- Modular version for modular-slot switchboards, also suitable for rear mounting plate fixing
- Plug-in or flush-mount version
- Version programmable with NFC
- Vast range of functions and time scales
- Reliable time and repeat accuracy.

Page 17-2

MODULAR TIME RELAYS

- Suitable for modular-slot switchboards
- Selectable time ranges and functions with potentiometers on front or via NFC and APP
- LED indication
- Mounting on 35mm DIN rail
- Screw terminals.

Page 17-5

PLUG-IN AND FLUSH-MOUNT TIME RELAYS, 48X48MM

- Flush and internal panel mounting
- Time ranges: 0.05s...10h
- LED indication
- 8 and 11-pin sockets for panel mounting.

On delay time relay. Multiscale. Multivoltage

TM P

Order code	Time of scale range	Rated auxiliary supply voltage	Qty per pkg	Wt
		[V]	n°	[kg]
TM P	0.1...1s 1...10s 6...60s 1...10min 6min...1h 1...10h 0.1...1 day 1...10 days ON only OFF only	24...48VDC 24...240VAC	1	0.048
TM P A440	0.1...1s 1...10s 6...60s 1...10min	380...440VAC	1	0.090

General characteristics
- Electronic time relay, multiscale, multivoltage. On delay, delay on make, with start at relay energising for TM P
- Electronic time relay, multiscale with 2 normally open (N/O-SPST) contacts with common pole for TM P A 440.
- 1 relay output with 1 changeover contact (SPDT)
- Delay time adjustable on front by rotary switch: 10...100%
- Green LED indicator for power on
- Red LED indicator for relay state; flashing for delay and steady when relay energised
- Modular DIN 43880 housing, 1 module
- IEC degree of protection: IP40 on front (only when mounted in housing or electric board with IP40); IP20 on terminals.

Certifications and compliance
Certifications obtained: EAC; UL Listed, for USA and Canada (cULus - File E93601).
Compliant with standards: IEC/EN 61812-1, UL508, CSA C22.2 n° 14.

Multifunction time relay. Multiscale. Multivoltage. 1 relay output

TM M1

Order code	Time of scale range	Rated auxiliary supply voltage	Qty per pkg	Wt
		[V]	n°	[kg]
TM M1	0.1...1s 1...10s 6...60s 1...10min 6min...1h 1...10h 0.1...1 day 1...10 days ON only OFF only	12...240V AC/DC	1	0.086

General characteristics
- Electronic time relay, multifunction, multiscale, multivoltage, with 1 relay output SPDT
- Enabling input
- Selectable functions: (a) On delay. (b) Pulse on relay energising with start when energised. (c) Symmetrical flasher starting with OFF. (d) Symmetrical flasher starting with ON. (e) Off delay; relay energising at external contact closing with start on break. (f) Pulse on relay energising with start on external contact closing. (g) Pulse on relay energising with start on external contact opening. (h) On-off delay. Delay on make, with start at external contact closing, and delay at break, with start at external contact opening. (i) Internal ON/OFF trigger with relay contact closing or operating at each closing of an external contact. (j) Pulse generator.
- Delay time adjustable on front by rotary switch: 10...100%
- Green LED indicator for power on
- Red LED indicator for relay state; flashing for delay and steady when relay energised
- Modular DIN 43880 housing, 1 module suitable for fixing on 35mm DIN rail (IEC/EN 60715)
- IEC degree of protection: IP40 on front (only when mounted in housing or electric board with IP40); IP20 on terminals.

Certifications and compliance
Certifications obtained: EAC; UL Listed, for USA and Canada (cULus - File E93601).
Compliant with standards: IEC/EN 61812-1, UL508, CSA C22.2 n° 14.

Multifunction time relay. Multiscale. Multivoltage. 1 relay output. Programmable with NFC and APP

new

TM M1 NFC

Order code	Time of scale range	Rated auxiliary supply voltage	Qty per pkg	Wt
		[V]	n°	[kg]
TM M1 NFC	0.1s... 999days ON only OFF only	12...240V AC/DC	1	0.086

General characteristics
- Electronic time relay, multifunction, multiscale, multivoltage, with 1 relay output with changeover contact (SPDT), with NFC technology and APP NFC Lovato
- Command input for the enabling of the function or to pause the timing
- 40 selectable functions. For details consult the technical manual on the website www.LovatoElectric.com
- NFC connectivity for the programming of the parameters with the APP NFC
- Simple, fast and intuitive programming
- Very high accuracy and repeatability of the settings
- Internal counter which stops the function when the relay output reaches a programmable number of closures
- Possibility to save the program on smartphone or tablet to be copied on others TM M1 NFC, even with device powered off
- Possibility to protect the settings with a password
- QR code for the direct connection to the LOVATO Electric website for the download of the technical manual
- Green LED indicator for power on
- Red LED indicator for relay state; flashing for delay and steady when relay energised
- Modular DIN 43880 housing (1 module), suitable for fixing on 35mm DIN rail (IEC/EN 60715)
- IEC degree of protection: IP40 on front (only when mounted in housing or electric board with IP40), IP20 on terminals.

Certifications and compliance
Certifications (pending): cULus, EAC.
Compliant with standards: IEC/EN 61812-1, UL508, CSA C22.2 n°14.

Multifunction time relay. Multiscale. Multivoltage. 2 relay outputs

TM M2

Order code	Time of scale range	Rated auxiliary supply voltage	Qty per pkg	Wt
		[V]	n°	[kg]
TM M2	0.1...1s 1...10s 6...60s 1...10min 6min...1h 1...10h 0.1...1 day 1...10 days ON only OFF only	12...240V AC/DC	1	0.094

General characteristics
- Electronic time relay, multifunction, multiscale, multivoltage
- Enabling input
- 2 relay outputs, one with 1 delayed changeover (C/O-SPDT) contact and the other with 1 normally open (N/O-SPST) contact, programmable as instantaneous or delayed
- Selectable functions: (a) On delay; delay on make with start at relay energising. (b) Pulse on relay energising with start when energised. (c) Flasher starting with OFF interval. Equal timing recycle. (d) Flasher starting with ON interval. Equal timing recycle. (e) Off delay; relay energising at external contact closing with start on break. (f) Pulse on relay energising with start on external contact closing. (g) Pulse on relay energising with start on external contact opening. (h) On-off delay. Delay on make, with start at external contact closing, and delay at break, with start at external contact opening. (i) Internal ON/OFF trigger with relay contact closing or operating at each closing of an external contact. (j) Pulse generator, unequal timing recycle; starting with OFF pulse time and 0.5s ON pulse.
- Delay time adjustable on front by rotary switch: 10...100%
- Green LED indicator for power on
- Red LED indicator for relay state; flashing for delay and steady when relay energised
- Modular DIN 43880 housing, 1 module suitable for fixing on 35mm DIN rail (IEC/EN 60715)
- IEC degree of protection: IP40 on front (only when mounted in housing or electric board with IP40); IP20 on terminals.

Certifications and compliance
Certifications obtained: EAC; UL Listed, for USA and Canada (cULus - File E93601) as Auxiliary Devices - Timers.
Compliant with standards: IEC/EN 61812-1, UL508, CSA C22.2 n° 14.

Recycle time relay, independent timings. Multiscale. Multivoltage

TM PL

Order code	Time of scale range	Rated auxiliary supply voltage	Qty per pkg	Wt
		[V]	n°	[kg]
TM PL	0.1...1s 1...10s 6...60s 1...10min 6min...1h 1h...10h 0.1...1 day 1...10 days 3...30 days 10...100 days	12...240V AC/DC	1	0.082

General characteristics
- Programmable time relay asymmetrical recycle time, multiscale, multivoltage. Flasher with independent timing for ON and OFF intervals
- Enabling input of ON or OFF interval
- 1 relay output with 1 changeover contact (SPDT)
- Delay time for OFF (pause) interval, adjustable on front by rotary switch: 10...100%
- Delay time for ON (work) interval, adjustable on front by rotary switch: 10...100%
- Green LED indicator for power on
- Red LED indicator for relay state; flashing for delay
- Modular DIN 43880 housing, 1 module; suitable for fixing on 35mm DIN rail (IEC/EN 60715)
- IEC degree of protection: IP40 on front (only when mounted in housing or electric board with IP40); IP20 on terminals.

Certifications and compliance
Certifications obtained: EAC; UL Listed, for USA and Canada (cULus - File E93601) as Auxiliary Devices - Timers.
Compliant with standards: IEC/EN 61812-1, UL508, CSA C22.2 n° 14.

Off delay time relay. Multiscale. Multivoltage

TM D

Order code	Time of scale range	Rated auxiliary supply voltage	Qty per pkg	Wt
		[V]	n°	[kg]
TM D	0.06...0.6s 0.6...6s 6...60s 18...180s	24...240V AC/DC	1	0.080

General characteristics
- Electronic time relay, multiscale, multivoltage. True off delay; delay on break with start at relay de-energising
- 1 relay output with 1 changeover contact (SPDT)
- Delay time adjustable on front by rotary switch: 10...100%
- Green LED indicator for power on
- Modular DIN 43880 housing, 1 module; suitable for fixing on 35mm DIN rail (IEC/EN 60715)
- IEC degree of protection: IP40 on front (only when mounted in housing or electric board with IP40); IP20 on terminals.

Certifications and compliance
Certifications obtained: EAC; UL Listed, for USA and Canada (cULus - File E93601) as Auxiliary Devices - Timers.
Compliant with standards: IEC/EN 61812-1, UL508, CSA C22.2 n° 14.

Time relay for starting. Multiscale. Multivoltage

TM ST

Order code	Time of scale range	Rated auxiliary supply voltage	Qty per pkg	Wt
		[V]	n°	[kg]
TM ST	0.1...1s 1...10s 6...60s 1...10min	24...48VDC 24...240VAC	1	0.090
TM ST A440	0.1...1s 1...10s 6...60s 1...10min	380...440VAC	1	0.090

General characteristics
- Electronic time relay, multiscale, multivoltage for starting (star-delta, impedance, autotransformer, etc) of induction motors (squirrel cage), 2 separate timings
- 1 relay output with 2 normally open (N/O-SPST) contacts with common pole
- Delay time adjustable on front by rotary switch: 10-100% for star connection
- Starting and transition (20...300ms time scale - from star to delta), time adjustable on front by rotary switch
- Green LED indicator for power on
- Red LED indicator for relay state; flashing during delay and steady at delay lapsing
- Modular DIN 43880 housing, 1 module; suitable for fixing on 35mm DIN rail (IEC/EN 60715)
- IEC degree of protection: IP40 on front (only when mounted in housing or electric board with IP40); IP20 on terminals.

Certifications and compliance
Certifications obtained: EAC; UL Listed, for USA and Canada (cULus - File E93601) as Auxiliary Devices - Timers.
Compliant with standards: IEC/EN 61812-1, UL508, CSA C22.2 n° 14.

Time relay for staircase

TM LS

Order code	Time of scale range	Rated auxiliary supply voltage	Qty per pkg	Wt
		[V]	n°	[kg]
TM LS	0.5...20min	220...240VAC	1	0.080

General characteristics
- Electronic time relay single scale and voltage for staircase illumination
- 1 relay output with 1 powered normally open (N/O-SPST) contact
- Delay time adjustable on front by rotary switch
- Suitable for 3 or 4-wire systems
- 1 slide switch for timed or constant lighting operation
- Function for one hour lighting and fast switch off
- Green LED indicator for power on
- Connection with up to 50 light-up switches maximum; ≤ 1mA each
- Modular DIN 43880 housing, 1 module suitable for fixing on 35mm DIN rail (IEC/EN 60715)
- IEC degree of protection: IP40 on front (only when mounted in housing or electric board with IP40); IP20 on terminals.

Certifications and compliance
Certifications obtained: EAC; UL Listed, for USA and Canada (cULus - File E93601) as Auxiliary Devices - Timers.
Compliant with standards: IEC/EN 61812-1, UL508, CSA C22.2 n° 14.

Time relay

31 L48TP...

31 L48TPB...

31 L48M...

Order code	Time scale range	Rated auxiliary supply voltage	Qty per pkg	Wt
		[V]	n°	[kg]
Time relay on delay. Multiscale and multivoltage.				
31 L48TP S 240	0.3...780s	24VAC/DC 110VAC 220...240VAC	1	0.124
31 L48TP M 240	18s...780min		1	0.124
Time relay on delay. Multiscale and single voltage.				
31 L48TPB M24	0.05s...10min	24VAC/DC	1	0.124
31 L48TPB M240		220...240VAC	1	0.124
Time relay, multifunction, multivoltage and multiscale.				
31 L48M M 240	0.05s...10min	24...240V AC/DC	1	0.135
31 L48M H 240	0.05min...10h		1	0.135

Accessories for 48x48mm time relay

HR7X S1

31 L48 P8

HR7X S2

31 L48 P11

	Order code	Description	Qty per pkg	Wt
			n°	[kg]
new	**HR7X S1**	8-pin socket for screw fixing or on 35mm DIN rail (IEC/EN 60715) of time relay type L48T....	10	0.061
	31 L48 P8	8-pin socket for the door-mounting of time relay type L48T... with accessory 31 L48AP	10	0.040
new	**HR7X S2**	11-pin socket for screw fixing or on 35mm DIN rail (IEC/EN 60715) of time relay type L48M....	10	0.064
	31 L48 P11	11-pin socket for the door-mounting of time relay type L48M... with accessory 31 L48AP	10	0.048
	31 L48AP	Flush mount bracket	10	0.012

NOTE: Max. conductor section for sockets: 2x2.5mm²/2x14AWG.
Tightening torque: 0.8Nm/7.1lbin.

General characteristics

TIME RELAY L48TP
- Electronic time relay, multiscale, multivoltage. On delay, delay on make with start at relay energising
- 1 relay output with 1 changeover contact (SPDT)
- Delay time adjustable on front by rotary knob
- Time range selected by dip switches: L48TP S: 0.3...3s; 1.2...12s; 10...100s; 7.8...780s. L48 TP M: 18s...3min; 72s...12min; 10...100min; 78...780min
- LED indicators for power on and relay state
- Plug-in housing with 8-pin socket, HR7X S1 or 31 L48 P8 with accessory 31 L48AP
- Flush mount bracket 31 L48AP available
- IEC protection degree: IP40 on front and IP20 at terminals.

Time range setting

	A B 1 0	A B 1 0	A B 1 0	A B 1 0
L48TP S	0,3...3s	1,2...12s	10...100s	7,8...780s
L48TP M	18s...3min	72s...12min	10...100min	78...780min

TIME RELAY L48TPB
- Electronic time relay, multiscale, single voltage, multifunction
- 2 relay outputs, each with 1 changeover contact (SPDT), configurable either delay on make or instantaneous
- Delay time adjustable on front by rotary knob
- Time range selected by dip switches: 0.05...1s; 0.1...10s; 0.6s...1min; 6s...10min
- LED indicators for power on and relay state
- Plug-in housing with 8-pin socket, HR7X S1 or 31 L48 P8 with accessory 31 L48AP
- Flush mount bracket 31 L48AP available
- IEC protection degree: IP40 on front and IP20 at terminals.

Time range setting

	A B 1 0	A B 1 0	A B 1 0	A B 1 0
L48TPB	0,05...1s	0,1...10s	0,6s...1min	6s...10min

TIME RELAY L48M
- Electronic time relay, multiscale, multivoltage, multifunction
- Selectable functions: On delay, delay on make with start at relay energising. On delay, delay on break with start at relay de-energising. Flasher, starting with OFF interval. Flasher, starting with ON interval. Time relay resetting is possible on closing of external contact (R) connected to terminals 7-6. Possible time relay stopping storing elapsed time on closing of external contact (M) connected to terminals 7-5 and then restarting time on its opening. See diagrams on page 17-9
- 2 relay outputs, each with 1 changeover contact; both delayed (SPDT)
- Delay time adjustable on front by rotary knob
- Time range selected by dip switches: L48M M: 0.05...1s; 0.1...10s; 0.6s...1min; 6s...10min L48M H: 0.05...1min; 0.1...10min; 0.6min...1h; 1min...10h
- LED indicators for power on and relay state
- Plug-in housing with 11-pin socket, HR7X S2 or 31 L48 P11 with accessory 31 L48AP
- Flush mount bracket 31 L48AP available
- IEC protection degree: IP40 on front and IP20 at terminals.

Time range setting

	A B 1 0	A B 1 0	A B 1 0	A B 1 0
L48M M	0,05...1s	0,1...10s	0,6s...1min	6s...10min
L48M H	0,05...1min	0,1...10min	0,6min...1h	1min...10h

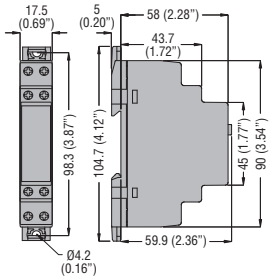
SOCKETS HR7X... AND L48...
- 8-pin and 11-pin version
- Screw fixing or on DIN rail for HR7X..., flush mount for L48... with accessory 31 L48AP
- Screw terminals
- Ratings: 10A - 250VAC.

Certifications and compliance

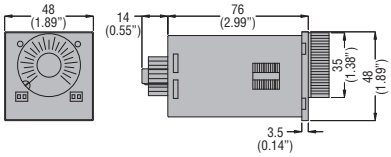
Certifications obtained: cURus (for L48T..., L48M... and HR7X... type), EAC.
Compliant with standards: IEC/EN 61810 (for HR7X... type), IEC/EN 61812-1, UL508, CSA C22.2 n° 14.

TIME RELAYS

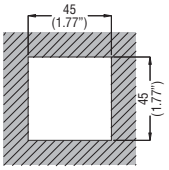
TM…



L48…

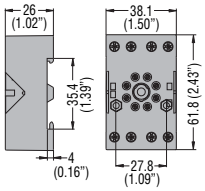


Cutout

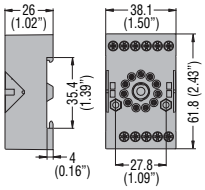


ACCESSORIES - SOCKETS

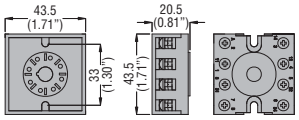
HR7XS1



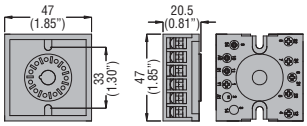
HR7XS2



L48 P8

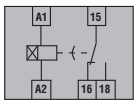


L48 P11

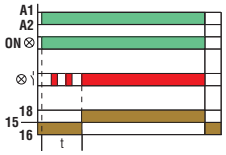


Wiring diagrams

TM P

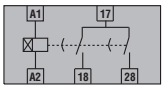


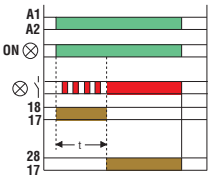
On delay. Delay on make, with start at relay energising



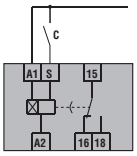
TM P A440

On delay. Delay on make, with start at relay energising

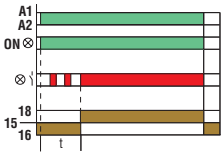




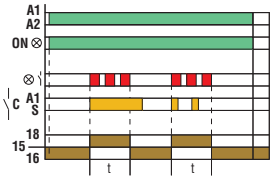
TM M1



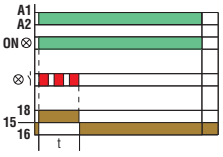
On delay. Delay on make, with start at relay energising



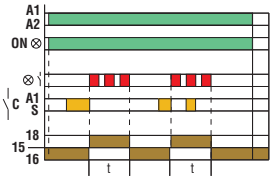
Pulse on relay energising with start at external contact closing



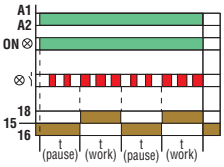
Pulse on relay energising with start on energising



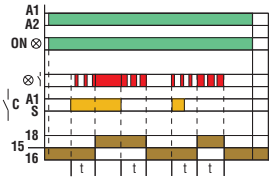
Pulse on relay energising with start at external contact opening



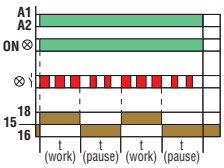
Flasher, starting with OFF (pause) interval. Equal timing recycle



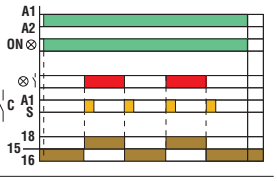
On-Off delay. Delay on make, with start at external contact closing, and delay at break, with start at external contact opening



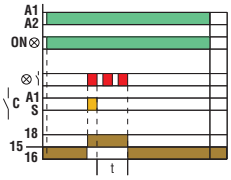
Flasher, starting with ON (work) interval. Equal timing recycle



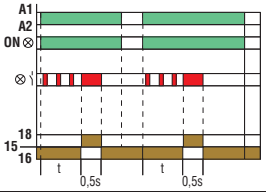
Internal ON/OFF trigger. Relay contact either closes or opens at each external contact closing



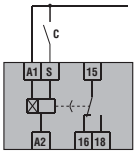
Off delay. Relay energising at external contact closing with start on break



Pulse generator. Unequal timing recycle, starting with OFF pulse time and 0.5sec ON time

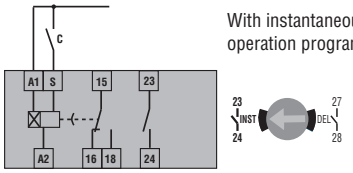


TM M1 NFC

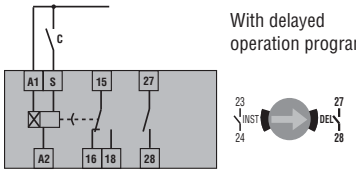


For operational diagrams see instructions manual on the website www.LovatoElectric.com.

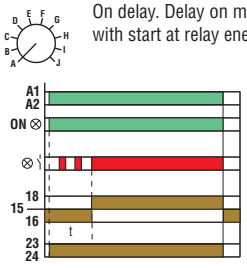
TM M2



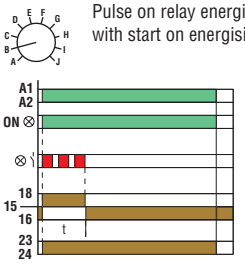
With instantaneous operation programmed



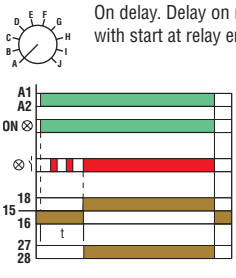
With delayed operation programmed



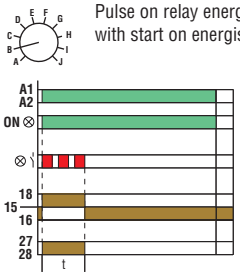
On delay. Delay on make, with start at relay energising



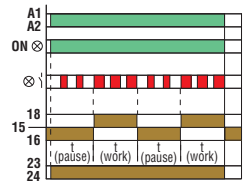
Pulse on relay energising with start on energising



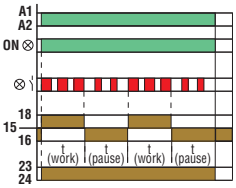
On delay. Delay on make, with start at relay energising



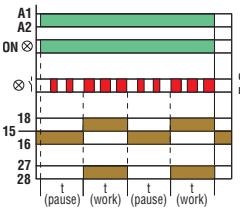
Pulse on relay energising with start on energising



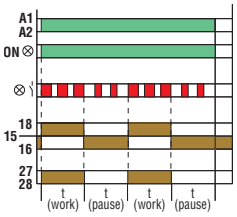
Flasher, starting with OFF (pause) interval. Equal timing recycle



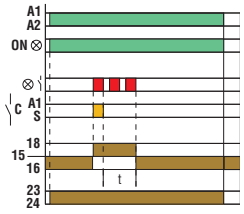
Flasher, starting with ON (work) interval. Equal timing recycle



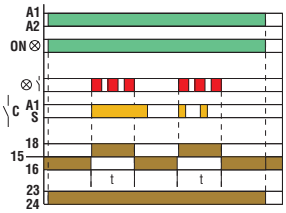
Flasher, starting with OFF (pause) interval. Equal timing recycle



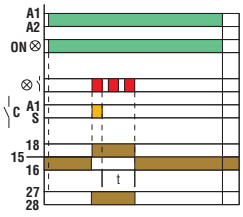
Flasher, starting with ON (work) interval. Equal timing recycle



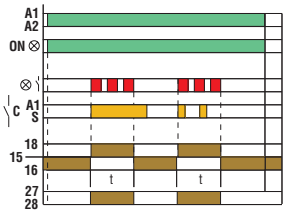
Off delay. Relay energising at external contact closing with start on break



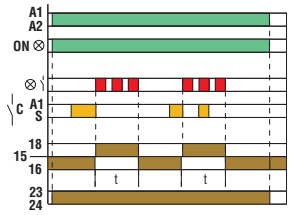
Pulse on relay energising with start on external contact closing



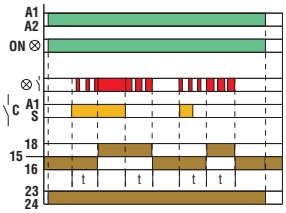
Off delay. Relay energising at external contact closing with start on break



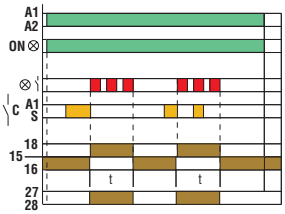
Pulse on relay energising with start on external contact closing



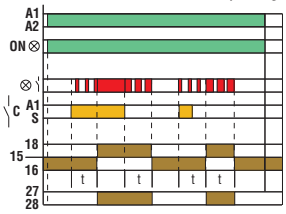
Pulse on relay energising with start on external contact opening



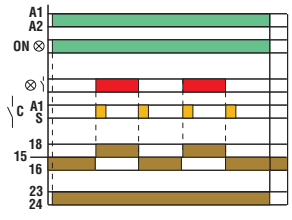
On-off delay. Delay make, with start at external contact closing and delay at break, with start at external contact opening



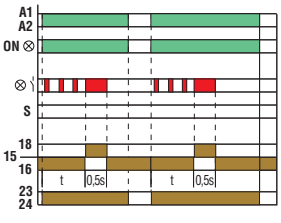
Pulse on relay energising with start on external contact opening



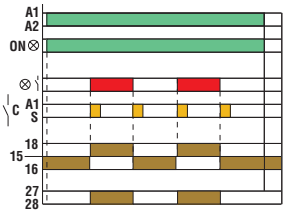
On-off delay. Delay make, with start at external contact closing and delay at break, with start at external contact opening



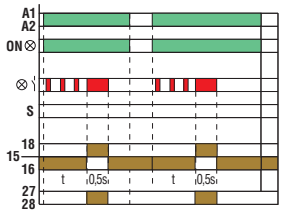
Internal trigger ON/OFF. Relay contact either closes or opens at each external contact closing



Pulse generator. Unequal timing recycle, starting with ON pulse time

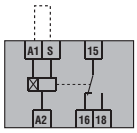


Internal trigger ON/OFF. Relay contact either closes or opens at each external contact closing

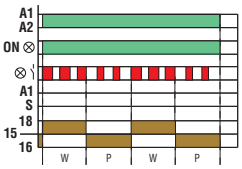


Pulse generator. Unequal timing recycle, starting with ON pulse time

TM PL

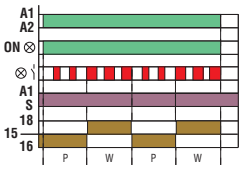


Flasher, starting with ON interval.
Equal timing recycle, ON first



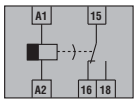
W = Work (ON)
P = Pause (OFF)

Flasher, starting with OFF interval.
Equal timing recycle, OFF first

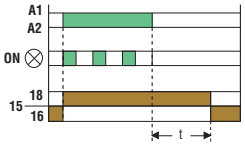


W = Work (ON)
P = Pause (OFF)

TM D

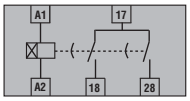


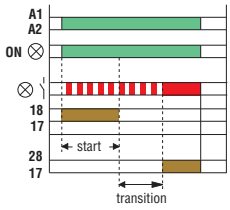
True off delay. Delay on break, starting at relay de-energising



TM ST

For starting

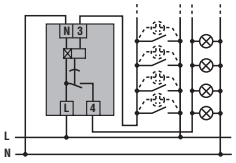




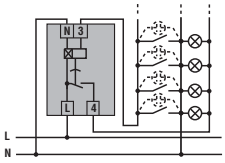
TM LS

Staircase lighting

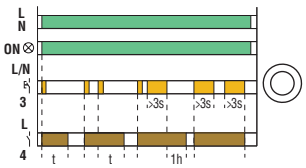
4-wire connection



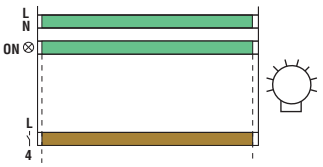
3-wire connection



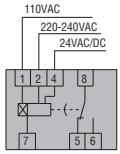
Timed lighting



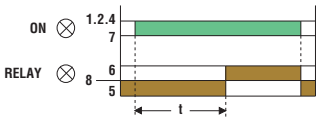
Constant lighting



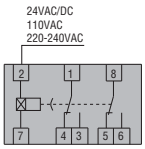
L48TP...



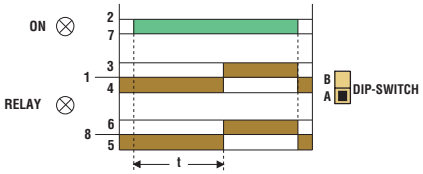
On delay

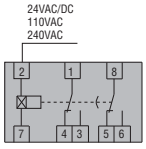


L48TPB...

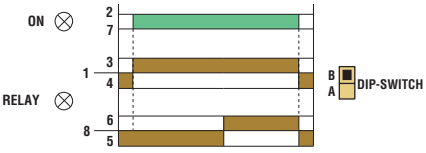


On delay with both instantaneous c/o contacts

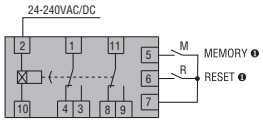




On delay with one instantaneous c/o contact and one late-break c/o contact

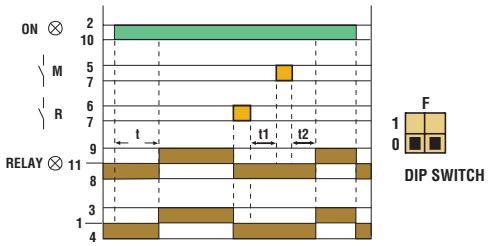


L48M...

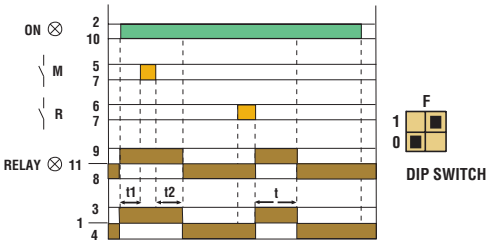


T (preset time) = T1+T2
❶ Contacts "M" and "R" are to be volt free (dry).

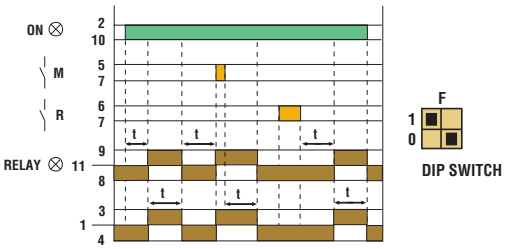
On delay



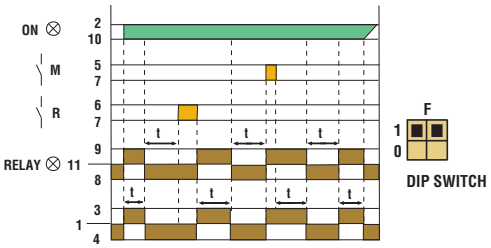
Pulse on relay energising with start on energising



Flasher starting with OFF



Flasher starting with ON



TYPE	TM P	TM P A440	TM M1 - TM M2	TM M1 NFC	TM PL	TM D	TM ST	TM LS
DESCRIPTION								
	On delay	On delay	Programmable multifunction	Programmable multifunction with NFC	Asymmetrical recycle	True off delay	For starting	Staircase illumination
	Multiscale	Multiscale	Multiscale	Multiscale	Multiscale	Multiscale	Multiscale	Single scale
	Multivoltage	Single voltage	Multivoltage	Multivoltage	Multivoltage	Multivoltage	Multivoltage	Single voltage
CONTROL CIRCUIT								
Rated auxiliary supply voltage Us	24...48VDC 24...240VAC	380...440VAC	12...240VAC/DC			24...240VAC/DC	24...48VDC 24...240VAC / 380...440VAC	220...240VAC
Rated frequency	50/60Hz							
Operating voltage range	0.85...1.1 Us							
Power consumption (maximum)	1.2VA/0.8W max (24...48VAC/DC) 16VA/0.9W max (110...240VAC)	19VA/1.7W max	TM M1: 0.6VA/0.3W max (12...48VAC/DC) 1.6VA/1.2W max (110...240VAC/DC) TM M2: 1.1VA/0,8W max (12...48VAC/DC) 1.8VA/1.2W max (110...240VAC/DC)	0.6VA/0.3W max (12...48VAC/DC) 1.6VA/1.2W max (110...240VAC/DC)	0.6VA/0.3W max (12...48VAC/DC) 1.6VA/1.2W max (110...240VAC/DC)	0.1VA/0.1W (24...48VAC/DC) 1.1VA/0.8W (110...240VAC/DC)	1.2VA/0.8W max (24...48VAC/DC) 1.6VA/0.9W max (110...240VAC)❶	De-energised 5VA/0.5W max Energised 12VA/0.8W max
TIMING CIRCUIT								
Time setting range	Multiscale 0.1...1s 1...10s 6s...60s 1...10min 6min...1h 1...10h 0,1...1day 1...10days ON only OFF only	Multiscale 0.1...1s 1...10s 6s...60s 1...10min	Multiscale 0.1...1s 1...10s 6s...60s 1...10min 6min...1h 1...10h 0.1...1day 1...10days ON only OFF only	Multiscale 0.1s...999h programmable via NFC and APP	Multiscale 0.1...1s 1...10s 6s...60s 1...10min 6min...1h 1h...10h 0.1...1gg 1...10gg 3...30gg 10...100gg	Multiscale 0.06...0.6s 0.6...6s 6s...60s 18s...180s	Multiscale 0.1...1s 1...10s 6s...60s 1...10min	Single scale 0.5...20min
Setting accuracy	< ±9%			0	< ±9%			
Repeat accuracy	< ±0.1%	< ±0.5%	<±0.5% - <±0.2%	< ±0.1%	< ±0.2%	< ±0.5%		
Influence of voltage variation	< ±0.01%							< ±0.5%
Average variation of set delays related to +20°C condition a –20°C	< ±0.2%							< ±0.25%
Minimum power time	—	—	—	—	—	≥ 200ms	—	—
Minimum ON time	—	—	25ms (no maximum limit)			—	—	≥ 60ms (no max lim.)
Resetting time during timing	≥ 100ms	≥ 100ms	≥ 100ms	≥ 100ms	≥ 100ms	—	≥ 100ms	≥ 100ms
Resetting time elapsed time	≥ 50ms	≥ 50ms	≥ 50ms	≥ 50ms	≥ 50ms	—	≥ 50ms	—
Immunity time for microbreakings	≤ 50ms	—	≤ 25ms - ≤ 15ms	≤ 25ms	≤ 25ms	—	≤ 40ms❷	≤ 20ms
RELAY OUTPUTS								
Contact arrangement	1 delayed changeover	2 delayed changeover	TM M1: 1 delayed changeover TM M2: 1 inst./delayed N/O + 1 delayed c/o	1 delayed changeover	1 delayed changeover	1 delayed changeover	2 delayed N/O	1 delayed N/O
Maximum switching voltage	250VAC							
IEC conventional free air thermal current (Ith)	8A	8A	8A	8A	8A	5A	8A	16A
UL/CSA and IEC/EN 60947-5-1 designation	B300							(16A AC1 240VAC)
Electrical life (with rated load)	10^5 cycles							
Mechanical life	$30x10^6$ cycles							
Tightening torque maximum	max. 0.8Nm (7lbin; 7...9lbin per UL)							
Conductor section min-max	0.2...4mm² (24...12 AWG; 12...18 AWG per UL)							
INSULATION (input-output)								
IEC rated insulation voltage	250V							
IEC rated impulse withstand voltage	4kV							
IEC power frequency withstand voltage	2kV							
AMBIENT CONDITIONS								
Operating temperature	–20...+60°C							
Storage temperature	–30...+80°C							
Housing material	Self-extinguishing polyamide							

❶ For 380...440VAC types: 19VA/1.7W max. ❷ Used at 24...48VDC or 24...240VAC; ≤30ms at 380...440VAC.
NOTE: N/O = normally open / SPST c/o = changeover / SPDT; inst. = instantaneous.

TYPE		L48TP...	L48TPB...	L48M...
DESCRIPTION				
		On delay	On delay	Programmable multifunction
		Multiscale	Multiscale	Multiscale
		Multivoltage	Single voltage	Multivoltage
CONTROL CIRCUIT				
Rated supply voltage Us		24VAC/DC❶	24VAC/DC❶	24...240VAC/DC❶
		110VAC❶	220...240VAC❶	
		220...240VAC❶		
Rated frequency		50...60Hz		
Operating voltage range		0.85...1.1 Us		
Power consumption (maximum)		6VA		
Power dissipation (maximum)		❷		
TIMING CIRCUIT				
Time setting range		Multiscale 0.3...3s 1.2...12s 10...100s 7.8...780s	Multiscale 0.05...1s 0.10...10s 0.6s...1min 6s...10min	Multiscale 0.05...1s 0.1...10s 0.6s...1min 6s...10min
		18s...3min 72s...12min 10...100min 78...780min		0.05...1min 0.1...10min 0.6min...1h 1min...10h
Setting accuracy		±5%		
Repeat accuracy		±0.5%		
Influence of voltage variation		±0,5%		
Average variation of set delays in related to 20°C condition	at –20°C	+2%		
	at +60°C	–3%		
Minimum ON time		—		
Resetting time	during operation	≥ 0.1s	≥ 0.1s	≥ 0.1s
	elasped time	≥ 65ms	≥ 65ms	≥ 65ms
Immunity time for microbreakings		≤ 40ms	≤ 40ms	≤ 40ms
RELAY OUTPUTS				
Number of relays		1	2	2
Contact arrangement		1 delayed c/o	2 del. or 1 inst. + 1 del. c/o	2 delayed c/o
Maximum switching voltage		250V		
IEC conventional free air thermal current (Ith)		5A		
UL/CSA and IEC/EN 60947-5-1 designation		B300		
Electrical life (with rated load)		10^5 cycles		
Mechanical life		$30x10^6$ cycles		
CONNECTIONS				
Tightening torque maximum		—		
Conductor section (min-max)		—		
INSULATION (input-output)				
IEC rated insulation voltage Ui		250V		
IEC power frequency withstand voltage Uimp		—		
IEC power frequency withstand voltage		2kV		
AMBIENT CONDITIONS				
Operating temperature		–10...+60°C		
Storage temperature		–30...+80°C		
Housing material		Self-extinguishing polyamide		

❶ Other voltages on request.
❷ Consult Technical support for information; see contact details on inside front cover.
NOTE: del. = delayed inst. = instantaneous c/o = changeover/SPDT

- Modular version for modular-slot switchboards, also suitable for rear mounting plate fixing
- Minimum and maximum voltage monitoring relays for single and three-phase systems, with or without neutral
- Voltage asymmetry, phase sequence and phase loss control relays
- Multifunction voltage and frequency monitoring relays with NFC technology and APP
- Frequency monitoring relays
- Minimum and maximum current monitoring relays
- Interface protection system units compliant with Italian standards CEI 0-21, CEI 0-16, DEWA DRRG and G59.

