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PROTECTOR TRIP RELAYS

TE'S CROMPTON INSTRUMENTS



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PROTECTOR TRIP RELAYS



Features

- LED fault indication
- Adjustable nominal voltages, trip points, time delay and differentials
- Compact DIN-rail enclosure
- Power on LED (Green)
- Designed to avoid nuisance tripping

Benefits

- Protection of power assets
- Detection and isolation of faults
- Maintains supply continuity of healthy circuits
- High speed tripping to avoid damage

Applications

- Switchgear
- Distribution systems
- Process control
- Motor protection
- Equipment and network protection

An extensive range of electronic control products providing continuous monitoring and protection of any electrical parameter. When the monitored parameter deviates from the desired set trip limit, the relay will operate to prevent damage to power asset. This versatile range features a host of stylish DIN-rail protectors offering numerous trip functions for single and three-phase power systems, including over and under voltage, current, frequency, phase sequence/failure or balance, reverse power, synchro-check, speed sensing and finally DC inputs.

New Products

Voltage Relays
with Auxiliary



Lower profile
Earth Leakage Protection Relay



DC Voltage Relays



Multifunction Timer Relays



AC CURRENT



AC current protectors provide a continuous surveillance of monitored circuits and offer user adjustable trip points (set points) with time delay settings. When the current moves outside the set point limit for longer than the time delay, the relay will operate providing an alarm control or tripping signal.

Basic Parameters

- Universal auxiliary supply 24-240V AC/DC galvanically isolated from monitored current circuit
- Pre-set differential (hysteresis) 1%
- Trip level adjustment between 40-120% (I_n)
- Available with 1A or 5A nominal inputs of (I_n)
- Power on LED (green)

Under Current - PAU

- Single-phase
- Continuously monitors to provide under current protection (set level I_{min})
- Adjustable time delay
- 1 module version

Over Current - PAO

- Single-phase
- Continuously monitors to provide over current protection (set level I_{max})
- Adjustable time delay
- 1 module version

Under and Over Current - PAD

- Single-phase
- Monitors decrease of current under a set level I_{min} and simultaneously an over range of current above a set level I_{max}
- Independently adjustable delay on both over and under set points
- Two output relays
- Three module version

Under or Over Current - PAP/V

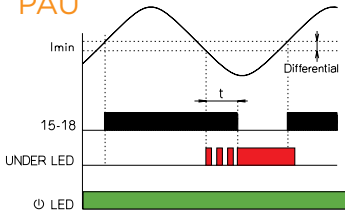
- Three-phase, three/four-wire
- Continuously monitors to provide under or over protection (set level I_n)
- Monitors three-phase current
- Selectable under or over protection
- Six module version

Part number	1-phase	3-phase 3/4-wire	Protection
PAU	x		Under current
PAO	x		Over current
PAD	x		Under and over current
PAP/V		x	Under or over current

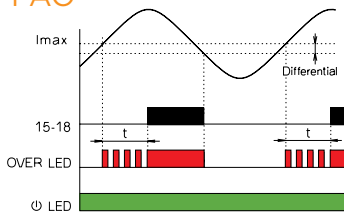
AC CURRENT

Characteristics

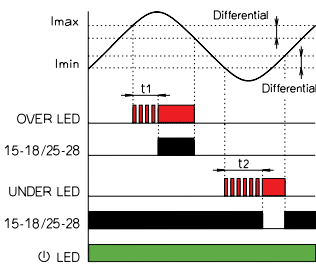
PAU



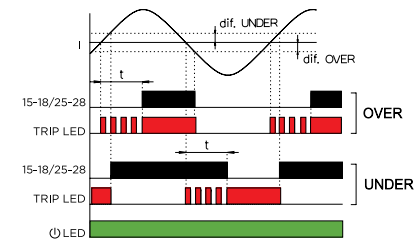
PAO



PAD



PAP/V



Operation

The set point adjustment range is between 40% and 120% of the nominal current with 1A or 5A nominal input current (via current transformers or direct connection). An internal differential setting of 1% reduces nuisance tripping if the measured signal is noisy or unstable. Relay will trip if the measured current moves outside the set point limit and the red LED indicates a fault condition. An adjustable time delay eliminates premature operation on short duration current fluctuations. During this delay period the red LED will flash. Protectors draw their operating power from a separate auxiliary supply input.

Under Current - PAU

Should the monitored current fall below the set point level I_{min} , the protector will trip and the red LED will illuminate indicating the fault condition. During the time delay period the red LED will flash for the set time (t) before the relay de-energises output relay contacts. The relay will automatically reset once the monitored current rises above the set point level I_{min} plus the differential (internally pre-set 1%) causing the red LED to extinguish and the relay to make without time delay.

Over Current - PAO

Should the monitored current exceed the set point level I_{max} , the protector will trip and the red LED will illuminate indicating the fault condition. During the time delay period the red LED will flash for the set time (t) before the relay energises output relay contacts. The protector will automatically reset once the monitored current falls below the set point level I_{max} plus the differential (internally pre-set 1%) causing the red LED to extinguish and the relay to release without time delay.

Under and Over Current - PAD

- PAD is a combination of both PAU and PAO products.

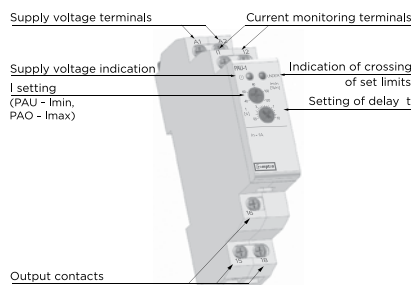
Under or Over Current - PAP/V

The manner of operation depends on the mode selected at the front panel either Under Current or Over Current.

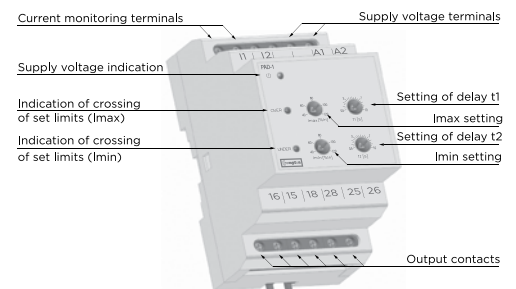
Note: Red LED indicates fault condition, not relay status.

Protector Overview

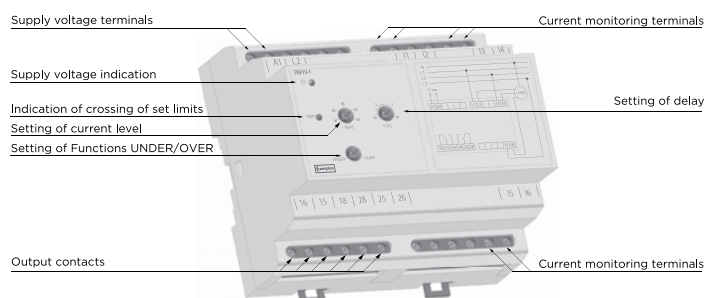
PAU, PAO



PAD



PAP/V

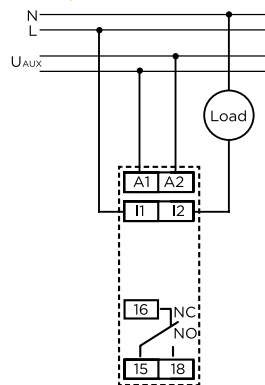


Single-phase

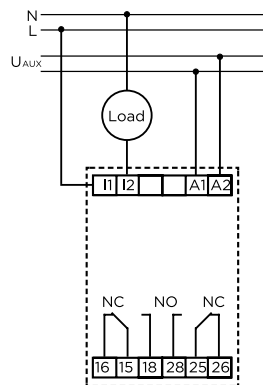
Technical parameters	PAU-1	PAU-5	PAO-1	PAO-5	PAD-1	PAD-5
Under current protection (de-energise on trip):	•	•			•	•
Over current protection (energise on trip):			•	•	•	•
Auxiliary supply terminals:	A1, A2					
Auxiliary supply voltage:	24-240V AC/DC					
Auxiliary supply voltage tolerance:	±10%					
Auxiliary voltage burden (max):	2.6VA/0.8W			3VA/1.2W		
Operating frequency AC:	45-65 Hz					
Current input terminals:	I1, I2					
Rated current In:	1A AC	5A AC	1A AC	5A AC	1A AC	5A AC
Current input burden (max):	0.1VA	0.5VA	0.1VA	0.5VA	0.1VA	0.5VA
Upper current limit Imax:	Adjustable 40-120% In					
Lower current limit Imin:	Adjustable 40-120% In					
Overload capacity -continuous: -max. 3s:	2A 20A	10A 50A	2A 20A	10A 50A	2A 20A	10A 50A
Differential (hysteresis):	Internally pre-set at 1% In					
Time delay:	Adjustable 0.5-10s				Independently adjustable under/over 0.5-10s	
Output relay-contact:	1x change over (AgNi) plated				2x change over (AgNi) plated	
Output relay-contact terminals:	15, 16, 18				Under 15, 16, 18/over 25, 26, 28	
Load capability of relay contact AC:	250V/8A, max. 2000VA					
Load capability of relay contact DC:	30V/8A					
Mechanical life:	3x10 ⁶ by rated load					
Relay reset:	Automatic					
ANSI no.:	37	37	50	50	37/50	37/50
Operating temperature:	-20 +55°C					
Storage temperature:	-30 +70°C					
Electric strength (supplying - contact relay):	4kV/1min.					
Overvoltage category:	III.					
Pollution degree:	2					
Enclosure integrity:	IP40 from the front panel/IP10 terminals				IP40 from the front panel/ IP20 terminals	
Enclosure style:	DIN-rail, 1 module				DIN-rail, 3 module	
Case material:	Flame retardant polycarbonate					
Connecting conductors profile (mm ²):	max. 2x2.5mm ² /1x4mm ²				max. 2x1.5mm ² /1x2.5mm ²	
Dimensions:	H90xW17.6xD64mm				H90xW52xD65mm	
Weight:	70g	70g	70g	70g	208g	208g
Standards:	EN 60255-6, EN 60255-27, EN 61000-6-2, EN 6100-6-4					

