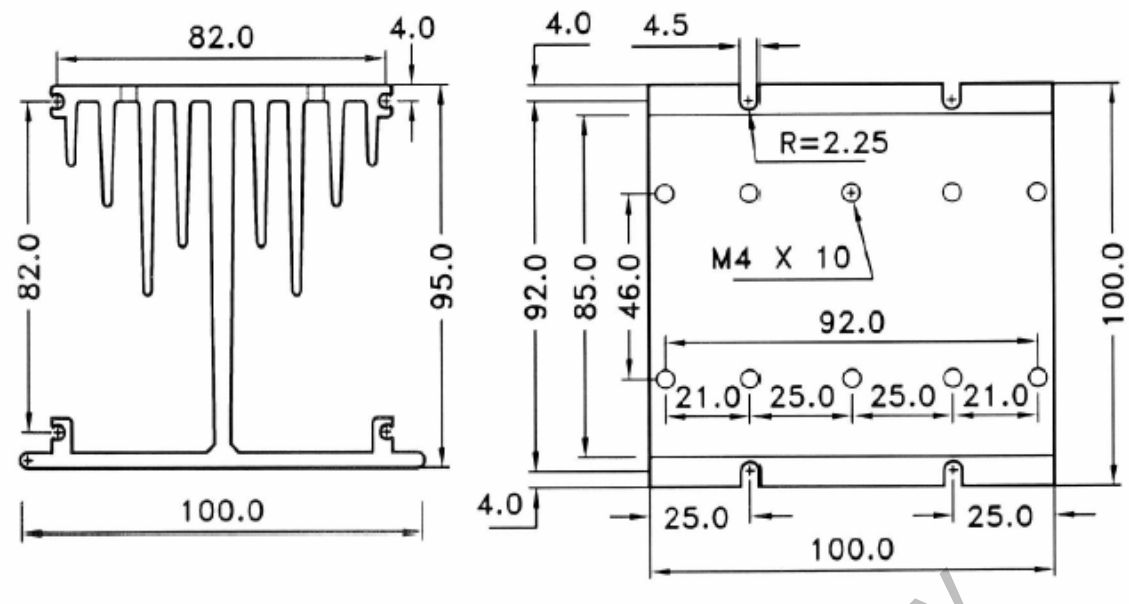
Номинальный продолжительный ток



Длительность пикового тока (периоды напряжения)

5. Размеры радиатора.

HS-100 (TSR-100)



HS-100H