Pages 18-4 to 7

VOLTAGE MONITORING RELAYS
- For three-phase systems with or without neutral and single-phase systems
- Minimum and maximum AC voltage
- Phase loss and incorrect phase sequence
- Asymmetry
- Minimum and maximum frequency.

Page 18-8

MULTIFUNCTION VOLTAGE AND FREQUENCY MONITORING RELAYS
- Voltage and frequency monitoring relays for three-phase systems with or without neutral
- Programmable via NFC technology and APP
- Minimum and maximum AC voltage
- Phase loss, neutral loss and incorrect phase sequence
- Asymmetry
- Minimum and maximum frequency.

Page 18-8

FREQUENCY MONITORING RELAYS
- For single and three-phase systems
- Minimum frequency
- Maximum frequency.

Pages 18-9 and 10

CURRENT MONITORING RELAYS
- For single and three-phase systems
- Maximum AC/DC current
- Minimum or maximum AC/DC current
- Minimum and maximum AC/DC current.

Page 18-11

PUMP PROTECTION RELAYS
- For single and three-phase systems
- Minimum cosφ for dry running protection
- Maximum AC current
- Phase loss and incorrect phase sequence.

Page 18-12

INTERFACE PROTECTION SYSTEM UNITS
- Compliant with Italian standard CEI 0-21, for low voltage
- Compliant with Italian standard CEI 0-16, for medium voltage
- Compliant with standard SHAMS DUBAI - DRRG (DEWA)
- Compliant with technical guide G59 (ENA).

Lovato electric

Voltage monitoring relays for three-phase systems without neutral




	PMV10	PMV20	PMV30	PMV40	PMV50	PMV70
Modular version	●(1U)	●(2U)	●(2U)	●(2U)	●(2U)	●(2U)
Minimum AC voltage			●		●	●
Maximum AC voltage					●	●
Phase loss	●	●	●	●	●	●
Incorrect phase sequence	●	●	●	●	●	●
Asymmetry				●		●
Page	18-4				18-5	18-5

Voltage monitoring relays for three-phase systems with or without neutral




NFC

	PMV50N	PMV70N	PMV80N	PMV95N
Modular version	●(3U)	●(3U)	●(3U)	●(2U)
Minimum AC voltage	●	●	●	●
Maximum AC voltage	●	●	●	●
Phase loss	●	●	●	●
Neutral loss	●	●	●	●
Incorrect phase sequence	●	●	●	●
Asymmetry		●		●
Minimum frequency			●	●
Maximum frequency			●	●
Programmable via NFC technology and APP				●
Page	18-6	18-6	18-7	18-8

Voltage monitoring relay for single-phase systems

	PMV55
Modular version	●(2U)
Minimum AC voltage	●
Maximum AC voltage	●
Page	18-7

Frequency monitoring relays for single-phase and three-phase systems

	PMF20
Modular version	●(2U)
Minimum frequency	●
Maximum frequency	●
Page	18-8

Current monitoring relays for single and three-phase systems

	PMA20	PMA30	PMA40
Modular version	●(2U)	●(2U)	●(3U)
Maximum AC/DC current	●		
Minimum or maximum AC/DC current		●	
Minimum and maximum AC/DC current			●
Page	18-9	18-10	

Pump protection relay for single and three-phase systems

	PMA50
Modular version	●(3U)
Minimum cosφ for dry running pump protection	●
Maximum AC current	●
Phase loss	●
Incorrect phase sequence	●
Page	18-11

Interface protection system units

	PMVF20	PMVF30	PMVF51	PMVF60	PMVF70
CEI 0-21	●		●		
CEI 0-16		●			
DEWA DRRG				●	
G59					●
Page	18-12	18-14	18-13	18-15	18-16

For three-phase systems, without neutral

PMV10 A440

Order code	Rated voltage to control Ue (phase to phase)	Qty per pkg	Wt
	[V] 50/60Hz	n°	[kg]
Three-phase system, without neutral. Phase loss and incorrect phase sequence. Instantaneous trip. 1 module housing.			
PMV10 A440	208...480VAC	1	0.050
2 modules housing.			
PMV20 A240	100...240VAC	1	0.120
PMV20 A575	208...575VAC	1	0.120
PMV20 A600	380...600VAC	1	0.120

General characteristics
- Voltage monitoring relay, self powered, for phase loss and incorrect phase sequence
- Phase loss detection if one of the voltages is <70% rated value
- Phase loss tripping time: 60ms
- 1 relay output with 1 changeover contact (SPDT)
- Modular DIN 43880 housing: 1 module for PMV10; 2 modules for PMV20
- IEC degree of protection: IP40 on front (only when placed in IP40 enclosure or control board); IP20 at terminals.

Certifications and compliance
Certifications obtained: EAC; UL Listed, for USA and Canada (cULus - File E93601) as Auxiliary Devices.
Compliant with standards: IEC/EN 60255-5, IEC/EN 61000-6-2, IEC/EN 61000-6-3, UL 508, CSA C22.2 n° 14.

PMV20...

Order code	Rated voltage to control Ue (phase to phase)	Qty per pkg	Wt
	[V] 50/60Hz	n°	[kg]
Three-phase system, without neutral. Minimum AC voltage. Delayed trip. Phase loss and incorrect phase sequence. Instantaneous trip.			
PMV30 A240	208...240VAC	1	0.130
PMV30 A575	380...575VAC	1	0.130
PMV30 A600	600VAC	1	0.130

General characteristics
- Voltage monitoring relay, self powered, for minimum voltage, phase loss and incorrect phase sequence
- Configurable rated voltage (Ue):
  - PMV30 A240: 208-220-230-240VAC
  - PMV30 A575: 380-400-415-440-460-480-525-575VAC
- Excellent tripping accuracy
- TRMS measurements (True Root Mean Square)
- Control of phase-to-phase voltages
- Phase loss detection if one of the voltages is <70% rated value
- Phase loss tripping time: 60ms
- 1 relay output with 1 changeover contact (SPDT)
- Modular DIN 43880 housing, 2 modules
- IEC degree of protection: IP40 on front (only when placed in IP40 enclosure or control board); IP20 at terminals.

ADJUSTMENTS

"V min"	Minimum voltage tripping threshold 80...95% Ue
"Delay"	Tripping time 0.1...20s
"Reset delay"	Resetting time 0.1...20s.

Certifications and compliance
Certifications obtained: EAC; UL Listed, for USA and Canada (cULus - File E93601), as Auxiliary Devices.
Compliant with standards: IEC/EN 60255-5, IEC/EN 61000-6-2, IEC/EN 61000-6-3, UL 508, CSA C22.2 n° 14.

PMV30...

Order code	Rated voltage to control Ue (phase-to-phase)	Qty per pkg	Wt
	[V] 50/60Hz	n°	[kg]
Three-phase system, without neutral. Asymmetry. Delayed trip. Phase loss and incorrect phase sequence. Instantaneous trip.			
PMV40 A240	208...240VAC	1	0.130
PMV40 A575	380...575VAC	1	0.130
PMV40 A600	600VAC	1	0.130

General characteristics
- Voltage monitoring relay, self powered, for asymmetry, phase loss and incorrect phase sequence
- Excellent tripping accuracy
- TRMS measurements (True Root Mean Square)
- Control of phase-to-phase voltages
- Phase loss detection if one of the voltages is <70% rated value
- Phase loss tripping time: 60ms
- 1 relay output with 1 changeover contact (SPDT)
- Modular DIN 43880 housing, 2 modules
- IEC degree of protection: IP40 on front (only when placed in IP40 enclosure or control board); IP20 at terminals.

ADJUSTMENTS

"Asymmetry"	High voltage asymmetry tripping threshold 5...15% Ue
"Delay"	Tripping time 0.1...20s
"Reset delay"	Resetting time 0.1...20s.

Certifications and compliance
Certifications obtained: EAC; UL Listed, for USA and Canada (cULus - File E93601), as Auxiliary Devices.
Compliant with standards: IEC/EN 60255-5, IEC/EN 61000-6-2, IEC/EN 61000-6-3, UL 508, CSA C22.2 n° 14.

PMV40...

For three-phase systems, without neutral

PMV50...

Order code	Rated voltage to control Ue (phase-to-phase)	Qty per pkg	Wt
	[V] 50/60Hz	n°	[kg]
Three-phase system, without neutral. Minimum and maximum AC voltage. Delayed trip. Phase loss and incorrect phase sequence. Instantaneous trip.			
PMV50 A240	208...240VAC	1	0.130
PMV50 A575	380...575VAC	1	0.130
PMV50 A600	600VAC	1	0.130

General characteristics
- Voltage monitoring relay, self powered, for minimum and maximum voltage, phase loss and incorrect phase sequence
- Configurable rated voltage (Ue):
  - PMV50 A240: 208-220-230-240VAC
  - PMV50 A575: 380-400-415-440-460-480-525-575VAC
- High tripping accuracy
- TRMS measurements (True Root Mean Square)
- Control of phase-to-phase voltages
- Phase loss detection if one of the voltages is <70% rated value
- Phase loss tripping time: 60ms
- 1 relay output with 1 changeover contact (SPDT)
- Modular DIN 43880 housing, 2 modules
- IEC degree of protection: IP40 on front (only when placed in IP40 enclosure or control board); IP20 on terminals.

ADJUSTMENTS

"V max"	Maximum voltage tripping threshold 105...115% Ue
"V min"	Minimum voltage tripping threshold 80...95% Ue
"Delay" for each	Tripping time 0.1...20s
"Reset delay"	Resetting time 0.1...20s.

Certifications and compliance
Certifications obtained: EAC; UL Listed, for USA and Canada (cULus - File E93601) as Auxiliary Devices.
Compliant to standards: IEC/EN 60255-5, IEC/EN 61000-6-2, IEC/EN 61000-6-3, UL 508, CSA C22.2 n° 14.

PMV70...

Order code	Rated voltage to control Ue (phase to phase)	Qty per pkg	Wt
	[V] 50/60Hz	n°	[kg]
Three-phase system, without neutral. Minimum and maximum AC voltage and asymmetry. Delayed trip. Phase loss and incorrect phase sequence. Instantaneous trip.			
PMV70 A240	208...240VAC	1	0.130
PMV70 A575	380...575VAC	1	0.130
PMV70 A600	600VAC	1	0.130

General characteristics
- Voltage monitoring relay, self powered, for minimum and maximum voltage, phase loss, incorrect phase sequence and asymmetry
- Configurable rated voltage (Ue):
  - PMV70 A240: 208-220-230-240VAC
  - PMV70 A575: 380-400-415-440-460-480-525-575VAC
- Excellent tripping accuracy
- TRMS measurements (True Root Mean Square)
- Control of phase-to-phase voltages
- Phase loss detection if one of the voltages is <70% rated value
- Phase loss tripping time: 60ms
- 1 relay output with 1 changeover contact (SPDT)
- Modular DIN 43880 housing, 2 modules
- IEC degree of protection: IP40 on front (only when placed in IP40 enclosure or control board); IP20 at terminals.

ADJUSTMENTS

"V max"	Maximum voltage tripping threshold 105...115% Ue
"V min"	Minimum voltage tripping threshold 80...95% Ue
"Delay" for each	Tripping delay 0.1...20s
"Asymmetry"	High voltage asymmetry tripping threshold 5...15% Ue.

Certifications and compliance
Certifications obtained: EAC; UL Listed, for USA and Canada (cULus - File E93601), as Auxiliary Devices.
Compliant with standards: IEC/EN 60255-5, IEC/EN 61000-6-2, IEC/EN 61000-6-3, UL 508, CSA C22.2 n° 14.

For three-phase systems with or without neutral

PMV50N...

Order code	Rated voltage to control Ue (phase to phase)	Qty per pkg	Wt
	[V] 50/60Hz	n°	[kg]
Three-phase system, with or without neutral. Minimum and maximum AC voltage. Delayed trip. Phase loss, neutral loss and incorrect phase sequence. Instantaneous trip.			
PMV50N A240	208...240VAC	1	0.200
PMV50N A440	380...440VAC	1	0.200
PMV50N A600	480...600VAC	1	0.200

General characteristics
- Voltage monitoring relay, self powered, for minimum and maximum voltage, phase loss, neutral loss and incorrect phase sequence
- 4 configurable rated voltage (Ue):
  - PMV50N A240: 208-220-230-240VAC (phase-phase) 120-127-132-138VAC (phase-neutral)
  - PMV50N A440: 380-400-415-440VAC (phase-phase) 220-230-240-254VAC (phase-neutral)
  - PMV50N A600: 480-525-575-600VAC (phase-phase) 277-303-332-347VAC (phase-neutral)
- Excellent tripping accuracy
- TRMS measurements (True Root Mean Square)
- Phase loss detection when one of the voltages is <70% rated voltage
- Phase or neutral loss tripping time: 60ms
- 2 relay outputs, each with 1 changeover contact (SPDT)
- Modular DIN 43880 housing, 3 modules
- IEC degree of protection: IP40 on front (only when placed in IP40 enclosure or control board); IP20 at terminals.

ADJUSTMENTS

"V max"	Maximum voltage tripping threshold 105...115% Ue
"V min"	Minimum voltage tripping threshold 80...95% Ue
"Delay" for each	Tripping time 0.1...20s
"Reset Delay"	Resetting time 0.1...20s.

Certifications and compliance
Certifications obtained: EAC.
Compliant with standards: IEC/EN 60255-5, IEC/EN 61000-6-2, IEC/EN 61000-6-3, UL 508, CSA C22.2 n° 14.

PMV70N...

Order code	Rated voltage to control Ue (phase to phase)	Qty per pkg	Wt
	[V] 50/60Hz	n°	[kg]
Three-phase system, with or without neutral. Minimum and maximum AC voltage and asymmetry. Delayed trip. Phase loss, neutral loss and incorrect phase sequence. Instantaneous trip.			
PMV70N A240	208...240VAC	1	0.200
PMV70N A440	380...440VAC	1	0.200
PMV70N A600	480...600VAC	1	0.200

General characteristics
- Voltage monitoring relay, self powered, for minimum and maximum voltage, phase loss, neutral loss, incorrect phase sequence and asymmetry
- 4 configurable rated voltage (Ue):
  - PMV70N A240: 208-220-230-240VAC (phase-phase) 120-127-132-138VAC (phase-neutral)
  - PMV70N A440: 380-400-415-440VAC (phase-phase) 220-230-240-254VAC (phase-neutral)
  - PMV70N A600: 480-525-575-600VAC (phase-phase) 277-303-332-347VAC (phase-neutral)
- Excellent tripping accuracy
- TRMS measurements (True Root Mean Square)
- Phase loss detection when one of the voltages is <70% rated value
- Phase or neutral loss tripping time: 60ms
- 2 relay outputs, each with 1 changeover contact (SPDT)
- Modular DIN 43880 housing, 3 modules
- IEC degree of protection: IP40 on front (only when placed in IP40 enclosure or control board); IP20 at terminals.

ADJUSTMENTS

"V max"	Maximum voltage tripping threshold 105...115% Ue
"V min"	Minimum voltage tripping threshold 80...95% Ue
"Delay" for each	Tripping time 0.1...20s
"Asymmetry"	High voltage asymmetry tripping threshold 5...15% Ue.

Certifications and compliance
Certifications obtained: EAC.
Compliant with standards: IEC/EN 60255-5, IEC/EN 61000-6-2, IEC/EN 61000-6-3, UL 508, CSA C22.2 n° 14.

For three-phase systems, with or without neutral

PMV80N...

Order code	Rated voltage to control Ue (phase to phase)	Qty per pkg	Wt
	[V] 50/60Hz	n°	[kg]
Three-phase system, with or without neutral. Minimum and maximum AC voltage, minimum and maximum frequency. Delayed trip. Phase loss, neutral loss and incorrect phase sequence. Instantaneous trip.			
PMV80N A240	208...240VAC	1	0.200
PMV80N A440	380...440VAC	1	0.200
PMV80N A600	480...600VAC	1	0.200

General characteristics
- Voltage monitoring relay, self powered, for minimum and maximum voltage, minimum and maximum frequency, phase loss, neutral loss and incorrect phase sequence
- 4 configurable rated voltage (Ue):
  - PMV80N A240: 208-220-230-240VAC (phase-phase) 120-127-132-138VAC (phase-neutral)
  - PMV80N A440: 380-400-415-440VAC (phase-phase) 220-230-240-254VAC (phase-neutral)
  - PMV80N A600: 480-525-575-600VAC (phase-phase) 277-303-332-347VAC (phase-neutral)
- Excellent tripping accuracy
- TRMS measurements (True Root Mean Square)
- Phase loss detection if one of the voltages is <70% rated value
- Phase or neutral loss tripping time: 60ms
- 2 relay outputs, each with 1 changeover contact (SPDT)
- Modular DIN 43880, 3 modules
- IEC degree of protection: IP40 on front (only when placed in iP40 enclosure or control board); IP20 at terminals.

ADJUSTMENTS

"V max"	Maximum voltage tripping threshold 105...115% Ue
"V min"	Minimum voltage tripping threshold 80...95% Ue
"Hz min/max"	Minimum/maximum frequency tripping threshold 1...10%
"V delay"	Tripping time 0.1...20s
"Hz delay"	Tripping time 0.1...5s.

Certifications and compliance
Certifications obtained: EAC.
Compliant with standards: IEC/EN 60255-5, IEC/EN 61000-6-2, IEC/EN 61000-6-3, UL 508, CSA C22.2 n° 14.

For single-phase systems

PMV55...

Order code	Rated voltage to control Ue	Qty per pkg	Wt
	[V] 50/60Hz	n°	[kg]
Single-phase system. Minimum and maximum AC voltage. Delayed trip.			
PMV55 A240	208...240VAC	1	0.125
PMV55 A440	380...440VAC	1	0.125

General characteristics
- Voltage monitoring relay, self powered, for minimum and maximum voltage
- 4 configurable rated voltage (Ue):
  - PMV55 A240: 208-220-230-240VAC
  - PMV55 A440: 380-400-415-440VAC
- Excellent tripping accuracy
- TRMS measurements (True Root Mean Square)
- 1 relay output with 1 changeover contact (SPDT)
- Modular DIN 43880 housing, 2 modules
- IEC degree of protection: IP40 on front (only when placed in IP40 enclosure or control board); IP20 at terminals.

ADJUSTMENTS

"V max"	Maximum voltage tripping threshold 105...115% Ue
"V min"	Minimum voltage tripping threshold 80...95% Ue
"Delay" for each	Tripping time 0.1...20s
"Reset delay"	Resetting time 0.1...20s.

Certifications and compliance
Certifications obtained: EAC; UL Listed, for USA and Canada (cULus - File E93601), as Auxiliary Devices.
Compliant with standards: IEC/EN 60255-5, IEC/EN 61000-6-2, IEC/EN 61000-6-3, UL 508, CSA C22.2 n° 14.

Multifunction voltage and frequency monitoring relays for three-phase systems with or without neutral, with NFC technology and APP

PMV95N...

new

Order code	Rated voltage to control Ue (phase to phase)	Qty per pkg	Wt
	[V] 50/60Hz	n°	[kg]
Three-phase system, with or without neutral. Minimum and maximum AC voltage, minimum and maximum frequency and asymmetry. Delayed trip. Phase loss, neutral loss and phase sequence. Instantaneous trip. Programmable via smartphone or tablet with NFC technology and APP.			
PMV95N A240 NFC	208...240VAC	1	0.130
PMV95N A575 NFC	380...575VAC	1	0.130

General characteristics
- Multifunction voltage and frequency monitoring relay, self powered, for minimum and maximum voltage, minimum and maximum frequency, phase loss, neutral loss, incorrect phase sequence and asymmetry.
- NFC connectivity for parameter setting with NFC APP, may be downloaded for free from Google Play Store
- Simple, fast and intuitive programming
- Very high accuracy and repeatibility of the settings
- Possibility to save the program on smartphone or tablet to be copied on other PMV95N, even with device powered off
- Possibility to enable or disable individually the functions of interest
- Possibility to protect the settings with a password
- QR code for the direct connection to the LOVATO Electric website for the download of the technical manual
- Excellent tripping accuracy
- TRMS measurements (True Root Mean Square)
- Phase loss detection if one of the voltages is <70% rated value
- 1 relay output with changeover contact (SPDT)
- Modular DIN 43880 housing, 2 modules
- IEC degree of protection: IP40 on front (only when placed in IP40 enclosure or control board); IP20 at terminals.

ADJUSTMENTS:
Consult the technical manual on the website www.LovatoElectric.com.

Certifications and compliance
Certifications (pending): cULus, EAC.
Compliant with standards: IEC/EN 60255-5, IEC/EN 61000-6-2, IEC/EN 61000-6-3, UL 508, CSA C22.2 n° 14.

Frequency monitoring relay for single and three-phase systems

PMF20...

Order code	Rated voltage Ue	Qty per pkg	Wt
	[V] 50/60Hz	n°	[kg]
Single and three-phase systems. Minimum and maximum frequency. Delayed trip. Automatic reset.			
PMF20 A240	220...240VAC	1	0.125
PMF20 A415	380...415VAC	1	0.125

General characteristics
- Frequency monitoring relay, self powered, for minimum and maximum control
- Rated frequency selection: 50 or 60Hz
- Tripping threshold for minimum and maximum frequency
- Excellent tripping accuracy
- 1 relay output, configurable, with 1 changeover contact (SPDT)
- Modular DIN 43880 housing, 2 modules
- IEC degree of protection: IP40 on front (only when placed in IP40 enclosure or control board); IP20 at terminals.

ADJUSTMENTS

"Hz max"	Maximum frequency tripping threshold +1...+10%
"Delay"	Tripping time 0.1...20s
"Hz min"	Minimum frequency tripping threshold -1...-10%
"Delay"	Tripping time 0.1...20s
"Reset delay"	Resetting time 0.1...20s
"Mode"	• Minimum and maximum frequency • Output relay energised at maximum frequency • Output relay energised at minimum frequency • Output relay de-energised at maximum frequency.

Certifications and compliance
Certifications obtained: EAC; UL Listed, for USA and Canada (cULus - File E93601), as Auxiliary Devices.
Compliant with standards: IEC/EN 60255-5, IEC/EN 61000-6-2, IEC/EN 61000-6-3, UL 508, CSA C22.2 n° 14.

For single-phase systems

PMA20 240

Order code	Rated current Ie	Auxiliary supply voltage	Qty per pkg	Wt
	[A]	[V]	n°	[kg]
Single-phase system. AC/DC maximum current control. Auxiliary AC/DC power supply. Automatic or manual reset.				
PMA20 240	5 or 16A	24...240V AC/DC	1	0.121

General characteristics

- Current monitoring relay for AC/DC maximum current control, AC/DC multivoltage auxiliary power supply
- Direct connection up to 16A max or by current transformer (CT)
- Excellent tripping accuracy
- TRMS current measurements (True Root Mean Square)
- Resetting and inhibition input
- 1 relay output with 1 changeover contact (SPDT)
- Modular DIN 43880 housing, 2 modules
- IEC degree of protection: IP40 on front (only when placed in IP40 enclosure or control board); IP20 at terminals.

ADJUSTMENTS

"Imax"	Maximum current tripping threshold 5...100% Ie
"Hysteresis"	Maximum hysteresis thresold 1...50%
"Trip delay"	Tripping time 0.1...30s
"Inhibition time"	Inhibition delay for external input or at power up 1...60s
"Aut. reset delay"	Automatic resetting time 0.1...30s
"Mode"	• Rated current 5A or 16A • Relay output normally energised or de-energised • Tripping memory (Latch) On or Off.

Certifications and compliance

Certifications obtained: EAC; UL Listed, for USA and Canada (cULus - File E93601), as Auxiliary Devices - Modular ampere monitoring relays.
Compliant with standards: IEC/EN 60255-5, IEC/EN 61000-6-2, IEC/EN 61000-6-3, UL 508, CSA C22.2 n° 14.

For single and three-phase systems

PMA30 240

Order code	Rated current Ie	Auxiliary supply voltage	Qty per pkg	Wt
	[A]	[V]	n°	[kg]
Single and three-phase system. AC/DC minimum or maximum current control. Delayed trip. Auxiliary AC/DC power supply. Automatic or manual reset.				
PMA30 240	5 or 16A	24...240V AC/DC	1	0.121

General characteristics
- Current monitoring relay for AC/DC minimum or maximum current control; AC/DC multivoltage auxiliary power supply
- Direct connection up to 16A max or by current transformer (CT)
- Excellent tripping accuracy
- TRMS current measurements (True Root Mean Square)
- Resetting and inhibition input
- 1 relay output with 1 changeover contact (SPDT)
- Modular DIN 43880 housing, 2 modules
- IEC degree of protection: IP40 on front (only when placed in IP40 enclosure or control board); IP20 at terminals.

ADJUSTMENTS

"Set point"	Minimum or maximum current tripping threshold 5...100% Ie
"Hysteresis"	Minimum or maximum hysteresis threshold 1...50%
"Trip delay"	Tripping time 0.1...30s
"Inhibition time"	Inhibition delay for external input or at power up 1...60s
"Ie"	Current scale selection: 5A or 16A
"Mode"	• Min or max function • Relay output normally energised or de-energised • Tripping memory (Latch) On or Off.

Certifications and compliance
Certifications obtained: EAC; UL Listed, for USA and Canada (cULus - File E93601), as Auxiliary Devices - Modular ampere monitoring relays.
Compliant with standards: IEC/EN 60255-5, IEC/EN 61000-6-2, IEC/EN 61000-6-3, UL 508, CSA C22.2 n° 14.

PMA40 240

Order code	Rated current Ie	Auxiliary supply voltage	Qty per pkg	Wt
	[A]	[V]	n°	[kg]
Single and three-phase system. AC/DC minimum and maximum current control. Delayed trip. Auxiliary AC/DC power supply. Automatic or manual reset.				
PMA40 240	0.02-0.05-0.25-1-5-16A	24...240V AC/DC	1	0.166

General characteristics
- Current monitoring relay for AC/DC minimum and maximum current control, AC/DC multivoltage auxiliary power supply
- Direct connection up to 16A max or by current transformer (CT)
- Excellent tripping accuracy
- TRMS current measurements (True Root Mean Square)
- Automatic or manual resetting (manual resetting by power removal)
- 2 relay outputs (Min and Max), configurable, each with 1 changeover contact (SPDT)
- Modular DIN 43880 housing, 3 modules
- IEC degree of protection: IP40 on front (only when placed in IP40 enclosure or control board); IP20 at terminals.

ADJUSTMENTS

"Imax"	Maximum current tripping threshold 5...100% Ie
"Imin"	Minimum current tripping threshold 5...100% Ie
"Trip delay"	Minimum and maximum current tripping time 0.1...30s
"Inhibition time"	Inhibition time at power up 1...60s
"Ie"	Current scale selection: 20mA, 50mA, 250mA, 1A, 5A or 16A
"Mode"	• Separate or common relay outputs • Relay output normally energised or de-energised • Tripping memory (Latch) On or Off.

Certifications and compliance
Certifications obtained: EAC; UL Listed, for USA and Canada (cULus - File E93601), as Auxiliary Devices - Modular ampere monitoring relays.
Compliant with standards IEC/EN 60255-5, IEC/EN 61000-6-2, IEC/EN 61000-6-3, UL 508, CSA C22.2 n° 14.

For single and three-phase systems

PMA50…

Order code	Rated current Ie	Auxiliary supply voltage	Qty per pkg	Wt
	[A]	[V]	n°	[kg]
Single and three-phase systems. Maximum AC current and minimum cosφ. Delayed trip. Phase loss and incorrect phase sequence. Instantaneous trip. Auxiliary AC power supply. Automatic or manual reset.				
PMA50 A240	5 or 16A	220...240VAC	1	0.251
PMA50 A415		380...415VAC	1	0.251
PMA50 A480		440...480VAC	1	0.251

General characteristics
- Pump protection relay against dry running, auxiliary AC power supply
- Motor under-load and over-current control
- Direct connection up to 16A max or by current transformer (CT)
- Excellent tripping accuracy
- Voltage control range 80...660VAC
- Current control range 0.1...16A
- Resetting and enabling consent input
- 1 relay output relay with 1 changeover contact (SPDT)
- Modular DIN 43880 housing, 3 modules
- IEC degree of protection: IP40 on front (only when placed in IP40 enclosure or control board); IP20 at terminals.

ADJUSTMENTS

"Cosφ min"	Minimum cosφ threshold 0.1...0.99 (under-load/dry running)
"Imax"	Maximum (over) current threshold 10...100%Ie
"Trip delay"	Tripping time for minimum cosφ and maximum current 0.1...10s
"Inhibition time"	Inhibition delay for external input or at power up 1...60s
"Aut. reset delay"	Automatic reset time OFF...100min
"Mode"	• Rated current 5A or 16A • Single or three phase • External reset On or Off.

Certifications and compliance
Certifications obtained: EAC; UL Listed, for USA and Canada (cULus - File E93601), as Auxiliary Devices - Modular ampere monitoring relays.
Compliant with standards: IEC/EN 60255-5, IEC/EN 61000-6-2, IEC/EN 61000-6-3, UL 508, CSA C22.2 n° 14.

For low voltage

PMVF 20...

Order code	Rated voltage Control	Auxiliary	Qty per pkg	Wt
	[V]	[V]	n°	[kg]
Three-phase system, with or without neutral, in low voltage. Dual threshold minimum and maximum voltage and frequency protection. Flush mount type.				
PMVF 20	230VAC 400VAC	100...400VAC/ 110...250VDC	1	0.568
PMVF 20 D048		12...48VDC	1	0.580

Voltage threshold per CEI 0-21

Type of protection	Tripping threshold	Tripping time
Maximum voltage 59.S2	1.15Un	0.2s
Maximum voltage 59.S1 (moving mean over 10min)	1.10Un	≤ 3s
Minimum voltage 27.S1	0.85Un	0.4s
Minimum voltage 27.S2	0.4Un	0.2s

Frequency threshold per CEI 0-21

Type of protection	Tripping threshold	Tripping time
High external signal and low local control conditions.		
Maximum frequency 81>.S2	51.5Hz	0.1s
Minimum frequency 81<.S2	47.5Hz	0.1s
Low external signal and high local control conditions.		
Maximum frequency 81>.S2	51.5Hz	1s
Minimum frequency 81<.S2	47.5Hz	4s
High conditions for both external signal and local control.		
Maximum frequency 81>.S1	50.5Hz	0.1s
Minimum frequency 81<.S1	49.5Hz	0.1s

NOTE: Low conditions for both external signal and local control are not taken into consideration by the standard.

EXP10 03

Order code	Description
EXPANSION MODULES FOR PMVF 20. For independent signal in case of phase power unbalance (LSP).	
EXP10 03	2 relay outputs 5A 250VAC
Communication ports.	
EXP10 18❶	IEC/EN 61850 interface
EXP10 10	Opto-isolated USB interface
EXP10 11	Opto-isolated RS232 interface
EXP10 12	Opto-isolated RS485 interface
EXP10 13	Opto-isolated Ethernet interface

❶ **IEC/EN 61850 protocol**
The EXP10 18 module will be made available only when the competent authorities have established the exact terms of the supervision and control of the specific commands (currently under study as specified in the Italian CEI 0-21 standard).

General characteristics
PMVF 20 interface protection system (IP) unit has been developed according to the Italian CEI 0-21 standard prescriptions. It is used when a local generating system is connected in parallel with the low-voltage electric utility. The controls refer to limits of voltage and frequency monitoring.
In the case when either the voltage or the frequency are out of admissible limits, the SPI must step in by de-energising a relay output so that the interface device (DDI) trips.
PMVF 20 is equipped with 4 inputs having the following functions:
- DDI status feedback
- External signal for frequency selection (communication network malfunction)
- Local control for frequency selection
- Remote tripping (forced DDI opening independent of voltage and frequency values).

Also, there are two relay outputs for:
- DDI opening and closing
- Standby device opening (programmable: retentive normally energised, retentive normally de-energised or adjustable pulse).

The standby device control is compulsory in installations with more than 20kW and consists of a signal, with a 0.5s delay respect to the DDI opening command, transmitted only if the DDI fails and does not complete the disconnection.
By fitting the EXP10 03 expansion module on the PMVF 20, the following functions can be configured as:
- Programmable alarm
- Autonomous signalling in case of phase power unbalance (LSP), only if three CTs are also installed.

Operational characteristics
- Auxiliary voltage:
  - PMVF 20: 100…400VAC/110…250VDC
  - PMVF 20 D048: 12…48VDC
- Voltage inputs:
  - 400VAC (three-phase connection)
  - 230VAC (single-phase connection)
- Relay outputs 5A 250VAC AC1 / 5A 30VDC
- 4 digital inputs
- Current inputs (optional): Use via CTs with selectable /5A or /1A secondary
- Support of EXP series communications ports (USB, RS232, RS485, Ethernet) see section 30
- Parameter configuration and remote control (only with comunication expansion module) with software Synergy and Xpress
- Housing: Flush mount 96x96mm/3.78x3.78”
- IEC degree of protection: IP65 on front; IP20 on terminals
- **Predisposed for IEC/EN 61850 signal supervision using expansion or external module❶.**

Reference standards
Compliant with standards: Italian CEI 0-21, IEC/EN 60255-5, IEC/EN 61010-1, IEC/EN 61000-6-2, IEC/EN 61000-6-3.
Note for Italian CEI 0-21 standard:
According to standard prescriptions, once the installation is completed, the interface protection must be tested by the installer using a relay test box which controls the trip thresholds and timing.

Supervision and energy management Synergy software
See section 29.

Configuration and remote control software Xpress
See section 29.

For low voltage

PMVF 51

Order code	Rated voltage Control	Auxiliary	Qty per pkg	Wt
	[V]	[V]	n°	[kg]
Three-phase system with or without neutral in low voltage. Dual threshold minimum and maximum voltage and frequency protection. Modular type with 2 relay outputs.				
PMVF 51	230VAC 400VAC	100...240VAC/ 110...250VDC	1	0.470

Voltage threshold per CEI 0-21

Type of protection	Tripping threshold	Tripping time
Maximum voltage 59.S2	1.15Un	0.2s
Maximum voltage 59.S1 (moving mean over 10min)	1.10Un	≤ 3s
Minimum voltage 27.S1	0.85Un	0.4s
Minimum voltage 27.S2	0.4Un	0.2s

Frequency threshold per CEI 0-21

Type of protection	Tripping threshold	Tripping time
High external signal and low local control conditions.		
Maximum frequency 81>.S2	51.5Hz	0.1s
Maximum frequency 81<.S2	47.5Hz	0.1s
Low external signal and high local control conditions.		
Maximum frequency 81>.S2	51.5Hz	1s
Minimum frequency 81<.S2	47.5Hz	4s
High conditions for both external signal and local control.		
Maximum frequency 81>.S1	50.5Hz	0.1s
Minimum frequency 81<.S1	49.5Hz	0.1s

NOTE: Low conditions for both external signal and local control are not taken into consideration by the standard.

EXM10...

Order code	Description
EXPANSION MODULES FOR PMVF 51. Communication ports.	
EXM10 10	Opto-isolated USB interface
EXM10 11	Opto-isolated RS232 interface
EXM10 12	Opto-isolated RS485 interface
EXM10 13	Opto-isolated Ethernet interface
EXM10 18❶	IEC/EN 61850 interface
Inputs and outputs.	
EXM10 01	2 digital opto-isolated inputs and 2 relay outputs 5A 250VAC

❶ **IEC/EN 61850 protocol**
The EXM10 18 module will be made available only when the competent authorities have established the exact terms of the supervision and control of the specific commands (currently under study as specified in the Italian CEI 0-21 standard).

General characteristics
PMVF 51 interface protection system (IP) unit has been developed according to the Italian CEI 0-21 standard prescriptions. Each is used when a local solar generating system is connected in parallel with the low-voltage electric utility. The controls refer to limits of voltage and frequency monitoring.
In the case when either the voltage or the frequency are out of admissible limits, the SPI must step in by de-energising a relay output so that the interface device (DDI) trips.
PMVF 51 is equipped with 4 inputs having the following functions:
– DDI status feedback
– External signal for frequency selection (communication network malfunction)
– Local control for frequency selection
– Remote tripping (forced DDI opening, independent of voltage and frequency values).
Also, there are two relay outputs for:
– DDI opening and closing
– Standby device opening (programmable: retentive normally energised, retentive normally de-energised or adjustable pulse).
The standby device control is compulsory in installations with more than 20kW and consists of a signal, with a 0.5s delay respect to the DDI opening command, transmitted only if the DDI failed and did not complete the disconnection.
PMVF 51 also has two additional relay outputs to configure as:
– Programmable alarm
– Autonomous signalling in case of phase power unbalance (LSP), only if three CTs are also installed.

Operational characteristics
– Auxiliary voltage: 100...240VAC/110...250VDC
– Voltage inputs:
  • 400VAC (three-phase connection)
  • 230VAC (single-phase connection)
– Relay outputs 5A 250VAC AC1 / 5A 30VDC
– 4 digital inputs
– Current inputs (optional): Use via CTs with selectable /5A or /1A secondary
– Support of EXM series communications inputs (USB, RS232, RS485, Ethernet) see section 30
– Modular housing: 6 modules
– Parameter configuration and remote control (only with comunication expansion module) with software Synergy and Xpress
– Degree of protection for both: IP40 on front; IP20 on terminals
– **Predisposed for IEC/EN 61850 signal supervision using expansion or external module❶.**

Reference standards
Compliant with standards: Italian CEI 0-21, IEC/EN 60255-5, IEC/EN 61010-1, IEC/EN 61000-6-2, IEC/EN 61000-6-3.
Note for Italian CEI 0-21 standard:
According to standard prescriptions, once the installation is completed, the interface protection must be tested by the installer using a relay test box which controls the trip thresholds and timing.