Connection

PAU, PAO



PAD



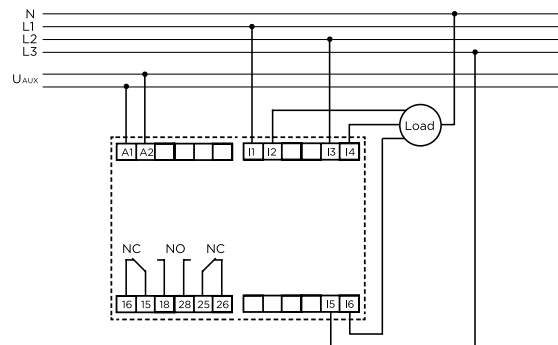


Three-phase three/four-wire

Technical parameters	PAP/V-1	PAP/V-5
Under current protection (de-energise on trip):	Selectable	Selectable
Over current protection (energise on trip):	Selectable	Selectable
System type:	3-phase (3-)	3-phase (3-)
Auxiliary supply terminals:	A1, A2	
Auxiliary supply voltage:	24-240V AC/DC	
Auxiliary supply voltage tolerance:	±10%	
Auxiliary voltage burden (max):	3VA/1.2W	
Operating frequency AC:	45-65 Hz	
Current input terminals		
L1 phase:	I1, I2	
L2 phase:	I3, I4	
L3 phase:	I5, I6	
Rated current In:	1A AC	5A AC
Current input burden (max):	0.1VA	0.5VA
Upper current limit Imax:	Adjustable 40-120% In	
Lower current limit Imin:	Adjustable 40-120% In	
Overload capacity		
-continuous:	2A	10A
-max. 3s:	50A	50A
Differential (hysteresis):	Internally pre-set at 1% In	
Time delay:	Adjustable 0.5-10s	
Output relay-contact:	2x change over (AgNi) plated	
Output relay-contact terminals:	15, 16, 18 & 25, 26, 28	
Load capability of relay contact AC:	250V/8A, max. 2000VA	
Load capability of relay contact DC:	30V/8A	
Mechanical life:	3x10 ⁶ by rated load	
Relay reset:	Automatic	
ANSI no.:	37/50	37/50
Operating temperature:	-20 +55°C	
Storage temperature:	-30 +70°C	
Electric strength (supplying - contact relay):	4kV/1min.	
Over voltage category:	III.	
Pollution degree:	2	
Enclosure integrity:	IP40 from the front panel/IP20 terminals	
Enclosure style:	DIN-rail, 6 module	
Case material:	Flame retardant polycarbonate	
Connecting conductors profile (mm ²):	max. 2x1.5mm ² /1x2.5mm ²	
Dimensions:	H90xW105xD64mm	
Weight:	208g	208g
Standards:	EN 60255-6, EN 60255-27, EN 61000-6-2, EN 6100-6-4	

Connection

PAP/V



AC VOLTAGE



When the measured voltages moves outside the set point limit for longer than the time delay, the relay will operate giving an alarm control or tripping signal. The Protector can be used for under and over voltage detection, start standby generators, operation of mains failure units and switching standby suppliers. An illuminated red LED indicates a fault condition. The three-phase, three or four-wire models with protect each phase independently.

Basic Parameters

- Available with three voltage ranges 100-120V, 173-240V & 380-480V (U_n)
- Trip level adjustment between 75-100% (U_n) Under
- Trip level adjustment between 100-125% (U_n) Over
- Non-phase sequence sensitive
- Adjustable differential (hysteresis) 1-15%
- Adjustable time delay 0.5-10s (t)
- Power ON LED (green)
- Optional auxiliary voltage

Under Voltage

- Continuously monitors to provide under voltage protection (set level U_{min})
- One and three module versions

Part number	1-phase	3-phase 3-wire	3-phase 4-wire
PVU/Z	x		
PVK/J		x	
PVV/X			x

Over Voltage

- Continuously monitors to provide over voltage protection (set level U_{max})
- One and three module versions

Part number	1-phase	3-phase 3-wire	3-phase 4-wire
PVO/H	x		
PVA/C		x	
PVP/S			x

Under and Over Voltage

- Continuously monitors to provide under and over protection (set level U_{min} and U_{max})
- Two output relays
- Three module version

Part number	1-phase	3-phase 3-wire	3-phase 4-wire
PVB	x		
PVM		x	
PVE			x

AC Voltage Auxiliary

- Auxiliary option is available on all models.

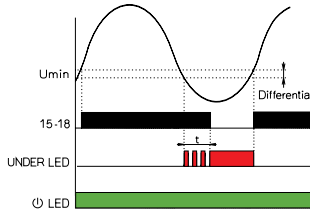
Example:

- PVV/X-380/480-AUX includes 24V/240V AC/DC auxiliary supply
- PVV/X-380/480 self-powered

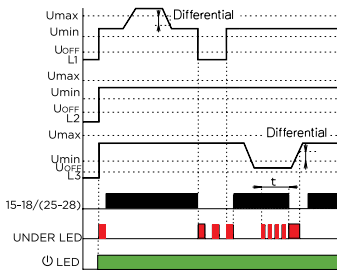
AC VOLTAGE

Characteristics

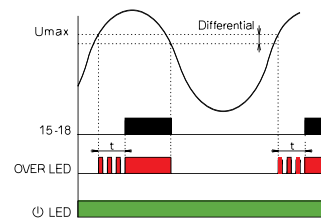
PVU/Z



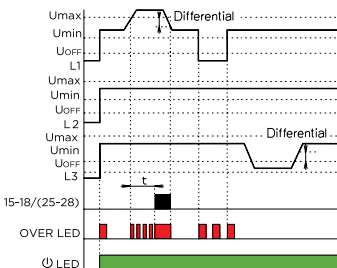
PVK/J, PVV/X



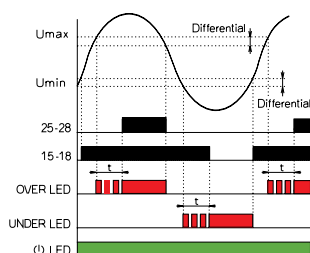
PVO/H



PVA/C, PVP/S



PVB



Operation

The set point adjustment range is 25%, operating between 75% and 100% of the nominal supply for under voltage and between 100% and 125% for the over voltage.

The adjustable differential setting range is 1% to 15% and can be used to reduce nuisance tripping if the measured signal is noisy or unstable. In case the measured voltage moves outside the set point limit the protector trips, illuminating the red LED indicating a fault condition.

An adjustable time delay is provided to eliminate premature operation on short duration voltage fluctuations. During this delay period the red LED will flash. The protectors draw their operating power from the measured inputs. Three-phase products monitor the voltage level for each phase and are not phase sequence sensitive.

Under Voltage - PVU/Z, PVK/J, PVV/X

Should the monitored voltage fall below the set point level U_{min} , the protector will trip and the red LED will illuminate to indicate the fault condition. During the time delay period the red LED will flash for the set time (t) before the relay deenergises. The protector will automatically reset once the monitored voltage rises above the set point level U_{min} plus the differential (between 1-15%) causing the red LED to extinguish and the relay to make without time delay. Should the voltage fall below the value of opening level U_{off} the protector under red LED will flash indicating a status of low nominal voltage causing the relay contact to return to original status.

Over Voltage - PVO/H, PVA/C, PVP/S

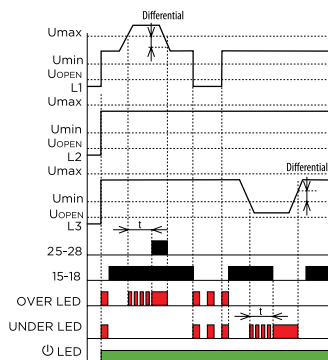
Should the monitored voltage exceed the set point level U_{max} , the protector will trip and the red LED will illuminate to indicate the fault condition. During the time delay period the red LED will flash for the set time (t) before the relay energises. The protector will automatically reset once the monitored voltage falls below the set point level U_{max} plus the differential (between 1-15%) causing the red LED to extinguish and the relay to release without time delay. Should the voltage fall below the value of opening level U_{off} the protector over red LED will flash indicating a status of low nominal voltage causing the relay contact to return to original status.

Under and Over Voltage - PVB, PVM, PVE

- PVB is a combination of both PVU/Z and PVO/H products
- PVM is a combination of both PVK/J and PVA/C products
- PVE is a combination of both PVV/X and PVP/S products

Note: Red LED indicates fault condition, not relay status.

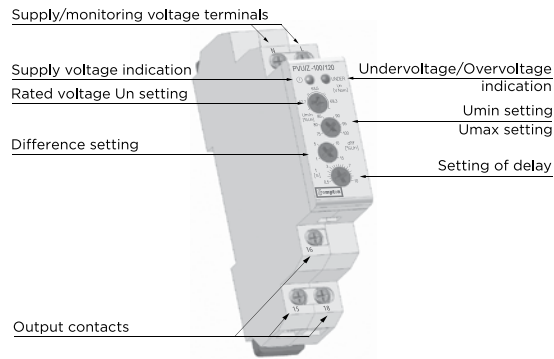
PVM, PVE



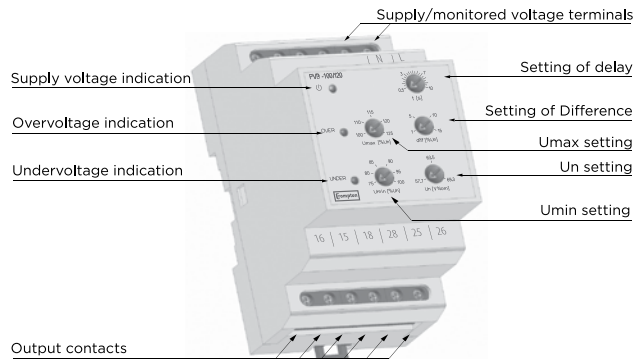
AC VOLTAGE

Protector Overview

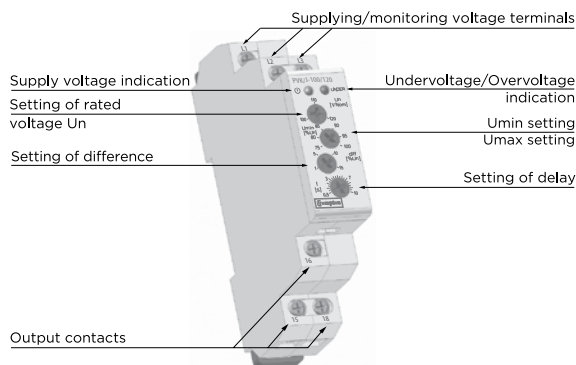
Single-phase PVU/Z, PVO/H



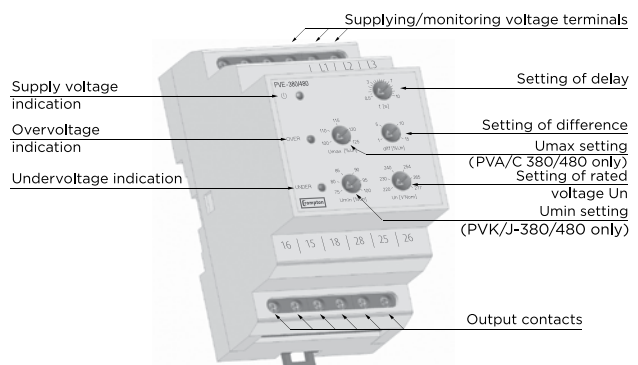
PVB



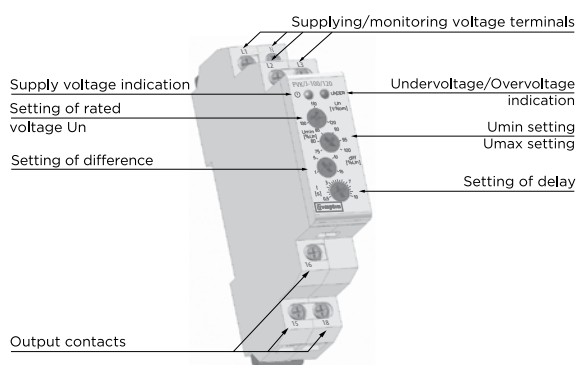
Three-phase three-wire PVK/J, PVA/C (100/120, 173/240)