Supervision and energy management Synergy software
See section 29.

Configuration and remote control software Xpress
See section 29.

For medium voltage

PMVF 30...

Order code	Rated voltage Control	Auxiliary	Qty per pkg	Wt
	[V]	[V]	n°	[kg]
Medium-voltage system. Dual threshold minimum and maximum voltage and frequency protection. Flush mount type.				
PMVF 30	Measure-ments via VTs in MV or direct in LV	100...400VAC/ 110...250VDC	1	0.566
PMVF 30 D048		12...48VDC	1	0.566

Voltage threshold per CEI 0-16

Type of protection	Tripping threshold	Tripping time
Maximum voltage 59.S2	1.2Un	0.6s
Maximum voltage 59.S1 (moving mean over 10min)	1.1Un	≤ 3s
Minimum voltage 27.S1	0.85Un	0.4s
Minimum voltage 27.S2	0.3Un	0.2s
Maximum residual voltage 59.V0 (59N)	5% √3 Un	25s

Frequency threshold per CEI 0-16
Frequency protection at voltage choice

Type of protection	Tripping threshold	Tripping time
Configuration in standard conditions.		
Maximum frequency 81>.S2	51.5Hz	1s
Minimum frequency 81<.S2	47.5Hz	4s
Limited configuration in case of local control or voltage choice condition.		
Maximum frequency 81>.S1	50.2Hz	0.15s
Minimum frequency 81<.S1	49.8Hz	0.15s
– Voltage choice functions		
Maximum residual voltage 59.V0 (59N)	5% √3 Un	-
Minimum direct sequence voltage 27.Vd	70% Un	-
Maximum inverse sequence voltage 59.Vi	15% Un	-

EXP10...

Order code	Description
EXPANSION MODULES FOR PMVF 30 AND PMVF 30 D048. For auto reclosing management of automatic circuit breaker (DDI).	
EXP10 03	2 relay outputs 5A 250VAC
Communication ports.	
EXP10 18❶	IEC/EN 61850 interface
EXP10 10	Opto-isolated USB interface
EXP10 11	Opto-isolated RS232 interface
EXP10 12	Opto-isolated RS485 interface
EXP10 13	Opto-isolated Ethernet interface

❶ **IEC/EN 61850 protocol**
The EXP10 18 module will be made available only when the competent authorities have established the exact terms of the supervision and control of the specific commands (currently under study as specified in the Italian CEI 0-16 standard).

General characteristics
PMVF 30 interface protection system (IP) unit has been developed according to the Italian CEI 0-16 standard prescriptions. It is used when a local generating system is connected in parallel with the medium-voltage utility distribution grid. The controls refer to limits of voltage and frequency monitoring.
In the case when either the voltage or the frequency are out of admissible limits, the SPI must step in by de-energising a relay output so that the interface device (DDI) trips.
PMVF 30 is equipped with inputs having the following functions:
– DDI status feedback
– Interface protection system exclusion
– Local control
– Remote tripping (forced DDI opening, independent of voltage and frequency values).
In addition, there are two relay outputs to configure as:
– DDI opening
– Programmable (either as factory default for standby device opening or to set up as auto reclosing if the DDI is an automatic circuit breaker).

Standby device opening
In installations with more than 400kW, the standard specifies there must be a command signal, that releases another standby device, given within 1 second whenever the DDI opening fails or malfunctions.

Automatic DDI reclosing
Whenever an automatic circuit breaker is used as the DDI, the PMVF 30 is capable of controlling both the opening (according to the installation conditions indicated in the Italian CEI 0-16 standard) and the auto reclosing. The auto reclosing function includes defining the number of attempts and the time interval between an attempt and the following one as well as generating an alarm if the closing operation does not take place.
This function can be carried out through a programmable output of the PMVF 30 (unless it is already used for the standby device operation) or by installing an EXP10 03 expansion module.

Operational characteristics
– Auxiliary voltage:
  • PMVF 30: 100...400VAC/110...250VDC
  • PMVF 30 D048: 12...48VDC
– Voltage inputs (connection via VTs in MV or directly in LV end):
  • Primary: 400...150,000V
  • Secondary: 50...500V (for voltage/frequency); 50...150V (for residual voltage measurement)
– Relay outputs 5A 250VAC AC1 / 5A 30VDC
– 4 digital inputs
– 3 current inputs (for optional measuring): Use via CTs with selectable /5A or /1A secondary
– Support of EXP series communications puts (USB, RS232, RS485, Ethernet); see section 30
– Housing: Flush mount 96x96mm/3.78x3.78”
– Parameter configuration and remote control (only with comunication expansion module) with software Synergy and Xpress
– Degree of protection: IP65 on front; IP20 on terminals
– **Predisposed for IEC/EN 61850 signal supervision using expansion or external module❶.**

Reference standards
Compliant with standards: Italian CEI 0-16; IEC/EN 60255-5, IEC/EN 61010-1, IEC/EN 61000-6-2, IEC/EN 61000-6-3.

Supervision and energy management Synergy software
See section 29.

Configuration and remote control software Xpress
See section 29.

PMVF 60

new

Order code	Rated voltage Control	Auxiliary	Qty per pkg	Wt
	[V]	[V]	n°	[kg]
Three-phase systems with or without neutral in low or medium voltage. Dual threshold minimum and maximum voltage and frequency protection. ROCOF and Vector shift. Modular type.				
PMVF 60	230VAC 400VAC	100...240VAC/ 110...250VDC	1	0.470

Voltage threshold

Type of protection	Tripping threshold	Tripping time
Maximum voltage 59-2	1.15Un	0.2s
Maximum voltage 59-1 (moving mean over 10min)	1.10Un	≤ 3s
Minimum voltage 27-1	0.85Un	0.4s
Minimum voltage 27-2	0.4Un	0.2s

Frequency threshold

Type of protection	Tripping threshold	Tripping time
Maximum frequency 81>-2	OFF	0.1s
Maximum frequency 81>-1	52.5Hz	0.1s
Minimum frequency 81>-1	47.5Hz	4s
Minimum frequency 81>-2	OFF	4s
ROCOF	OFF	–
Vector shift	OFF	–

EXM10...

Order code	Description
EXPANSION MODULES FOR PMVF 60. Communication ports.	
EXM10 10	Opto-isolated USB interface
EXM10 11	Opto-isolated RS232 interface
EXM10 12	Opto-isolated RS485 interface
EXM10 13	Opto-isolated Ethernet interface
EXM10 18❶	IEC/EN 61850 interface
Inputs and outputs.	
EXM10 01	2 digital opto-isolated inputs and 2 relay outputs 5A 250VAC

❶ **IEC/EN 61850 protocol**
The EXM10 18 module will be made available only when the competent authorities have established the exact terms of the supervision and control specific commands.

General characteristics
PMVF 60 interface protection (IP) system unit has been developed according to the Engineering recommendation SHAMS DUBAI - DRRG (DEWA) prescriptions. Each is used when a local generating system is connected in parallel with the low and medium voltage electric utility. The controls refer to limits of voltage and frequency monitoring.
In the case when either the voltage or the frequency are out of admissible limits, the IP must step in by de-energising a relay output so that the interface switch (IS) trips.
PMVF 60 is equipped with 4 inputs having the following functions:
– IS status feedback
– External signal for frequency selection
– Disabling signal
– Remote tripping (forced IS opening, independent of voltage and frequency values).
Also, there are two relay outputs for:
– IS opening and closing
– Backup device opening (programmable: retentive normally energised, retentive normally de-energised or adjustable pulse).
The backup device consists of a signal contemporary or with a 0.5s delay respect to the IS opening command, transmitted only if the IS failed and did not complete the disconnection.
PMVF 60 also has two additional relay outputs to configure as:
– Autonomous signalling in case of phase power unbalance (LSP), only if three CTs are also installed
– Programmable alarm.

Operational characteristics
– Auxiliary voltage: 100...240VAC/110...250VDC
– Voltage inputs:
  • 400VAC (three-phase connection)
  • 230VAC (single-phase connection)
– Relay outputs 250VAC 5A (AC1) / 30VDC 5A
– Relay can be password protected to prevent parameters being altered
– 4 digital inputs
– Current inputs (optional): via CTs with selectable /5A or /1A secondary
– Programmable rated voltage, programmable voltage and frequency thresholds and delays
– Support of EXM series communications modules (USB, RS232, RS485, Ethernet) see section 30
– Modular housing: 6 modules
– Parameter configuration and remote control (only with comunication expansion module) with software Synergy and Xpress
– Degree of protection: IP40 on front; IP20 on terminals
– **Predisposed for IEC/EN 61850 signal supervision using expansion or external module❶.**

Reference standards
Compliant with standards: SHAMS DUBAI - DRRG (DEWA), IEC/EN 60255-5, IEC/EN 61010-1, IEC/EN 61000-6-2, IEC/EN 61000-6-4.

Supervision and energy management Synergy software
See section 29.

Configuration and remote control software Xpress
See section 29.

PMVF 70

new

Order code	Rated voltage Control	Auxiliary	Qty per pkg	Wt
	[V]	[V]	n°	[kg]
Three-phase / single-phase systems with or without neutral in low and high voltage. Dual threshold minimum and maximum voltage and frequency protection, ROCOF and Vector shift. Modular type.				
PMVF 70	230VAC 400VAC	100...240VAC/ 110...250VDC	1	0.470

Voltage threshold

Type of protection	Tripping threshold	Tripping time
Maximum voltage O/V ST.2	1.19Un	0.5s
Maximum voltage O/V ST.1	1.14Un	1s
Minimum voltage U/V ST.1	0.87Un	2.5s
Minimum voltage U/V ST.2	0.8Un	0.5s

Frequency threshold

Type of protection	Tripping threshold	Tripping time
Maximum frequency O/F ST.2	52Hz	0.5s
Maximum frequency O/F ST.1	51.5Hz	90s
Minimum frequency U/F ST.1	47.5Hz	20s
Minimum frequency U/F ST.2	47Hz	0.5s
ROCOF	OFF	–
Vector shift	OFF	–

EXM10...

Order code	Description
EXPANSION MODULES FOR PMVF 70. Communication ports.	
EXM10 10	Opto-isolated USB interface
EXM10 11	Opto-isolated RS232 interface
EXM10 12	Opto-isolated RS485 interface
EXM10 13	Opto-isolated Ethernet interface
Inputs and outputs.	
EXM10 01	2 digital opto-isolated inputs and 2 relay outputs 5A 250VAC

General characteristics
PMVF 70 interface protection (IP) system unit has been developed according to the Engineering recommendation G59 (ENA) prescriptions. It is used when a local generating system is connected in parallel with the low and high voltage electric utility. The controls refer to limits of voltage and frequency monitoring.
In the case when either the voltage or the frequency are out of admissible limits, the IP must step in by de-energising a relay output so that the interface switch (IS) trips.
PMVF 70 is equipped with 4 inputs having the following functions:
– IS status feedback
– ROCOF/Vector shift delay
– Disabling signal
– Remote tripping (forced IS opening, independent of voltage and frequency values).
Also, there are two relay outputs for:
– IS opening and closing
– Backup device opening (programmable: retentive normally energised, retentive normally de-energised or adjustable pulse).
The backup device consists of a signal contemporary or with a 0.5s delay respect to the IS opening command, transmitted only if the IS failed and did not complete the disconnection.
PMVF 70 also has two additional relay outputs to configure as:
– Autonomous signalling in case of phase power unbalance (LSP), only if three CTs are also installed
– Programmable alarm.

Operational characteristics
– Auxiliary voltage: 100...240VAC/110...250VDC
– Voltage inputs:
  • 400VAC (three-phase connection)
  • 230VAC (single-phase connection)
– Relay outputs 5A 250VAC AC1 / 5A 30VDC
– Relay can be password protected to prevent parameters being altered
– 4 digital inputs
– Current inputs (optional): via CTs with selectable /5A or /1A secondary
– Programmable rated voltage, programmable voltage and frequency thresholds and delays
– Support of EXM series communications modules (USB, RS232, RS485, Ethernet). See section 30
– Modular housing: 6 modules
– Parameter configuration and remote control (only with comunication expansion module) with software Synergy and Xpress
– Degree of protection: IP40 on front; IP20 on terminals

Reference standards
Compliant with standards: Engineering recommendation G59 (ENA), IEC/EN 60255-5, IEC/EN 61010-1, IEC/EN 61000-6-2, IEC/EN 61000-6-4.

Supervision and energy management Synergy software
See section 29.

Configuration and remote control software Xpress
See section 29.

GSM modem for remote disconnection signal management

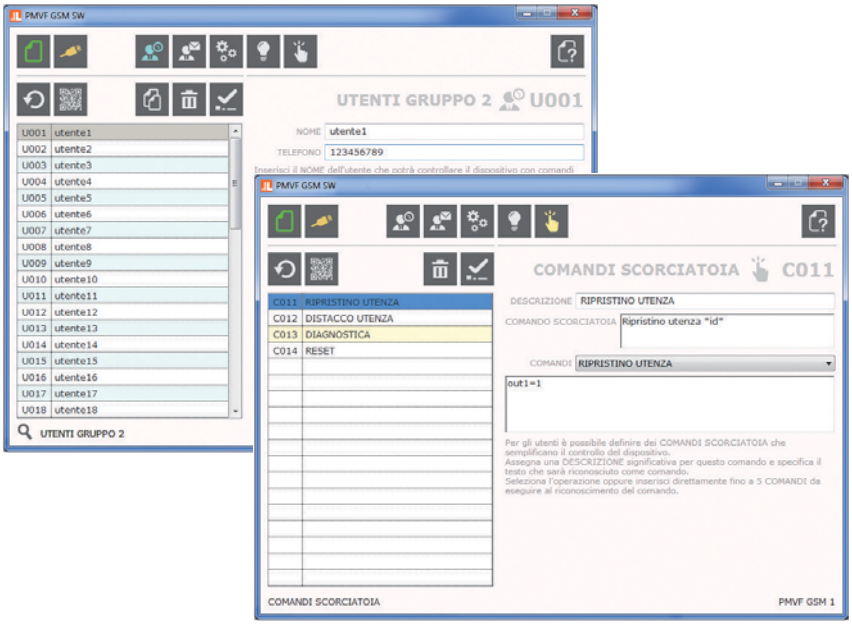
Compliant with Italian CEI 0-16 Standard, paragraph 8.8.6.5 and annex M, resolution 421/2014 of the AEEGSI

Order code	Description
	GSM Modem (modular - 4U). IP69K exterior aerial with 2.5 m cable. RJ45-USB programming cable (included).
PMVF GSM 1	9.5...35VDC/9.5...27VAC

PMVF GSM 1

Software

To configure the PMVF GSM 1 modem (using the RJ45-USB programming cable included), the PMVF GSM SW software must be used. This can be downloaded for free from the www.LovatoElectric.com website.
The software allows you to set:
– the users enabled to exchange messages with the modem
– the active customer code (POD)
– the functions assigned to the digital outputs and input
– the texts of the SMS associated with the commands.
Configuration is also possible off-line, creating a file to transfer to the modem at another time.



Application requirements
The Italian CEI 0-16 Standard, in paragraph 8.8.6.5 and annex M, prescribes that electricity production systems powered by wind or the sun through photovoltaics with a power equal to or greater than 100kW, connected to or to be connected to medium-voltage networks, have a GSM modem.
The modem must be able to receive the signals sent by the electricity distributor for the management of generation disconnection.

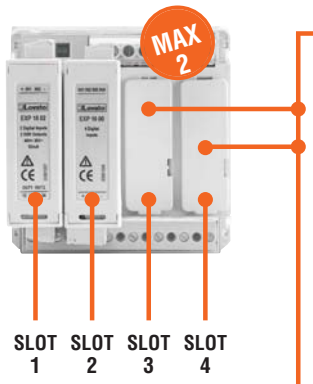
Functional characteristics
– Connection to the GSM network for sending and receiving SMS messages
– Programmable message texts
– Control output controlled by SMS for sending of intertripping signal to the protection interface
– Digital input for receiving the status of the Interface Device (DDI) and sending of successful DDI opening and closing SMSs
– POD management (active user code)
– Management of the list of caller IDs (CLI) up to 50 callers enabled
– Detection of mobile network coverage
– Full compatibility with medium-voltage PI LOVATO Electric PMVF 30: no software/hardware updates or programming required
– **Compatibility with third-party PIs where the remote disconnection signal is transmitted via digital input (dry contact).**
For additional information contact our Technical support Tel. + 39 035 4282422; E-mail: service@LovatoElectric.com.

Operational characteristics
MODEM
– 35mm DIN (IEC/EN 60715) rail fixing
– 4 modules
– Supply: 9.5...35VDC / 9.5...27VAC
– Consumption: 200mW (5W peak)
– 2 digital outputs 3A 250VAC
– 1 self-supplied digital input
– Housing for 3V and 1.8V SIM card
– SIM PIN management
– Certified according to FCC rules, part 15
– Back-up battery 320mAh (3.7 V)
– Operating temperature: 0...+45°C; -30...+60°C with back-up battery disconnected (for disconnection procedure consult the manual supplied with the product)
– Protection rating: IP40 on front; IP20 on terminals.

AERIAL
– Quad band 850/900/1800/1900MHz
– Exterior IP69K
– 2.5m cable
– Fixing via M10 hole:
• with adhesive seal
• with threaded pin and nut.

Compliance
Compliant with standards: IEC/EN 60950-1 (≤2013-05); EN 50385; EN 301 489-7 V1.3.1; EN 301 489-1 V1.9.2; EN 301 511 V9.0.2

Maximum combination for PMVF 20 and PMVF 30 types
In addition to the two standard-supplied modules, another two expansion modules (one per type) can be installed from the following indicated below. For further information on modules see section 30.



EXP10 03
Used as:
1. Phase power unbalance signal (LSP) for PMVF 20 or for auto reclosing control of circuit breaker for PMVF 30.
2. Programmable alarm.

EXP10 18
Ethernet interface
according to IEC/EN 61850

EXP10 10
USB
interface

EXP10 11
RS232
interface

EXP10 12
RS485
interface

EXP10 13
Ethernet
TCP/IP
interface

Maximum combination for PMVF 51/60/70 type
In addition to the standard-supplied module (1), two other expansion modules (one per type) can be installed from the indicated types. For info on modules see section 30.

EXM10 18
Ethernet interface
per IEC/EN 61850

EXM10 10
USB
interface

EXM10 11
RS232
interface

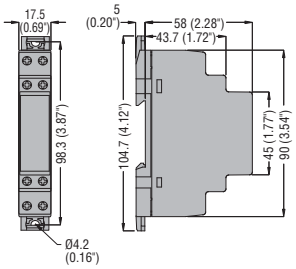
EXM10 12
RS485
interface

EXM10 13
Ethernet
TCP/IP
interface

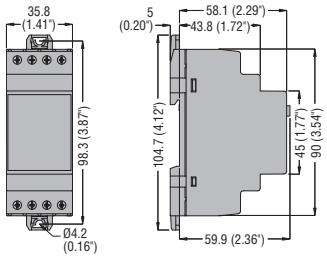
EXM10 01
Used as:
1. Phase power unbalance signal (LSP).
2. Programmable alarm.

MONITORING RELAYS

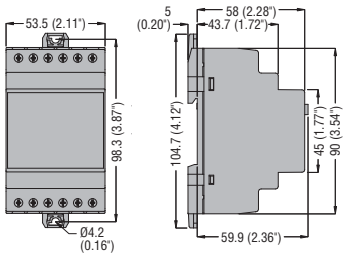
PMV10...



PMV... - PMV95N... - PMF20
PMA20... - PMA30...



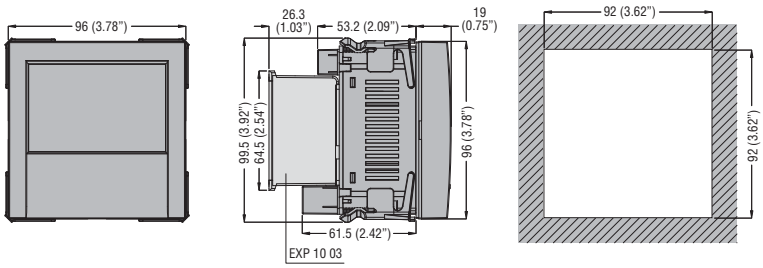
PMV50N... - PMV70N... - PMV80N... - PMA40...
PMA50...



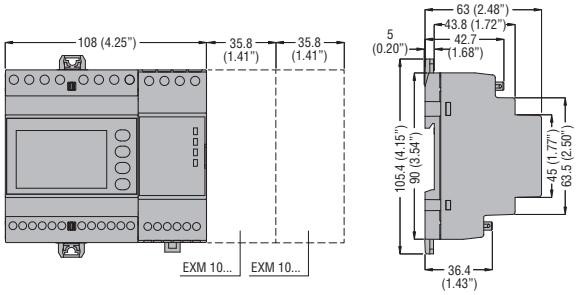
INTERFACE PROTECTION SYSTEM UNITS FOR LOW VOLTAGE

PMVF 20...

Cutout



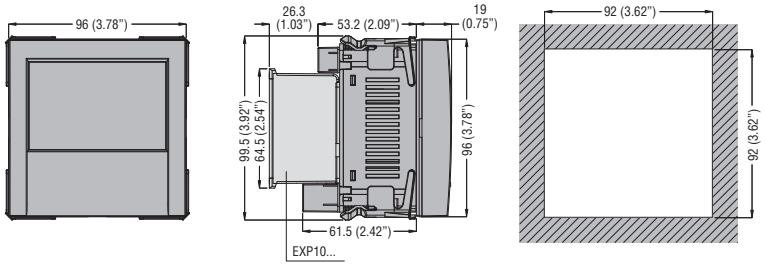
PMVF 51 - PMVF 60 - PMVF 70



INTERFACE PROTECTION SYSTEM UNIT FOR MEDIUM VOLTAGE

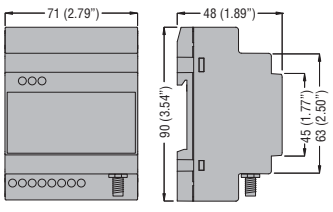
PMVF 30

Cutout



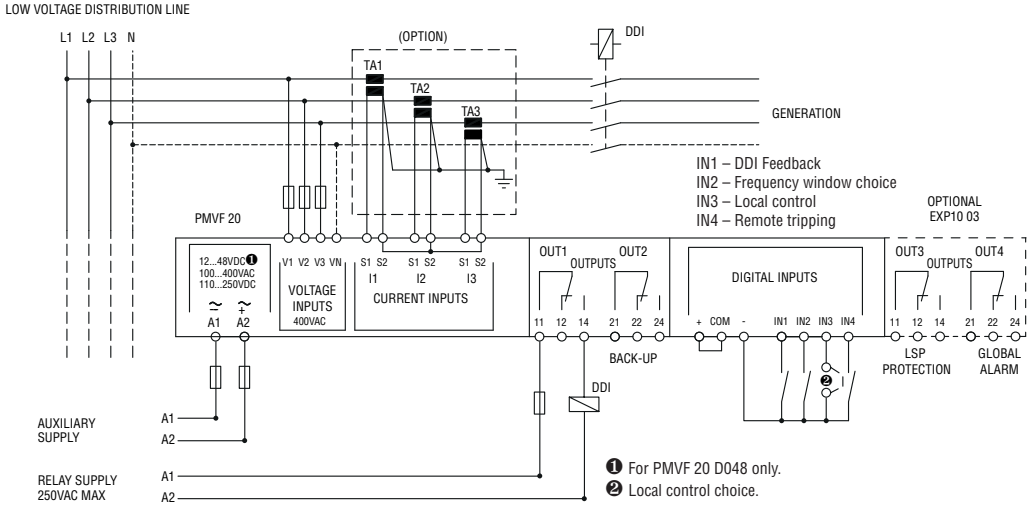
GSM MODEM FOR REMOTE DISCONNECTION SIGNAL

PMVF GSM 1



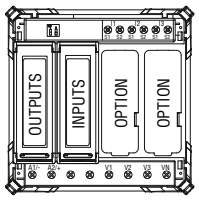
Interface protection system units compliant with Italian CEI 0-21 standard - For low voltage

PMVF 20...
Three-phase connection



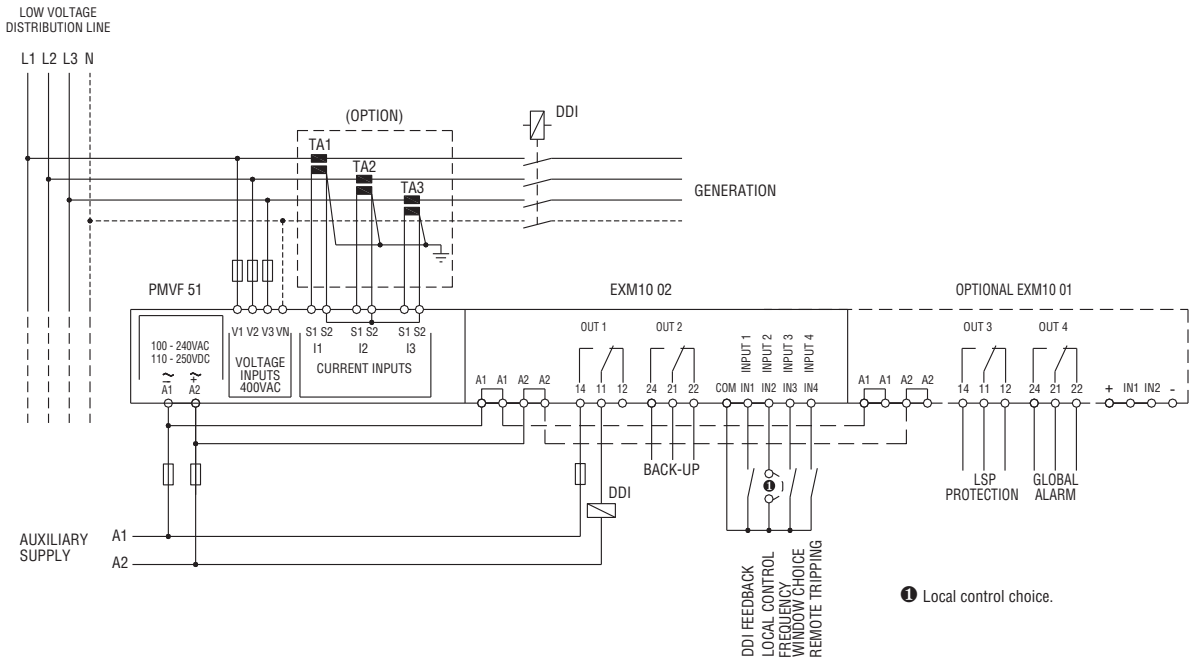
❶ For PMVF 20 D048 only.
❷ Local control choice.

Rear view



Interface protection system units compliant with Italian CEI 0-21 standard - For low voltage

PMVF 51
Three-phase connection

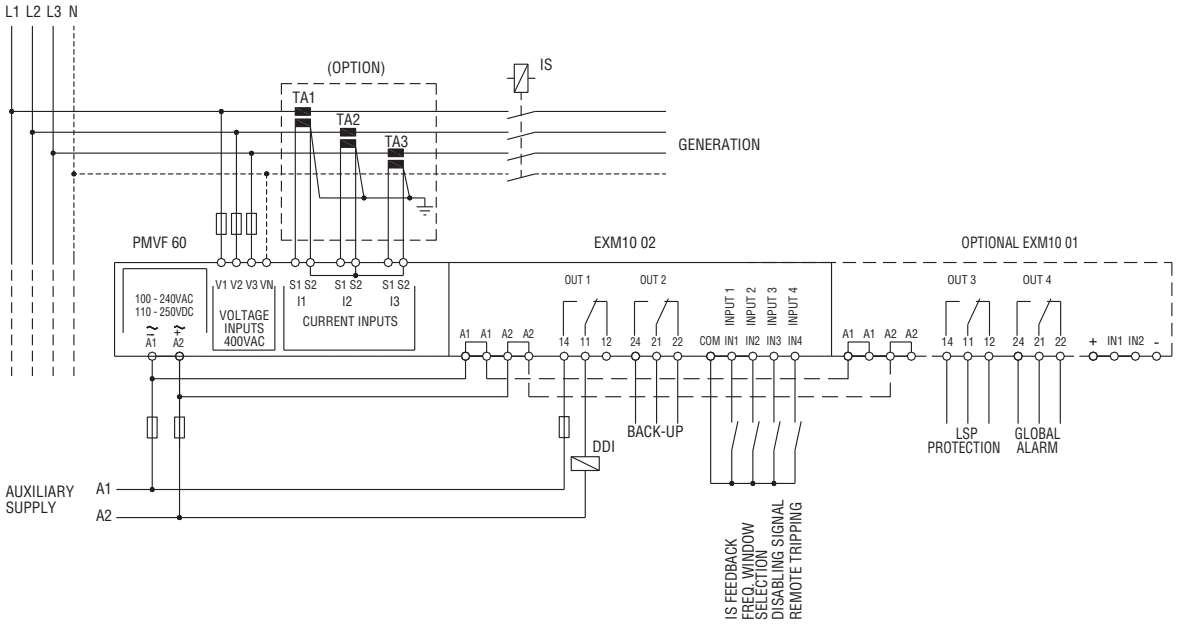


❶ Local control choice.

Interface protection system units compliant with standard SHAMS DUBAI - DRRG (DEWA)

PMVF 60

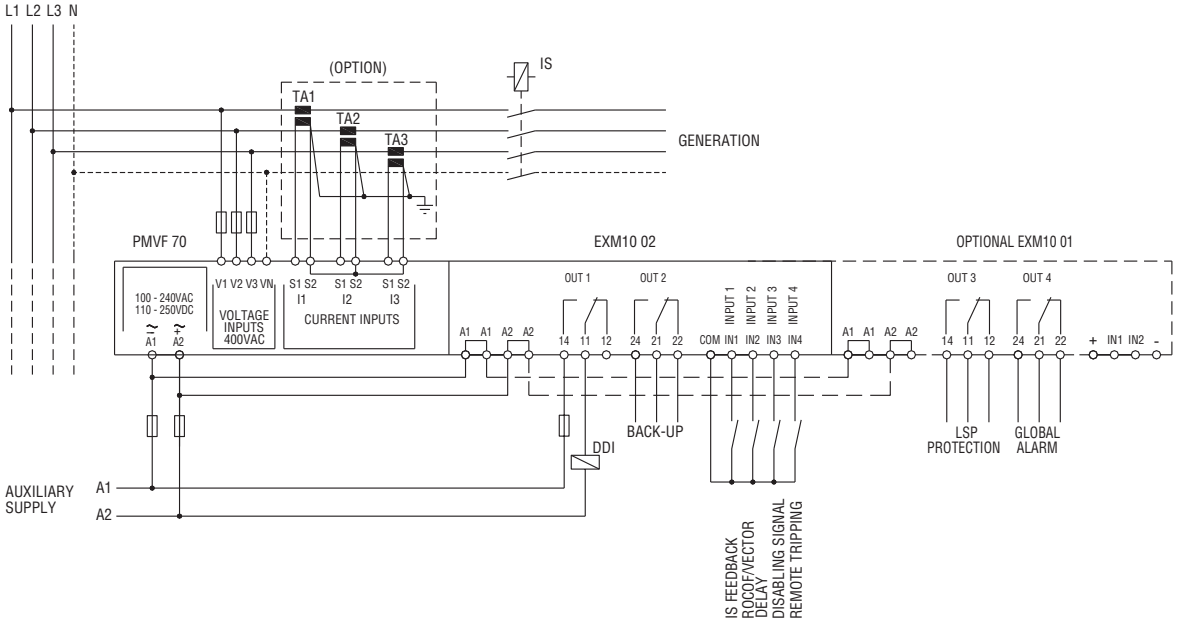
Three-phase connection



Interface protection system units compliant with technical guide G59 (ENA)

PMVF 70

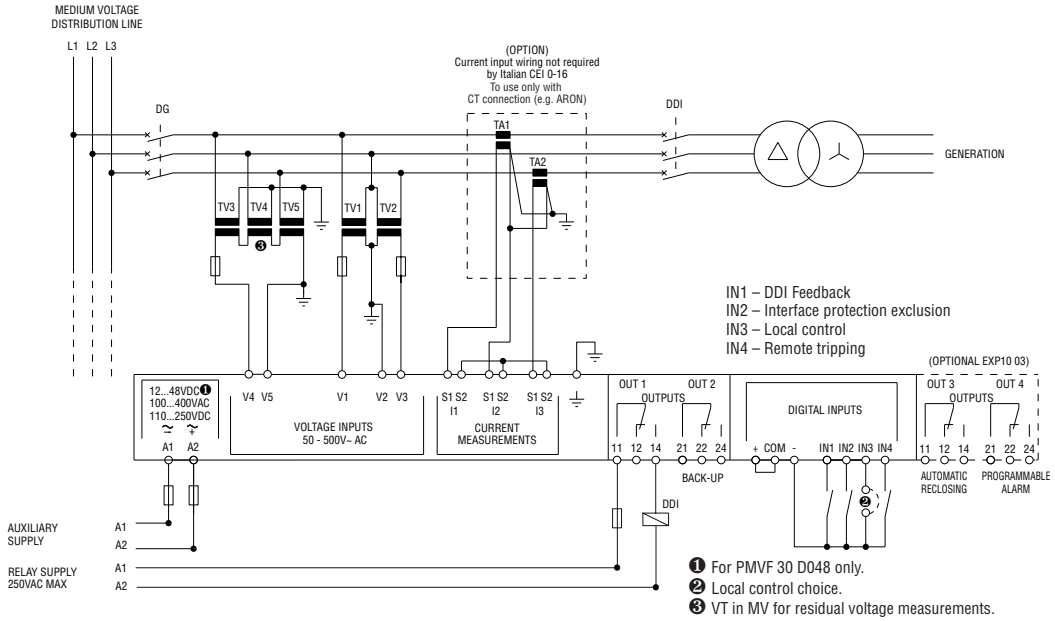
Three-phase connection



Interface protection system units compliant with Italian CEI 0-16 standard - For medium voltage

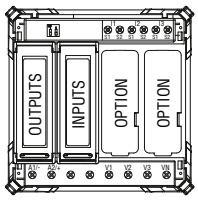
PMVF 30...

Connection through VTs in Medium Voltage
Three-phase connection

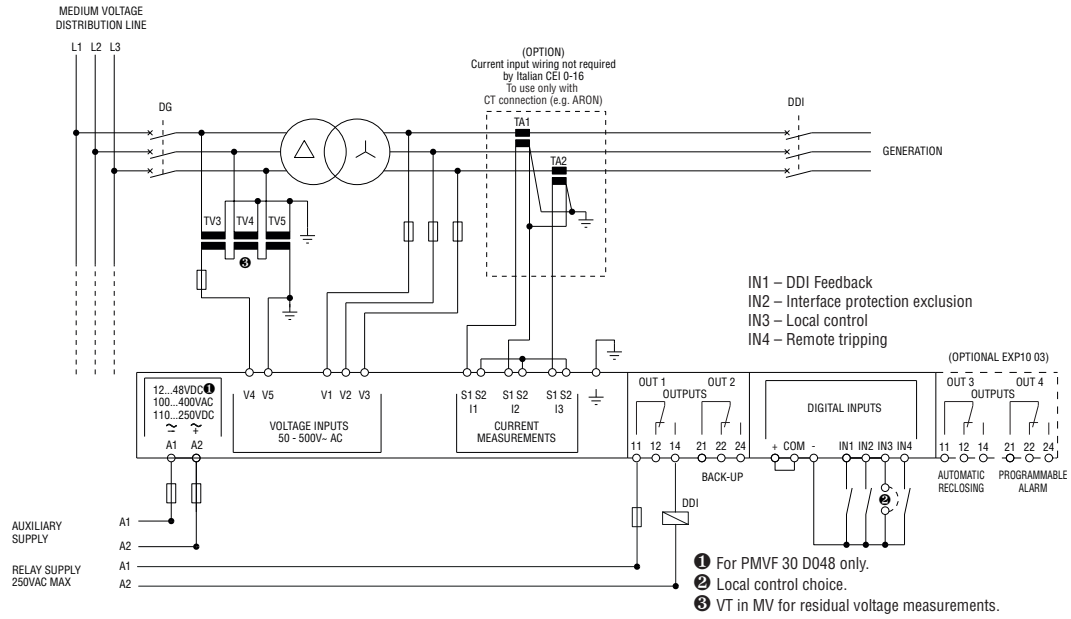


❶ For PMVF 30 D048 only.
❷ Local control choice.
❸ VT in MV for residual voltage measurements.

Rear view

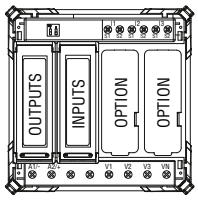


Direct connection in Low Voltage
Three-phase connection



❶ For PMVF 30 D048 only.
❷ Local control choice.
❸ VT in MV for residual voltage measurements.

Rear view

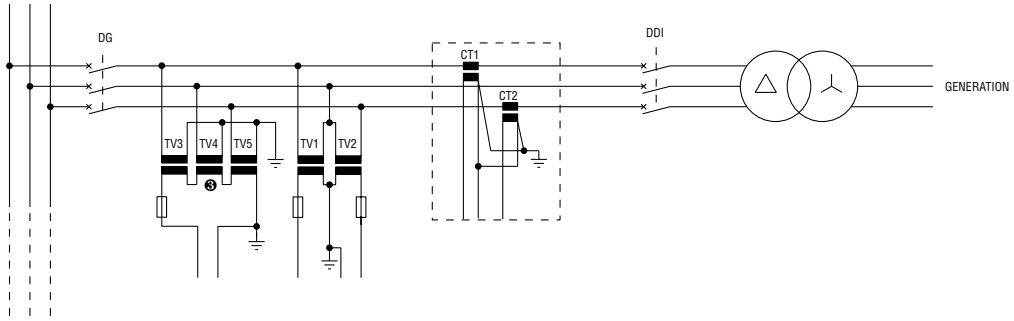


Interface protection system units compliant with Italian CEI 0-16 standard - For medium voltage
PMVF 30... with **PMVF GSM 1**

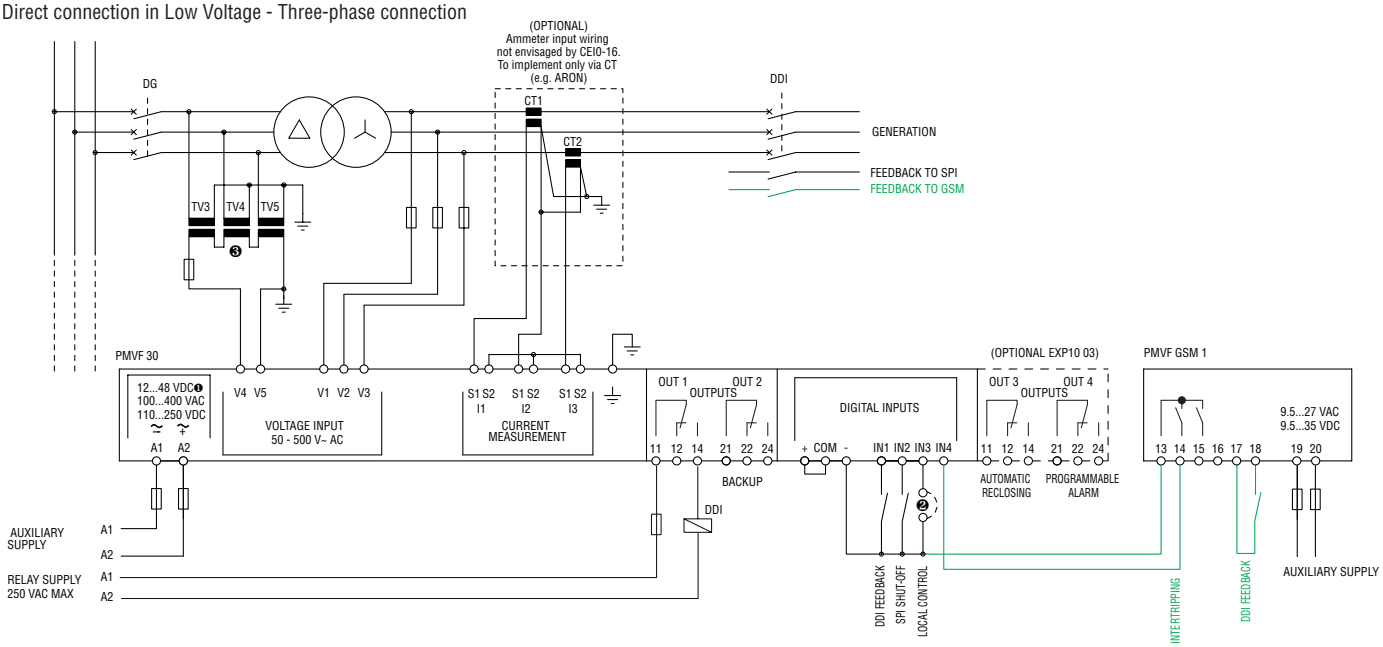
MEDIUM-VOLTAGE DISTRIBUTION NETWORK

L1 L2 L3

Connection through VTs in Medium Voltage



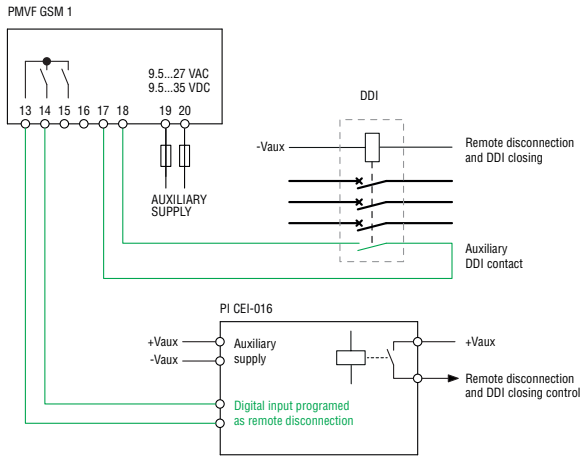
Direct connection in Low Voltage - Three-phase connection



❶ For PMVF 30 D048 only.
❷ Local control choice.
❸ VT in MV for residual voltage measurements.

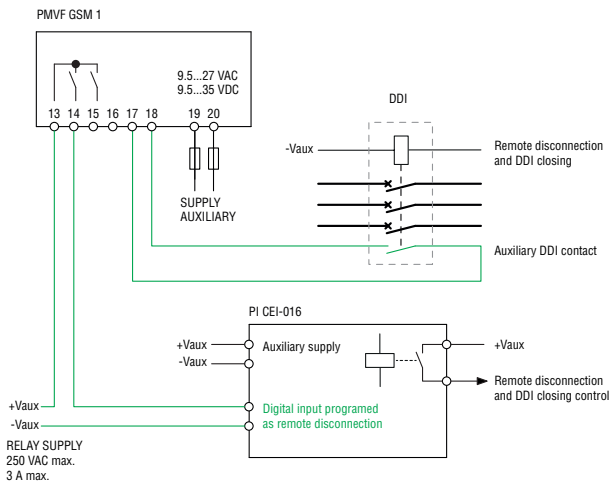
The connections coloured in GREEN, in addition to the GSM Modem, represent the only wiring necessary for the adaptation.

PMVF GSM 1 modem wiring diagram with other interface protections (PI) with self-supplied remote disconnection input



The connections coloured in GREEN, in addition to the GSM Modem, represent the only wiring necessary for the adaptation.

PMVF GSM 1 modem wiring diagram with other interface protections (PI) with remote disconnection input to be supplied



TYPE	Single phase	**PMV55**	—	—	—	—	
	Three phase	—	**PMV10**	**PMV20**	**PMV30**	**PMV40**	
	Three phase with/without neutral	—	—	—	—	—	
DESCRIPTION							
		Minimum and maximum AC voltage	Phase loss and incorrect phase sequence		Minimum AC voltage, phase loss and incorrect phase sequence	Asymmetry, phase loss and incorrect phase sequence	
CONTROL CIRCUIT							
Rated voltage to control (Ue)		208...240VAC	208...480VAC	100...240VAC	208...240VAC	208...240VAC	
		380...440VAC		208...575VAC	380...575VAC	380...575VAC	
				380...600VAC	600VAC	600VAC	
Maximum voltage set-point		105...115% Ue	—	—	—	—	
Minimum voltage set-point		80...95% Ue	—	—	80...95% Ue	—	
Asymmetry set-point		—	—	—	—	5...15%Ue	
Minimum and maximum frequency set-point		—	—	—	—	—	
Tripping time		0.1...20s	60ms		0.1...20s		
Resetting time		0.1...20s (0.5s at power up)	0.5s		0.1...20s (0.5s at power up)		
Resetting hysteresis		3%	5%		3%		
Instantaneous tripping for Ue		<70% Ue configured	Umin<70% Umax		<70% Ue configured	<70% minimum Ue	
Repeat accuracy		< ±0.1%	< ±1%		< ±0.1%	< ±0.1%	
POWER SUPPLY							
Auxiliary voltage (Us)		Self powered					
Operating range		0.7...1.2Ue	0.85...1.1Ue		0.7...1.2Ue		
Frequency		50/60Hz ±5%					
Power consumption (maximum)		10VA (208...240VAC)❶ 17VA (380...440VAC)❶	20VA❶	28VA❶	11VA (208...240VAC)❶ 30VA (380...575VAC)❶ 19VA (600VAC)❶		
Power dissipation (maximum)		1.5W	2.2W	2.5W			
RELAY OUTPUTS							
Number of relays		1					
Relay state		Normally energised De-energises at tripping					
Contact arrangement		1 changeover SPDT					
Rated operational voltage		250VAC					
Maximum switching voltage		400VAC					
Conventional free-air thermal current (Ith)		8A					
UL/CSA and IEC/EN 60947-5-1 designation		B300					
Electrical life (with rated load)		10^5 cycles					
Mechanical life		$30x10^6$ cycles					
Indications		1 green LED for power on and tripping 2 red LEDs for tripping	1 green LED for power on and tripping		1 green LED for power on and tripping 1 red LED for tripping		
CONNECTIONS							
Terminal tightening torque (maximum)		0.8Nm (7lbin; 7...9lbin per UL/CSA)					
Conductor section min...max		0.2...4.0mm² (24...12AWG; 18...12 AWG per UL/CSA)					
INSULATION (input-output)							
IEC rated insulation voltage Ui		440VAC	480VAC	600VAC			
IEC rated impulse withstand voltage Uimp		6kV					
IEC power frequency withstand voltage		4kV					
AMBIENT CONDITIONS							
Operating temperature		–20...+60°C					
Storage temperature		–30...+80°C					
HOUSING							
Material		Self-extinguishing polyamide					

❶ Power consumption (maximum) at 50Hz.
❷ Contact our Technical support Tel. + 39 035 4282422; E-mail: service@LovatoElectric.com.

	—	—	—	—	—	—
	PMV50	**PMV70**	—	—	—	—
	—	—	**PMV50 N**	**PMV70 N**	**PMV80 N**	**PMV95 N**
	Minimum and maximum AC voltage, phase loss and incorrect phase sequence	Minimum and maximum AC voltage, phase loss, incorrect phase sequence and asymmetry	Minimum and maximum AC voltage, phase loss, neutral loss and incorrect phase sequence	Minimum and maximum AC voltage, phase loss, neutral loss, incorrect phase sequence and asymmetry	Minimum and maximum AC voltage and frequency, phase loss, neutral loss and incorrect phase sequence	Minimum and maximum AC voltage and frequency, phase loss, neutral loss, incorrect phase sequence and asymmetry
	208...240VAC	208...240VAC	208...240VAC	208...240VAC	208...240VAC	208...240VAC
	380...575VAC	380...440VAC	380...440VAC	380...440VAC	380...440VAC	380...575VAC
	600VAC	480...600VAC	480...600VAC	480...600VAC	480...600VAC	—
	105...15% Ue	105...115% Ue	105...115% Ue	105...115% Ue	105...115% Ue	105...115% Ue
	80...95% Ue	80...95% Ue	80...95% Ue	80...95% Ue	80...95% Ue	80...95% Ue
	—	5...15% Ue	—	5...15% Ue	—	5...15% Ue
	—	—	—	—	1...10% rated frequency	1...10% rated frequency
	0.1...20s				0.1...20s / 0.1...5s freq.	0,1...30s
	0.1...20s (0.5s at power up)	0.5s	0.1...20s	0.5s	0.5s	0,1...30s
	3%	3%	3%	3%	3% / 0.5% freq.	programmable❷
	<70% Ue configured					
	< ±0.1%					
	Self powered					
	0.7...1.2Ue					
	50/60Hz ±5%					
	11VA (208...240VAC)❶ 30VA (380...575VAC)❶ 19VA (600VAC)❶		27VA max			❷
	2.5W		1.9W max			❷
	1		2			1
	Normally energised De-energises at tripping					
	1 changeover SPDT		2 changeover SPDT			1 changeover SPDT
	250VAC					
	400VAC					
	8A					
	B300					
	10^5 cycles					
	$30x10^6$ cycles					
	1 green LED for power on and tripping 2 red LEDs for tripping	1 green LED for power on and tripping 3 red LEDs for tripping	1 green LED for power on and tripping 2 red LEDs for tripping			1 green LED for power 5 red LEDs for tripping
	0.8Nm (7lbin; 7...9lbin per UL/CSA - PMV...N excluded)					
	0.2...4.0mm^2 (24...12AWG; 18...12 AWG per UL/CSA - PMV...N excluded)					
	600VAC					
	6kV					
	4kV					
	–20...+60°C					
	–30...+80°C					
	Self-extinguishing polyamide					

TYPE		PMA20	PMA30	PMA40	
DESCRIPTION					
		Single-phase maximum current monitoring AC/DC multiscale	Single-phase minimum or maximum current monitoring AC/DC multiscale	Single-phase minimum and maximum current monitoring AC/DC multiscale	
CONTROL CIRCUIT					
Rated current to be monitored Ie		5 or 16A		0.02 - 0.05 - 0.25 - 1 - 5 - 16A	
Rated frequency		50/60Hz ±5%			
Overload capacity		5 Ie for 1s 160A for 10ms Constant 16A		50mA - 1A inputs 5 Ie for 1s 10Ie for 10ms Constant 2Ie	16A input 5 Ie for 1s 160A for 10ms Constant 16A
Connection		Direct or by current transformer			
Adjustment	Tripping values	5...100% f.s.			
	Tripping time	0.1...30s			
	Inhibition time	1...60s			
	Resetting hysteresis	1...50%		3% fixed	
Resetting		Automatic / Manual			
External input		Resetting / Inhibition		—	
Repeat accuracy		±1% with constant parameters			
AUXILIARY SUPPLY					
Auxiliary supply voltage Us		24...240VAC/DC			
Operating range		0.85...1.1 Us			
Rated frequency		50/60Hz ±5%			
Power consumption (maximum)		3.2VA		7VA	
Power dissipation (maximum)		1.6W		1.7W	
RELAY OUTPUTS					
Number of relays		1		2	
Relay state		Normally energised / de-energised (selectable)			
Contact arrangement		1 changeover contact SPDT each			
Rated operational voltage		250VAC			
Maximum switching voltage		400VAC			
IEC conventional free air thermal current Ith		8A			
UL/CSA and IEC/EN 60947-5-1 designation		B300			
Electrical life (with rated load)		10^5 cycles			
Mechanical life		$30x10^6$ cycles			
Indications		1 green LED for power on/inhibition 1 red LED for tripping		1 green LED for power on/inhibition 2 red LEDs for max/min tripping	
CONNECTIONS					
Tightening torque maximum		0.8Nm (7lbin; 7...9lbin per UL/CSA)			
Conductor section min...max		0.2...4.0mm² (24...12AWG; 18...12 AWG per UL/CSA)			
INSULATION (input-output)					
IEC rated insulation voltage Ui		415VAC			
IEC rated impulse withstand voltage Uimp		4kV			
IEC power frequency withstand voltage		2.5kV			
AMBIENT CONDITIONS					
Operating temperature		–20...+60°C			
Storage temperature		–30...+80°C			
HOUSING					
Material		Self-extinguishing polyamide			

TYPE		**PMA50**
DESCRIPTION		
		Single and three-phase pump protection (motor under-load and over-current control) monitoring for max AC current, min cosφ, phase loss and incorrect phase sequence
CURRENT AND COSφ CONTROL CIRCUIT		
Rated current Ie		5 or 16A
Rated frequency		50/60Hz ±5%
Overload capacity		5Ie for 1s 160A for 10ms Constant 16A
Connection		Direct or by current transformer
Adjustments	End-scale value	5 or 16A
	Tripping for MAX current	10...100Ie
	Tripping for cosφ	0.1...0.99 cosφ (MIN)
	Tripping delay	0.1...10s
	Inhibition time	1...60s
	Automatic resetting delay	OFF...100min
External input		Consent for running/resetting
Repeat accuracy		±1% with constant parameters
VOLTAGE CONTROL CIRCUIT		
Voltage measuring range (Ue)		80...660VAC
Tripping time for phase loss		60ms
AUXILIARY SUPPLY		
Auxiliary supply voltage Us		220...240VAC
		380...415VAC (maximum voltage for UL/CSA)
		440...480VAC
Operating range		0.85...1.1 Us
Frequency range		50/60Hz ±5%
Power consumption (maximum)		4.5VA
Power dissipation (maximum)		2.3W
RELAY OUTPUTS		
Number of relays		1
Relay state		Normally energised, de-energises at tripping
Contact arrangement		1 changeover contact SPDT each
Rated operational voltage		250VAC
Maximum switching voltage		400VAC
IEC conventional free air thermal current Ith		8A
UL/CSA and IEC/EN 60947-5-1 designation		B300
Electrical life (With rated load)		10^5 cycles
Mechanical life		$30x10^6$ cycles
Indications		1 green LED for power on/inhibition 2 red LEDs for minimum/maximum tripping
CONNECTIONS		
Tightening torque maximum		0.8Nm (7lbin)
Conductor section min...max		0.2...4.0mm² (24...12AWG; 18...12 AWG per UL/CSA)
INSULATION (input-output)		
IEC rated insulation voltage Ui		600VAC
IEC rated impulse withstand voltage Uimp		6kV
IEC power frequency withstand voltage		2.5kV
AMBIENT CONDITIONS		
Operating temperature		–20...+60°C
Storage temperature		–30...+80°C
HOUSING		
Material		Self-extinguishing polyamide

TYPE		**PMF20**
DESCRIPTION		Single-phase minimum and maximum frequency control
FREQUENCY CONTROL CIRCUIT		
Rated frequency		50 or 60Hz selectable
Operating frequency range		40...70Hz
Adjustment	MAX tripping	101...110% operating frequency
	MIN tripping	90...99% operating frequency
	Resetting hysteresis	0.5%
	Inhibition time	0.1...20s
	Reset delay	0.1...20s
Resetting		Automatic
Repeat accuracy		< ±0.1%
AUXILIARY SUPPLY		
Auxiliary supply voltage Us		220...240VAC
		380...415VAC
Operating range		0.85...1.1 Us
Rated frequency		50/60Hz
Power consumption (maximum)		10VA (220...240VAC); 17VA (380...415VAC)
Power dissipation (maximum)		1.5W
RELAY OUTPUTS		
Number of relays		1
Relay state		Normally energised, de-energises at tripping❶
Contact arrangement		1 changeover contact SPDT
Rated operational voltage		250VAC
Maximum switching voltage		400VAC
IEC conventional free air thermal current Ith		8A
UL/CSA and IEC/EN 60947-5-1 designation		B300
Electrical life (with rated load)		10^5 cycles
Mechanical life		$30x10^6$ cycles
Indications		1 green LED for power on/tripping 2 red LEDs for min-max tripping
CONNECTIONS		
Tightening torque maximum		0.8Nm (7lbin)
Conductor section min-max		0.2...4.0mm² (24...12AWG)
INSULATION (input - output)		
IEC rated insulation voltage Ui		575VAC
IEC rated impulse withstand voltage Uimp		6kV
IEC power frequency withstand voltage		4kV
AMBIENT CONDITIONS		
Operating temperature		–20...+60°C
Storage temperature		–30...+80°C
HOUSING		
Material		Self-extinguishing polyamide

❶ Normally de-energised, energises at tripping with $\overline{\text{MAX}}$ function configured.

TYPE		PMVF 20	PMVF 20 D048
AUXILIARY POWER SUPPLY			
Rated control supply voltage Us		100...400VAC/110...250VDC	12...48VDC
Operating limits		90...440VAC/93.5...300VDC	9...70VDC
Frequency		45...55Hz	—
Power consumption	AC supply	6VA at 110VAC; 8VA at 230VAC; 11VA at 400VAC	—
	DC supply	25mA at 110VDC; 11mA at 250VDC	250mA at 12VDC; 120mA 24VDC; 62mA at 48VDC
Power dissipation	AC supply	2.7W at 110VAC; 3W at 220V; 3.9W at 400VAC	—
	DC supply	2.6W at 110VAC; 2.8W at 250VDC	3W at 12VDC; 2.9W at 24VDC; 3W at 48VDC
Micro-breaking immunity		≤50ms at 110VAC ; ≤200ms at 230VAC	≤ 15ms at 12VDC; ≤30ms at 24VDC; ≤70ms at 48VDC
Overload category		III	III
VOLTAGE INPUTS			
Maximum rated operating voltage		400VAC L-L; 230VAC L-N 50Hz	
Measuring range		20...480VAC L-L; 10...276VAC L-N	
Frequency range		45...55Hz	
Overload category		IV	
CURRENT INPUTS (OPTIONAL)			
Rated operational current Ie		1A or 5A in AC programmable	
Measuring range		For 1A scale: 0.01...1.2A; for 5A scale: 0.01...6A	
Type of input		Shunts powered by external current transformer (low voltage) 5A max.	
Type of measurement		RMS	
Overload capacity		±20% Ie	
Overload peak		50A for 1 second	
Burden (per phase)		≤0.6W	
RELAY OUTPUTS			
Number of outputs		2	
Type of output		1 changeover contact/SPDT each	
Rated operating voltage		250VAC	
UL/CSA and IEC/EN 60947-5-1 designation		5A 250VAC AC1 /B300 ; 5A 30VDC	
Overload category		III	
DIGITAL INPUTS			
Number and type of inputs		4 negative (NPN)	
Input voltage		24VDC isolated	
Input current		7mA	
SUPPLY/VOLTAGE MEASURING CIRCUIT CONNECTIONS			
Type of terminals		Screw - removable	
Conductor section (min...max)		0.2...2.5mm² (24...12 AWG)	
Tightening torque		0.5Nm (4.5lbin)	
CURRENT MEASURING CIRCUIT CONNECTIONS			
Type of terminals		Screw - fixed	
Number of terminals		6 for external CT connections	
Conductor section (min...max)		0.2...4mm² (26...10 AWG)	
Tightening torque		0.8Nm (7lbin)	
RELAY OUTPUT CONNECTIONS			
Type of terminals		Screw - removable	
Conductor section (min...max)		0.2...2.5 mm² (24...12 AWG)	
Tightening torque		0.5Nm (4.5 lbin)	
INPUT CONNECTIONS – Input terminals			
Type of terminals		Screw - removable	
Conductor section (min...max)		0.2...1.5 mm² (28...14 AWG)	
Tightening torque		0.18Nm (1.7lbin)	
INPUT CONNECTIONS – COM and auxiliary voltage terminals			
Type of terminals		Screw - removable	
Conductor section (min...max)		0.2...2.5 mm² (24...12 AWG)	
Tightening torque		0.5Nm (4.5lbin)	
HOUSING			
Material		Polyamide	
Version		Flush mount 96x96mm / 3.78x3.78”	

TYPE		PMVF 51 - PMVF 60 - PMVF 70
AUXILIARY POWER SUPPLY		
Rated control supply voltage Us		100...240VAC/110...250VDC
Operating limits		85...264VAC/93.5...300VDC
Frequency		45...55Hz
Power consumption	AC supply	4.6VA at 110VAC; 12.5VA at 230VAC
	DC supply	23mA at 110VDC; 11mA 250VDC
Power dissipation	AC supply	2.5W at 110VAC; 2.7W at 230VAC
	DC supply	2.3W at 110VDC; 2.5W at 250VDC
Micro-breaking immunity		≤50ms at 100VDC; ≤200ms at 240VDC
Overload category		II
VOLTAGE INPUTS		
Maximum rated operating voltage		400VAC L-L; 230VAC L-N 50Hz
Measuring range		20...480VAC L-L; 10...276VAC L-N
Frequency range		45...55Hz
Overload category		IV
CURRENT INPUTS (OPTIONAL)		
Rated operational current Ie		1A or 5A in AC programmable
Measuring range		For 1A scale: 0.01...1.2A; for 5A scale: 0.01...6A
Type of measurement		RMS
Overload capacity		±20% Ie
Overload peak		50A for 1 second
Burden (per phase)		≤0.6W
RELAY OUTPUTS		
Number of outputs		2❶
Type of output		1 changeover contact/SPDT each
Rated operating voltage		250VAC
UL/CSA and IEC/EN 60947-5-1 designation		For NO contact: 5A 250VAC AC1/C300; 5A 30VDC For NC contact: 2A 250VAC AC1 / C300; 2A 30VDC
Overload category		II
DIGITAL INPUTS		
Number and type of inputs		4 positive (PNP)
Input voltage		12VDC isolated
Input current		7mA
SUPPLY/VOLTAGE MEASURING CIRCUIT CONNECTIONS		
Type of terminals		Screw - removable
Conductor section (min...max)		0.2...4mm² (24...12 AWG)
Tightening torque		0.8Nm (4.5lbin)
CURRENT MEASURING CIRCUIT CONNECTIONS		
Type of terminals		Screw - fixed
Number of terminals		6 for external CT connections
Conductor section (min...max)		0.2...2.5mm² (24...12 AWG)
Tightening torque		0.44Nm (4lbin)
RELAY OUTPUT CONNECTIONS		
Type of terminals		Screw - removable
Conductor section (min...max)		0.2...2.5 mm² (24...12 AWG)
Tightening torque		0.44Nm (4lbin)
INPUT CONNECTIONS – Input terminals		
Type of terminals		Screw - removable
Conductor section (min...max)		0.2...2.5 mm² (24...12 AWG)
Tightening torque		0.5Nm (4.5lbin)
HOUSING		
Material		Polyamide
Version		Modular 6U

❶ Single insulation between the two outputs. Both outputs must use the same voltage group.

TYPE		PMVF 30
AUXILIARY POWER SUPPLY		
Rated control supply voltage Us		100...400VAC/110...250VDC
Operating limits		90...440VAC/93.5...300VDC
Frequency		45...55Hz
Power consumption	AC supply	7.5VA at 110VAC; 10VA at 230VAC; 14VA at 400VAC
	DC supply	35mA at 110VDC; 14mA at 250VDC
Power dissipation	AC supply	4W at 110VAC; 4.2W at 220V; 5W at 400VAC
	DC supply	3.8W at 110VAC; 4W at 250VDC
Micro-breaking immunity		≤30ms at 110VAC ; ≤140ms at 230VAC
Overload category		III
VOLTAGE INPUTS		
Maximum rated operating voltage		50...500VAC (for voltages/frequency) / 50...150V (for residual voltage measurement)
Measuring range (Un)		400-150,000V (VT primary)
Frequency range		45...55Hz
Overload category		IV
CURRENT INPUTS (OPTIONAL)		
Rated operational current Ie		1A or 5A in AC programmable
Measuring range		For 1A scale: 0.01...1.2A; for 5A scale: 0.01...6A
Type of input		Shunts powered by external current transformer (low voltage) 5A max.
Type of measurement		RMS
Overload capacity		±100% Ie
Overload peak		50A for 1 second
Burden (per phase)		≤0.3W
RELAY OUTPUTS		
Number of outputs		2
Type of output		1 changeover contact/SPDT each
Rated operating voltage		250VAC
UL/CSA and IEC/EN 60947-5-1 designation		5A 250VAC AC1 /B300; 5A 30VDC
Overload category		III
DIGITAL INPUTS		
Number and type of inputs		4 negative (NPN)
Input voltage		24VDC isolated
Input current		7mA
SUPPLY/VOLTAGE MEASURING CIRCUIT CONNECTIONS		
Type of terminals		Screw - removable
Number of terminals		2 for power supply; 5 for voltage control
Conductor section (min...max)		0.2...2.5mm² (24...12 AWG)
Tightening torque		0.5Nm (4.5lbin)
CURRENT MEASURING CIRCUIT CONNECTIONS		
Type of terminal		Screw - fixed
Number of terminals		6 for external CT connections
Conductor section (min...max)		0.2...4mm² (26...10 AWG)
Tightening torque		0.8Nm (7lbin)
RELAY OUTPUT CONNECTIONS		
Type and (number) of terminals		Screw – removable (3)
Conductor section (min...max)		0.2...2.5 mm² (24...12 AWG)
Tightening torque		0.5Nm (4.5 lbin)
INPUT CONNECTIONS – Input terminals		
Type and (number) of terminals		Screw – removable (4)
Conductor section (min...max)		0.2...1.5 mm² (28...14 AWG)
Tightening torque		0.18Nm (1.7lbin)
INPUT CONNECTIONS – COM and auxiliary voltage terminals		
Type and (number) of terminals		Screw – removable (3)
Conductor section (min...max)		0.2...2.5 mm² (24...12 AWG)
Tightening torque		0.5Nm (4.5lbin)
HOUSING		
Material		Polyamide
Version		Flush mount 96x96mm / 3.78x3.78”

Level controls

- Level monitoring relays for electrically conductive liquids
- Modular and plug-in versions
- Adjustable 2.5…200kΩ sensitivity
- Single and three-pole probes
- Float switches
- Start-up priority change relays.

Page 19-3

LEVEL CONTROL RELAYS
- For conductive liquids
- Single, dual or multivoltage
- Emptying or filling functions
- Multifunctions
- Automatic reset
- Modular and plug-in versions.

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PROBES, ELECTRODES AND ELECTRODE HOLDERS
- Single pole
- Three pole.

Page 19-7

FLOAT SWITCHES
- Versions for grey and dirty water
- Versions with PVC and Neoprene cable
- Emptying or filling functions.

Page 19-8

START-UP PRIORITY CHANGE RELAYS
- 2 outputs
- Single or multivoltage
- Modular and plug-in versions.

Lovato electric

Description	LEVEL CONTROL RELAYS						PRIORITY CHANGE RELAYS FOR 2 MOTORS		
	LVM20	LVM25	LVM30	LVM40	LV1E	LV2E	LVMP05	LVMP10	CSP2E
Modular version	●(2U)	●(1U)	●(3U)	●(3U)			●(1U)	●(3U)	
Plug-in version					● (8 pin)	● (11 pin)			● (11 pin)
3 detecting electrodes (MIN, MAX and COM)	●	●	●		●	●			
5 detecting electrodes (MIN1, MAX1, MIN2, MAX2 and COM)				●					
Sensitivity adjustment 2.5...50kΩ	●		●						
Sensitivity adjustment 2.5...100kΩ		●							
Sensitivity adjustment 2.5...200kΩ				●					
Fixed sensitivity: 7…8kΩ					●	●			
Adjustable sensitivity full-scale value 25-50-100-200 kΩ				●					
Separate sensitivity adjustment for MAX probe (foam detection)				●					
Emptying function	●	●	●	●	●	●			
Filling function		●	●	●					
Emptying function with Extra-MIN and/or Extra-MAX alarm				●					
Filling function with Extra-MIN and/or Extra-MAX alarm				●					
Emptying function with start change control				●					
Filling function with start change control				●					
Tank filling, well drawing functions and alarm				●					
Filling-emptying adjustment selector		●	●						
Programming selector for 5 different functions				●					
Motor start-up priority change							●		
Motor start-up priority change with stand-by motor function								●	●
Page	19-3			19-4	19-5		19-8		

Some permitted liquid substances				Liquid substances not permitted
Type of liquid	Resistivity kΩcm	Type of liquid	Resistivity kΩcm	
Drinking water	5–10	Milk	~1	• Purified water • Deionised water • Petrol • Oil • Liquid gases • Paraffin • Ethylene glycol • Paints • Liquids with a high percentage of alcohol
Well water	2–5	Whey	~1	
River water	2–15	Fruit juices	~1	
Rainwater	15–25	Vegetable juices	~1	
Sludge	0.5–2	Soups	~1	
Seawater	~0.03	Wine	~2.2	
Salt water	~2.2	Beer	~2.2	
Natural/hard water	~5	Coffee	~2.2	
Chlorinated water	~5	Suds	~18	
Condensed water	~18			

N.B. The resistivity values in the table are purely indicative.

Single-voltage relay

LVM20...

Order code	Auxiliary supply voltage	Type of output contact	Qty per pack	Wt
	[V] 50/60Hz	⅂'	n°	[kg]
Emptying function. Automatic reset.				
LVM20 A024	24VAC	1 C/O (SPDT)	1	0.215
LVM20 A127	110...127VAC	1 C/O (SPDT)	1	0.215
LVM20 A240	220...240VAC	1 C/O (SPDT)	1	0.215
LVM20 A415	380...415VAC	1 C/O (SPDT)	1	0.215

Operational characteristics
- Used with 3 sensing electrodes, MIN, MAX and COM
- 2.5…50kΩ adjustable sensitivity
- Double insulation between each supply, electrodes and output relay circuits
- Fixed probe signal delay: <1s
- Green LED indicator for power on
- Red LED indicator for output relay state
- Modular DIN 43880 housing (2 modules)
- IEC degree of protection: IP40 on front (only when mounted in housing or electric board with IP40); IP20 on terminals.

Certifications and compliance
Certifications obtained: EAC, UL Listed, for USA and Canada (cULus-File E93601), as Auxiliary Devices - Level control relays.
Compliant with standards: IEC/EN 60255-5,IEC/EN 61000-6-2, IEC/EN 61000-6-3, UL508, CSA C22.2 no. 14.

Probes, electrode holders and float switches
Use probes and electrode holders type:
SN1/PS31/PS3S/SCM/CGL or similar (see page 19-6).
For the choice of float switches see page 19-7.

Multi-voltage relay

LVM25 240

LVMKIT25

Order code	Auxiliary supply voltage	Type of output contact	Qty per pack	Wt
	[V]	⅂'	n°	[kg]
Emptying or filling functions. Automatic reset.				
LVM25 240	24...240VAC/DC	1 C/O (SPDT)	1	0.095

Order code	Description	Qty per pack	Wt
		n°	[kg]
Level control relay LVM25 240 and SN1 electrodes kit.			
LVMKIT25	Level control relay LVM25 240 and 2 SN1 probes	1	0.192

Operational characteristics
- Used with 3 sensing electrodes, MIN, MAX and COM
- 2.5…100kΩ adjustable sensitivity
- Insensitivity to stray electrode-cable capacitance
- Programming selector for emptying or filling function with fail-safe operation
- Double insulation between each supply, electrodes and output relay circuits
- Fixed probe signal delay: <1s
- Green LED indicator for power on
- Red LED indicator for output relay state
- Modular DIN 43880 housing (1 module)
- IEC degree of protection: IP40 on front (only when mounted in housing or electric board with IP40); IP20 on terminals.

Certifications and compliance
Certifications obtained: EAC, UL Listed, for USA and Canada (cULus-File E93601), as Auxiliary Devices - Level control relays.
Compliant with standards: IEC/EN 60255-5, IEC/EN 61000-6-2, IEC/EN 61000-6-4, UL508, CSA C22.2 n° 14.

Probes, electrode holders and float switches
Use probes and electrode holders type:
SN1/PS31/PS3S/SCM/CGL or similar (see page 19-6).
For the choice of float switches see page 19-7.

Dual-voltage relay

LVM30...

Order code	Auxiliary supply voltage	Type of output contact	Qty per pack	Wt
	[V] 50/60Hz	⅂'	n°	[kg]
Emptying or filling functions. Automatic reset.				
LVM30 A240	24/220...240VAC	2 C/O (SPDT)	1	0.315
LVM30 A415	110...127VAC 380...415VAC	2 C/O (SPDT)	1	0.315

Operational characteristics
- Used with 3 sensing electrodes, MIN, MAX and COM
- 2.5…50kΩ adjustable sensitivity
- Programming selector for emptying or filling function with fail-safe operation
- Double insulation between each supply, electrodes and output relay circuits
- Adjustable probe signal delay: 1...10s or pump start delay: 0...300s
- Green LED indicator for power on
- Red LED indicator for output relay state
- Modular DIN 43880 housing (3 modules)
- IEC degree of protection: IP40 on front (only when mounted in housing or electric board with IP40); IP20 on terminals.

Certifications and compliance
Certifications obtained: EAC, UL Listed, for USA and Canada (cULus-File E93601), as Auxiliary Devices - Level control relays.
Compliant with standards: IEC/EN 60255-5, IEC/EN 61000-6-2, IEC/EN 61000-6-3, UL508, CSA C22.2 n° 14.

Probes, electrode holders and float switches
Use probes and electrode holders type:
SN1/PS31/PS3S/SCM/CGL or similar (see page 19-6).
For the choice of float switches see page 19-7.

Single-voltage multifunction relay

LVM40…

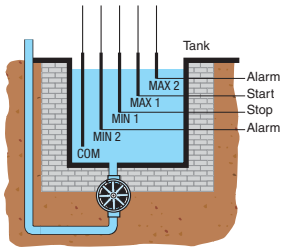
Order code	Auxiliary supply voltage	Type of output contacts	Qty per pack	Weight
	[V] 50/60Hz	❶	n°	[kg]
Emptying or filling functions. Multifunctions. Automatic reset.				
LVM40 A024	24VAC	1+1NO	1	0.278
LVM40 A127	110...127VAC	1+1NO	1	0.278
LVM40 A240	220...240VAC	1+1NO	1	0.278
LVM40 A415	380...415VAC	1+1NO	1	0.278

❶ Two relay outputs; one with c/o (SPDT) and the other with N/O (SPST).

FUNCTIONS

A- Emptying with MIN and/or MAX alarms.

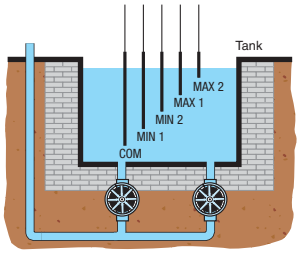
B- Filling with MIN and/or MAX alarms.



EXAMPLE OF EMPTYING OPERATION
To achieve this type of operation, two electrodes are used to control the liquid between the fixed limits using MIN1 and MAX1 and two alarm levels using MIN2 and MAX2. When one of the alarm electrodes is wet, the alarm relay is de-energised.
The alarm can be caused by pump malfunction, insufficient pump delivery capacity, MAX control level failure or MIN level electrode shorted.
With a proper connection, only the MIN alarm or MAX alarm can be activated or neither of the two can be activated so the relative output contacts can be used for pump control.

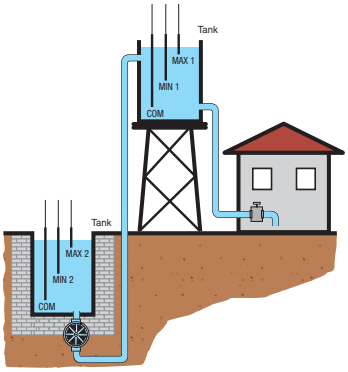
C- Emptying with pump priority change.

D- Filling with pump priority change.



EXAMPLE OF EMPTYING OPERATION
This operation is obtained by using four electrodes positioned at four different levels and two relay outputs to control two pumps. For example, one can place the four electrodes, MIN1, MIN2, MAX1 and MAX2, in increasing order from the lowest to the highest levels and must control the tank emptying. Usually the level is controlled between the MIN1 and MAX1 levels by starting one of the two pumps. This case is different so the pumps can be maintained at the best efficiency and optimise their wear. When the liquid wets the MAX2 level and because the first pump is faulty or else a higher delivery capacity is needed, the second stand-by pump is activated to back up the first pump. When the liquid lowers and no longer wets the MIN2 level, the second pump is stopped and then when the MIN1 level is no longer wet, the first pump is stopped too.

E- Tank filling and well drawing with alarm.



EXAMPLE.
Two electrodes are used in this operation to control the tank level and another two for the well. One relay is used to activate the pump while the other for dry running / no water alarm.
When the well liquid wets the MAX2 level and the liquid wets the MIN1 tank level, the tank-filling pump is activated.
When the tank MAX1 level is wet, the pump is stopped. During the tank filling, the pump could stop before the MAX1 level is wet because the well MIN2 level is no longer wet.
Should the tank MIN1 level no longer be wet at which the pump should restart but the well MIN2 level is also no longer wet, then the alarm relay is de-energised.