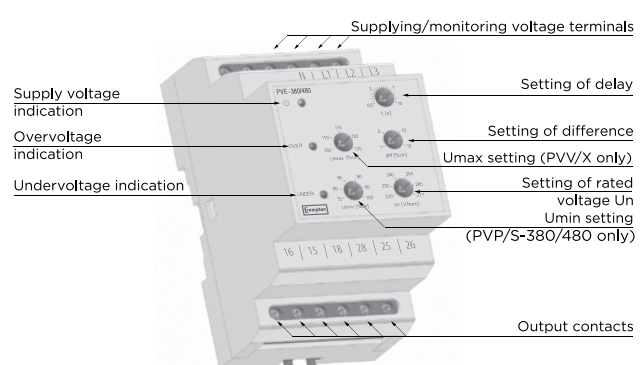
PVM (100/120, 173/240, 380/480) PVK/J, PVA/C (380/480)



Three-phase four-wire PVV/X, PVP/S (100/120, 173/240)



PVE (100/120, 173/240, 380/480) PVV/X, PVP/S (380/480)



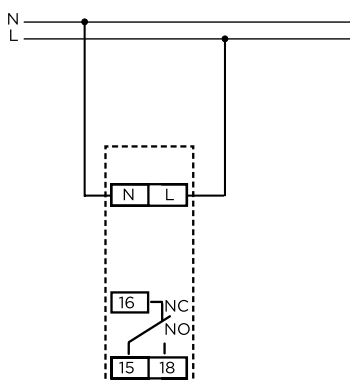
Note: when auxiliary option specified (-Aux) terminals A1 and A2 are present for connection of the Voltage/Auxiliary supply.

AC VOLTAGE

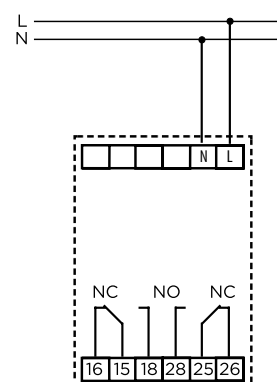
Single-phase

Technical parameters	PVU/Z-100 /120	PVU/Z-173 /240	PVU/Z-380 /480	PVO/H-100 /120	PVO/H-173 /240	PVO/H-380 /480	PVB-100 /120	PVB-173 /240	PVB-380 /480
Under voltage protection (de-energise on trip):	•	•	•				•	•	•
Over voltage protection (energise on trip):				•	•	•	•	•	•
System type:	1-phase (1-)	1-phase (1-)	1-phase (1-)	1-phase (1-)	1-phase (1-)	1-phase (1-)	1-phase (1-)	1-phase (1-)	1-phase (1-)
Voltage input terminals:	L1, N								
Nominal voltage (L-N) (Adjustable):	57.7, 63.5, 69.3V	100, 110, 115, 120, 127, 139V	220, 230, 240, 254, 265, 277V	57.7, 63.5, 69.3V	100, 110, 115, 120, 127, 139V	220, 230, 240, 254, 265, 277V	57.7, 63.5, 69.3V	100, 110, 115, 120, 127, 139V	220, 230, 240, 254, 265, 277V
Voltage burden (max):	1VA/0.7W		1VA/0.7W	1.8VA/1.1W PV/H-380/480		3VA/1.7W			
Operating frequency AC:	45-65 Hz								
Trip level under Umin:	Adjustable 75-100% Un								
Trip level over Umax:	Adjustable 100-125% Un								
Overload capacity -continuous: (L-N):	87V	174V	346V	87V	174V	346V	87V	174V	346V
-max. 10s: (L-N):	104V	209V	416V	104V	209V	416V	104V	209V	416V
Opening level off (L-N):	38V	66V	145V	38V	66V	145V	38V	66V	145V
Differential (hysteresis):	Adjustable 1-15% Un								
Time delay:	Adjustable 0.5-10s (t)								
Output relay-contact:	1x change over (AgNi) plated								
Output relay-contact terminals:	15, 16, 18	15, 16, 18	15, 16, 18	15, 16, 18	15, 16, 18	15, 16, 18	Under 25, 26, 28/Over 15, 16, 18		
Load capacity AC:	250V/8A, max. 2000VA								
Load capacity DC:	30V/8A								
Mechanical life:	3x10 ⁶ by rated load								
Relay reset:	Automatic								
ANSI no.:	27	27	27	59	59	59	27/59	27/59	27/59
Operating temp:	-20 +55°C								
Storage temp:	-30 +70°C								
Insulation:	4kV/1min.								
Overvoltage category:	III.								
Pollution degree:	2								
Enclosure integrity:	IP40 from the front panel/IP10 terminals		IP40 from the front panel/IP20 terminals	IP40 from the front panel/IP10 terminals		IP40 from the front panel/IP20 terminals			
Enclosure style:	DIN-rail, 1 module			DIN-rail, 1 module			DIN-rail, 3 module		
Case material:	Flame retardant polycarbonate								
Connecting conductors:	max.2x2.5mm ² /1x4mm ²		max.2x1.5mm ² /1x2.5mm ²	max.2x2.5mm ² /1x4mm ²		max.2x1.5mm ² /1x2.5mm ²			
Dimensions:	H90xW17.6xD64mm					H90xW52xD65mm			
Weight:	65g					125g			
Standards:	EN 60255-6, EN 60255-27, EN 61000-6-2, EN 6100-6-4								
Optional (specify at the time of ordering, include -AUX to product part number)									
Auxiliary supply voltage	24V/240V AC/DC								
A.C. supply frequency	45-65Hz								
Supply voltage tolerance	10% +/-								
Auxiliary voltage burden (Max)	3VA/1.2W								
Enclosure style	DIN-rail, 3 module								
Output relay-contact	2x change over (AgNi) plated								
Output relay-contact terminals	15, 16, 18 & 25, 26, 28								

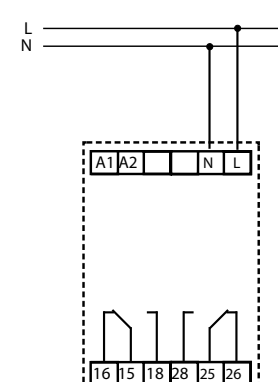
Connection PVU/Z, PVO/H



PVB



Auxiliary Option



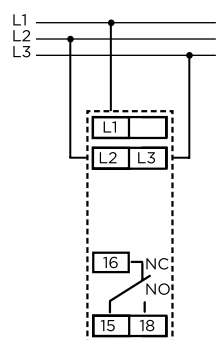
AC VOLTAGE

Three-phase three-wire

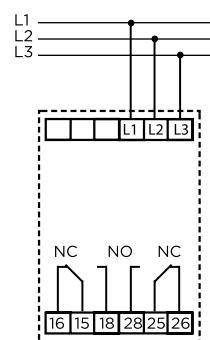
Technical parameters	PVK/J-100 /120	PVK/J-173 /240	PVK/J-380 /480	PVA/C-100 /120	PVA/C-173 /240	PVA/C-380 /480	PVM-100 /120	PVM-173 /240	PVM-380 /480
Under voltage protection (de-energise on trip):	•	•	•				•	•	•
Over voltage protection (energise on trip):				•	•	•	•	•	•
System type:	3-phase 3-wire (3-)	3-phase 3-wire (3-)	3-phase 3-wire (3-)	3-phase 3-wire (3-)	3-phase 3-wire (3-)	3-phase 3-wire (3-)	3-phase 3-wire (3-)	3-phase 3-wire (3-)	3-phase 3-wire (3-)
Voltage input terminals:	L1, L2, L3								
Nominal voltage (L-L) (Adjustable):	100, 110, 120V	173, 190, 200, 208, 220, 240V	380, 400, 415, 440, 460, 480V	100, 110, 120V	173, 190, 200, 208, 220, 240V	380, 400, 415, 440, 460, 480V	100, 110, 120V	173, 190, 200, 208, 220, 240V	380, 400, 415, 440, 460, 480V
Voltage burden (max):	1VA/0.7W		3VA/1.7W	1.8VA/1.1W			3VA/1.7W		
Operating frequency AC:	45-65 Hz								
Trip level under Umin:	Adjustable 75-100% Un								
Trip level under Umax:	Adjustable 100-125% Un								
Overload capacity -continuous: (L-L):	150V	300V	600V	150V	300V	600V	150V	300V	600V
-max. 10s: (L-L):	180V	360V	720V	180V	360V	720V	180V	360V	720V
Opening level off (L-L):	73V	126V	277V	73V	126V	277V	73V	126V	277V
Differential (hysteresis):	Adjustable 1-15% Un								
Time delay:	Adjustable 0.5-10s (t)								
Output relay-contact:	1x change over (AgNi) plated		2x change over (AgNi) plated	1x change over (AgNi) plated			2x change over (AgNi) plated		
Output relay-contact terminals:	5, 16, 18	15, 16, 18	15, 16, 18 & 25, 26, 28	15, 16, 18	15, 16, 18	15, 16, 18 & 25, 26, 28	Under 15, 16, 18/Over 25, 26, 28		
Load capacity AC:	250V/8A, max.2000VA								
Load capacity DC:	30V/8A								
Mechanical life:	3x10 ⁶ by rated load								
Relay reset:	Automatic								
ANSI no.:	27	27	27	59	59	59	27/59	27/59	27/59
Operating temp:	-20 +55°C								
Storage temp:	-30 +70°C								
Insulation:	4kV/1min.								
Overvoltage category:	III.								
Pollution degree:	2								
Enclosure integrity /IP10 terminals:	IP40 from the front panel/IP10 terminals		IP40 from the front panel/IP20 terminals	IP40 from the front panel/IP10 terminals			IP40 from the front panel/IP20 terminals		
Enclosure style:	DIN-rail, 1 module		DIN-rail, 3 module	DIN-rail, 1 module			DIN-rail, 3 module		
Case material:	Flame retardant polycarbonate								
Connecting conductors profile (mm ²):	max.2x2.5mm ² /1x4mm ²		max.2x1.5mm ² /1x2.5mm ²	max.2x2.5mm ² /1x4mm ²			max.2x1.5mm ² /1x2.5mm ²		
Dimensions:	H90xW17.6xD64mm		H90xW52xD65mm	H90xW17.6xD64mm			H90xW52xD65mm		
Weight	65g		125g	65g			125g		
Standards	EN 60255-6, EN 60255-27, EN 61000-6-2, EN 6100-6-4								
Optional (specify at the time of ordering, include -AUX to product part number)									
Auxiliary supply voltage	24V/240V AC/DC								
A.C. supply frequency	45-65Hz								
Supply voltage tolerance	10% +/-								
Auxiliary voltage burden (Max)	3VA/1.2W								
Enclosure style	DIN-rail, 3 module								
Output relay-contact	2x change over (AgNi) plated								
Output relay-contact terminals	15, 16, 18 & 25, 26, 28								