Operational characteristics
- Use with 5 sensing electrodes, MIN1, MAX1, MIN2, MAX2 and COM
- 2.5…200kΩ adjustable sensitivity
- Adjustable sensitivity full-scale value: 25-50-100-200kΩ
- Separate sensitivity adjustment of MAX electrodes for foam detection
- Insensitivity to stray electrode-cable capacitance
- Programming selector for 5 different functions:
  - emptying function and alarms (pos. A)
  - filling function and alarms (pos. B)
  - emptying function with priority start-up change control (pos. C)
  - filling function with priority start-up change pump (pos. D)
  - well draining and tank filling and alarms (pos. E)
- Double insulation between each supply, electrodes and output relay circuits
- Adjustable probe signal delay: 1...10s
- Adjustable pump start delay: 0...30min
- Green LED indicator for power on
- Red LED indicators for output relay and electrode state
- Modular DIN 43880 housing (3 modules)
- IEC degree of protection: IP40 on front (only when mounted in housing or electric board with IP40); IP20 on terminals.

Certifications and compliance
Certifications obtained: EAC, UL Listed, for USA and Canada (cULus-File E93601), as Auxiliary Devices - Level control relays.
Compliant with standards: IEC/EN 60255-5, IEC/EN 61000-6-2, IEC/EN 61000-6-3, UL508, CSA C22.2 n° 14.

Probes, electrode holders and float switches
Use probes and electrode holders type:
SN1/PS31/PS3S/SCM/CGL or similar (see page 19-6).
For the choice of float switches see page 19-7.

Single-voltage relay

31 LV1E...

Order code	Auxiliary supply voltage	Type of output contact	Qty per pack	Wt
	[V] 50/60Hz		n°	[kg]
Emptying or filling functions. Automatic reset.				
31 LV1E 24	24VAC	1 C/O (SPDT)	1	0.263
31 LV1E 110	110...120VAC	1 C/O (SPDT)	1	0.263
31 LV1E 230	220...240VAC	1 C/O (SPDT)	1	0.263
31 LV1E 400	380...415VAC	1 C/O (SPDT)	1	0.263

Operational characteristics
- Used with 3 sensing electrodes, MIN, MAX and COM
- 7…8kΩ fixed sensitivity
- Red LED indicator for output relay state
- Max. relay-electrode cable length: 500m/547yd single-core, double insulated cables
- Mounting on 35mm (IEC/EN 60715) DIN rail or 8-pin plug-in housing
- 8-pin plug-in housing (socket S8; see page 19-9)
- IEC degree of protection: IP30.

Certifications and compliance
Certifications obtained: EAC.
Compliant with standards: IEC/EN 60255-5.

Probes, electrode holders and float switches
Use probes and electrode holders type:
SN1/PS31/PS3S/SCM/CGL or similar (see page 19-6).
For the choice of float switches see page 19-7.

Dual-voltage relay

31 LV2E...

Order code	Auxiliary supply voltage	Type of output contact	Qty per pack	Wt
	[V] 50/60Hz		n°	[kg]
Emptying or filling functions. Automatic reset.				
31 LV2E 48	24/48VAC	1 C/O (SPDT)	1	0.266
31 LV2E 220	110...120VAC/ 220...240VAC	1 C/O (SPDT)	1	0.266
31 LV2E 400	220...240VAC/ 380...415VAC	1 C/O (SPDT)	1	0.266

Operational characteristics
- Used with 3 sensing electrodes, MIN, MAX and COM
- 7…8kΩ fixed sensitivity
- Red LED indicator for output relay state
- Max. relay-electrode cable length: 500m/547yd single-core, double insulated cables
- Mounting on 35mm (IEC/EN 60715) DIN rail or 11-pin plug-in housing
- 11-pin plug-in housing (socket S11; see page 19-9)
- IEC degree of protection: IP30.

Certifications and compliance
Certifications obtained: EAC.
Compliant with standards: IEC/EN 60255-5.

Probes, electrode holders and float switches
Use probes and electrode holders type:
SN1/PS31/PS3S/SCM/CGL or similar (see page 19-6).
For the choice of float switches see page 19-7.

Probes and electrode holders

11 SN1

31 SCM…

31 CGL125…

31 PS31

31 PS3S

Order code	Probe included	Probe length	Qty per pack	Weight
		[mm/in]	n°	[kg]
Single pole electrodes.				
11 SN1	yes	100❶/3.9”	10	0.050
31 SCM 04	yes	43/1.7”	1	0.060
31 SCM 50	yes	500/19.7”	1	0.115
31 SCM 100	yes	1000/39.4”	1	0.162
31 CGL125 3	yes	327/12.9”	1	0.126
31 CGL125 5	yes	500/19.7”	1	0.158
31 CGL125 7	yes	700/27.6”	1	0.208
31 CGL125 10	yes	1000/39.4”	1	0.281
Three pole electrode.				
31 PS31	yes	300/11.8”	1	0.120
Electrode holder (for 3 rod probes).				
31 PS3S	no	—	1	0.184

❶ Total electrode length.

General characteristics
SN1 SINGLE POLE PROBES
A single pole probe used for level control in wells or storage tanks. It comprises of an AISI 303 stainless steel electrode, a plastic (PPOX) holder and a cable gland.
A seal ring and the tightening of the cable gland PG7 prevent water from entering the cable terminal connector and causing its oxidation.
Cable connection: screw.
The external cable diameter must be 2.5 to 6mm/Ø0.1 to 0.24” to warrant perfect sealing.
Maximum connection cable section: 2.5mm^2.
Maximum operating temperature: +60°C.
Application: Tanks and deep wells.

SCM… PROBES
A single pole probe used for level control on boilers, autoclaves and in general where pressure (10 bar maximum) and high temperature (+100°C maximum) are present. It comprises of an AISI 303 stainless steel electrode embedded in an aluminium oxide body and a 3/8” GAS threaded metal support holder.
Cable connection: Threaded rod with nut.
Application: Tanks, pressurised tanks and boilers.

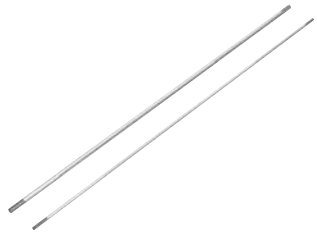
CGL125… PROBES
A single pole probe with AISI 302 electrode, used for level control on boilers and autoclaves and in general wherever pressure is up to 10 bar maximum.
Maximum operating temperature: +180°C.
Threaded coupling: 3/8” GAS.
Cable connection: Threaded rod with nut.
Application: Tanks, pressurised tanks and boilers.

PS31 PROBE
A small electrode holder, complete with three AISI 304 stainless steel probes.
Particularly suited to small containers whenever pressure is maximum up to 2 bar.
Maximum operating temperature: +70°C.
Threaded coupling: 1/2” GAS.
Faston termination; related lugs supplied.
Application: Tanks and automatic dispensers.

PS3S ELECTRODE HOLDER
A thermoset resin electrode holder to be used with three probes (rods probes to be ordered separately) and complete with terminal cover.
Maximum operating temperature: +100°C.
2” GAS threaded coupling.
Cable connection: screw.
Application: tanks.

Certification and compliance
Certification obtained: EAC.
Compliant with standards: IEC/EN 60255-5.

Electrodes



31 ASTA…

Order code	Rod probe length	Qty per pack	Weight
	[mm/in]	n°	[kg]
For SCM probes.			
31 ASTA 460 MM4	460/18.11”	1	0.053
31 ASTA 960 MM4	960/37.8”	1	0.103
For PS3S electrode holder.			
31 ASTA 460 MM6	460/18.11”	1	0.100
31 ASTA 960 MM6	960/37.8”	1	0.210

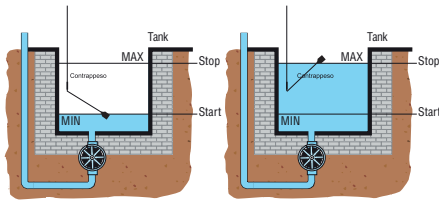
General characteristics
Stainless steel AISI 304 electrodes with 4M or 6M threaded extremity suitable as extensions for SCM probe or as rod probe for PS3S electrode holder.
For connecting SCM probes with electrode extension unit (ASTA...MM4), see page 19-9.

Certification
Certification obtained: EAC.

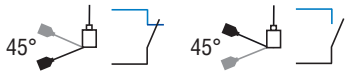
For grey water

Order code	Cable material	Cable length	Counter-weight included	Qty	Wt
		[m]		n°	[kg]
LVFS P1 W 03	PVC	3	Yes	1	0.610
LVFS P1 W 05	PVC	5	Yes	1	0.830
LVFS P1 W 10	PVC	10	Yes	1	1.410
LVFS P1 W 15	PVC	15	Yes	1	1.930
LVFS P1 W 20	PVC	20	Yes	1	2.380
LVFS N1 W 03	Neoprene	3	Yes	1	0.640
LVFS N1 W 05	Neoprene	5	Yes	1	0.880
LVFS N1 W 10	Neoprene	10	Yes	1	1.510
LVFS N1 W 15	Neoprene	15	Yes	1	2.080
LVFS N1 W 20	Neoprene	20	Yes	1	2.480

Filling function

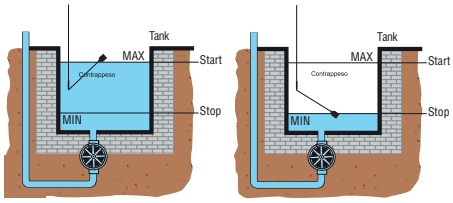


This function is achieved by connecting the black and blue float terminals. The level regulator contact closes the lower circuit at minimum level and opens the circuit when the float reaches the upper maximum level. The MIN and MAX levels can be adjusted by varying the distance between counterweight and float.



Start Stop

Emptying function



This function is achieved by connecting the black and brown float terminals. The level regulator contact closes the upper circuit at maximum level and opens the circuit when the float reaches the lower minimum level. The MIN and MAX levels can be adjusted by varying the distance between counterweight and float.

Start Stop

General characteristics

Float switches are used in the automation of electrical equipment, such as: pumps, solenoid valves, alarms, motorised sluice gates, etc. All versions feature an internal changeover contact operated in accordance with the level of liquid where the float is located. The cables used are high-quality and offer excellent mechanical and chemical resistance over time.
The cables are 3x1 type, that is 3 wires with section 1mm^2. This allows the user to choose the filling and emptying function during regulator wiring.

Operational characteristics

They are used for the civil and industrial control of levels of grey water, e.g. rainwater, groundwater or cooling water from industry. They are available with PVC and neoprene cables of various lengths.
- Activation angle ±45°
- 130g external counterweight included
- Float casing material: polypropylene
- Cable A05 VV-F3X1 (PVC) available in lengths of 3, 5, 10, 15 and 20m and cable H07 RN-F3X1 (Neoprene) available in lengths of 3, 5, 10, 15 and 20m
- Rated cable diameter: 9mm (PVC and Neoprene)
- Relay with changeover contact 10(8)A 250VAC 50/60Hz
- Maximum installation depth: 30m
- Maximum pressure: 3bar
- Operating temperature: 0…+50°C
- Storage temperature: -20…+70°C
- IEC degree of protection: IP68
- Insulation class: II.

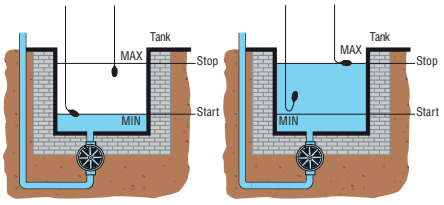
Certifications and compliance

Certifications: TÜV.
Compliant with standards: IEC/EN 60730-1, IEC/EN 60730-2-15.

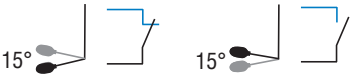
For dirty water

Order code	Cable material	Cable length	Counter-weight	Qty	Wt
		[m]		n°	[kg]
LVFS N1 B 05	Neoprene	5	Internal	1	1.250
LVFS N1 B 10	Neoprene	10	Internal	1	1.860
LVFS N1 B 15	Neoprene	15	Internal	1	2.460
LVFS N1 B 20	Neoprene	20	Internal	1	3.060

Filling function❶

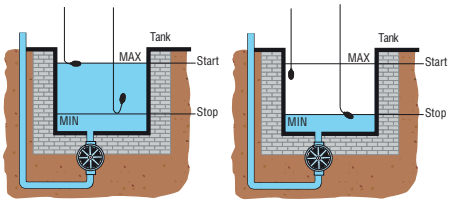


This function uses two floats and is achieved by connecting the black and blue float terminals. The MIN and MAX levels can be adjusted by varying the position of the floats.

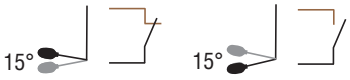


Start Stop

Emptying function❶



This function uses two floats and is achieved by connecting the black and brown float terminals. The MIN and MAX levels can be adjusted by varying the position of the floats.



Start Stop

❶ It is possible to use even a single float for black water, adjusting the level in a fixed range of 10cm MAX, a solution which is not advisable for turbulent waters.

Operational characteristics

These float switches are used for the civil and industrial control of levels of dirty water, e.g. sewage or waste water from industry. The float switches comprises of a one-piece external blow-moulded polypropylene casing, with fixed internal counterweight located in the cable exit area.
The regulator contact is positioned centrally in its own watertight chamber. This is insulated from the external casing by injecting closed-cell foam. This solution further increases protection against moisture leakage and heat insulates the watertight chamber housing the contact, eliminating the creation of condensation.
- Activation angle ±15°
- Internal counterweight
- Float casing material: polypropylene
- Cable H07 RN-F3X1 (Neoprene) available in lengths of 5, 10, 15 and 20m
- Rated cable diameter: 9mm
- Relay with changeover contact 10(4)A 250VAC 50/60Hz
- Maximum installation depth: 50m
- Maximum pressure: 5bar
- Operating temperature: 0…+50°C
- Storage temperature: -20…+70°C
- IEC degree of protection: IP68
- Insulation class: II.

Certifications and compliance

Certifications: TÜV.
Compliant with standards: IEC/EN 60730-1. IEC/EN 60730-2-15.

Modular version

LVMP05

Order code	Auxiliary supply voltage	Type of output contacts	Qty per pack	Weight
	[V]	⍳	n°	[kg]
2 outputs. AC and DC supply voltage.				
LVMP05	24/48VDC 24...240VAC	2N/O (SPST)	1	0.090

General characteristics
Priority change relays are designed to balance the operating time, and hence the wear of pumps, compressors, generators, when two units, primary and stand-by, are installed.

Operational characteristics
- Operating limits: 0.85...1.1 Ue
- Connection: permanent
- Green LED indicator for power on
- Red LED indicators for output relay state
- Modular DIN 43880 housing (1 module)
- IEC degree of protection: IP40 on front (only when mounted in housing or electric board with IP40); IP20 on terminals.

Certifications and compliance
Certifications obtained: EAC, UL Listed, for USA and Canada (cULus-File E93601), as Auxiliary Devices - Automatic starting control.
Compliant with standards: IEC/EN 60255-5, IEC/EN 61000-6-2, IEC/EN 61000-6-3, UL508, CSA C22.2 n° 14.

LVMP10...

Order code	Auxiliary supply voltage	Type of output contacts	Qty per pack	Weight
	[V] 50/60Hz	⍳	n°	[kg]
2 outputs. AC supply voltage.				
LVMP10 A024	24VAC	2 NO (SPST)	1	0.250
LVMP10 A127	110...127VAC	2 NO (SPST)	1	0.250
LVMP10 A240	220...240VAC	2 NO (SPST)	1	0.250
LVMP10 A415	380...415VAC	2 NO (SPST)	1	0.250

General characteristics
Priority change relays are designed to balance the operating time, and hence the wear of pumps, compressors, generators, when two units, primary and stand-by, are installed.

Operational characteristics
- Operating limits: 0.85...1.1 Ue
- Connection: permanent
- Green LED indicator for power on
- Red LED indicators for output relay state
- Modular DIN 43880 housing (3 modules)
- IEC degree of protection: IP40 on front (only when mounted in housing or electric board with IP40); IP20 on terminals.

Certifications and compliance
Certifications obtained: EAC, UL Listed, for USA and Canada (cULus-File E93601), as Auxiliary Devices - Automatic starting control.
Compliant with standards: IEC/EN 60255-5, IEC/EN 61000-6-2, IEC/EN 61000-6-3, UL508, CSA C22.2 n° 14.

Plug-in version

31 CSP2E...

Order code	Auxiliary supply voltage	Type of output contacts	Qty per pack	Weight
	[V] 50/60Hz	⍳	n°	[kg]
2 outputs. AC supply voltage.				
31 CSP2E 24	24VAC	2 NO (SPST)	1	0.150
31 CSP2E 110	110VAC	2 NO (SPST)	1	0.150
31 CSP2E 220	220VAC	2 NO (SPST)	1	0.150
31 CSP2E 230	230...240VAC	2 NO (SPST)	1	0.150

General characteristics
Priority change relays are designed to balance the operating time, and hence the wear of pumps, compressors, generators, when two units, primary and stand-by, are installed.

Operational characteristics
- Operating limits: 0.85...1.1 Ue
- Connection: permanent
- Voltage applied to input contacts: 15VDC not insulated at power supply.
- Current consumption, input contacts: about 1mA.
- 11-pin plug-in housing (sockets S11; see page 19-9).
- IEC degree of protection: IP30.

Certifications and compliance
Certifications obtained: EAC.
Compliant with standards: IEC/EN 60255-5.

Accessories

31 RE213

31 S8

31 S11

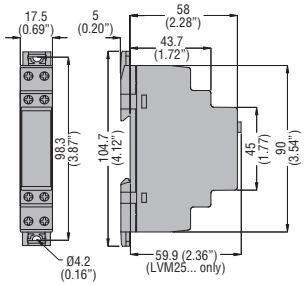
Order code	Description	Qty per pack	Weight
		n°	[kg]
31 RE213	Coupler unit for SCM with electrode extension ASTA...MM4	1	0.008
31 S8	8-pin socket for screw fixing or mounting on 35mm DIN rail (IEC/EN 60715), used with LV1E... relay. Screw terminals	10	0.061
31 S11	11-pin socket for screw fixing or mounting on 35mm DIN rail (IEC/EN 60715), used with LV2E... and CSP2E... relays. Screw terminals	10	0.064
31 RE014	Relay-socket retention bracket; S8 or S11 types only	10	0.001

Operational characteristics
SOCKETS FOR INSTALLING PLUG-IN LEVEL CONTROL RELAYS.
- max. wire section for sockets: 2x2.5mm^2/2x14AWG
- tightening torque: 0.8Nm/7.1lbin
- ratings: 10A - 400VAC.

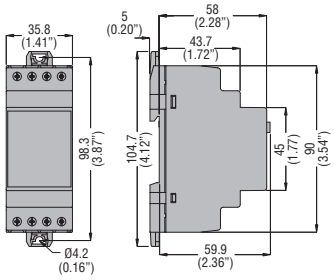
Certifications and compliance
Certifications obtained: EAC.
Compliant with standards: IEC/EN 61984, IEC/EN 61210, IEC/EN 60999-1.

LEVEL CONTROL AND START-UP PRIORITY CHANGE RELAYS

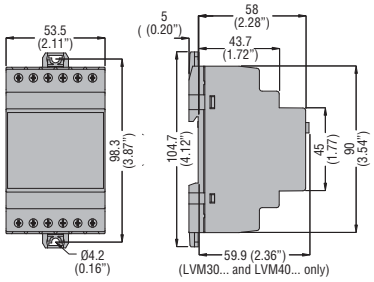
LVM25... - LVMP05



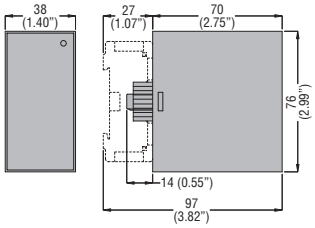
LVM20...



LVM30... - LVM40... - LVMP10

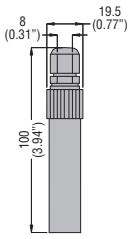


LV1E... - LV2E... - CSP2E...

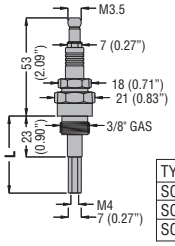


PROBES AND ELECTRODE HOLDERS FOR CONDUCTIVE LIQUIDS

SN1

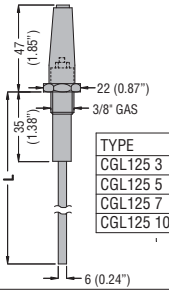


SCM...



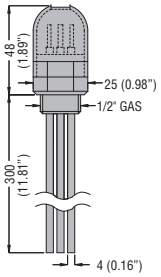
TYPE	L
SCM04	43 (1.69")
SCM50	500 (19.68")
SCM100	1000 (39.37")

CGL125...

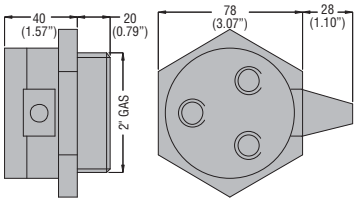


TYPE	L
CGL125 3	327 (12.87")
CGL125 5	500 (19.68")
CGL125 7	700 (27.56")
CGL125 10	1000 (39.37")

PS31

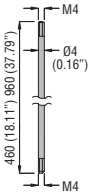


PS3S

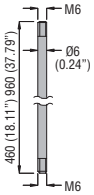


ELECTRODES

ASTA 460 MM4
ASTA 960 MM4

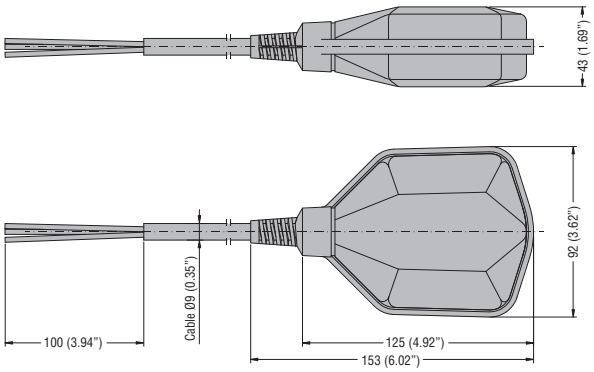


ASTA 460 MM6
ASTA 960 MM6

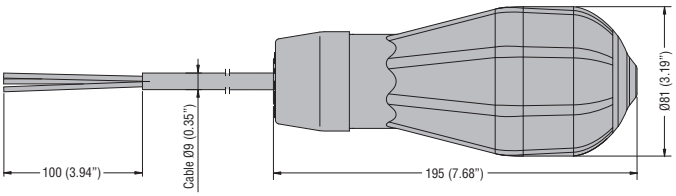


FLOAT SWITCHES

LVFS...W...

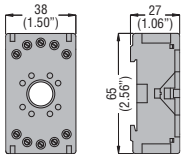


LVFS N1 B...

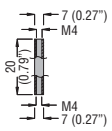


ACCESSORIES

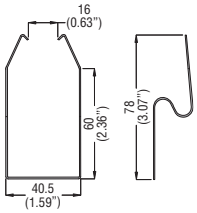
S8 - S11



Coupler unit
RE213

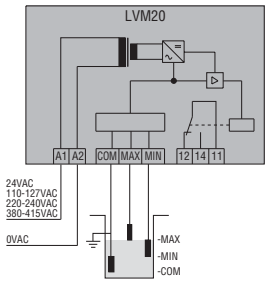


RE014

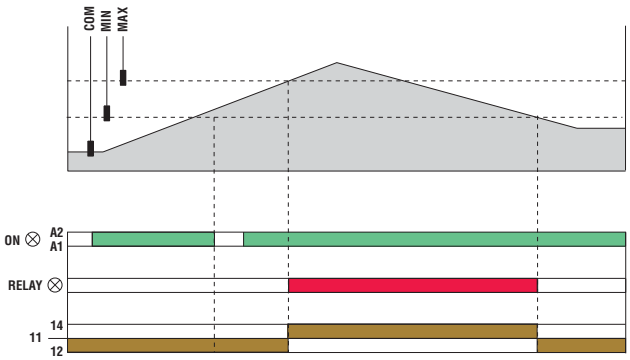


Emptying function

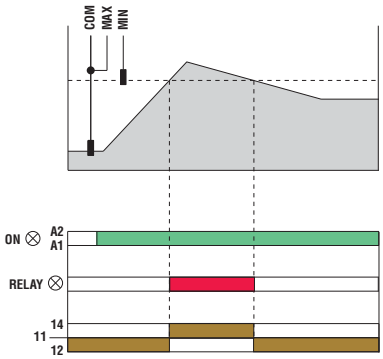
LVM20



Emptying function with 3 electrodes

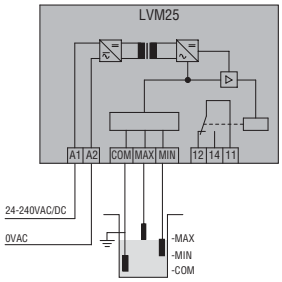


Emptying function with 2 electrodes

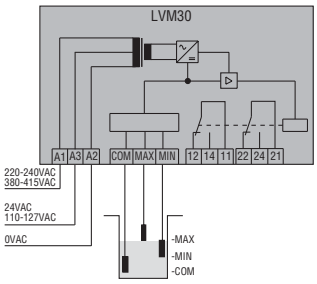


Emptying or filling functions

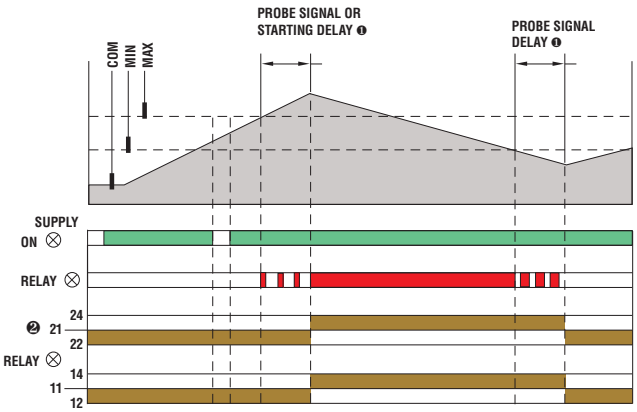
LVM25



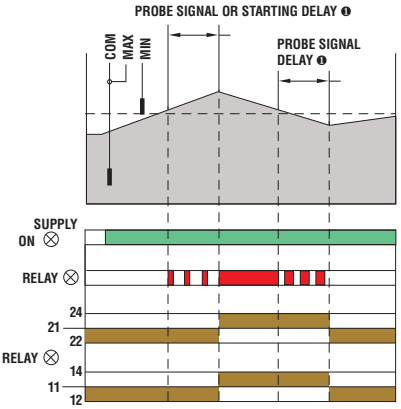
LVM30



Emptying function (DOWN)
Connection with 3 electrodes

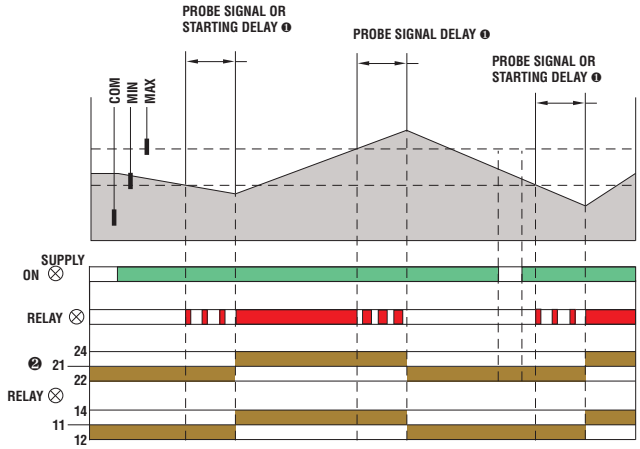


Connection with 2 electrodes

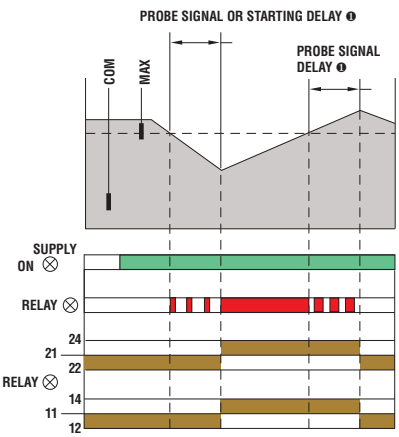


❶ Delay for LVM30 only.
❷ Changeover contact (SPDT) for LVM30 only.

Filling function (UP)
Connection with 3 electrodes



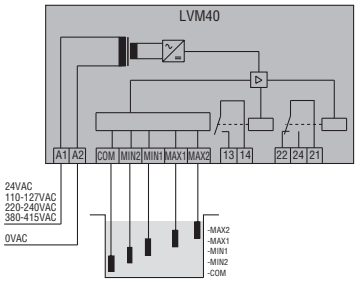
Connection with 2 electrodes



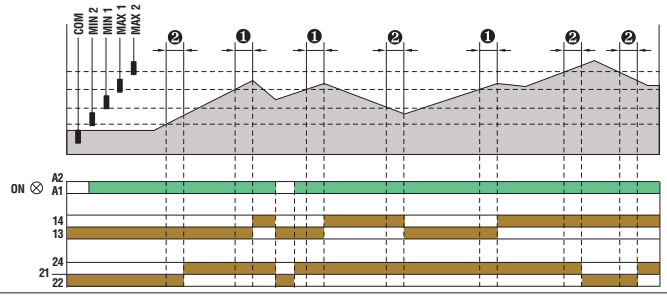
❶ Delay for LVM30 only.
❷ Changeover contact (SPDT) for LVM30 only.

Multifunctions.

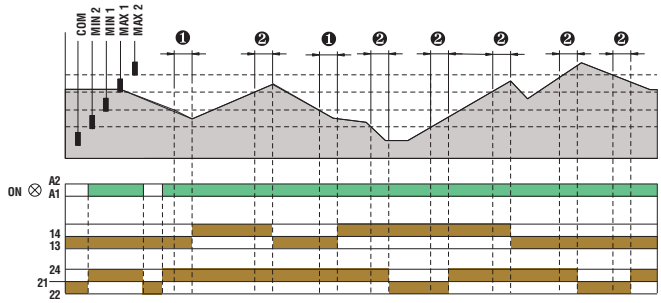
LVM40



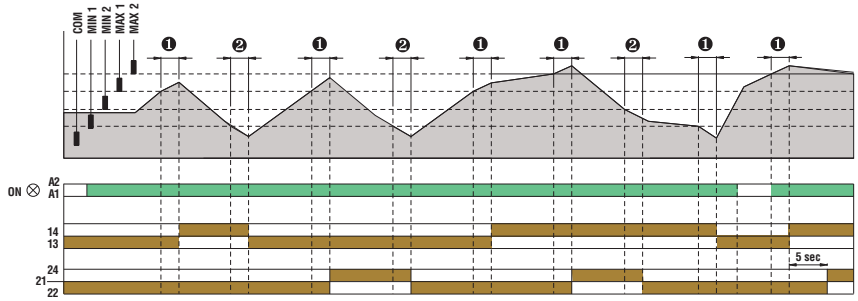
Emptying function + alarms



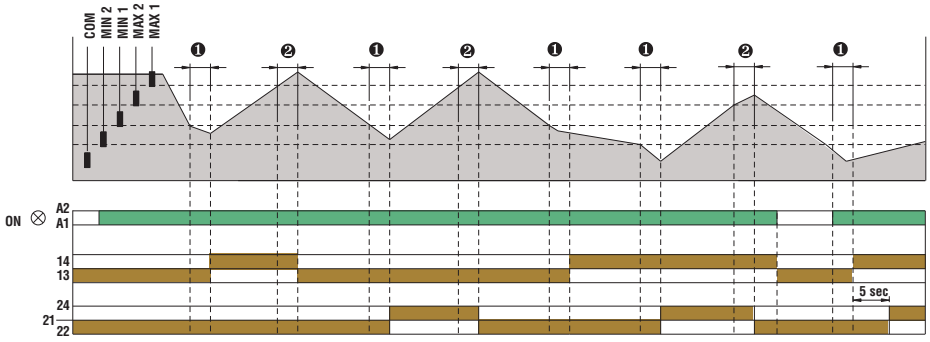
Filling function + alarms



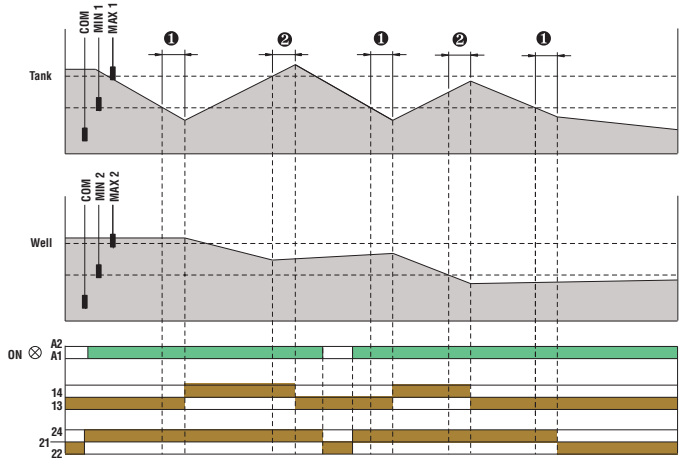
Emptying function + pump start change



Filling function + pump start change



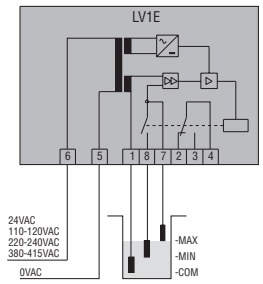
Filling tank and draining well function + alarm



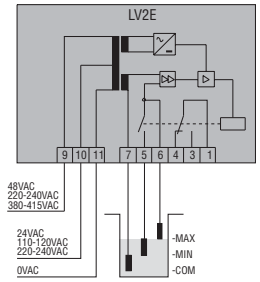
❶ Probe signal + starting delay.
❷ Probe signal delay.

Emptying function

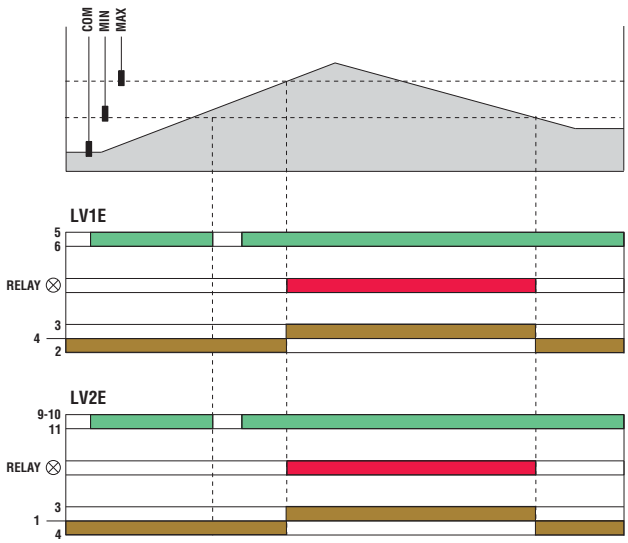
LV1E



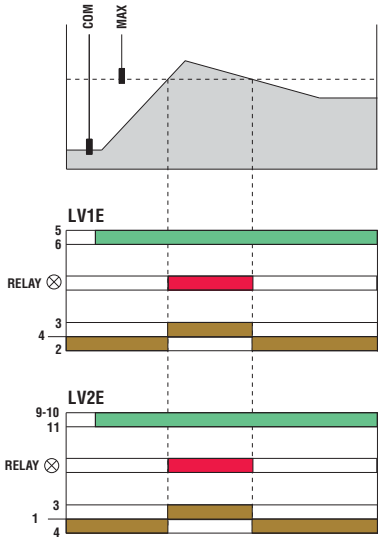
LV2E



Emptying function with 3 electrodes

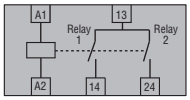


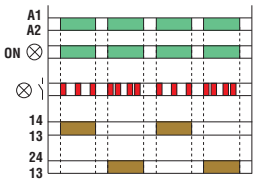
Emptying function with 2 electrodes



Priority change relays

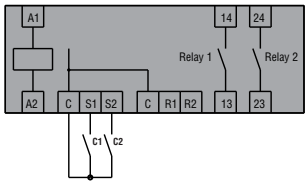
LVMP05



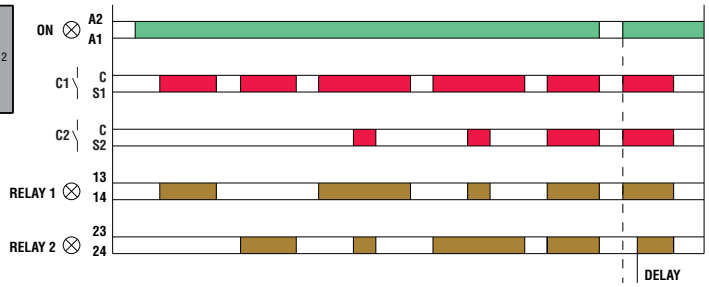


LVMP10

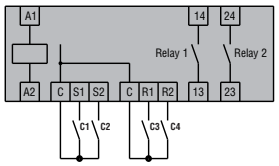
2-wire connection



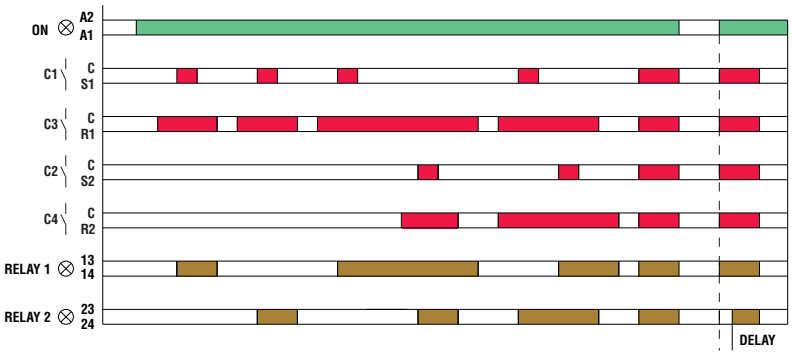
C1 = Primary
C2 = Secondary / Standby



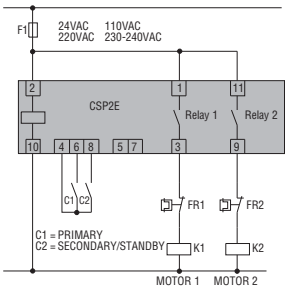
3-wire connection



C1 = Start Primary
C2 = Start Standby
C3 = Stop Primary
C4 = Stop Standby



CSP2E



TYPE	LVM20…	LVM25…	LVM30…	LVM40…
DESCRIPTION				
	Modular			
	Automatic reset			
	Single voltage	Multi voltage	Dual voltage	Single voltage
Application (examples)	Emptying function	Emptying or filling function	Emptying or filling function	Multifunctions
Operating principle	Electrical conductivity of liquids			
AUXILIARY SUPPLY				
Supply voltage Us	24VAC 110...127VAC 220...240VAC 380...415VAC	24...240VAC/DC	24/220...240VAC 110...127/380...415VAC	24VAC 110...127VAC 220...240VAC 380...415VAC
Operating voltage range	0.85...1.1 Ue; 50/60Hz ±5%			
Power consumption (maximum)	3.5VA	3VA	5.5VA	4.5VA
Power dissipation (maximum)	1.8W	1.2W	2.8W	2.8W
OUTPUTS				
Number of connectable electrodes	3	3	3	5
Type of electrode	Electrode and electrode holders: SN1 / SCM / CGL / PS31 / PS3S or similar			
Electrode voltage	7.5VAC	10VPP	7.5VAC	10VPP
Sensitivity	2.5...50kΩ	2.5...100kΩ	2.5...50kΩ	2.5...200kΩ
TIME DELAYS				
Tripping time (minimum)	≤600ms	≤1s	1s	1s
Resetting time (minimum)	≤750ms	≤1s	1s	1s
Probe tripping delay	—	—	OFF...10s	1...10s
Relay energising delay	—	—	OFF...300s	0...30min
RELAY OUTPUTS				
Number of relays	1	1	1	2
Relay state	Normally de-energised, energises at tripping			
Contact arrangement	1 changeover / SPDT	1 changeover / SPDT	2 changeover / SPDT each	1 changeover / SPDT and 1 with 1 N/O - SPST
Rated utilisation voltage	250VAC			
Maximum switching voltage	400VAC			
IEC conventional free air thermal current Ith	8A			
UL/CSA and IEC/EN 60947-5-1 designation	B300			
Electrical life (with rated load)	10^5 cycles			
Mechanical life	$30x10^6$ cycles			
Indications	1 green LED for power on 1 red LED for relay state	1 green LED for power on 1 red LED for relay state	1 green LED indicator for power on 1 red LED for relay state	green LED indicator for power on 2 red LEDs for relay state 2 red LEDs for probe state
INSULATION				
IEC rated insulation voltage Ui	415VAC	240VAC	415VAC	415VAC
IEC rated impulse wihstand voltage Uimp	6kV	4kV	6kV	6kV
IEC power frequency withstand voltage	4kV	2kV	4kV	4kV
Double insulation Supply/relay/electrode	≤250VAC	≤250VAC❶	≤250VAC	≤250VAC
CONNECTIONS				
Tightening torque maximum	0.8Nm (7lbin; 7-9lbin for UL/CSA)			
Conductor section min-max	0.2-4mm² (24-12AWG; 18-12 AWG for UL/CSA)			
AMBIENT CONDITIONS				
Operating temperature	–20...+60 °C			
Storage temperature	–30...+80 °C			
HOUSING				
Material	Self-extinguishing polyamide			
Typical configuration (examples)	LVM20 + n° 3 SN1 electrodes LVM30 + n° 3 SN1 electrodes		LVM25 + n° 3 SN1 electrodes LVM40 + n° 5 SN1 electrodes	
Maximum cable length	❸			

❶ Double insulaton between supply, electrodes and output relay circuit.
❷ Voltage applied to input contacts, not insulated at power supply.
❸ Consult Technical support for more information; see contact details on inside front cover.

	LV1E...	LV2E...	LVMP 05	LVMP 10	CSP2E
	Plug-in		Modular	Modular	Plug-in
	Automatic resetting	Automatic resetting	—	—	—
	Single voltage	Dual voltage	Multistage	Single voltage	Single voltage
	– Minimum-maximum level threshold – Maintains level between minimum and maximum – Protection against dry pump running		Priority change relay for motors		
	Electrical conductivity of liquids		—		
	24VAC	24/48VAC	24...48VDC 24....240VAC	24VAC	24VAC❷
	110...120VAC	110...120VAC/220...240VAC		110...127VAC	110VAC❷
	220...240VAC	220...240VAC/380...415VAC		220...240VAC	230/240VAC❷
	380...415VAC			380...415VAC	
	0.8...1.1 Ue 50/60Hz				
	5.5VA		1.6VA	4.8VA	5VA
	2.8W		0.9W	3W	3W
	3		—	—	—
	Electrode and electrode holders: SN1 / SCM / CGL / PS31 / PS3S / or similar		—	—	—
	9VAC (voltage between probes)		—	—	—
	7...8 kΩ fixed		—	—	—
	≤50ms		—	—	—
	≤100ms		—	—	—
	—		—	—	—
	—		—	—	—
	1		2	2	2
	Normally de-energised, energises at tripping				
	1 changeover contact / SPDT		1 N/O - SPST	1 N/O - SPST	1 N/O - SPST
	220VAC		250VAC	250VAC	250VAC
	380VAC		—	—	—
	5A		8A	8A	5A
	B300		B300	B300	B300
	$2.5x10^5$ cycles		10^5 cycles	10^5 cycles	10^5 cycles
	$50x10^6$ cycles		$30x10^6$ cycles	$30x10^6$ cycles	$30x10^6$ cycles
	1 red LED for relay tripping		1 green LED for power on 1 red LED for relay state	1 green LED for power on 1 red LED for relay state	1 green LED for power on 1 red LED for relay state
	415VAC		250VAC	415VAC	250VAC
	5kV		4kV	4kV	4kV
	2kV		2kV	2.5kV	2.5kV
	—				
	—		0.8Nm (7lbin; 7-9lbin for UL/CSA)		—
	—		0.2-4.0mm² (24-12AWG; 18-12 AWG for UL/CSA)		—
	-20...+60°C				
	-30...+80°C				
	Self-extinguishing polycarbonate		Self-extinguishing polyamide	Self-extinguishing polyamide	Self-extinguishing polycarbonate
	LV1E + n° 3 SN1 electrode LV2E + n° 2 SN1 electrodes + reset button		—	—	—
	500m/547yd single-core, double insulated cables		—	—	—

General purpose relays

- Electromechanical and SSR (solid state relay) versions
- AC or DC coils
- Sockets with screw or spring terminals
- Relays with LED state indicator and mechanical actuator
- Parallel busbars and noise filters.

Page 20-4

HR10
- Slim relay with socket width of just 6.2mm
- 1 changeover contact
- Electromechanical version
- In 6A
- Sockets with built-in LED
- Sockets with screw or spring terminals
- Control voltage from 12 to 230VAC/DC
- Parallel busbars.

Page 20-4

HR20
- Slim relay with socket width of just 6.2mm
- 1 solid-state (SSR) output
- Output current 2A in AC and 4A in DC
- Sockets with built-in LED
- Sockets with screw or spring terminals
- Control voltage 24VDC
- Parallel busbars.

Page 20-5

HR30
- Miniature relay
- 1 or 2 changeover contacts
- In 10A (16A on PCB)
- Versions with AC or DC control
- Sockets with screw or spring terminals
- Parallel busbars.

Page 20-6

HR50
- Miniature relay
- 1 or 2 changeover contacts
- In 10A
- LED and mechanical state indicator
- Mechanical test actuator with latch option
- Versions with AC or DC control
- Sockets with screw or spring terminals
- Parallel busbars.

Page 20-7

HR60
- Industrial relay
- 2 or 4 changeover contacts
- In 7A or 5A
- LED and mechanical state indicator
- Mechanical test actuator with latch option
- Versions with AC or DC control.

Page 20-8

HR70
- 8-pin and 11-pin industrial relay
- 2 or 3 changeover contacts
- In 10A
- LED and mechanical state indicator
- Mechanical test actuator with latch option
- Versions with AC or DC control.

Relays		Code	Contacts	Rated current	Control voltage	Sockets
SLIM RELAYS		**HRA10 1C E024**	1 C/O	6A	24VAC/DC	Version with relay assembled on socket
		HRA10 1C E024S❶	1 C/O	6A	24VAC/DC	
		**HR10 1C E012**	1 C/O	6A	12VAC/DC❸	**HR1X S024 - HR1X S024S❶** 
		HR10 1C E024	1 C/O	6A	24VAC/DC❸	
		HR10 1C E060	1 C/O	6A	110...125VAC/DC❷	**HR1X S110 - HR1X S110S❶**
					220...240VAC/DC❷	**HR1X S230 - HR1X S230S❶**
		HR20 1A S024	1 SSR	2A (AC)	24VDC	**HR1X S024 - HR1X S024S❶**
		HR20 1D S024	1 SSR	4A (DC)	24VDC	
MINIATURE RELAYS		**HR30 1C D012**	1 C/O	16A❹	12VDC	Max 10A
		HR30 1C D024	1 C/O	16A❹	24VDC	
		HR30 1C A024	1 C/O	16A❹	24VAC	
		HR30 1C A110	1 C/O	16A❹	110VAC	
		HR30 1C A230	1 C/O	16A❹	230VAC	
		HR30 2C D012	2 C/O	8A	12VDC	 **HR5X S21** Screw terminals. Contact terminals all on upper side.
		HR30 2C D024	2 C/O	8A	24VDC	
		HR30 2C A024	2 C/O	8A	24VAC	
		HR30 2C A110	2 C/O	8A	110VAC	
		HR30 2C A230	2 C/O	8A	230VAC	
MINIATURE RELAYS WITH LED STATE INDICATOR AND MECHANICAL ACTUATOR		**HR50 1C D012**	1 C/O	16A❹	12VDC	 **HR5X S22** Screw terminals.
		HR50 1C D024	1 C/O	16A❹	24VDC	
		HR50 1C D048	1 C/O	16A❹	48VDC	
		HR50 1C D110	1 C/O	16A❹	110VDC	
		HR50 1C A024	1 C/O	16A❹	24VAC	
		HR50 1C A110	1 C/O	16A❹	110VAC	 **HR5X S21S❸** Spring terminals.
		HR50 1C A230	1 C/O	16A❹	230VAC	
		HR50 2C D012	2 C/O	8A	12VDC	
		HR50 2C D024	2 C/O	8A	24VDC	
		HR50 2C D048	2 C/O	8A	48VDC	
		HR50 2C D110	2 C/O	8A	110VDC	
		HR50 2C A024	2 C/O	8A	24VAC	
		HR50 2C A110	2 C/O	8A	110VAC	
		HR50 2C A230	2 C/O	8A	230VAC	
INDUSTRIAL RELAYS WITH LED STATE INDICATOR AND MECHANICAL ACTUATOR		**HR60 2C D012**	2 C/O	7A	12VDC	 **HR6X S21** Screw terminals. Contact terminals on upper side.  **HR6X S22** Screw terminals.  **HR6X S21S❸** Spring terminals.
		HR60 2C D024	2 C/O	7A	24VDC	
		HR60 2C A024	2 C/O	7A	24VAC	
		HR60 2C A110	2 C/O	7A	110VAC	
		HR60 2C A230	2 C/O	7A	230VAC	
		HR60 4C D012	4 C/O	5A	12VDC	 **HR6X S41** Screw terminals. Contact terminals on upper side.  **HR6X S42** Screw terminals.  **HR6X S41S❸** Spring terminals.
		HR60 4C D024	4 C/O	5A	24VDC	
		HR60 4C A024	4 C/O	5A	24VAC	
		HR60 4C A110	4 C/O	5A	110VAC	
		HR60 4C A230	4 C/O	5A	230VAC	
8-PIN AND 11-PIN INDUSTRIAL RELAYS WITH LED STATE INDICATOR AND MECHANICAL ACTUATOR		**HR70 2C D024**	2 C/O	10A	24VDC	8-pin
		HR70 2C D110	2 C/O	10A	110VDC	 **HR7X S1** Screw terminals.
		HR70 2C A024	2 C/O	10A	24VAC	
		HR70 2C A110	2 C/O	10A	110VAC	
		HR70 2C A230	2 C/O	10A	230VAC	
		HR70 3C D024	3 C/O	10A	24VDC	11-pin
		HR70 3C D110	3 C/O	10A	110VDC	 **HR7X S2** Screw terminals.
		HR70 3C A024	3 C/O	10A	24VAC	
		HR70 3C A110	3 C/O	10A	110VAC	
		HR70 3C A230	3 C/O	10A	230VAC	

Code	Retaining clips	Code	Marker tags	Code	Parallel busbars	Code	Noise filters
	Included in the socket	**HR1X 30**		**HR1X 9020** (black)	20 poles 		
		HR1X 3016 (strip with 16 plates)		**HR1X 9120** (red)	20 poles 		
	HR3X 88 						
	HR5X 87 	**HR5X 30**		**HR5X 9008** (black) ❺	8 poles 	Resistor - Capacitor **HR6X 77024** (6...24VAC/DC) **HR6X 77230** (110...230VAC/DC) Diode + LED **HR6X 78024** (6...24VDC)	
	HR6X 88 	**HR6X 30**					
	HR7X 87 	**HR5X 30** (only for sockets with spring terminals)					

❶ Final S in code indicates spring terminals.
❷ Voltage dependent on selected relay socket.
❸ AC voltage only if linked to socket.
❹ Rated current if the relay is soldered directly onto the board; with socket the maximum current is 10A.
❺ Not suitable for sockets with spring terminals.

Slim relays

HRA10...

HR10...

HR20...

	Order code	Control voltage	Contacts	Rated current	Description	Qty per pkg
				[A]		no.
	Slim electromechanical relays assembled on the socket.					
new	**HRA10 1C E024**	24VAC/DC	1 C/O	6	Screw terminals	10
	HRA10 1C E024S	24VAC/DC	1 C/O	6	Spring terminals	10
	Slim electromechanical relays.					
	HR10 1C E012	12VDC	1 C/O	6	12VAC/DC control when on HR1XS024 or HR1XS024S socket	20
new	**HR10 1C E024**	24VDC	1 C/O	6	24VAC/DC control when on HR1XS024 or HR1XS024S socket	20
	HR10 1C E060	60VDC	1 C/O	6	110...125VAC/DC control when on HR1XS110 or HR1XS110S socket. 220...240VAC/DC control when on HR1XS230 or HR1XS230S socket	20
	Slim SSR (solid state relay) relays.					
new	**HR20 1A S024**	24VDC	1 SSR	2	Output 24...280VAC	10
	HR20 1D S024	24VDC	1 SSR	4	Output 3...28VDC	10

General characteristics
Slim-type relays have a reduced width that permits considerable optimisation of space. All sockets are equipped with supply indicator LED and retain/release clips. The availability of electromechanical and solid-state (SSR) versions permits the installation of the most technically suitable solution in accordance with system requirements. The socket terminals can be screw or spring type.
The parallel busbars make for quick wiring.

Operational characteristics
- Rated insulation voltage: 250V
- Rated impulse withstand voltage: 4kV
- Relay control voltage: 12, 24, 60VDC
- Relay control voltage + socket: 12, 24, 110...125, 220...240VAC/DC
- Max controllable power in AC-1: 1500W
- Max controllable power in AC-15: 360VA.

Certifications and compliance
Certifications obtained: cURus, EAC, VDE for electromechanical relay, cURus, TÜV for SSR relay.
Compliant with standards: IEC/EN61810 for electromechanical relays, IEC/EN62314 for SSR.

Sockets

HR1X S... HR1X S...S

	Order code	Control voltage	Terminals	Description	Qty per pkg
		AC/DC			no.
	Sockets for relays.				
	HR1X S024	12...24V	Screw	Use with relay HR1010E012, HR1010E024 and HR20...	10
	HR1X S110	110...125V	Screw	Use with relay HR1010E060	10
new	**HR1X S230**	220...240V	Screw	Use with relay HR1010E060	10
	HR1X S024S	12...24V	Spring	Use with relay HR1010E012, HR1010E024 and HR20...	10
	HR1X S110S	110...125V	Spring	Use with relay HR1010E060	10
	HR1X S230S	220...240V	Spring	Use with relay HR1010E060	10

General characteristics
HR1X.. sockets are equipped with supply indicator LED and retain/release clips. The socket terminals can be screw or spring type. Parallel busbars can be fitted to the sockets, for quick wiring. These busbars plug in, on both the screw and spring sockets, leaving the cable entry terminals free.

Operational characteristics
- Rated insulation voltage: 250V
- Rated impulse withstand voltage: 4kV
- Relay control voltage: 12, 24, 60VDC
- Relay control voltage + socket: 12, 24, 110...125, 220...240VAC/DC
- Green indication LED
- Fitting on DIN rail.

Certifications and compliance
Certifications obtained: cURus, CSA, EAC.
Compliant with standards: IEC/EN61810.

Accessories

HR1X 30...

HR1X 9020

HR1X 9120

	Order code	Description	Qty per pkg
			no.
new	**HR1X 30**	Marker tags	100
	HR1X 3016	Marker tags - strip with 16 plates	20
	HR1X 9020	20-pole parallel busbar - black	10
	HR1X 9120	20-pole parallel busbar - red	10

Miniature relays

HR30...

Order code	Control voltage	Contacts	Rated current	Description	Qty per pkg
			[A]		no.
Miniature relays.					
HR30 1C D012	12VDC	1 C/O	16❶	Fitting on socket HR5XS2... (max 10A)	20
HR30 1C D024	24VDC	1 C/O	16❶	Fitting on socket HR5XS2... (max 10A)	20
HR30 1C A024	24VAC	1 C/O	16❶	Fitting on socket HR5XS2... (max 10A)	20
HR30 1C A110	110/120VAC	1 C/O	16❶	Fitting on socket HR5XS2... (max 10A)	20
HR30 1C A230	230VAC	1 C/O	16❶	Fitting on socket HR5XS2... (max 10A)	20
HR30 2C D012	12VDC	2 C/O	8	Fitting on socket HR5XS2...	20
HR30 2C D024	24VDC	2 C/O	8	Fitting on socket HR5XS2...	20
HR30 2C A024	24VAC	2 C/O	8	Fitting on socket HR5XS2...	20
HR30 2C A110	110VAC	2 C/O	8	Fitting on socket HR5XS2...	20
HR30 2C A230	230VAC	2 C/O	8	Fitting on socket HR5XS2...	20

❶ Rated current if the relay is soldered directly onto the board; with socket the maximum current is 10A.

General characteristics
Miniature relays have compact dimensions but high functional performance. It's the ideal device for those looking for a cost-effective solution without compromising performance.

Operational characteristics
- Rated insulation voltage: 250V
- Rated impulse withstand voltage: 4kV
- Relay control voltage: 12 and 24VDC - 24, 110 and 230VAC, 50/60Hz
- Max controllable power in AC-1 (1C/2C): 4000/2000W
- Max controllable power in AC-15 (1C/2C): 300/150VA
- Maximum current (1C/2C): 16A/10A.

Certifications and compliance
Certifications obtained: cURus, EAC, VDE.
Compliant with standards: IEC/EN61810.

Sockets

HR5X S21 HR5X S22 HR5X S21S

Order code	Description	Qty per pkg
		no.
Sockets for relays (supplied without retain/release clip) for fitting on DIN rail or with screws. Terminal layout see page 20-10.		
HR5X S21	Screw terminals, contact terminals all on upper side	10
HR5X S22	Screw terminals	10
HR5X S21S	Spring terminals	10

General characteristics
HR5X... series sockets can have screw terminals or spring terminals for quick wiring. Screw terminals are available in 2 versions: with contact terminals separated from the coil terminals or with NC contact terminals near the coil terminals. Noise filters, parallel busbars and plates for writing can be snap-fitted to the sockets.

Operational characteristics
- Rated insulation voltage: 250V
- Rated impulse withstand voltage: 4kV
- Maximum current: 10A
- Terminal layout see page 20-10.

Certifications and compliance
Certifications obtained: cURus, CSA, EAC.
Compliant with standards: IEC/EN61810.

Accessories

HR3X 88

HR5X 30

HR6X 78 024

HR5X 9008

Order code	Description	Qty per pkg
		no.
HR3X 88	Retain/release clip	20
HR5X 30	Marker tags	100
HR6X 78 024	Plug-in noise filters. 6...24VDC with LED	10
HR6X 77 024	Plug-in noise filters. 6...24VAC/DC	10
HR6X 77 230	Plug-in noise filters. 110...230VAC/DC	10
HR5X 9008	8-pole parallel busbar - black - for sockets with screw terminals	10

Miniature relays with LED state indicator and mechanical actuator

HR50...

new

Order code	Control voltage	Contacts	Rated current	Description	Qty per pkg
			[A]		no.
Miniature relays with LED state indicator and mechanical actuator.					
HR50 1C D012	12VDC	1 C/O	16❶	Fitting on socket HR5XS2... (max 10A)	10
HR50 1C D024	24VDC	1 C/O	16❶	Fitting on socket HR5XS2... (max 10A)	10
HR50 1C D048	48VDC	1 C/O	16❶	Fitting on socket HR5XS2... (max 10A)	10
HR50 1C D110	110VDC	1 C/O	16❶	Fitting on socket HR5XS2... (max 10A)	10
HR50 1C A024	24VAC	1 C/O	16❶	Fitting on socket HR5XS2... (max 10A)	10
HR50 1C A110	110/120VAC	1 C/O	16❶	Fitting on socket HR5XS2... (max 10A)	10
HR50 1C A230	230VAC	1 C/O	16❶	Fitting on socket HR5XS2... (max 10A)	10
HR50 2C D012	12VDC	2 C/O	8	Fitting on socket HR5XS2...	10
HR50 2C D024	24VDC	2 C/O	8	Fitting on socket HR5XS2...	10
HR50 2C D048	48VDC	2 C/O	8	Fitting on socket HR5XS2...	10
HR50 2C D0110	110VDC	2 C/O	8	Fitting on socket HR5XS2...	10
HR50 2C A024	24VAC	2 C/O	8	Fitting on socket HR5XS2...	10
HR50 2C A110	110/120VAC	2 C/O	8	Fitting on socket HR5XS2...	10
HR50 2C A230	230VAC	2 C/O	8	Fitting on socket HR5XS2...	10

❶ Rated current if the relay is soldered directly onto the board; with socket the maximum current is 10A.

General characteristics
HR50 miniature relays have reduced dimensions and, in addition to the high electrical performance, are equipped with the following functions: LED to indicate voltage on the coil, mechanical contact state indicator and mechanical test actuator. The mechanical actuator is particularly useful for performing functional tests; it can also keep the relay closed continuously.

Operational characteristics
- Rated insulation voltage: 250V (400V with pollution degree 2)
- Rated impulse withstand voltage: 10kV
- Relay control voltage: 12 and 24VDC - 24, 110 and 230VAC, 50/60Hz
- Max controllable power in AC-1 (1C/2C): 4000/2000W
- Max controllable power in AC-15: 150VA
- Maximum current (1C/2C): 16A/8A.

Certifications and compliance
Certifications obtained: cURus, EAC, VDE.
Compliant with standards: IEC/EN61810.

Sockets

new

HR5X S21 HR5X S22 HR5X S21S

Order code	Description	Qty per pkg
		no.
Sockets for relays (supplied without retain/release clip), for fitting on DIN rail or with screws. Terminal layout see page 20-10.		
HR5X S21	Screw terminals, contact terminals all on upper side	10
HR5X S22	Screw terminals	10
HR5X S21S	Spring terminals	10

General characteristics
HR5X.. series sockets can have screw terminals or spring terminals for quick wiring. Screw terminals are available in 2 versions: with contact terminals separated from the coil terminals or with NC contact terminals near the coil terminals. Noise filters, parallel busbars and plates for writing can be snap-fitted to the sockets.

Operational characteristics
- Rated insulation voltage: 250V
- Rated impulse withstand voltage: 4kV
- Maximum current: 10A
- Terminal layout see page 20-10.

Certifications and compliance
Certifications obtained: cURus, CSA, EAC.
Compliant with standards: IEC/EN61810.

Accessories

new

HR5X 87

HR5X 30

HR6X 78 024

HR5X 9008

Order code	Description	Qty per pkg
		no.
HR5X 87	Retain clip	20
HR5X 30	Marker tags	100
HR6X 78 024	Plug-in noise filters. 6...24VDC with LED	10
HR6X 77 024	Plug-in noise filters. 6...24VAC/DC (RC)	10
HR6X 77 230	Plug-in noise filters. 110...230VAC/DC (RC)	10
HR5X 9008	8-pole parallel busbar - black	10

Industrial relays with LED state indicator and mechanical actuator

HR60...

new

Order code	Control voltage	Contacts	Rated current	Description	Qty per pkg
			[A]		no.
Industrial relays with LED state indicator and mechanical actuator.					
HR60 2C D012	12VDC	2 C/O	7	Fitting on socket HR6XS2...	10
HR60 2C D024	24VDC	2 C/O	7	Fitting on socket HR6XS2...	10
HR60 2C A024	24VAC	2 C/O	7	Fitting on socket HR6XS2...	10
HR60 2C A110	110/120VAC	2 C/O	7	Fitting on socket HR6XS2...	10
HR60 2C A230	230VAC	2 C/O	7	Fitting on socket HR6XS2...	10
HR60 4C D012	12VDC	4 C/O	5	Fitting on socket HR6XS4...	10
HR60 4C D024	24VDC	4 C/O	5	Fitting on socket HR6XS4...	10
HR60 4C A024	24VAC	4 C/O	5	Fitting on socket HR6XS4...	10
HR60 4C A110	110VAC	4 C/O	5	Fitting on socket HR6XS4...	10
HR60 4C A230	230VAC	4 C/O	5	Fitting on socket HR6XS4...	10

General characteristics
HR60-type industrial relays are available in 2/4-changeover-contact versions. They are equipped with LEDs that indicate control voltage, a mechanical contact state indicator and a mechanical actuator. The actuator is particularly useful for performing functional tests; it can also keep the relay closed continuously.

Operational characteristics
- Rated insulation voltage: 250V
- Rated impulse withstand voltage: 4kV
- Relay control voltage: 12 or 24VDC- 24, 110 and 230VAC, 50/60Hz
- Max controllable current in AC-1 (2C/4C): 7/5A
- Maximum current (2C/4C): 7A/5A.

Certifications and compliance
Certifications obtained: cURus, EAC, VDE.
Compliant with standards: IEC/EN61810.

Sockets

HR6X S21

HR6X S41

new

HR6X S42

HR6X S41S

Order code	Description	Qty per pkg
		no.
Sockets for relays (supplied without retein/release clip) for fitting on DIN rail or with screws. Terminal layout see page 20-10. For relays with 2 changeover contacts.		
HR6X S21	Screw terminals, contact terminals all on upper side	10
HR6X S22	Screw terminals	10
HR6X S21S	Spring terminals	10
For relays with 4 changeover contacts.		
HR6X S41	Screw terminals, contact terminals all on upper side	10
HR6X S42	Screw terminals	10
HR6X S41S	Spring terminals	10

General characteristics
HR6X.. series sockets have screw terminals and are supplied in two versions for relays with 2 or 4 contacts. Noise filters and plates for writing can be plugged in to the sockets.
They can be fixed on DIN rails or with screws.

Operational characteristics
- Rated insulation voltage: 250V
- Rated impulse withstand voltage: 4kV
- Maximum current: 10A
- Terminal layout see page 20-10.

Certifications and compliance
Certifications obtained: cURus, CSA, EAC.
Compliant with standards: IEC/EN61810.

Accessories

HR6X 88

HR5X 30

HR6X 78 024

new

Order code	Description	Qty per pkg
		no.
HR6X 88	Retain/release clip	20
HR6X 30	Marker tag for sockets with screw terminals	100
HR5X 30	Marker tag for sockets with spring terminals	100
HR6X 78 024	Plug-in noise filters. 6...24VDC with LED	10
HR6X 77 024	Plug-in noise filters. 6...24VAC/DC	10
HR6X 77 230	Plug-in noise filters. 110...230VAC/DC	10

8-pin and 11-pin industrial relays with LED state indicator and mechanical actuator

HR70...

	Order code	Control voltage	Contacts	Rated current	Description	Qty per pkg
				[A]		no.
	Industrial relays with LED state indicator and mechanical actuator. 8-pin type.					
	HR70 2C D024	24VDC	2 C/O	10	Fitting on socket HR7XS1	10
	HR70 2C D110	110VDC	2 C/O	10	Fitting on socket HR7XS1	10
	HR70 2C A024	24VAC	2 C/O	10	Fitting on socket HR7XS1	10
	HR70 2C A110	110/120VAC	2 C/O	10	Fitting on socket HR7XS1	10
new	**HR70 2C A230**	230VAC	2 C/O	10	Fitting on socket HR7XS1	10
	Industrial relays with LED state indicator and mechanical actuator. 11-pin type.					
	HR70 3C D024	24VDC	3 C/O	10	Fitting on socket HR7XS2	10
	HR70 3C D110	110VDC	3 C/O	10	Fitting on socket HR7XS2	10
new	**HR70 3C A024**	24VAC	3 C/O	10	Fitting on socket HR7XS2	10
	HR70 3C A110	110/120VAC	3 C/O	10	Fitting on socket HR7XS2	10
	HR70 3C A230	230VAC	3 C/O	10	Fitting on socket HR7XS2	10

General characteristics
HR70-type industrial relays are available in 2/3-changeover-contact versions. They are equipped with LEDs that indicate control voltage, mechanical contact state indicator and mechanical actuator. The actuator is particularly useful for performing functional tests; it can also keep the relay closed continuously.
HR70 has high electrical endurance performance and lends itself to the most heavy-duty applications.

Operational characteristics
- Rated insulation voltage: 250V
- Rated impulse withstand voltage: 4kV
- Relay control voltage: 24VDC- 24, 110 and 230VAC, 50/60Hz
- Maximum current: 10A.

Certifications and compliance
Certifications obtained: cURus, EAC.
Compliant with standards: IEC/EN61810.

Sockets

HR7X S1

HR7X S2

	Order code	Description	Qty per pkg
			no.
	Sockets for relays (supplied without retaing clip), for fitting on DIN rail or with screws. Terminal layout see page 20-11.		
new	**HR7X S1**	8-pin for HR70 2C... Screw terminals	10
	HR7X S2	11-pin for HR70 3C... Screw terminals	10

General characteristics
HR7X.. series sockets have screw terminals and are supplied in two versions for relays with 2 or 3 contacts (8-pin – 11-pin). They can be fixed on DIN rails or with screws.

Operational characteristics
- Rated insulation voltage: 250V
- Rated impulse withstand voltage: 4kV
- Maximum current: 10A.

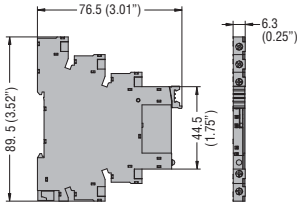
Certifications and compliance
Certifications obtained: cURus, CSA, EAC.
Compliant with standards: IEC/EN61810.

Accessories

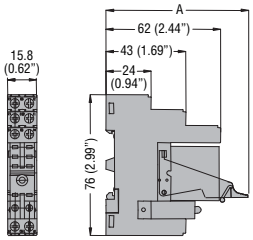
HR7X 87

	Order code	Description	Qty per pkg
			no.
new	**HR7X 87**	Metal retaining clip	20

HRA10... - HR10... - HR20 with socket HR1XS...

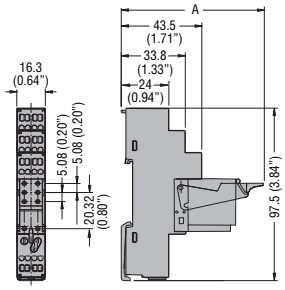


HR30... - HR50... with socket HR5XS21



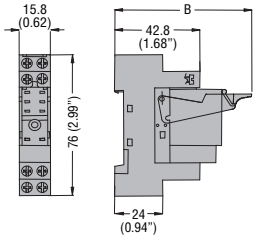
A: 65mm (2.56") con HR3X88
75mm (2.95") con XR5X88

HR30... - HR50... with socket HR5XS21S



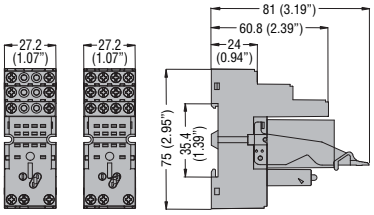
A: 65mm (2.56") con HR3X88
75mm (2.95") con XR5X88

HR30... - HR50... with socket HR5XS22

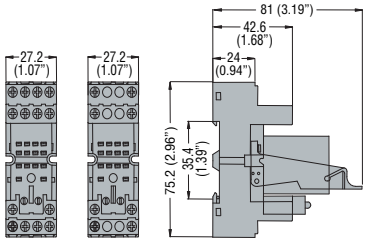


B: 72.5mm (2.85") con HR3X88
82.5mm (3.25) con XR5X88

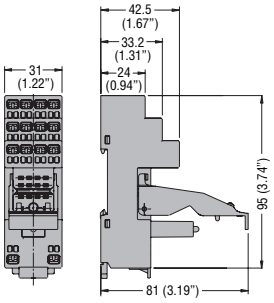
HR60 4C... with socket HR6XS41 - HR6XS42



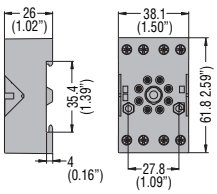
HR60 2C... with socket HR6XS21 - HR6XS22



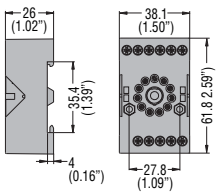
HR60 2C... - HR60 4C... with socket HR6XS21S - HR6XS41S



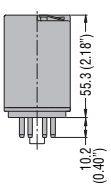
HR7XS1



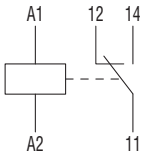
HR7XS2



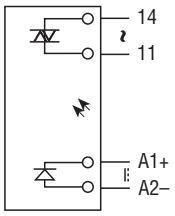
HR70 2C... - HX70 3C...



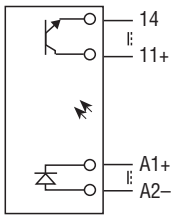
HR101C..., HRA101C...



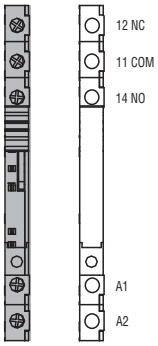
HRA201A...



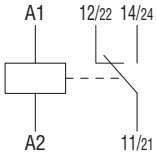
HRA201D...



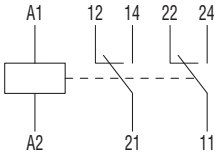
HR1XS...



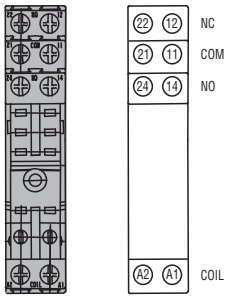
HR301C...



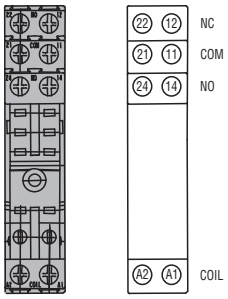
HR302C...



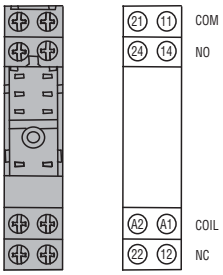
HR5XS21



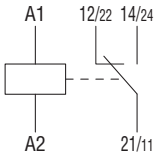
HR5XS21S



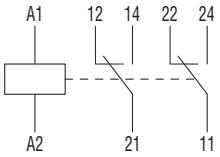
HR5XS22



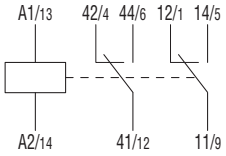
HR501C...



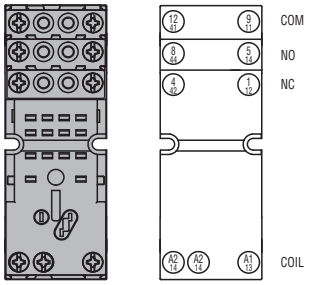
HR502C...



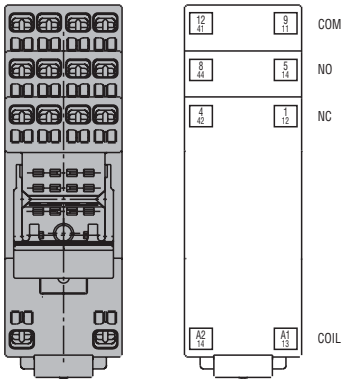
HR602C...



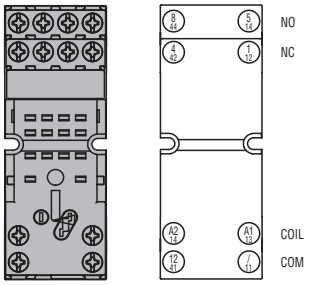
HR6XS21



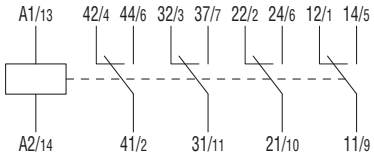
HR6XS21S



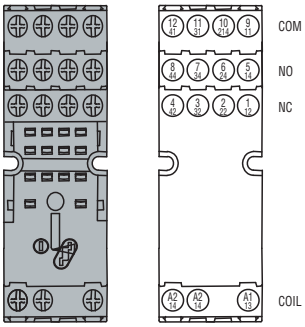
HR6XS22



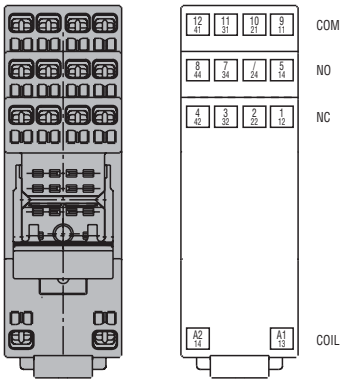
HR604C...



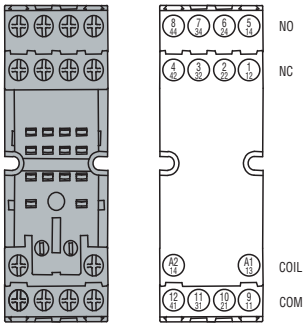
HR6XS41



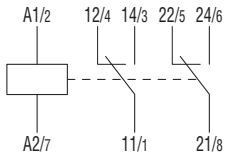
HR6XS41S



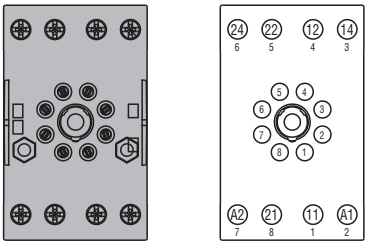
HR6XS42



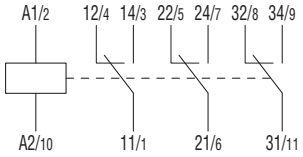
HR702C...



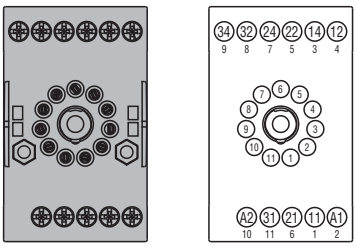
HR7XS1



HR703C...