Connection

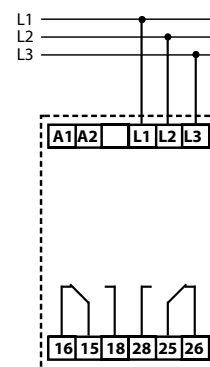
PVK/J, PVA/C (100/120, 173/240)



PVM (100/120, 173/240, 380/480) PVK/J, PVA/C (380/480)



Auxiliary Option



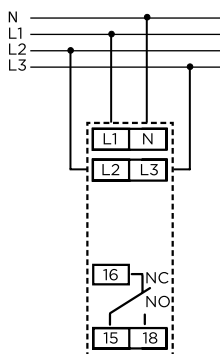
AC VOLTAGE

Three-phase four-wire

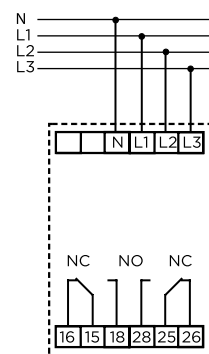
Technical parameters	PVV/X-100 /120	PVV/X-173 /240	PVV/X-380 /480	PVP/S-100 /120	PVP/S-173 /240	PVP/S-380 /480	PVE-100 /120	PVE-173 /240	PVE-380 /480
Under voltage protection (de-energise on trip):	•	•	•				•	•	•
Over voltage protection (energise on trip):				•	•	•	•	•	•
System type:	3-phase 4-wire (3-)	3-phase 4-wire (3-)	3-phase 4-wire (3-)	3-phase 4-wire (3-)	3-phase 4-wire (3-)	3-phase 4-wire (3-)	3-phase 4-wire (3-)	3-phase 4-wire (3-)	3-phase 4-wire (3-)
Voltage input terminals:	L1, L2, L3, N								
Nominal voltage (L-N) (Adjustable):	57.7, 63.5, 69.3V	100, 110, 115, 120, 127, 139V	220, 230, 240, 254, 265, 277V	57.7, 63.5, 69.3V	100, 110, 115, 120, 127, 139V	220, 230, 240, 254, 265, 277V	57.7, 63.5, 69.3V	100, 110, 115, 120, 127, 139V	220, 230, 240, 254, 265, 277V
Voltage burden (max):	1VA/0.7W		3VA/1.7W	1.8VA/1.1W		3VA/1.7W			
Operating frequency AC:	45-65 Hz								
Trip level under Umin:	Adjustable 75-100% Un								
Trip level under Umax:	Adjustable 100-125% Un								
Overload capacity -continuous: (L-N):	87V	174V	346V	87V	174V	346V	87V	174V	346V
-max. 10s: (L-N):	104V	209V	416V	416V	209V	416V	104V	209V	416V
Opening level off (L-N):	42V	73V	145V	161V	73V	161V	42V	73V	161V
Differential (hysteresis):	Adjustable 1-15% Un								
Time delay:	Adjustable 0.5-10s (t)								
Output relay-contact:	1x change over (AgNi) plated		2x change over (AgNi) plated	1x change over (AgNi) plated		2x change over (AgNi) plated			
Output relay-contact terminals:	15, 16, 18	15, 16, 18	15, 16, 18 & 25, 26, 28	15, 16, 18	15, 16, 18	15, 16, 18	Under 15, 16, 18/Over 25, 26, 28		
Load capacity AC:	250V/8A, max. 2000VA								
Load capacity DC:	30V/8A								
Mechanical life:	3x10 ⁶ by rated load								
Relay reset:	Automatic								
ANSI no.:	27	27	27	59	59	59	27/59	27/59	27/59
Operating temp:	-20 +55°C								
Storage temp:	-30 +70°C								
Insulation:	4kV/1min.								
Overvoltage category:	III								
Pollution degree:	2								
Enclosure integrity:	IP40 from the front panel/IP10 terminals		IP40 from the front panel/IP20 terminals	IP40 from the front panel/IP10 terminals		IP40 from the front panel/IP20 terminals			
Enclosure style:	DIN-rail, 1 module		Din-rail 3 module	Din-rail, 1 module		Din-rail, 3 module			
Case material:	Flame retardant polycarbonate								
Connecting conductors profile (mm ²):	max. 2x2.5mm ² /1x4mm ²		max. 2x1.5mm ² /1x2.5mm ²	max. 2x2.5mm ² /1x4mm ²		max. 2x1.5mm ² /1x2.5mm ²			
Dimensions:	H90xW17.6xD64mm		H90xW52xD65mm	H90xW17.6xD64mm		H90xW52xD65mm			
Weight:	65g		125g	65g		125g			
Standards:	EN 60255-6, EN 60255-27, EN 61000-6-2, EN 6100-6-4								
Optional (specify at the time of ordering, include -AUX to product part number)									
Auxiliary supply voltage	24V/240V AC/DC								
A.C. supply frequency	45-65Hz								
Supply voltage tolerance	10% +/-								
Auxiliary voltage burden (Max)	3VA/1.2W								
Enclosure style	DIN-rail, 3 module								
Output relay-contact	2x change over (AgNi) plated								
Output relay-contact terminals	15, 16, 18 & 25, 26, 28								

Connection

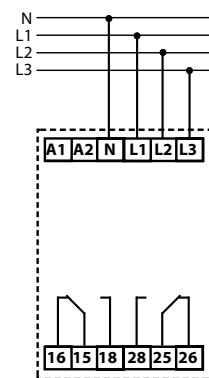
PVV/X, PVP/S
(100/120, 173/240)



PVE (100/120, 173/240, 380/480)
PVV/X, PVP/S (380/480)



Auxiliary Option



FREQUENCY



The frequency protector trip relay provides a continuous surveillance of the monitored circuits and offers user adjustable trip points (set points) with time delay and differential (hysteresis) settings. When the frequency moves outside the set point limits for longer than the time delay, the relay will operate giving an alarm control or tripping signal. Since speed is proportional to frequency, this protector can be used to monitor under and over speed to protect mains, computers supplies and standby supplies.

Basic Parameters

- Adjustable rated frequency, 50, 60 or 400Hz
- Trip level adjustment between 80-120% (Fn) Under
- Trip level adjustment between 80-120% (Fn) Over
- Adjustable differential (hysteresis) 0.5-5%
- Adjustable time delay 0.5-10s (t)
- Power on LED (green)

Under and Over Frequency

- Continuously monitors frequency to provide under and over frequency protection (set level Fmin and Fmax)
- Three module version
- 2 output relays
- Single phase

Part number	1-phase
PHD	x

Under and Over Frequency - PHD

The Frequency protector set point adjustment range is centred around the nominal system frequency of 50, 60 or 400Hz. The adjustable differential setting can be used to reduce nuisance tripping if the measured signal is noisy or unstable. Under normal conditions, with the supply frequency close to the nominal set point, both red LEDs are off with the Under relay energised and the Over relay de-energised. Should the supply fall below the opening threshold, both relays will de-energise and both red LEDs will flash slowly to indicate insufficient supply voltage.

Under protection

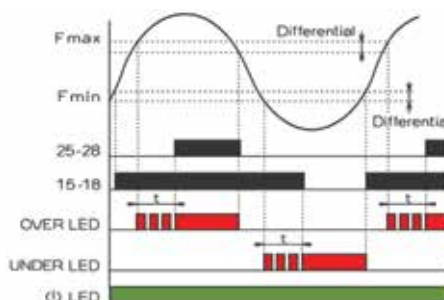
Should the monitored frequency falls below the set point level, Fmin, the protector trips and the red LED illuminates to indicate the fault condition. During the time delay period the red LED will flash for the set time, (t), before the relay de-energises (output relay-contact terminals 15, 16 & 18). The relay automatically resets once the monitored frequency rises above the set point level Fmin plus the differential (between 0.5-5%). Causing the red LED to extinguish and the relay to make without time delay.

Over protection

Should the monitored frequency exceed the set point level Fmax, the protector trip and the red LED illuminates to indicate the fault condition. During the time delay period the red LED will flash for the set time (t) before the relay energises (output relay-contacts terminals 25, 26 & 28). The relay automatically resets once the monitored frequency falls below the set point level Fmax plus the differential (between 0.5-5%). Causing the red LED to extinguish and the relay to release without time delay.