HR7XS2

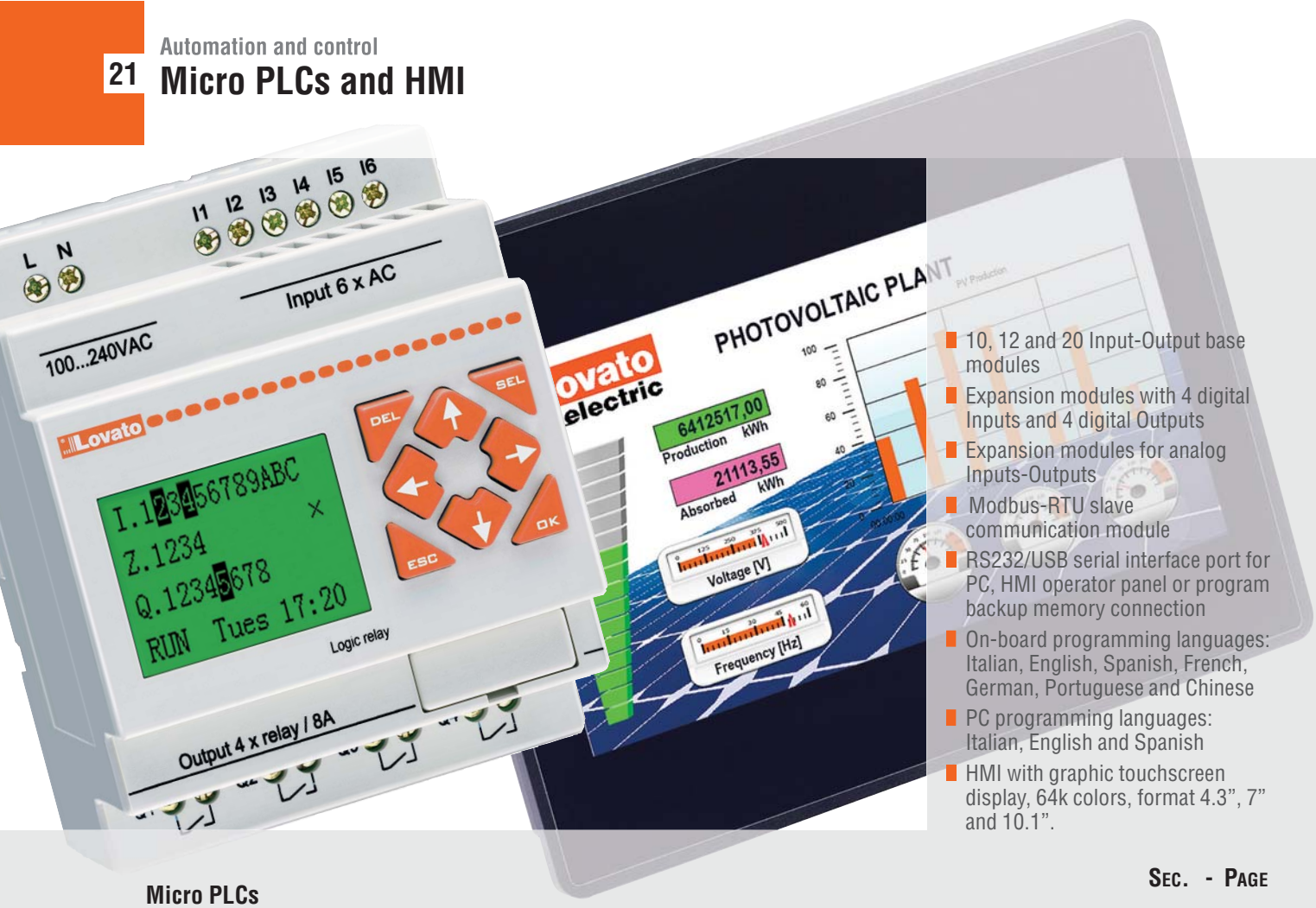


Type		HRA10... HR10...	HR20 1AS024	HR20 1DS024	HR30 1C..	HR30 2C..
CHARACTERISTICS OF THE CONTACTS						
Contact configuration		1 C/O	1 static	1 static	1 C/O	2 C/O
Rated insulation voltage Ui	VAC/DC	250	2500 (input/output)	2500 (input/output)	250	250
Rated impulse withstand voltage Uimp	kV	4	–	–	6	6
Conventional free air thermal current Ith	A	6	2	4	16❷	8
Maximum instantaneous current	A	20 (500ms)	80 (10ms)	48 (10ms)	60❶	20❶
Rated operating voltage AC1	VA	1500	❹	❺	4000	2000
Rated operating voltage AC15 (230 V AC)	VA	360	❹	❺	300❶	150❶
Single-phase motor control (230 V AC)	kW	0.186	❹	❺	0.4	0.2
Rated operating voltage DC1: 30/110/220 V	A	6 / 0.2 / 0.12	❹	❺	12 /0.3 / 0.1	8 /0.3 / 0.1
Minimum switching load	V / mA	5 / 100	24 /0.1	3 / 0.02	5 / 100	
Contact impedance	mΩ	100	-	-	100	
Contact material		Ag/Ni	-	-	AgSnO2	
Max socket terminal tightening torque	Nm	0.5			0.6	
Socket screw tightening tool (cross / flat blade)		Phillips 0 / 3.5mm			Phillips 1 / 4.5mm❸	
Wire section on sockets with screw terminals (min...max)	mm^2	0.5...1.5			0.5...2.5	
	AWG	20...16			20...14	
OPERATING TIMES						
Closing	ms	≤8	10	0.3	10ms	
Opening	ms	≤4	10	0.3	5ms	
ENDURANCE						
Mechanical	Cycles	10,000,000	Theoretically infinite		10,000,000	
Electrical with load AC1	Cycles	30,000❶	Theoretically infinite		50,000❶	
COIL CHARACTERISTICS						
Average coil consumption AC at 20°C	VA	–	–	–	0.9	
Average coil consumption AC at 20°C	W	0.2/0.2	–	–	0.45	
Operating range: closing	(% Un)	≥75	80...120	80...120	70...110 AC/ 75...110 DC	
opening	(% Un)	≥5			20...55 AC/ 10...30 DC	
Maximum cycle frequency	cycles/h	10,000	>100,000	>100,000	3,600	
AMBIENT CONDITIONS						
Operating temperature	°C	-40...+70	-30...+80		-40...+85	
Storage temperature	°C	-40...+80	-30...+100		-40...+85	
Fitting position		Any				
OTHER CHARACTERISTICS						
Indicator LED		Yes (on the socket)			No	
Mechanical contact position indicator		No			No	
Mechanical test actuator		No			No	
Socket fixing		On 35mm DIN rail			On 35mm DIN rail and with screws	

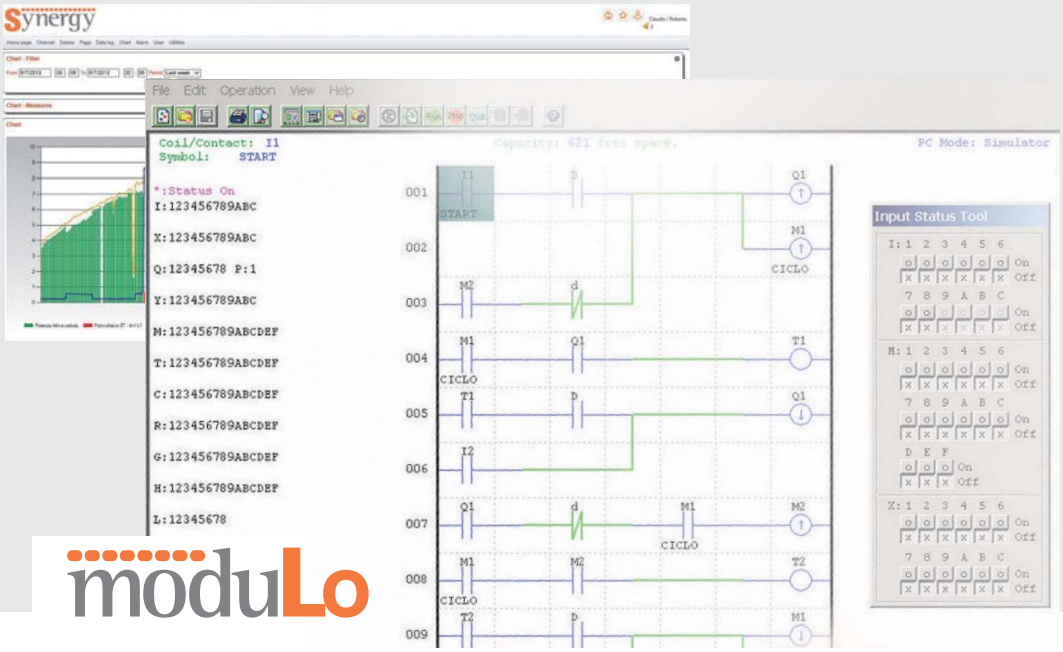
❶ NO contact.
❷ Maximum socket current of 10A.
❸ 2.5mm flat blade for versions with spring terminals.
❹ 2A output 24...280VAC.
❺ 4A output 3...28VDC.

	HR50 1C..	HR50 2C..	HR60 2C..	HR60 4C..	HR70 2C..	HR70 3C..
	1 C/O	2 C/O	2 C/O	4 C/O	2 C/O	3 C/O
	250		500		250	
	6		4		6	
	16❷	8	7	5	10	10
	20❶	10❶	–	–	–	–
	4000	2000	1750	1250	2500	2500
	150❶	150❶	150❶	150❶	500	500
	0.1	-	0.37	0.37	1.2	1.2
	12 /0.3 / 0.1	8 /0.3 / 0.1	12 /0.3 / 0.1	8 /0.3 / 0.1	10 / - / -	10 / - / -
	5 / 100		5 / 100		5 / 100	
	100		100		100	
	Ag/Ni		Ag/Ni		Ag/Ni	
	0.6		0.6		0.6	
	Phillips 1 / 4.5mm❸		Phillips 1 / 4.5mm		Phillips 1 / 4.5mm	
	0.5...2.5		0.5...2.5		0.5...2.5	
	20...14		20...14		20...14	
	15ms		25ms		30ms	
	15ms		25ms		30ms	
	10,000,000		20,000,000		5,000,000	
	50,000❶	20,000❶	100,000		100,000	
	1		1.7		3	
	0.4		1.1		1.5	
	70...110 AC/ 75...110 DC		70...110 AC/ 75...110 DC		70...110 AC/ 75...110 DC	
	20...55 AC/ 10...30 DC		20...55 AC/ 10...30 DC		20...55 AC/ 10...30 DC	
	3,600		3,600			
	-40...+85		-40...+70		-40...+55	
	-40...+85		-40...+80		-40...+70	
	Any					
	Yes		Yes		Yes	
	Yes		Yes		Yes	
	Yes		Yes		Yes	
	On 35mm DIN rail and with screws		On 35mm DIN rail and with screws		On 35mm DIN rail and with screws	

Micro PLCs and HMI



- 10, 12 and 20 Input-Output base modules
- Expansion modules with 4 digital Inputs and 4 digital Outputs
- Expansion modules for analog Inputs-Outputs
- Modbus-RTU slave communication module
- RS232/USB serial interface port for PC, HMI operator panel or program backup memory connection
- On-board programming languages: Italian, English, Spanish, French, German, Portuguese and Chinese
- PC programming languages: Italian, English and Spanish
- HMI with graphic touchscreen display, 64k colors, format 4.3", 7" and 10.1".



moduLo

Page 21-5

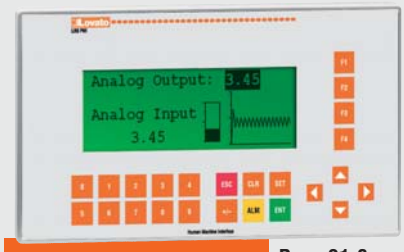
MICRO PLCs

- 10 Inputs/Outputs (LRD10...)
- 12 Inputs/Outputs (LRD12...)
- 20 Inputs/Outputs (LRD20...)
- 12VDC, 24VDC, 24VAC or 100...240VAC power supply
- Relay or transistor outputs.

Page 21-5

EXPANSION AND COMMUNICATION MODULES

- 4 digital inputs / 4 digital outputs
- Analog inputs, 0...10V or 0...20mA
- Analog outputs, 0...10V or 0...20mA
- Relay or transistor outputs
- PT100 temperature sensor inputs
- Modbus-RTU protocol slave communication unit
- 24VDC, 24VAC or 100...240VAC power supply.



Page 21-6

ACCESSORIES

- Program backup memory
- Programming and supervision software
- Power supply unit
- HMI operator panel with graphic LCD.

Page 21-6

STARTER AND TRAINING KITS

- Complete kit to begin using micro PLCs, each equipped with LRD relay, programming-supervision software and USB connecting cable
- Training kits complete with micro PLC and inputs/outputs simulation board.

Page 21-7

HMI

- TFT graphic display with touchscreen, 64k colors
- Available in formats 4.3", 7" and 10.1"
- Programming software
- IP66, Type 2 and 4X.

MICRO PLC - EXCEPTIONAL PERFORMANCE!

SYSTEM CONTROL AND SUPERVISION
- Contact status viewing in simple and small screen display
- Possibility to add the micro PLC to systems integrated on data networks. By using Synergy supervision and energy management software, a multiclient structure can also be managed through Web interface.

QUICK CONTROL BOARD INSTALLATION
- Fewer number of components
- Less wiring with minor number of connections.

REPETITIVENESS
- Less errors during panel building
- Considerable time saving.

FLEXIBILITY
- Quick correction of abnormal conditions at final testing
- Fast changes on control boards.

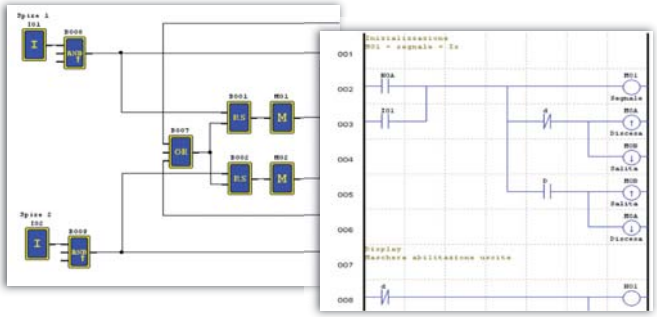
FUNCTION BLOCKS AND MEMORY

Timer (T) (delay on/off, recycle, pulsing, ...)	31
Real Time Clock (RTC) (daily, weekly, monthly and yearly mode)	31
Counter (C)	31
Analog comparator (G)	31
User's pages (H) - 16 characters - 4 lines	31
Auxiliary relay - Scratchpad (M + N memory types)	63 + 63
Arithmetic operation: addition/subtraction and multiplication/division	31 + 31
Data register (DR)	240

Saving can be in memory storage of:
- Auxiliary relay
- Counter value
- Data register.

PROGRAM SIZE

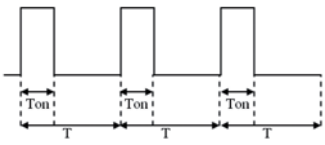
Language	
LADDER (contact scheme)	300 lines
FBD (function blocks)	260 blocks



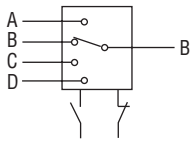
FUNCTIONS

PWM OUTPUT
Pulse train generation with programmable pulse time and frequency

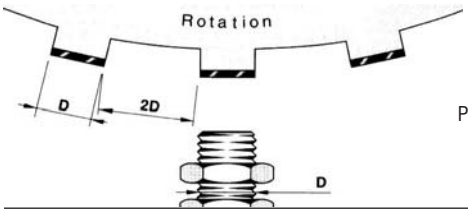
$$V_{out} = 24VDC \times \frac{T_{on}}{T}$$



MULTIPLEXER
Selection of 1 of 4 values based on the combination of two digital signals

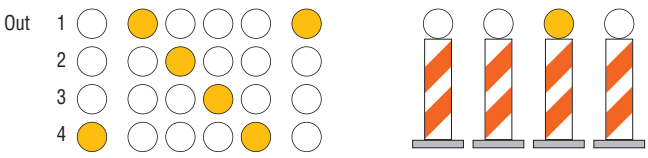


HIGH SPEED INPUT

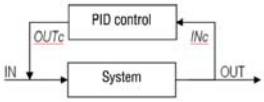


Position and speed detection

SHIFT FUNCTION - activation of pulsed outputs in sequence

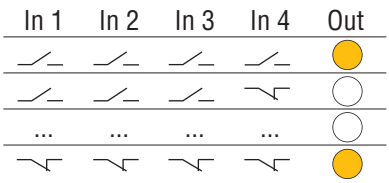


PID

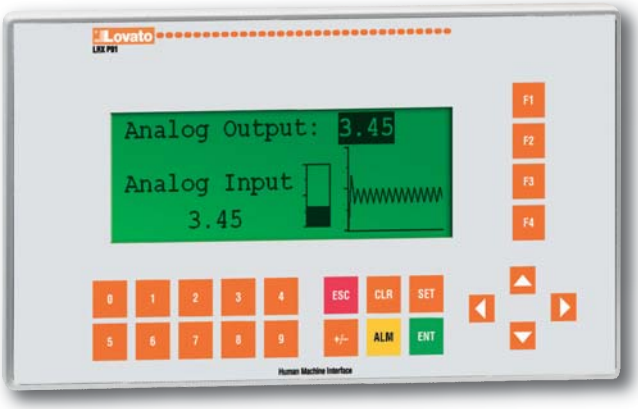


IN: Heating switch on and required temperature setting
OUT: Current room temperature
INc: Measured room temperature in an exact spot
OUTc: Temperature adjusting and controlling.

BOOLEAN LOGIC BLOCKS
Output activation based on a series of digital signals



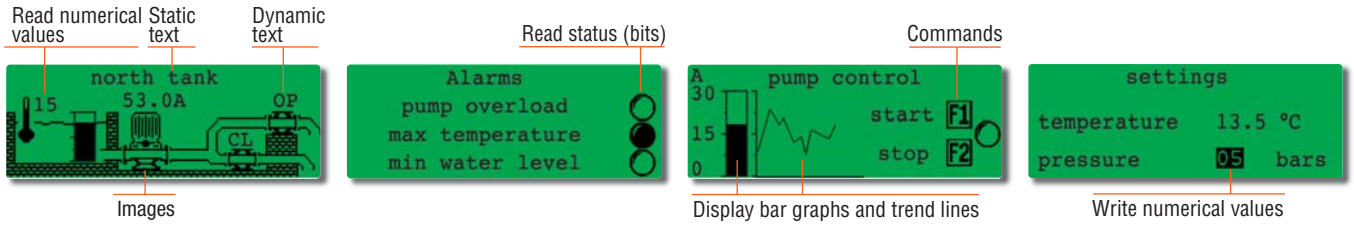
HMI Operator panel LRX P01



HMI INTERFACE

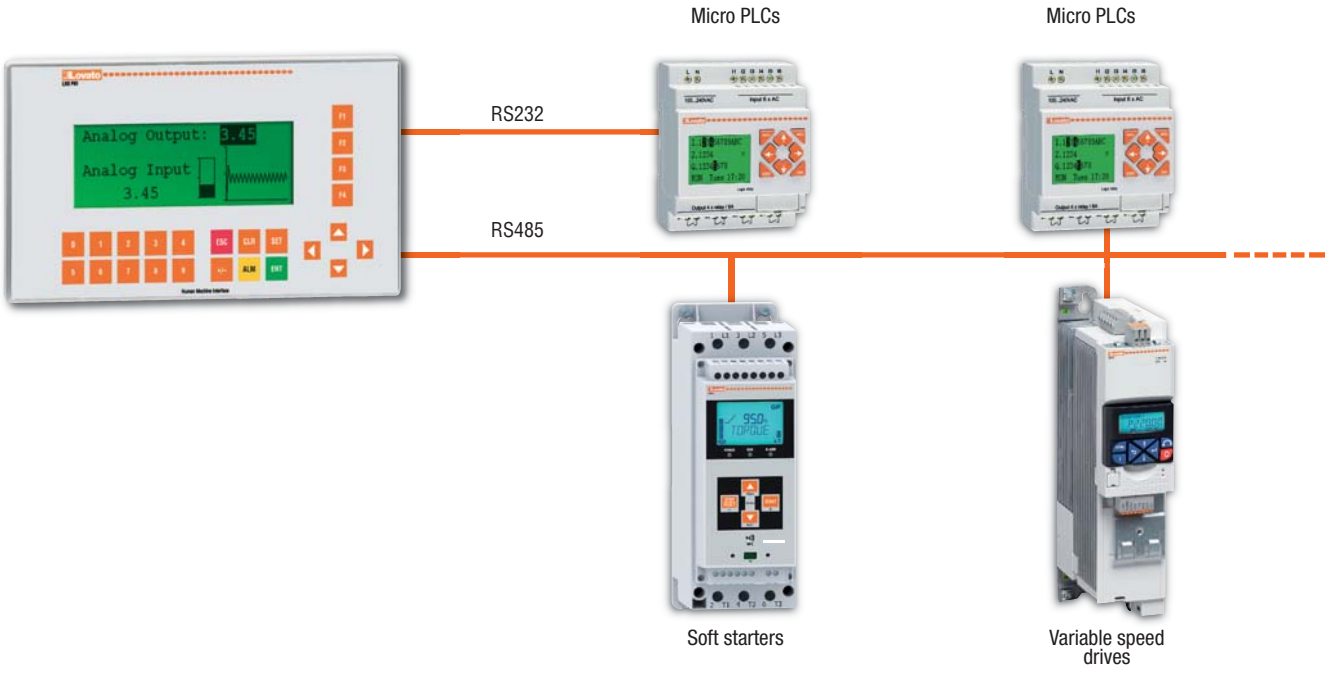
LRX P01 is a HMI operator panel, used with many types of PLCs or other intelligent controllers equipped with communication port.
By using the HMI, the values of both PLC inner registers and relay status can be monitored and changed with the keys or LEDs.
In this way, for machinery and equipment functioning results to be simple and direct.
The LRX SW P01 editor software permits to make dedicated screens by taking advantage of the graphic display to view bitmaps, bar graphs and trend lines.

BACKLIGHT 192x64 PIXEL GRAPHIC LCD



COMMUNICATION MODES

LRX P01 supports Modbus-RTU protocol and RS232 or RS485 communication modes can be chosen.



HMI LRH SERIES

HMI WITH COLOR TOUCHSCREEN DISPLAY

The HMI LRH series have a graphic TFT display with 64k colors, touchscreen, easy to program and extremely flexible. They can be interfaced with different type of devices, from PLC to any kind of intelligent controller provided with communication port, like multimeters, drives, process controllers.
The LRH SW programming software allows the configuration of the HMI in a simple and intuitive way, thanks to the graphical interface with which you can create customized screens to show images, trends, bar graphs, analog indicators, dynamic objects and other functionalities.
The HMI LRH series are the ideal solution for the supervision and control of small and large automations, features more and more required in the world of Industry 4.0.

WIDESCREEN DISPLAY WITH HIGH VISIBILITY

- TFT display with resistive touchscreen
- High brightness thanks to the LED backlighting
- 64k colors
- Available in formats 4.3", 7" and 10.1".

SIMPLICITY AND EFFICIENCY

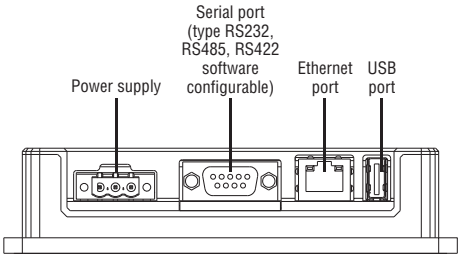
- Simple and elegant design with low energy consumption
- High robustness, thanks to the use of highly reliable industrial components
- Plastic enclosure, degree of protection IP66, Type 2 and 4X.

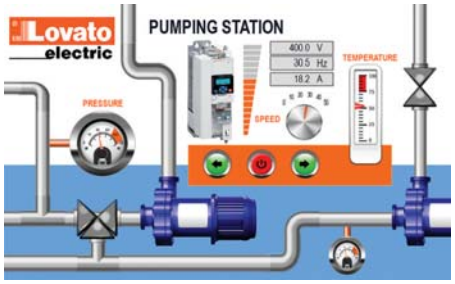
CONNECTIVITY FOR EASY INTEGRATION

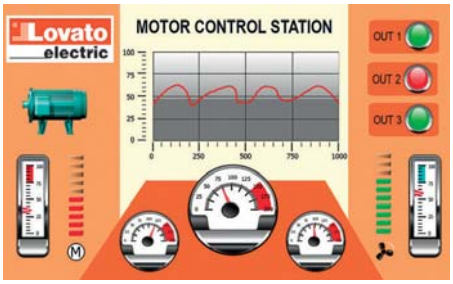
- 3 built-in communication ports: Ethernet, USB and serial (type RS232-RS485-RS422, configurable via software LRH SW)
- Support of communication protocols Modbus RTU Master/Slave, Modbus TPC Client/Server and OPC UA Client/Server.

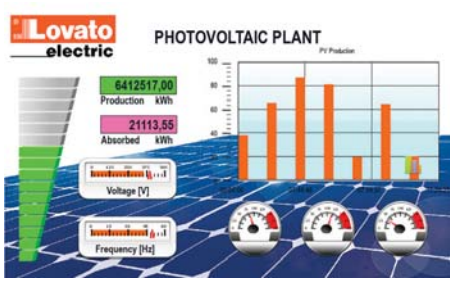
POWERFUL AND INTUITIVE PROGRAMMATION

- High performance CPU
- Extensive gallery of widgets, objects and pre-configured scenarios for typical applications
- Data acquisition and display on numeric indicators, trends or graphical gauges
- Support of vector graphics, images, analog indicators, bar graphs
- Advanced functionalities: dynamic objects, alarms and events management, support of multilingual applications, recipes, tags editor, user and password management, script language
- Advanced properties of the objects: e-mail, events scheduler, etc
- Support of HTML5 and JavaScript
- Possibility to simulate the program by working off-line.









Base modules

LRD10...
LRD12...

LRD20R D024 P1

Order code	Auxiliary supply voltage	In/Out❶	Qty per pkg	Wt
			n°	[kg]
Base modules.				
LRD12R D024	24VDC	8/4 relay	1	0.241
LRD12T D024	24VDC	8/4 transistor	1	0.220
LRD20R D024	24VDC	12/8 relay	1	0.360
LRD12R A024	24VAC	8/4 relay	1	0.250
LRD20R A024	24VAC	12/8 relay	1	0.368
LRD10R A240	100...240VAC	6/4 relay	1	0.242
LRD20R A240	100...240VAC	12/8 relay	1	0.367
LRD20R D012	12VDC	12/8 relay	1	0.360
Base modules with RS485 onboard.				
LRD20R D024 P1	24VDC	12/8 relay	1	0.360

❶ Inputs/Outputs.

General characteristics
FUNCTIONS
- Addition-Subtraction on variables
- Multiplication-Division on variables
- Comparator on variables
- HMI display for parameter viewing and programming
- PWM output
- High speed input (1kHz)
- PID function
- Multiplexer
- Analog ramp
- Register transfer (numerical variables and status)
- Shift function
- Boolean logic blocks
- LRD20R D024 P1 with RS485 port onboard.

Operational characteristics
- 8A Ith current relay outputs for AC and DC versions
- 0.3A 24VDC transistor outputs for DC version
- 0...10V analog inputs for DC version
- Version: modular for mounting on 35mm DIN rail (IEC/EN 60715) or M4x15mm screw fixing
- Type of terminal: Screw
- IEC degree of protection: IP20.

Certifications and compliance
Certifications obtained: UL Listed, for USA and Canada (cULus - File E300049), as Programmable Controllers; EAC.
Compliant with standards: IEC/EN 61131-2, UL508, CSA C22.2 n°142.

Expansion and communication modules

LRE...

Order code	Auxiliary supply voltage	In/Out❶	Qty per pkg	Wt
			n°	[kg]
Expansion and communication modules❷.				
LRE02A D024	24VDC	2 analog outputs 0...10V/0...20mA	1	0.160
LRE04A D024	24VDC	4 analog outputs 0...10V/0...20mA	1	0.160
LRE04P D024	24VDC	4 PT100 temp. sensor inputs	1	0.160
LRE08R D024	24VDC	4/4relay	1	0.171
LRE08T D024	24VDC	4/4 transistor	1	0.151
LRE08R A024	24VAC	4/4 relay	1	0.180
LRE08R A240	100...240VAC	4/4 relay	1	0.180
LRE P00	Modbus-RTU protocol communication unit		1	0.134

❶ Inputs/Outputs.
❷ The expansion modules are supplied with connector for base module.

INPUTS/OUTPUTS REFERENCE TABLE

BASE MODULES				BASE + DIGITAL EXPANSIONS
Type	Power supply	Inputs	Outputs	Max I/O
LRD12RD024	24VDC	6 digital + 2 digital/analog	4 relay	12 + 24
LRD12TD024	24VDC	6 digital + 2 digital/analog	4 transistor	12 + 24
LRD20RD012	12VDC	8 digital + 4 digital/analog	8 relay	20 + 24❸
LRD20RD024	24VDC	8 digital + 4 digital/analog	8 relay	20 + 24
LRD20RD024P1	24VDC	8 digital + 4 digital/analog	8 relay	20 + 24
LRD10RA240	100...240VAC	6 digital	4 relay	10 + 24
LRD20RA240	100...240VAC	12 digital	8 relay	20 + 24
LRD12RA024	24VAC	8 digital	4 relay	12 + 24
LRD20RA024	24VAC	12 digital	8 relay	20 + 24
EXPANSION AND COMMUNICATION MODULES				
LRE02AD024	24VDC	—	2 analog	—
LRE04AD024	24VDC	4 analog	—	—
LRE04PD024	24VDC	4 PT100	—	—
LRE08RD024	24VDC	4 digital	4 relay	—
LRE08TD024	24VDC	4 digital	4 transistor	—
LRE08RA240	100...240VAC	4 digital	4 relay	—
LRE08RA024	24VAC	4 digital	4 relay	—
LREP00	24VDC	RS485 Modbus-RTU protocol slave communication unit		

❸ Expansion modules supplied at 24VDC.

Accessories

LRX 1V3 D024

LRX C03

LRX P01

LRX C02

Order code	Description	Qty per pkg	Wt
		n°	[kg]
LRX M00	Program backup memory	1	0.011
LRX C00	PC (RS232)-LRD programming cable	1	0.083
LRX C03	PC (USB)-LRD programming cable and LRX P01 (RS232)-LRD direct connection	1	0.080
LRX SW	Programming and supervision software (CD-ROM)	1	0.057
LRX 1V3 D024	Power supply unit, 100...240VAC/24VDC, 1.3A	1	0.220
LRX P01	HMI operator panel, 24VDC, RS232, RS485 (Modbus-RTU Master)	1	0.180
LRX C02	PC-LRX P01 programming cable	1	0.057
LRX SW P01	LRX P01 editor software (CD-ROM)	1	0.057

Kit

LRDKIT...

LRD DEM...

Order code	Description	Qty per pkg	Wt
		n°	[kg]
Starter and training kits.			
LRDKIT 12R D024	LRD starter kit complete with LRD12R D024 base module, LRX SW software and LRX C03 cable	1	0.424
LRDKIT 12R A024	LRD starter kit complete with LRD12R A024 base module, LRX SW software and LRX C03 cable	1	0.424
LRDKIT 10R A240	LRD starter kit complete with LRD10R A240 base module, LRX SW software and LRX C03 cable	1	0.424
Training kits.			
LRD DEM 12R D024	Training kit with LRD12R D024 mounted on inputs/outputs simulation board	1	0.920
LRD DEM 20R D024	Training kit with LRD20R D024 mounted on inputs/outputs simulation board	1	1.060

Power supply unit and backup memory general characteristics

- The LRX 1V3 D024 power supply produces a direct-current voltage to power the LRD base and expansion modules in circumstances when 24VDC is not available in the application. The power supply can also be used to power eventual 24VDC auxiliary circuits.
- The LRX M00 backup memory allows to save the user's program and to simply and quickly transfer it to the base modules.

HMI panel LRX P01 general characteristics

- 24VDC power supply
- RS232 communication port:
  - Direct connection to LRD using cable LRX C00
  - Connection to other devices using a standard D-SUB 9 serial cable
- RS485 communication port
- LRX SW P01 editor software for specific pages and easy use
- IEC degree of protection: IP65.

FUNCTIONS

- Send commands
- Read status
- Provide static and dynamic texts
- Write variables
- Read variables:
  - Numerical value
  - Bar graph
  - Trend line.

Programming using software LRX SW

At any time and with extreme simplicity, LRD can be set up and reprogrammed to satisfy new requirements and improve the operation of a system.
Programming is simple and intuitive and can be done directly on the base module keypad or by personal computer, connected by LRX C00 (RS232) or LRX C03 (USB) interface and using the relative LRX SW software.
With a personal computer, two programming language locs can be used: FBD (Function Block Diagrams) and LADDER (contact scheme).
Both of the following can be accomplished:

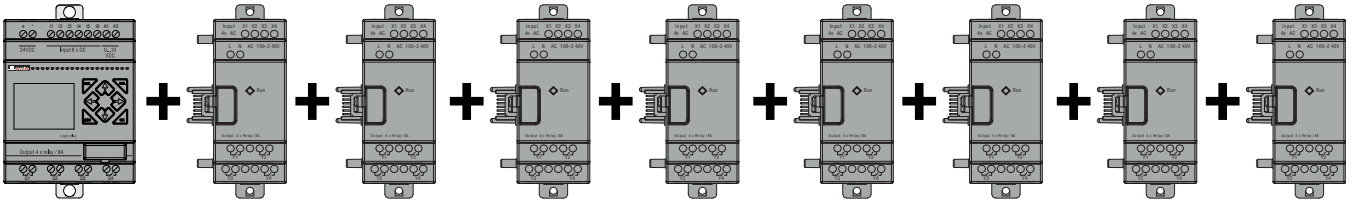
- Simulate the program directly "off-line" with a personal computer to test if it runs correctly.
- Use the supervision mode to check the project "on-line".

There are 8 function keys on front, dedicated to on-board adjustment, control and supervision of digital input and output status, analog input values, time and date entry and the operation status of the micro PLC itself.

Certifications and compliance

Certifications obtained: UL Listed, for USA and Canada (cULus - File E300049), as Programmable Controllers for power supply and HMI units and base module of kits.
Compliant with standards: IEC/EN 61131-2, UL508, CSA C22.2 n°142.

Maximum combinations



Base unit 12 inputs + 8 outputs
4 inputs + 4 outputs
4 inputs + 4 outputs
4 inputs + 4 outputs
4 PT100 temperature sensor inputs
2 outputs, 0...10V or 0...20mA
2 outputs, 0...10V or 0...20mA
4 inputs, 0...10V or 0...20mA
RS485 Modbus-RTU (slave)

- 24 digital inputs (4 configurable as analog 0...10V input)
- 20 digital outputs (relay, transistor or mixed)
- 4 analog inputs for PT100 temperature sensors
- 4 analog outputs configurable as 0...10V or 0/4...20mA
- 4 analog inputs configurable as 0...10V or 0/4...20mA
- 1 RS485 communication module.

N.B. The sequence and the maximum number of the products given above must be respected for correct operation.

LRH A 04

LRH A 07

LRH A 10

	Order code	Description	Qty per pkg	Wt
			n°	[kg]
	HMI.			
new	**LRH A 04**	4.3" TFT LCD display	1	0.400
new	**LRH A 07**	7" TFT LCD display	1	0.600
new	**LRH A 10**	10.1" TFT LCD display	1	1.000
	Programming software for HMI.			
	LRH SW 01	User licence for LRH SW software (available for download from www.LovatoElectric.com website), valid for 1 station	1	—
new	**LRH SW 01 CD**	CD-ROM with LRH SW programming software, including one LRH SW 01 licence	1	0.057
	RS485 connection cable.			
	EXC CAB 02	RS485 connection cable for LRH, length 3m	1	0.150

General characteristics
- Widescreen display with resistive touchscreen
- Available in formats 4.3", 7" and 10.1"
- LED Backlight
- Ethernet, USB and serial port (type RS232-RS485-RS422, configurable via software LRH SW)
- Lightweight and low-power design
- Highly reliable industrial components
- Powerful and intuitive programming with software LRH SW (downloadable from the website www.LovatoElectric.com or purchasable on Cd-rom), with 30-days trial licence included
- Support of protocols Modbus-RTU Master/Slave, Modbus-TCP Client/Server and OPC UA Client/Server
- Data display as numerical, text, bargraph, analog gauges and graphic image formats
- Data acquisition and trend presentation
- Recipe data handling
- Full support of multilingual applications
- Powerful script language
- Alarm handling
- User and group access control
- Monitoring and remote control
- Rich set of HMI features: dynamic objects, data acquisition, alarm handling, multilingual applications, recipes, tag editor and tag database, user and password, scripting ...
- Rich symbol library and project templates
- On-line and off-line simulation of the applications
- Advanced HMI objects: e-mail, events scheduler, …
- Pre-configured scenarios for typical applications managed with Lovato Electric products (monitoring and control of a micro-plc, supervision of a pumping station, monitoring of a photovoltaic system, etc..) freely downloadable from the website www.LovatoElectric.com.

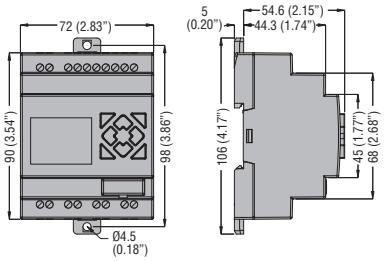
Operational characteristics
- Auxiliary power supply: 24VDC
- Operating temperature: 0…+50°C (vertical installation)
- Storage temperature: -20…+70°C
- Humidity: 5-85% RH, non condensing
- Protection degree: IP66, Type 2 and 4X (front); IP20 (rear).

Certifications and compliance
Certifications obtained: UL Listed, for USA and Canada (cULus – File E199715), EAC, RCM.
Compliant with standards: emissions EN 61000-6-4, immunity EN 61000-6-2 for installation in industrial environments; emissions EN 61000-6-3, immunity EN 61000-6-1 for installation in residential environments; UL508.