Note: Red LED indicates fault condition, not relay status

Characteristics

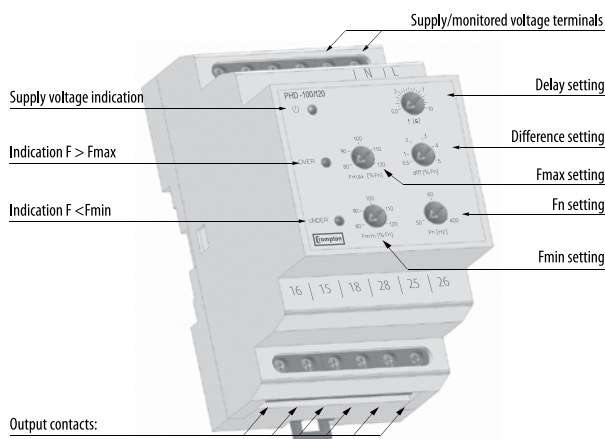


FREQUENCY

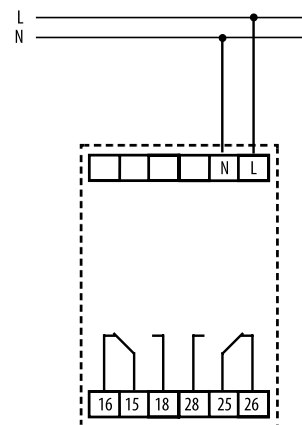
Single-phase

Technical parameters	PHD-100/120	PHD-173/240	PHD-380/480	PHD-280/860
Under frequency protection (de-energise on trip):	•	•	•	•
Over frequency protection (energise on trip):	•	•	•	•
System type:	1-phase (1-)	1-phase (1-)	1-phase (1-)	1-phase (1-)
Supply input terminals:	L, N			
Supply voltage:	43-87V	71-174V	161-346V	161-500V
Rated frequency Fn:	50/60/400 Hz			
Supply input burden (max):	1.6VA/1W approx			
Supply opening threshold Uopen:	43V	71V	161V	161V
Under frequency range Fmin:	Adjustable 80-120% In			
Over frequency range Fmax:	Adjustable 80-120% In			
Overload capacity				
-continuous:	87V	174V	346V	500V
-max. 10s:	104V	209V	416V	550V
Differential (hysteresis):	Adjustable 0.5-5% Fn			
Time delay:	Adjustable 0.5-10s			
Output relay-contact:	2x change over (AgNi) plated			
Output relay-contact terminals:	Under 15, 16, 18/Over 25, 26, 28			
Load capacity AC:	250V/8A, max.2 kVA			
Load capacity DC:	30V/8A			
Mechanical life:	3x10 ⁶ by rated load			
Relay reset:	Automatic			
ANSI no.:	810/U			
Operating temperature:	-20 +55°C			
Storage temperature:	-30 +70°C			
Insulation:	4kV/1min.			
Overvoltage category:	III.			
Pollution degree:	2			
Enclosure integrity:	IP40 from the front panel/IP20 terminals			
Enclosure style:	DIN-rail, 3 module			
Case material:	Flame retardant polycarbonate			
Connecting conductors profile (mm ²):	max.2x1.5mm ² /1x2.5mm ²			
Dimensions:	H90xW52xD64mm			
Weight:	124g approx			
Standards:	EN 60255-6, EN 60255-27, EN61000-6-2, EN6100-6-4			

Protector Overview PHD



Connection PHD



PHASE SEQUENCE AND PHASE FAILURE



The phase sequence and phase failure protector trip relay is designed to monitor the correct phase rotation or sequence of a three-phase supply system. It provides protection against incorrect phase sequence, loss of one phase and under voltage. Two versions are available to suit either three-phase three-wire (PVR3) or three-phase four-wire (PVR4) systems.

Basic Parameters

- Available with three voltage ranges 100-120V, 173-240V & 380-480V (Un)
- Adjustable nominal voltage range
- Power on LED (green)
- Fixed differential (hysteresis) 1%

Part number	3-phase 3-wire	3-phase 4-wire	Protection
PVR3	x		Phase sequence, under voltage 85%
PVR4		x	Phase sequence, under voltage 85%

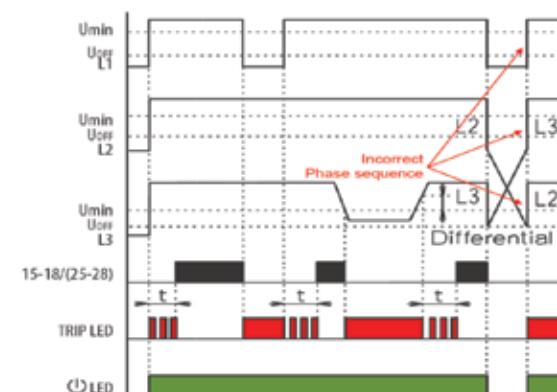
Operation

Applications where the involvement of three-phase motors which can rotate in the wrong direction, potentially could lead to physical damage or risk of injury to personnel, yet voltage and current readings may still appear normal. If one phase is lost because of a blown fuse, electric motors can continue to operate (single-phasing) which can result in severe electrical or mechanical damage. For permanent installations, this relay should be used to monitor the incoming supply, protecting all equipment against incorrect connection at initial installation or after maintenance work. Rotating machines that can not tolerate reverse rotation or pose significant risk to personnel under this condition should be individually protected with this relay.

The phase sequence and phase failure protector continuously monitors the three-phase supply. With the correct phase sequence applied, the front panel LED will be off and the relay energised. An incorrect sequence or missing phase will de-energise the relay and the LED will illuminate showing a fault condition. The supply falling below 85% of its nominal voltage will also cause a trip.

Note: If one phase is lost due to a blown fuse, some loads can re-generate the missing voltage. This relay can be used as a phase failure relay providing the regenerated voltage in open phase is less than 70% of the nominal supply voltage. If there is the possibility of a higher regenerated voltage, the phase balance PSF should be used.

Characteristics

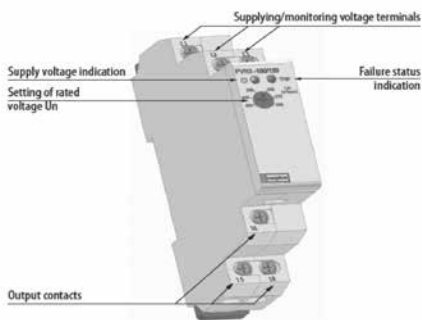


PHASE SEQUENCE AND PHASE FAILURE

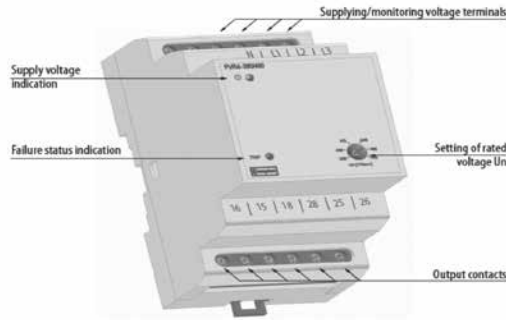
Technical parameters	PVR3-100/120	PVR3-173/240	PVR3-380/480	PVR4-100/120	PVR4-173/240	PVR4-380/480
Phase sequence under voltage 85% (de-energise on trip):	•	•	•	•	•	•
System type:	3-phase 3-wire (3-)	3-phase 3-wire (3-)	3-phase 3-wire (3-)	3-phase 4-wire (3-)	3-phase 4-wire (3-)	3-phase 4-wire (3-)
Supply input terminals:	L1, L2, L3			L1, L2, L3, N		
Rated voltage Un (V nom):	100, 110, 120	173, 190, 200, 208, 220, 240	380, 400, 415, 440, 460, 480	57.7, 63.5, 69.3	100, 110, 115, 120, 127, 139	220, 230, 240, 254, 265, 277
Operating frequency:	45-65 Hz					
Supply input burden (max):	3VA/1.7W approx			2.5VA/1.4W approx		
Supply threshold (Umin):	Fixed at 85% of V nom					
Overload capacity -continuous: -max. 10s:	150V 180V	300V 360V	600V 720V	87V 104V	174V 209V	346V 416V
Differential (hysteresis):	Fixed at 1% of V nom					
Trip reset delay:	Fixed at 0.5s					
Output relay-contact:	1x change over (AgNi) plated		2x change over (AgNi) plated	1x change over (AgNi) plated		2x change over (AgNi) plated
Output relay-contact terminals:	15, 16, 18	15, 16, 18	15, 16, 18 & 25, 26, 28	15, 16, 18	15, 16, 18	15, 16, 18 & 25, 26, 28
Load capacity AC:	250V/8A, max.2 KVA					
Load capacity DC:	30V/8A					
Mechanical life:	3x10 ⁶ by rated load					
Relay reset:	Automatic					
ANSI no.:	47					
Operating temperature:	-20 +55°C					
Storage temperature:	-30 +70°C					
Insulation:	4kV/1min.					
Overtoltage category:	III.					
Pollution degree:	2					
Enclosure integrity:	IP40 from the front panel/ IP10 terminals		IP40 from the front panel/ IP20 terminals	IP40 from the front panel/ IP10 terminals		IP40 from the front panel/ IP20 terminals
Enclosure style:	DIN-rail, 1 module		DIN-rail, 3 module	DIN-rail, 1 module		DIN-rail, 3 module
Case material:	Flame retardant polycarbonate					
Connecting conductors:	max.2x2.5mm ² /1x4mm ²		max.2x1.5mm ² /1x2.5mm ²	max.2x2.5mm ² /1x4mm ² 90x17.6x64mm/1x2.5mm ²		max.2x1.5mm ²
Dimensions:	H90xW17.6xD64mm		H90xW52x D64mm	H90xW17.6xD64mm		H90xW52x D64mm
Weight:	63g approx		121g approx	63g approx		121g approx
Standards:	EN 60255-6, EN 60255-27, EN61000-6-2, EN6100-6-4					

Protector Overview

PVR3/4 (100/120, 173/240)

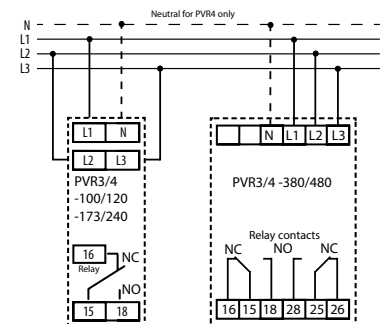


PVR3/4 (380/480)



Connection

PVR3/4



PHASE BALANCE, SEQUENCE AND VOLTAGE MONITOR



The phase balance, sequence and voltage protector trip relay, is designed to monitor a three-phase supply for phase imbalance, low or missing phases or incorrect phase sequence and to trip a relay if it detects any anomaly. Two versions are available to suit either three-phase three-wire (PSF/G3) or three-phase four-wire (PSF/G4) systems.

Basic Parameters

- Available with three voltage ranges 100-120V, 173-240V and 380-480V (U_n)
- Adjustable nominal voltage range
- Adjustable trip delay 0.5-10s
- Adjustable low voltage trip level 50-85%
- Adjustable phase imbalance trip level 5-15%
- Power on LED (green)
- Fixed differential (hysteresis) 1%

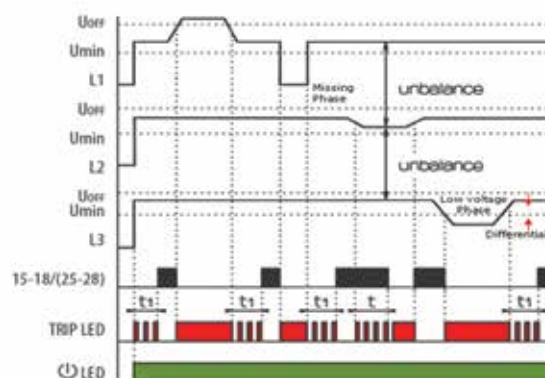
Part number	3-phase 3-wire	3-phase 4-wire	Protection
PSF/G3	x		Phase sequence, phase balance and under voltage
PSF/G4		x	Phase sequence, phase balance and under voltage

Operation

Rotating machines are particularly vulnerable to incorrect phase sequence, and rotate in the wrong direction, potentially leading to physical damage or the risk of injury to personnel. If one phase is lost because of a blown fuse, electric motors can continue to operate (single-phasing) which can result in severe electrical or mechanical damage.