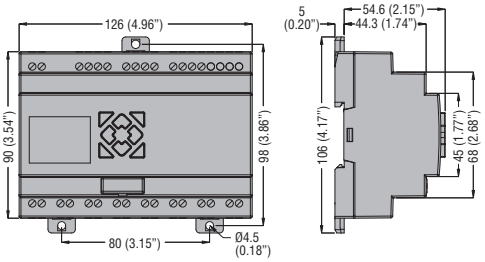
Model	LRH A 04	LRH A 07	LRH A 10
SYSTEM RESOURCES			
Display	4.3" TFT 16:9	7" TFT 16:9	10.1" TFT 16:9
Colors		64K	
Resolution	480x272	800x480	1024x600
Brightness		200Cd/m^2	
Dimming		Yes	
Touchscreen		Resistive	
CPU	ARM Cortex A8 300MHz	ARM Cortex A8 1GHz	ARM Cortex A8 1GHz
Operative system		Linux 3.12	
Flash	2GB	4GB	4GB
RAM	256MB	512MB	512MB
Application memory		60MB	
Real Time Clock, RTC backup, Buzzer		Yes	
INTERFACES			
Ethernet		1 (10/100 Mbit)	
USB		1 (Host v2.0, max 500mA)	
Serial		1 (RS232, RS485, RS422, software configurable)	
FUNCTIONALITIES			
Vector graphics		●	
Dynamic objects		●	
Font TrueType		●	
Alarms		●	
Event list		●	
Recipes		●	
Password		●	
Trends		●	
Multi-language management		●	

BASE MODULES

LRD10... - LRD12...

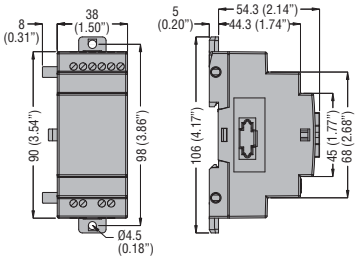


LRD20...



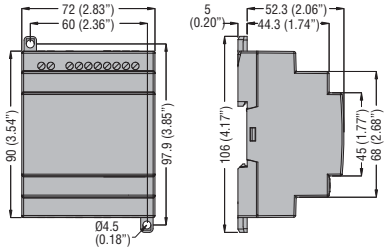
EXPANSION AND COMMUNICATION MODULES

LRE... expansion/communication modules

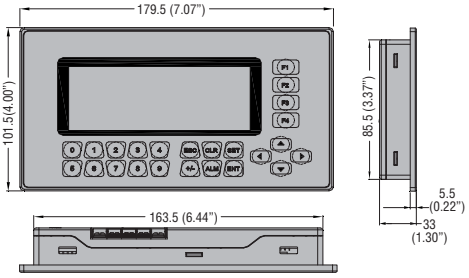


ACCESSORIES

LRX1V3 D024 power supply unit



LRX P01 HMI operator panel



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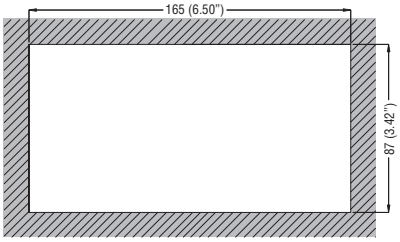
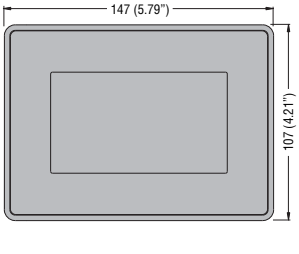


HMI

LRH A 04



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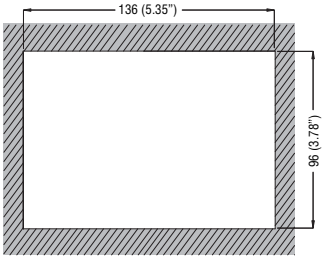
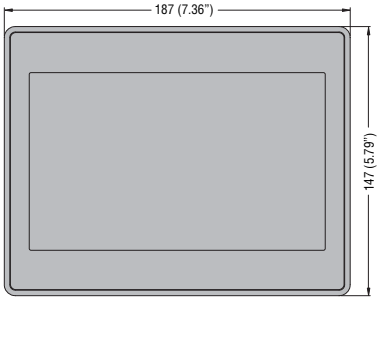


LRH A 07



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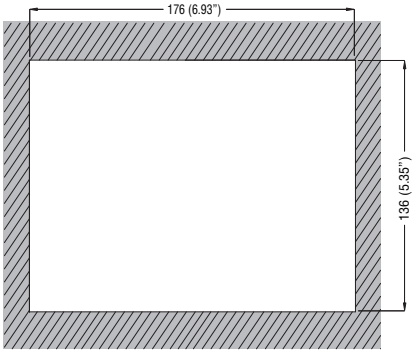
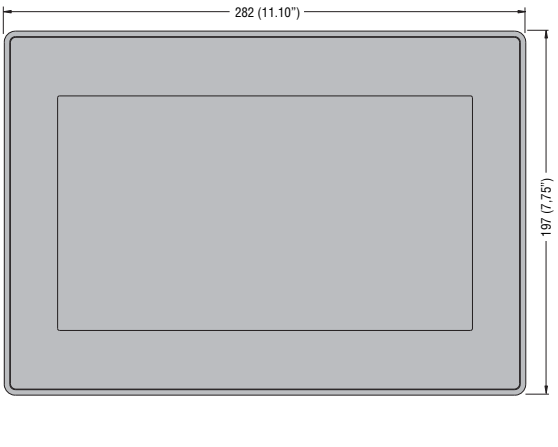


LRH A 10



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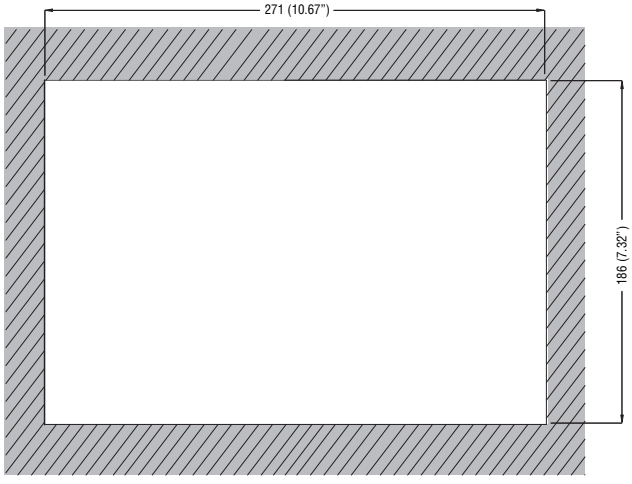
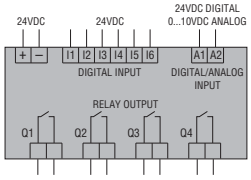
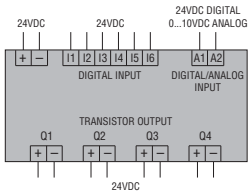


BASE MODULES

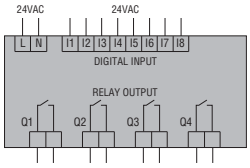
LRD12R D024



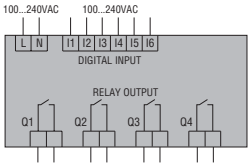
LRD12T D024



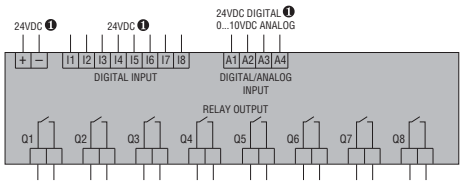
LRD12R A024



LRD10R A240

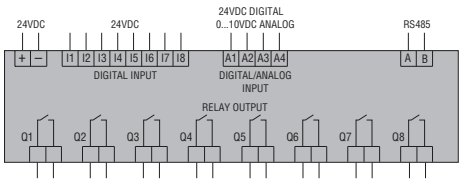


LRD20R D012 - LRD20R D024

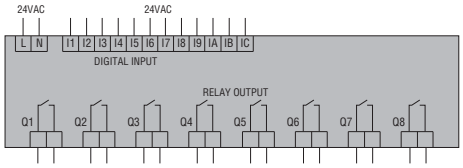


❶ 12VDC for LRD20R D012.

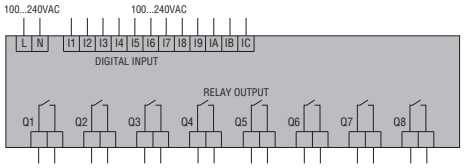
LRD20R D024 P1



LRD20R A024

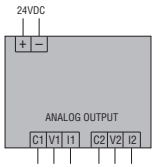


LRD20R A240

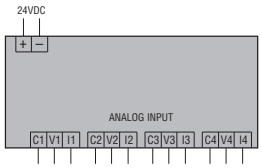


EXPANSION AND COMMUNICATION MODULES

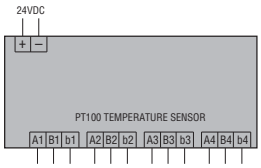
LRE02A D024



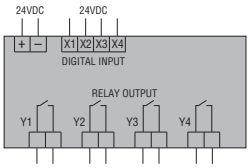
LRE04A D024



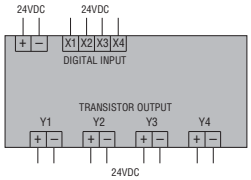
LRE04P D024



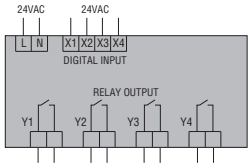
LRE08R D024



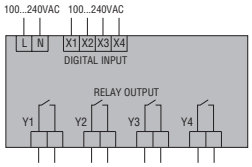
LRE08T D024



LRE08R A024

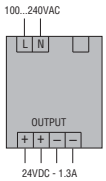


LRE08R A240

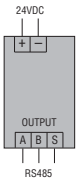


ACCESSORIES

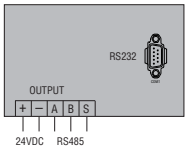
LRX 1V3 D024



LRE P00

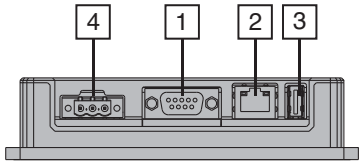


LRX P01

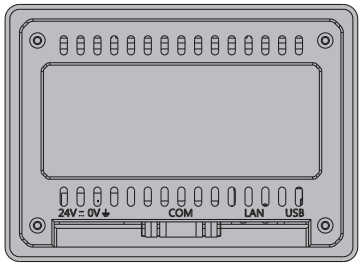


HMI

LRH A...



1 Serial port (type RS232, RS485, RS422 software configurable)
2 Ethernet port
3 USB port
4 Power supply



BASE MODULES		LRD... D012	LRD... D024	LRD... A024	LRD... A240
POWER SUPPLY					
IEC rated voltage Ue (frequency range)		12VDC	24VDC	24VAC (50...60Hz)	100...240VAC (50...60Hz)
Operating limits		10.4...14.4VDC	20.4...28.8VDC	20.4...28.8VAC (47...63Hz)	85...265VAC (47...63Hz)
Average current consumption		265mA	125mA (LRD12...) 185mA (LRD20...)	290mA	100mA
DIGITAL INPUTS					
Rated voltage		12VDC	24VDC	24VAC (50-60Hz)	100-240VAC (50-60Hz)
Input voltage	State 0	<2.5VDC	<5VDC	<6VAC	<40VAC
	State 1	>7.5VDC	>15VDC	>14VAC	>79VAC
Delay time	0 to 1	4ms (0.5ms for high speed)	4ms (0.5ms for high speed)	90ms	50/45ms (Ue=120VAC) - 22/18ms (Ue=240VAC)
	1 to 0	4ms (0.3ms for high speed)	4ms (0.3ms for high speed)	90ms	50/45ms (Ue=120VAC) - 90/85ms (Ue=240VAC)
ANALOG INPUTS FOR DC VERSIONS ONLY					
Input signal range		0...10V		—	—
Display resolution		0.01V		—	—
Conversion		12bit		—	—
Current consumption at 10VDC		<0.17mA		—	—
Input impedance		>40kΩ		—	—
Admissible overload		14VDC	28VDC	—	—
Sampling time		5...20ms (LADDER); 2...10ms (FBD)		—	—
Maximum cable length		≤30m/98ft of screened type		—	—
DIGITAL OUTPUTS					
Type of output / IEC rated current Ith		Relay / 8A (LDR...R... / LRE08R... only) Transistor / 0.3A 24VDC (LRD...T... / LRE08T... only)			
Applied voltage		Max 265VAC/30VDC (LDR...R... / LRE08R... only) 10...28.8VDC (LRD...T... / LRE08T... only)			
AMBIENT CONDITIONS					
Operating temperature		-20...+55°C			
Storage temperature		-40...+70°C			
Relative humidity		20...90% without condensation			
HOUSING					
Version		Modular for mounting on 35mm DIN rail (IEC/EN 60715) or M4x15mm screw fixing			
Connections	Type of terminal	Screw			
	Conductor section	0.14...2.5mm² / 26...14AWG			
	Tightening torque	0.6Nm / 0.4lbft			
	Maximum cable length	≤100m/328ft			
IEC degree of protection		IP20			

EXPANSION MODULES	LRE02A D024		LRE04A D024	LRE04P D024
POWER SUPPLY				
IEC rated voltage Ue	24VDC		24VDC	24VDC
Operating limits	20.4...28.8VDC		20.4...28.8VDC	20.4...28.8VDC
ANALOGIC INPUTS/OUTPUTS				
Type of channels	2 outputs configurable for voltage or current		4 outputs configurable for voltage or current	4 inputs for PT100 temperature sensors
Operating limits	0...10V	0...20mA	0...10V	-100...+600°C
Display resolution	0.00...10.00V	0.00...20.00mA	0.00...10.00V	-100.0...+600.0°C
Resolution	10mV	40µA	10mV	0.1°C
Accuracy	±2.5%		±2.5%	±1%
Power consumption	70mA		70mA	70mA

COMMUNICATION MODULE	LRE P00
IEC rated voltage Ue	24VDC
RS485 connection	Isolated
Baud rate	4800...38400bps
Terminator resistor	Integrated 120Ohm
Cable length	0.14...1.5mm² (26...16AWG)
Tightening torque	0.6Nm (5.4lb-in)

HMI OPERATOR PANEL	**LRX P01**
SUPPLY	
IEC rated voltage Ue	24VDC
Operating limits	20.4…26.4 VDC (-15%...+10%)
Power consumption	1.9 W
AMBIENT CONDITIONS	
Operating temperature	0…+55°C
Storage temperature	-40…+70°C
Altitude	≤2000m
Relative humidity	10…95% (non-condensing)
Maximum pollution degree	2 (IEC/EN 61131-3)
Vibration resistance	15g
Shock resistance	0.5g
Conductor section	0.4…3.3 mm² (22-12 AWG)
Tightening torque	1.8 Nm / 10.4 lbin
IEC degree of protection	IP65

HMI	**LRH A 04**	**LRH A 07**	**LRH A 10**
POWER SUPPLY			
Rated voltage Ue	24VDC		
Max current consumption at 24VDC	0.25A	0.3A	0.38A
ENVIRONMENT CONDITIONS			
Operating temperature	0...+50°C		
Storage temperature	-20...+70°C		
Relative humidity	5...85% (non condensing)		
Protection degree	IP66, Type 2, 4X (front); IP20 (rear)		

Switching power supplies

- Versions: modular and 35mm DIN rail mount
- Output voltage adjustment by front potentiometer
- Short-circuit protection
- Built-in input voltage surge suppressor
- Used as power supply for DC electromechanical and electronic equipment
- Redundancy modules

Page 22-2

POWER SUPPLIES MODULAR AND DIN RAIL MOUNT VERSIONS

- Single phase
- Output voltage: 12 or 24VDC
- Output power: 10...100W.

Page 22-3

POWER SUPPLIES DIN RAIL MOUNT VERSION

- Single, two and three phase
- Output voltage: 24 or 48VDC
- Output power: 5...960W.

Page 22-3

REDUNDANCY MODULES

- Modular and 35mm DIN rail mount
- Output voltage: 12 or 24VDC
- Output current: 10 or 20A.

Modular version

PSL1M 010...

PSL1M 033 12
PSL1M 036 24

Order code	Rated output voltage	Rated output current	Output power	Qty per pkg	Wt
	[V]	[A]	[W]	n°	[kg]
Single phase.					
PSL1M 010 12	12VDC	0.83	10	1	0.114
PSL1M 024 12		2	24	1	0.177
PSL1M 033 12		2.75	33	1	0.248
PSL1M 054 12		4.5	54	1	0.311
PSL1M 072 12		6	72	1	0.443
PSL1M 010 24	24VDC	0.42	10	1	0.114
PSL1M 024 24		1	24	1	0.177
PSL1M 036 24		1.5	36	1	0.248
PSL1M 060 24		2.5	60	1	0.311
PSL1M 100 24		4.2	100	1	0.443

General characteristics
Switching power supplies transform an AC input voltage into a DC output one. This type of equipment is used in industrial and domestic automation fields. The power supplies are equipped with switching technology offering very high efficiency in an extremely compact size. Dimensions are compatible with modular consumer panels and its plastic housing is suitable for building automation installations as well as industrial automation applications.
The wide range of power supply voltages and the choice of DC current outputs provide for the best adaptability to supply voltage needs of the most common electronic and electromechanical devices.

Protections:
– Short circuit
– Overload
– Input voltage peaks.

Indications:
– LED indicator for low voltage conditions
– LED indicator for power on.

Operational characteristics
– Rated supply voltage: 100...240VAC
– Rated output voltage: 12VDC for PSL1M...12 types; 24VDC for PSL1M...24 types
– Mains frequency: 50/60Hz
– Output voltage adjustment by front potentiometer
– High efficiency up to 89%
– 35mm DIN rail (IEC/EN 60715) mounting
– Screw connection terminals
– Modular DIN 43880 housing; number of modules:
  • 1 for PSL1M 010...
  • 2 for PSL1M 024...
  • 3 for PSL1M 033 12 and PSL1M 036 24
  • 4 for PSL1M 054 12 and PSL1M 060 24
  • 5 for PSL1M 072 12 and PSL1M 100 24
– IEC degree of protection: IP20 on terminals.

Certifications and compliance
Certifications obtained: EAC, RCM; UL Listed for USA and Canada (cULus-File E318016) as Power Supplies in power circuit and motor-mounted apparatus category.
Compliant with standards: IEC/EN 60950-1 (Class II), IEC/EN 61000-6-2, IEC/EN 61000-6-3, UL508, CSA C22.2 n° 107-1.

Din Rail mount version


PSL1 005 24
PSL1 010 24
PSL1 018 24

PSL1 030…
PSL1 060…


PSL1 100…
PSL1 120…

PSL1 240…
PSL1 300…

PSL1 480 24
PSL1 480 48

PSL3 960…

Order code	Rated output voltage	Rated output current	Output power	Qty per pkg	Wt
	[V]	[A]	[W]	n°	[kg]
Single phase.					
PSL1 005 24	24VDC	0.21	5	1	0.190
PSL1 010 24		0.42	10	1	0.196
PSL1 018 24		0.75	18	1	0.226
PSL1 030 24		1.25	30	1	0.336
PSL1 060 24		2.5	60	1	0.400
PSL1 100 24		4.2	100	1	0.508
PSL1 120 24		5	120	1	1.018
PSL1 240 24		10	240	1	1.486
PSL1 300 24		12.5	300	1	1.496
PSL1 480 24		20	480	1	2.348
PSL1 030 48	48VDC	0.625	30	1	0.336
PSL1 060 48		1.25	60	1	0.400
PSL1 100 48		2.1	100	1	0.508
PSL1 120 48		2.5	120	1	1.018
PSL1 240 48		5	240	1	1.486
PSL1 300 48		6.25	300	1	1.496
PSL1 480 48		10	480	1	2.348
Two phase.					
PSL2 100 24	24VDC	4.2	100	1	0.570
PSL2 100 48	48VDC	2.1	100	1	0.570
Three phase❶.					
PSL3 120 24	24VDC	5	120	1	0.910
PSL3 240 24		10	240❶	1	1.190
PSL3 480 24		20	480❶	1	1.995
PSL3 960 24		40	960❶	1	3.672
PSL3 240 48	48VDC	5	240❶	1	1.190
PSL3 480 48		10	480❶	1	1.995
PSL3 960 48		20	960❶	1	3.672

❶ Two-phase connection is admissible with a 25% output power derating.

General characteristics
This type of equipment is used to power supply electromechanical and electronic devices with DC control, such as contactors, time relays, sensors, PLCs, DC motors, displays, SSRs and other equipment normally found in automation systems and networks.

Protections:
– Short circuit
– Overload
– Input voltage peaks.

Indications:
– LED indicator for low voltage conditions
– LED indicator for power on.

Operational characteristics
– Rated supply voltage:
  100...240VAC (PSL1 005...PSL1 100)
  115...230VAC self-configurable (PSL1 120...PSL1 480)
  400...500VAC (PSL2... and PSL3...❶)
– Rated output voltage: 24VDC (PSL...24) / 48VDC (PSL...48)
– Mains frequency: 50/60Hz
– Output voltage adjustment by front potentiometer
– PFC function for types:
  PSL1 120 24...PSL3 960 24
  PSL1 120 48...PSL3 960 48
– Parallel connection for types: PSL1 120 24, PSL1 240 24, PSL1 300 24, PSL1 480 24, PSL2 100 24, PSL3 240 24, PSL3 480 24, PSL3 960 24, PSL1 120 48, PSL1 240 48, PSL1 300 48, PSL1 480 48, PSL2 100 48, PSL3 240 48, PSL3 480 48, PSL3 960 48
– High efficiency up to 92%
– 35mm DIN rail (IEC/EN 60715) mounting
– Screw connection terminals
– Plastic or metal housing depending on type
– IEC degree of protection: IP20 on terminals.

Certifications and compliance
Certifications obtained: EAC, RCM; UL Listed for USA and Canada (cULus-File E318016) as Power Supplies in power circuit and motor-mounted apparatus category.
Compliant with standards: IEC/EN 60950-1 (Class II), IEC/EN 61000-6-2, IEC/EN 61000-6-3, UL508, CSA C22.2 n° 107.1.

Redundancy modules

PSLR M1024

PSLR 2024

Order code	Rated output voltage	Rated output current	Qty per pkg	Wt
	[V]	[A]	n°	[kg]
PSLRM 10 24	12...24VDC	10	1	0.075
PSLR 20 24	24VDC	20	1	0.210

Indications (PSLR 20 24)

Input voltage A	Input voltage B	LED A	LED B	Relay A	Relay B
Within limits	Within limits	ON	ON	Energ.	Energ.
Within limits	<MIN or >MAX	ON	OFF	Energ.	De-energ.
<MIN or >MAX	Within limits	OFF	ON	De-energ.	Energ.
<MIN or >MAX	<MIN or >MAX	OFF	OFF	De-energ.	De-energ.

General characteristics
They are used for the redundancy connection of two or more power supplies to enhance the reliability of the DC supply. The redundancy modules ensure a perfect insulation between the power supplies connected.

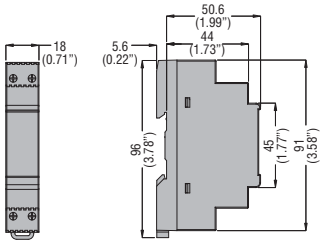
Indications (only for PSLR 20 24):
– LED indicator for DC voltage within limit
– Alarm relay.

Operational characteristics
– Rated input voltage:
  12...24VDC (PSLRM 10 24)
  24VDC (PSLR 20 24)
– Rated input current:
  10A (PSLRM 10 24)
  20A (PSLR 20 24)
– Maximum input current (for channel):
  8A per 300s(PSLRM 10 24)
  16A per 300s (PSLR 20 24)
– Rated output current :
  10A (PSLRM 10 24)
  20A (PSLR 20 24)
– Maximum output current:
  16A per 300s (PSLRM 10 24)
  30A per 300s (PSLR 20 24)
– Modular housing DIN 43880 2 modules (PSLRM 10 24)
– 35mm DIN rail (IEC/EN 60715) mounting (PSLR 20 24)
– Screw connection terminals
– Plastic or metal housing depending on type
– IEC degree of protection: IP20 on terminals.

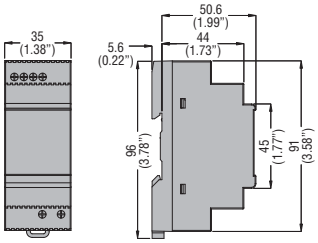
Certifications and compliance
Certifications obtained: cULus (only for PSLR 20 24), EAC.
Compliant with standards: IEC/EN 60950-1, IEC/EN 61000-4-2, IEC/EN 61000-4-3, IEC/EN 61000-4-4, IEC/EN 61000-4-6, IEC/EN 61000-4-8, UL 508 (only for PSLR 20 24).

MODULAR SWITCHING POWER SUPPLIES

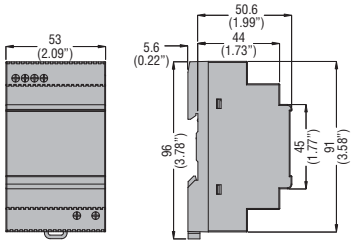
PSL1M 010...



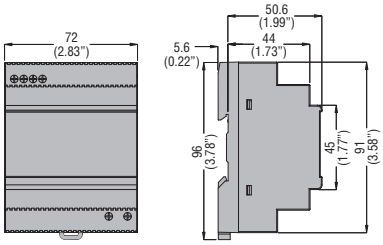
PSL1M 024...



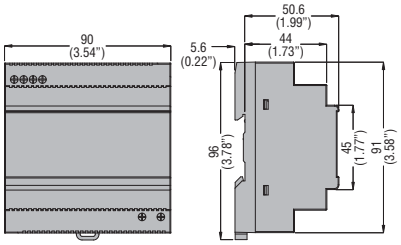
PSL1M 033 12 - PSL1M 036 24



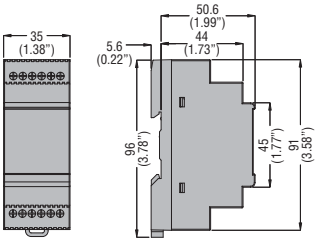
PSL1M 054 12 - PSL1M 060 24



PSL1M 72 12 - PSL1M 100 24

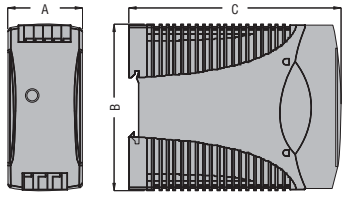


PSLRM 10 24



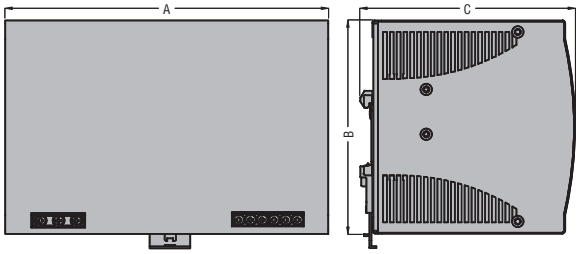
SWITCHING POWER SUPPLIES

PSL1 005 24 - PSL1 100 48
PSL2 100



TYPE	A	B	C
PSL1 005 24	22.5 (0.88")	90 (3.54")	115 (4.53")
PSL1 010 24	22.5 (0.88")	90 (3.54")	115 (4.53")
PSL1 018 24	22.5 (0.88")	90 (3.54")	115 (4.53")
PSL1 030...	40.5 (1.59")	90 (3.54")	115 (4.53")
PSL1 060...	40.5 (1.59")	90 (3.54")	115 (4.53")
PSL1 100...	54 (2.12")	90 (3.54")	115 (4.53")
PSL2 100...	54 (2.12")	90 (3.54")	115 (4.53")

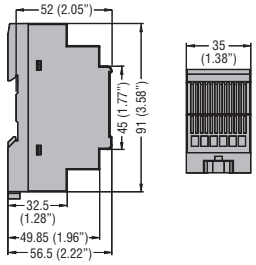
PSL1 120 24 - PSL1 480 48
PSL3...



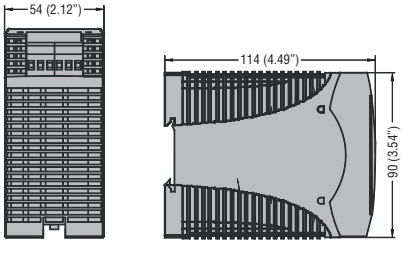
TYPE	A	B	C
PSL1 120...	64 (2.52")	124.5 (4.90")	123.6 (4.87")
PSL1 240...	83.5 (3.29")	124.5 (4.90")	123.6 (4.87")
PSL1 300...	83.5 (3.29")	124.5 (4.90")	123.6 (4.87")
PSL1 480...	175.5 (6.91")	124.5 (4.90")	123.6 (4.87")
PSL3 120 24	74.3 (2.92")	124 (4.88")	118.8 (4.68")
PSL3 240...	89 (3.50")	124 (4.88")	118.8 (4.68")
PSL3 480...	150 (5.90")	124 (4.88")	118.8 (4.68")
PSL3 960...	275.8 (10.86")	125.9 (4.96")	120.3 (4.74")

REDUNDANCY MODULES

PSLRM 10 24

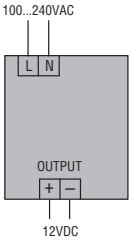


PSLR 20 24

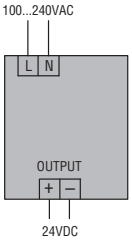


MODULAR SWITCHING POWER SUPPLIES

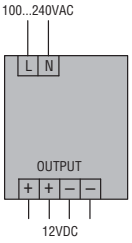
PSL1M 010 12



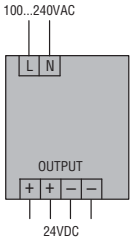
PSL1M 010 24



PSL1M 024 12 - PSL1M 033 12
PSL1M 054 12 - PSL1M 072 12

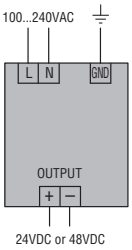


PSL1M 024 24 - PSL1M 036 24
PSL1M 060 24 - PSL1M 100 24

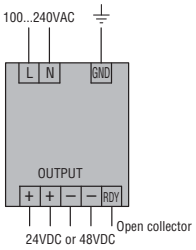


SWITCHING POWER SUPPLIES

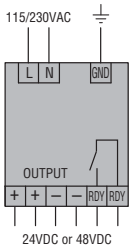
PSL1 005 24
PSL1 010 24
PSL1 018 24



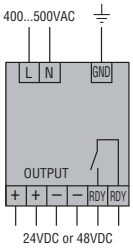
PSL1 030...
PSL1 060...



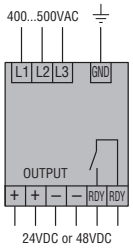
PSL1 100... - PSL1 120...
PSL1 240... - PSL1 300...
PSL1 480...



PSL2 100...



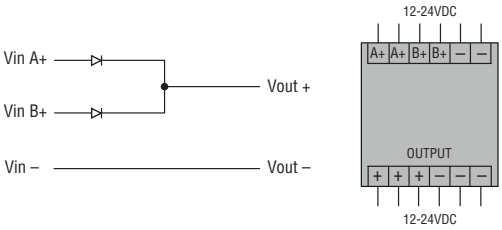
PSL3 120 24 - PSL3 240...❶
PSL3 480...❶ - PSL3 900...❶



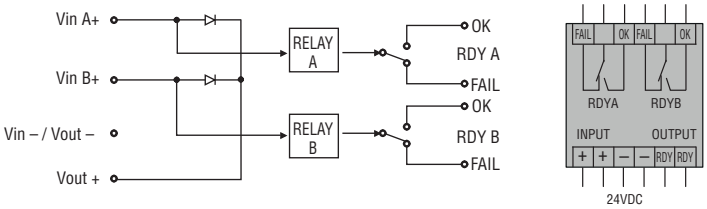
❶ Two-phase connection is permissable with a 25% output power derating.

REDUNDANCY MODULES

PSLRM 10 24



PSLR 20 24



MODULAR SWITCHING POWER SUPPLIES **PSL1M...** TYPES

TYPE						
	Single phase	**PSL1M 010 12 - PSL1M 010 24**	**PSL1M 024 12 - PSL1M 024 24**	**PSL1M 033 12 - PSL1M 036 24**	**PSL1M 054 12 - PSL1M 060 24**	**PSL1M 072 12 - PSL1M 100 24**
	Two phase	—	—	—	—	—
	Three phase	—	—	—	—	—
		—	—	—	—	—
INPUT CHARACTERITICS						
Rated supply voltage		Multivoltage 100...240VAC				
Operating range		90...264VAC / 120...375VDC				
Consumption (max)		300mA	600mA	900mA	1.5A	1.7/2.2A
Frequency range		47...63Hz				
PFC		—				
Insulation voltage Input/output		3000VAC (4242VDC)				
Internal fuse (250VAC) ❶		T1A	T2A			T3A
OUTPUT CHARACTERISTICS						
Voltage		12VDC (PSL1M...12); 24VDC (PSL1M...24)				
Voltage trimming (potentiometer)		—	12...14VDC (PSL1M...12) 24...28VDC (PSL1M...24)			
Current		0.83A (PSL1M...12) 0.42A (PSL1M...24)	2A (PSL1M...12) 1A (PSL1M...24)	2.75A (PSL1M...12) 1.5A (PSL1M...24)	4.5A (PSL1M...12) 2.5A (PSL1M...24)	6A (PSL1M...12) 4.2A (PSL1M...24)
Temperature coefficient		±0.03%/°C				
Line adjustment		±1%				
Load adjustment		±1%				
Efficiency		78% (PSL1M...12) 80% (PSL1M...24)	84% (PSL1M...12) 85%(PSL1M...24)	83% (PSL1M...12) 84% (PSL1M...24)	84% (PSL1M...12) 86% (PSL1M...24)	86% (PSL1M...12) 89% (PSL1M...24)
Overload protection		125...185%	120...160%	110...150%	110...150%	110...150%
Short-circuit protection		Hiccup	Hiccup	Fold forward		
Ripple noise		50mV				
Parallel connection (n° of units)❸		—				
INDICATIONS						
LED indicator for power on		Yes				
LED indicator for low voltage		Yes				
Power Rdy (Ready) (minimum limit)		—				
AMBIENT CONDITIONS						
Operating temperature ❹		-40...+71°C				
Storage temperature		-40...+85°C				
Derating (>60°C)		2.5%/°C				
HOUSING						
Material		Plastic				

REDUNDANCY MODULES **PSLR...**

TYPE	**PSLRM 10 24**	**PSLR 20 24**
INPUTS CHARACTERISTICS		
Rated input voltage	12-24VDC	24VDC
Operating range	9…35VDC	21…28VDC
Number of input	2	2
Rated input current	10A	20A
Maximum input current (for channel)	8A for 300s	15A for 300s
OUTPUTS CHARACTERISTICS		
Output voltage drop	0.5V	0.5V
Rated output current	10A	20A
Maximum reverse voltage	35V	30V
Maximum output current	16A for 300s	30A for 300s
INDICATIONS		
DC ON indicator for input A	-	Yes
DC ON indicator for input B	-	Yes
Power Rdy (Ready) (minimum limit)	-	Ok if input >20V (±5%) or <30V(±5%) Fail if input <20V (±5%) or >30V(±5%) 1A at 30VDC
AMBIENT CONDITIONS		
Operating temperature	-40…+71°C	
Storage temperature	-40…+85°C	
HOUSING		
Material	Plastic	Plastic

SWITCHING POWER SUPPLIES **PSL...** TYPES

PSL1 005 24	**PSL1 010 24**	**PSL1 018 24**	**PSL1 030 24** **PSL1 030 48**	**PSL1 060 24** **PSL1 060 48**	**PSL1 100 24** **PSL1 100 48**	**PSL1 120 24** **PSL1 120 48**	**PSL1 240 24** **PSL1 240 48**	**PSL1 300 24** **PSL1 300 48**	**PSL1 480 24** **PSL1 480 48**	—	—	—	—	—
—	—	—	—	—	—	—	—	—	—	**PSL2 100 24** **PSL2 100 48**	—	—	—	—
—	—	—	—	—	—	—	—	—	—	—	**PSL3 120 24**	**PSL3 240 24**	**PSL3 480 24**	**PSL3 960 24**
—	—	—	—	—	—	—	—	—	—	—	—	**PSL3 240 48**	**PSL3 480 48**	**PSL3 960 48**

Multivoltage 100...240VAC						Self-configurable 115...230VAC				Multivoltage 400...500VAC ❷				
90...264VAC / 120...375VDC			85...264VAC / 90...375VDC		90...264VAC 120...375VDC	90...132VAC / 180...264VAC 210...375VDC			90...264VAC 120...375VDC	340...575VAC 480...820VDC				
200mA	300mA	500mA	800mA	1.5A	2.4A	2.8A	5.4A/2.2A	6A	6A/3A	750mA	500mA	850mA	1.4A	2.4A
47...63Hz														
—						0.7			0.97	0.55			0.65	0.8
3000VAC (4242VDC)														
T2A					T3.15A		T6.3A	T8A	T10A	T2A			T3.15A/500VAC	T5A/500VAC

24VDC (PSL...24); 48VDC (PSL...48)														
21.6...28.8VDC			24...28VDC 48...55VDC		22.5...28.5VDC 47...56VDC					22.5...28.5 VDC		22.5...28.5VDC 47...56VDC		
0.21A	0.42A	0.75A	1.25A 0.625A	2.5A 1.25A	4.2A 2.1A	5A 2.5A	10A 5A	12.5A 6.25A	20A 10A	4.2A 2.1A	5A	10A 5A	20A 10A	40A 20A
0.03%/°C										0.03%/°C				
±1%			0.5%		±1%	±0.5%				±1%				
±2%			0.5%		±1%									
72%	76%	77%	86%	89%	86% 88%	86% 87%	89% 90%		89% 90%	87% 89%	89%	90% 91%	90% 91%	92% 93%
110...135%	110...145%	110...140%	110...150%		110...140%	110...145%	120...145%		110...140%	115...135%		120...140%	110...135%	125...145%
Hiccup			Fold forward							Hiccup			Fold forward	Hiccup
50mV						50mV	100mV			50mV	100mV			80mV
—						3				2	—	2	2	2

Yes														
Yes			—	—	Yes									
—			Yes (transistor output) (18.8VDC)		Yes (relay output) (17.6VDC)							Yes (trans. output) (60VDC)	Yes (relay output) (17.6VDC)	

-20...+71°C			-40...+71°C		-35...+71°C		-40...+71°C	-30...+71°C	-40...+71°C				-30...+71°C	-40...+71°C
-25...+85°C			-40...+85°C											
2.5%/°C														3.5%/°C

Plastic			Metal	
Plastic			Metal	

❶ No replacement by user.
❷ Two-phase connection is possible with 25% power derating, except types PSL2 100 24 and PSL3 120 24.
❸ Minimum load of 150mA.
❹ Maximum surrounding temperature of 50°C for use according to UL508.