The PSF protector continuously monitors the three-phase supply, with all correct phase sequence applied and all three voltages balanced within the required limits the front panel, the LED will be off and the relay energised. An incorrect sequence, missing phase, out of balance or under voltage condition will de-energise the relay and the LED will illuminate. The set point control allows adjustment of the voltage imbalance, if one phase voltage differs from the other by more than the set percentage, between 5% and 15%, than the relay will de-energise and the LED will illuminate. The time delay function operates only for the voltage imbalance condition. This delay can be used to prevent nuisance tripping due to short term imbalance situations.

Characteristics

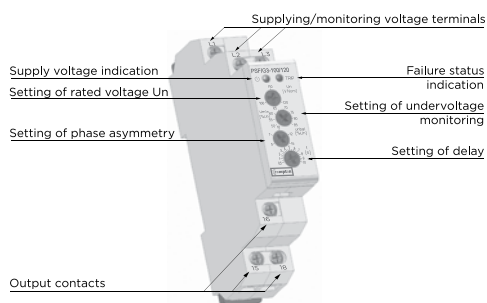


PHASE BALANCE, SEQUENCE AND VOLTAGE MONITOR

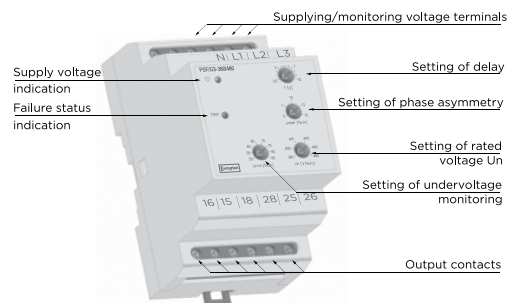
Technical parameters	PSF/G3-100/120	PSF/G3-173/240	PSF/G3-380/480	PSF/G4-100/120	PSF/G4-173/240	PSF/G4-380/480
Phase loss, imbalance and under voltage (de-energise on trip):	•	•	•	•	•	•
System type:	3-phase 3-wire (3-)	3-phase 3-wire (3-)	3-phase 3-wire (3-)	3-phase 4-wire (3-)	3-phase 4-wire (3-)	3-phase 4-wire (3-)
Supply input terminals:	L1, L2, L3			L1, L2, L3, N		
Rated voltage Un (V nom):	100, 110, 120	173, 190, 200, 208, 220, 240	380, 400, 415, 440, 460, 480	57.7, 63.5, 69.3	100, 110, 115, 120, 127, 139	220, 230, 240, 254, 265, 277
Operating frequency:	45-65 Hz					
Supply input burden (max):	3VA/1.7W approx			2.5VA/1.4W approx		
Phase imbalance trip level (V nom):	Adjustable 5-15% Un (V nom)					
Differential (hysteresis):	Fixed at 1% of V nom					
Low-voltage trip level (Umin):	Adjustable 50-85% Un (V nom)					
Trip delay t:	Adjustable 0.5-10s					
Trip reset delay t1:	Fixed at 0.5s					
Overload capacity						
-continuous:	150V	300V	300V	87V	174V	346V
-max. 10s:	180V	360V	600V	104V	209V	416V
Max operating voltage (Uoff)	187V	374V	749V	108V	216V	432V
Differential (hysteresis):	Fixed at 1% of V nom					
Output relay-contact:	1x change over (AgNi) plated		2x change over (AgNi) plated	1x change over (AgNi) plated		2x change over (AgNi) plated
Output relay-contact terminals:	15, 16, 18	15, 16, 18	15, 16, 18 & 25, 26, 28	15, 16, 18	15, 16, 18	15, 16, 18 & 25, 26, 28
Load capacity AC:	250V/8A, max.2 kVA					
Load capacity DC:	30V/8A					
Mechanical life:	3x10 ⁶ by rated load					
Relay reset:	Automatic					
ANSI no.:	47					
Operating temperature:	-20 +55°C					
Storage temperature:	-30 +70°C					
Insulation:	4kV/1min.					
Overvoltage category:	III.					
Pollution degree:	2					
Enclosure integrity:	IP40 from the front panel/ IP10 terminals		IP40 from the front panel/ IP20 terminals	IP40 from the front panel/ IP10 terminals		IP40 from the front panel/ IP20 terminals
Enclosure style:	DIN-rail, 1 module		DIN-rail, 3 module	DIN-rail, 1 module		DIN-rail, 3 module
Case material:	Flame retardant polycarbonate					
Connecting conductors profile (mm ²):	max.2x2.5mm ² /1x4mm ²		max.2x1.5mm ² /1x2.5mm ²	max.2x2.5mm ² /1x4mm ²		max.2x1.5mm ² /1x2.5mm ²
Dimensions:	H90xW17.6xD64mm		H90xW52xD64mm	H90xW17.6xD64mm		H90xW52xD64mm
Weight:	63g approx		121g approx	63g approx		121g approx
Standards:	EN 60255-6, EN 60255-27, EN61000-6-2, EN6100-6-4					

Protector Overview

PSF/G3/4 (100/120, 173/240)

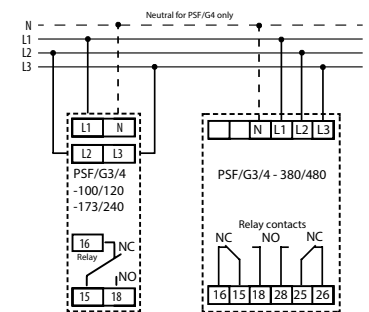


PSF/G3/4 (380/480)



Connection

PSF/G3/4



SYNCHRO-CHECK (PARALLELING)



The synchro-check (paralleling) protector trip relay compares the voltage, frequency and phase angle of two supplies and operates a relay according to the state of synchronisation of the supplies. If the two supplies are not synchronised, the relay operates to provide a control output. The relay output can be used for alarm or control purposes.

The unit also provides a dead bus function. If the bus supply fails, the relay operates and the output can be used to switch in an emergency generator.

Basic Parameters

- Available with three voltage ranges
- Adjustable nominal voltage range
- Adjustable synch tolerance
- Dead bus function on/off switch
- Power on LED (green)

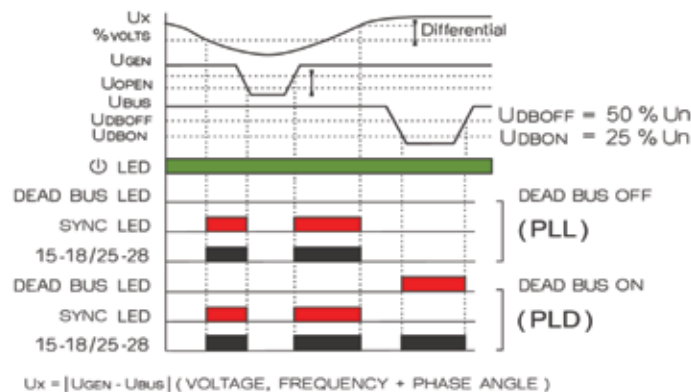
Part number	1-phase, 3-phase 3-wire/4-wire	Protection
PLL/D	x	Phase angle and voltage dead bus option

Operation

As part of a manual control system, the operator will make adjustments to generator voltage (excitation) and frequency (engine speed) using a synchroscope or lamps and will then attempt to manually close the breaker. This synchro check protector will qualify that two systems are closely matched before permitting the breaker to close. As part of an automatic synchronising arrangement, the synchro-check (paralleling) trip relay can be used as an independent backup or checking device to ensure the two systems are suitably matched before the breaker can close.

The synchro-check (paralleling) trip relay continuously monitors the voltage, phase displacement and frequency of the two supplies. While the two supplies match in volts, frequency and phase to the degree set by the %Volts control, the sync LED illuminates and the relay is energised, indicating that the two supplies are matched and it is safe to close the breaker. The relay is fitted with a selectable Dead Bus detection function. If there is a requirement for a continuous supply or emergency power, then the generator can be connected without synchronising, thus ensuring continuity of supply. The absence of the bus voltage will cause the relay to energise.

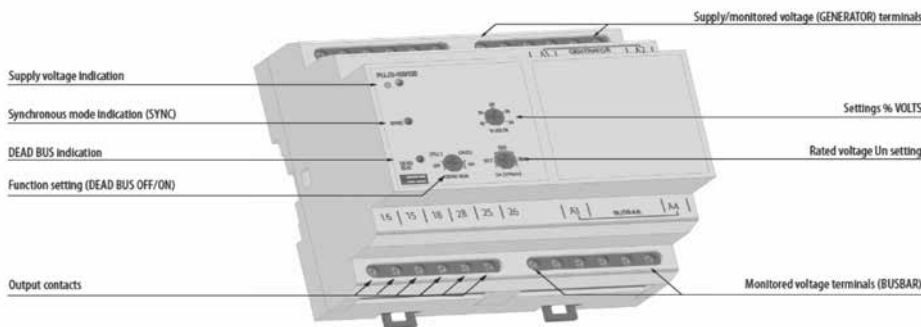
Characteristics



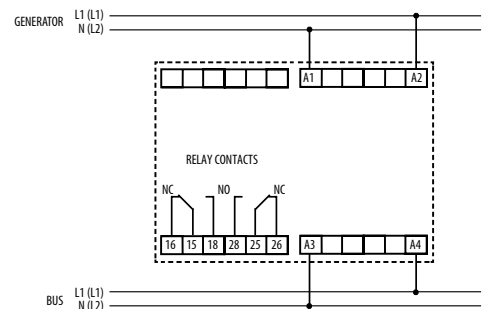
SYNCHRO-CHECK (PARALLELING)

Technical parameters	PLL/D-100/120	PLL/D-173/240	PLL/D-380/480	PLL/D-277/500
Phase angle and voltage dead bus option (energise on trip):	•	•	•	•
System type:	1-phase (1-), 3-phase 4-wire (3-)			
Input terminals (generator):	A1, A2			
Input terminals (busbar):	A3, A4			
Rated voltage Un (V nom) L-N:	57.7, 63.5, 69.3	100, 110, 115, 120, 127, 139	220, 230, 240, 254, 265, 277	277, 300, 380, 400, 415, 440, 480, 500
Operating frequency:	45-65 Hz			
Supply input burden (max):	2VA/1.6W approx	2.7VA/1.7W approx	4VA/2.2W approx	5 VA/2.8W approx
Dead bus on Udbon:	25% Uon			
Dead bus off Udboff:	50% Uon			
Sync tolerance adjustable:	10-30% volts			
Overload capacity				
-continuous:	87V	174V	346V	600V
-max. 10s:	104V	209V	416V	700V
Opening level (Uopen):	35V	60V	132V	166V
Output relay-contact:	2x change over (AgNi) plated			
Output relay-contact terminals:	15, 16, 18 & 25, 26, 28			
Load capacity AC:	250V/8A, max.2 kVA			
Load capacity DC:	30V/8A			
Mechanical life:	3x10 ⁶ by rated load			
Relay reset:	Automatic			
ANSI no.:	25			
Operating temperature:	-20 +55°C			
Storage temperature:	-30 +70°C			
Insulation:	4kV/1min.			
Overvoltage category:	III.			
Pollution degree:	2			
Enclosure integrity:	IP40 from the front panel/IP20 terminals			
Enclosure style:	DIN-rail, 6 module			
Case material:	Flame retardant polycarbonate			
Connecting conductors profile (mm ²):	max.2x1.5mm ² /1x2.5mm ²			
Dimensions:	H90xW105xD64mm			
Weight:	291g approx	335g approx	332g approx	335g approx
Standards:	EN 60255-6, EN 60255-27, EN61000-6-2, EN6100-6-4			

Protector Overview PLL/D



Connection PLL/D



REVERSE POWER (CURRENT)



The Reverse Power protector trip relay monitors a single- or three-phase supply for reverse power and trips a relay if it detects reverse power ($I \times \cos \Phi$) over a set limit. The relay output is typically used to prevent 'motoring' of a generator (where the generator turns the engine), which can damage the engine.

Basic Parameters

- Available with three voltage ranges 100-120V, 173-240V and 380-480V (U_n)
- Adjustable nominal current range, 2, 3, 4, 5, 8 & 10 Amps (I_n)
- Adjustable trip delay 0.5-20s
- Adjustable set point 2-20%
- Power on LED (green)

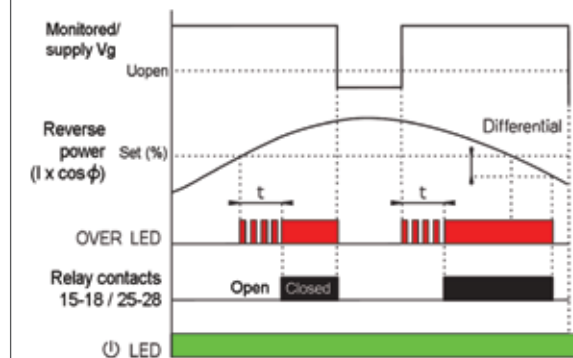
Part number	3-phase 3-wire	3-phase 4-wire	Protection
PAT	x		Reverse power 2-20%
PAS		x	Reverse power 2-20%

Operation

The Reverse Power trip relay provides continuous surveillance of AC generators against motoring. Reverse power relays are used to detect the failure of the prime mover (engine) when active energy (Watts) flows into the generator causing rotation - the set will operate like an electric motor which can cause significant mechanical damage. This relay offers an adjustable reverse power set between 2% and 20% of the nominal power and time delay adjustment range of 0 to 20 seconds. The protector relay estimates the power level in the system by measuring current and power factor, but does not actually measure the system voltage. When the reverse power level exceeds the set point, and after the time delay has elapsed, the relay will energise and the red LED will illuminate to indicate the trip condition. The relay will automatically reset once the power level falls below the set point minus the fixed differential of 1% causing the LED to extinguish and the relay to de-energise.

Note: The % set potentiometer trimmer on the front label is calibrated as a percentage of the current rating e.g. of 5A and not of the forward kW.

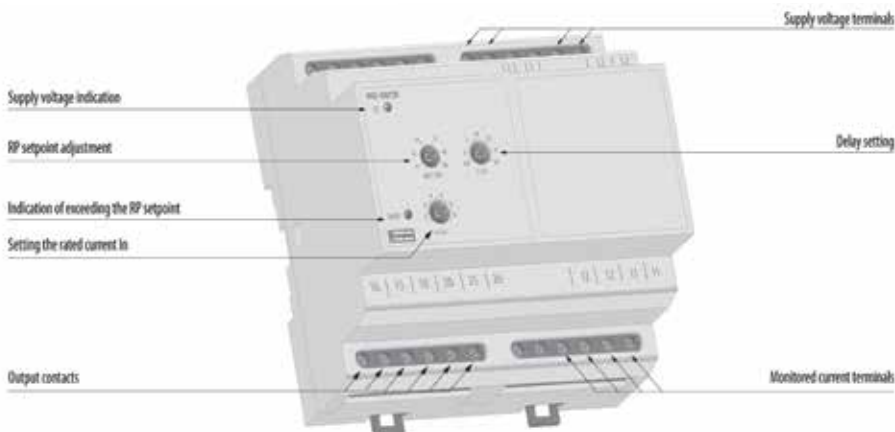
Characteristics



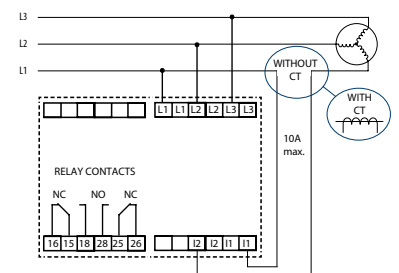
REVERSE POWER (CURRENT)

Technical parameters	PAT-100/120	PAT-173/240	PAT-380/480	PAS-100/120	PAS-173/240	PAS-380/480
Reverse power (energise on trip):	•	•	•	•	•	•
System type:	3-phase 3-wire (3-)	3-phase 3-wire (3-)	3-phase 3-wire (3-)	1-phase, 3-phase 4-wire (3-)	1-phase, 3-phase 4-wire (3-)	1-phase, 3-phase 4-wire (3-)
Voltage input terminals:	L1, L2, L3			L1, N		
Current input terminals:	I1, I2					
Rated voltage U_n (V nom):	100 - 120	173 - 240	380-480	57.7-69.3	100-139	220-277
Rated current I_n (A):	2A, 3A, 4A, 5A, 8A, 10A					
Operating frequency:	45-65 Hz					
Supply input burden (max):	2.5VA/ 1.5W approx	4.2VA/ 3.2W approx	6VA/4W approx	1.4VA/ 1W approx	1.6VA/ 1.3W approx	2.9VA/ 2.1W approx
Monitored current range:	2..100% I_n					
Monitored $\cos \Phi$ range:	0.2 inductive to 0.2 capacitive					
Reverse power setpoint range:	2..20% ($\cos \Phi = 1$)					
Differential (hysteresis):	Fixed at 1%					
Trip reset:	Adjustable 0.5-20s					
Overload capacity -continuous:	3 x 150V	3 x 300V	3 x 600V	87V	174V	346V
-max. 10s:	3 x 180V	3 x 360V	3 x 720V	104V	209V	416V
Opening level (U_{open}):	3 x 60V	3 x 104V	3 x 228V	35V	60V	132V
Output relay-contact:	2x change over (AgNi) plated					
Output relay-contact terminals:	15, 16, 18 & 25, 26, 28					
Load capacity AC:	250V/8A, max.2 kVA					
Load capacity DC:	30V/8A					
Mechanical life:	3x10 ⁶ by rated load					
Relay reset:	Automatic					
ANSI no.:	32					
Operating temperature:	-20 +55°C					
Storage temperature:	-30 +70°C					
Insulation:	4kV/1min.					
Overvoltage category:	III.					
Pollution degree:	2					
Enclosure integrity:	IP40 from the front panel/IP20 terminals					
Enclosure style:	DIN-rail, 6 module					
Case material:	Flame retardant polycarbonate					
Connecting conductors profile (mm ²):	max.2x1.5mm ² /1x2.5mm ²					
Dimensions:	H90xW105xD64mm					
Weight:	298g approx	340g approx	338g approx	248g approx	269g approx	268g approx
Standards:	EN 60255-6, EN 60255-27, EN61000-6-2, EN6100-6-4					

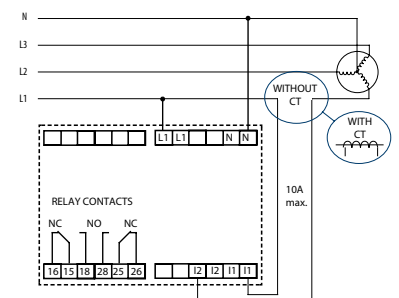
Protector Overview PAT & PAS



Connection PAT



PAS



DC VOLTS, MILLIVOLTS AND TRANSDUCER



The DC volts, millivolts and transducer trip relay protectors provide continuous surveillance of DC voltages or current signals. When the input signals move outside the set point limits the relay will operate and the fault LED will illuminate.

Basic Parameters

- Adjustable rated DC current input 0-1mA, 0-10mA, 4-20mA (PBV)
- Adjustable rated DC millivolts input 50mV, 75mV, 100mV (PBT/S)
- Adjustable rated DC voltage 10V, 20V, 40V, 80V, 120V (PDU/E)
- Trip level adjustment Low 0-80% (U_n)
- Trip level adjustment High 80-120% (U_n)
- Adjustable trip delay 0.5-10s
- Power on LED (green)

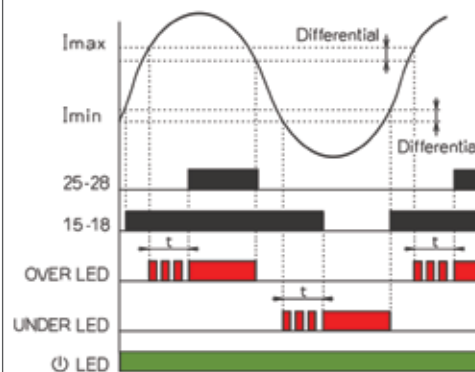
Part number	Type	Protection
PBV	DC transducer	High 40-120% and low 0-80% trip
PBT/S	DC millivolts	High 40-120% and low 0-80% trip
PDU/E	DC voltage	High 40-120% and low 0-80% trip

Operation

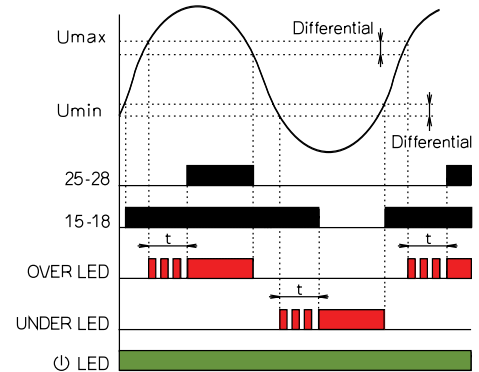
The DC volts, millivolts and transducer trip relay offers adjustable low and high trip points (set points) and time delay settings. If the monitored signal exceeds either the Low or High set point, the time delay is started and the red LED will illuminate to indicate a trip condition. When the time delay has elapsed, the relay will energise. The relay will automatically reset once the monitor signal falls below the set point minus the differential set point. When reset the red LED will extinguish and the relay will de-energise.

Characteristics

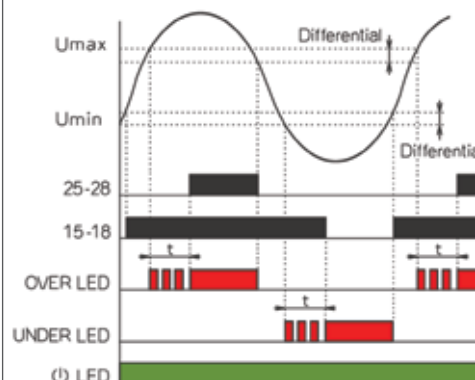
PBV



PDU/E



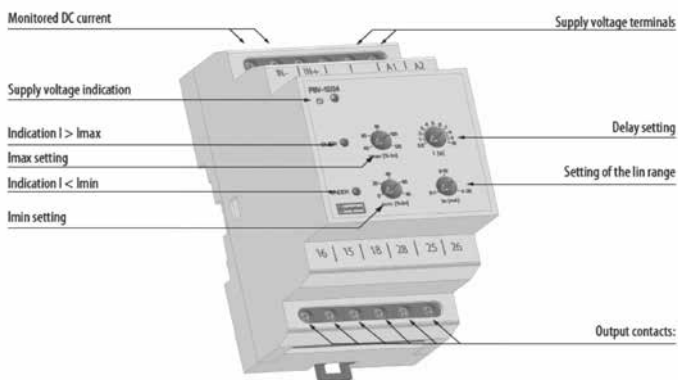
PBT/S



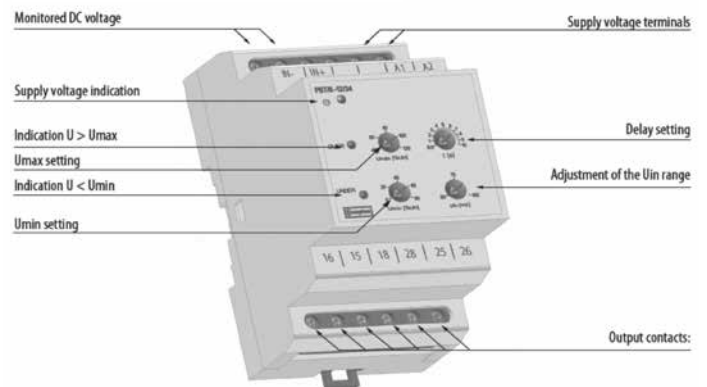
DC VOLTS, MILLIVOLTS AND TRANSDUCER

Technical parameters	PBT/S-12/24	PBT/S-24/240	PBV-12/24	PBV-24/240	PDU/E 24/240
DC millivolts trip:	•	•			
DC transducer trip:			•	•	
DC voltage:					•
Supply terminals:	A1, A2				
Input/monitoring terminal:	IN+, IN-				
Supply voltage:	12-24V DC	24-240V AC/DC (AC 45-65Hz)	12-24V DC	24-240V AC/DC (AC 45-65Hz)	
Supply voltage burden (max):	1W	3VA/0.9W	1W	3VA/0.9W	
Supply voltage tolerance:	+/-10%				
Rated input:	50mV, 75mV, 100mV		0-1mA, 0-10mA, 4-20mA		10, 20, 40, 80, 120 V
Input impedance:	50kΩ		-		1 MΩ
Voltage drop across input:	-		1V max. at 120% I _{in}		-
Over-range:	40-120% U _{in}		40-120% I _{in}		40-120% U _{in}
Under-range:	0-80% U _{in}		0-80% I _{in}		0-80% U _{in}
Differential:	Fixed at 1% U _{in}		Fixed at 1% I _{in}		Fixed at 1% U _{in}
Trip time delay:	Adjustable 0.5 to 10s				Adjustable 0.5 to 60s
Overload capacity - continuous: - 1s max.:	10 x U _{in}		3 x I _{in} 10 x I _{in}		1.2 x U _{in}
Output relay-contact:	2x change over (AgNi) plated				
Output relay-contact terminals:	15, 16, 18 & 25, 26, 28				
Load capacity AC:	250V/8A, max.2 kVA				
Load capacity DC:	30V 8A				
Mechanical life:	3x10 ⁶ by rated load				
Electrical life (AC1):	7 x 10 ⁶				
ANSI no.:	74				
Operating temperature:	-20 +55°C				
Storage temperature:	-30 +70°C				
Insulation:	4kV/1min.				
Overvoltage category:	III.				
Pollution degree:	2				
Enclosure integrity:	IP40 from the front panel/IP20 terminals				
Enclosure style:	DIN-rail, 3 module				
Case material:	Flame retardant polycarbonate				
Connecting conductors profile (mm ²):	max.2x1.5mm ² /1x2.5mm ²				
Dimensions:	H90xW52xD64mm				
Weight:	135g approx				
Standards:	EN 60255-6, EN 60255-27, EN61000-6-2, EN6100-6-4				

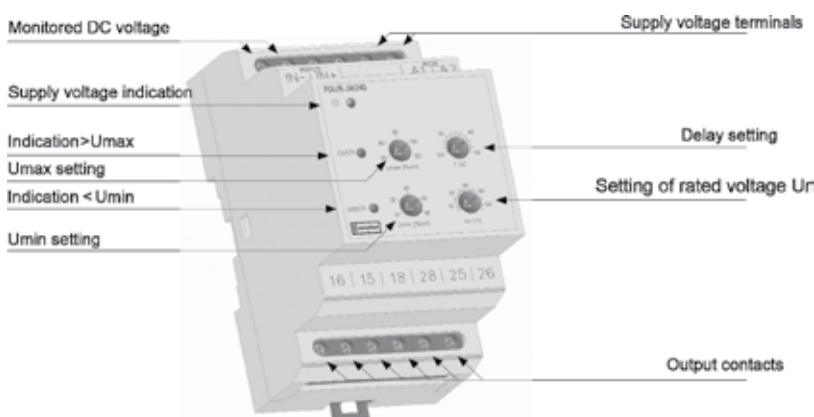
Protector Overview PBV



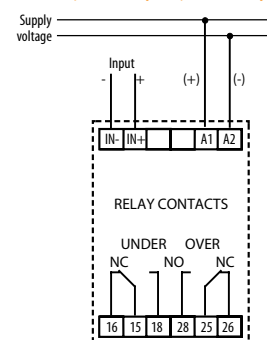
PBT/S



PDU/E



Connection PBV, PBT/S, PDU/E



THERMISTOR



The Thermistor protector trip relay monitors the temperature of a motor using the PTC sensor (positive temperature coefficient resistor) or thermostat (TK) switch built in to the motor winding. Relay contacts can be used to disconnect the supply to the motor should it overheat. LEDs indicate mains on and fault status.

Basic Parameters

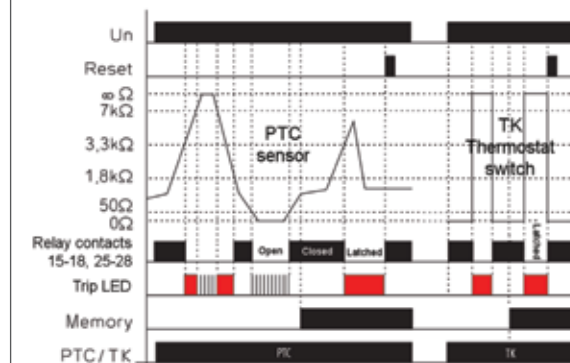
- Selectable PTC or TK modes
- Reset function
- Selectable memory function for latching
- Power on LED (green)

Part number	Type	Protection
PMM/T	PTC, TK thermistors	Over-temperature

Operation

The Thermistor protector trip relay operates by de-energising a relay and illuminating a red LED when the thermistor detects a critical temperature condition. Should the motor overheat and the PTC resistance go above the 3.3kOhms, the relays de-energise. The contacts remain de-energised until the PTC resistance falls to 1.8kOhms. The selectable memory switch allows the option of latching the relay and the red LED stays illuminated until the reset button is pressed or triggered via the external reset switch. Any number of thermistors may be used in series connection providing the resistance at normal working temperature is less than 1500 ohms.

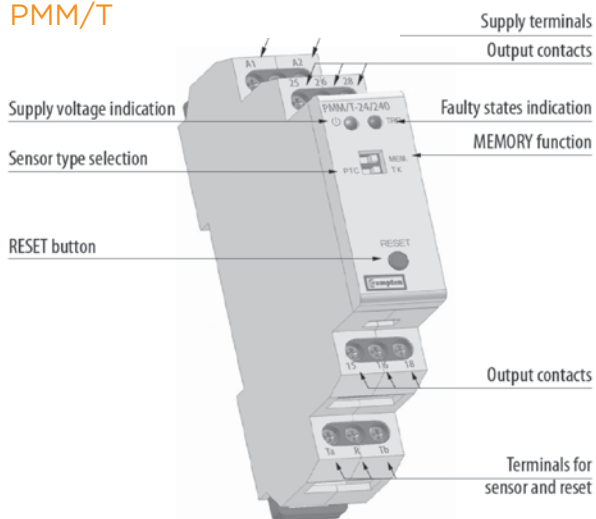
Characteristics



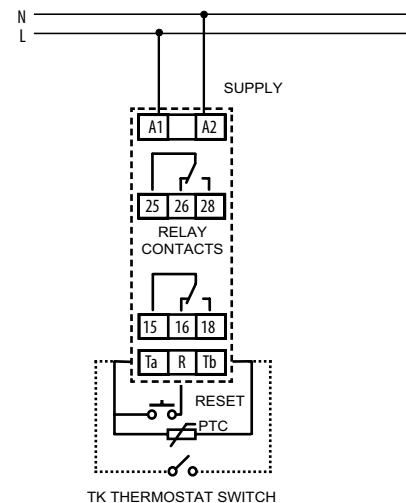
THERMISTOR

Technical parameters	PMM/T-24/240
PTC, TK thermistor:	•
System type:	Monitoring temperature of motor winding
Supply terminals:	A1, A2
Input/thermistor terminals:	Ta, Tb
Supply voltage:	AC/DC 24-240V (AC 45-65Hz)
Supply voltage burden (max):	2VA max
Supply voltage tolerance:	-15/10%
PTC sensor ranges:	
Cold:	50Ω - 1.5 kΩ
Lower limit:	1.8 kΩ
Upper limit:	3.3 kΩ
Sensor failure indication:	Red LED flashes
Repetition accuracy (mech):	<5%
Switching error:	±5%
Temperature dependence:	<0.1%/°C
Output relay-contact:	2x change over (AgNi) plated
Output relay-contact terminals:	15, 16, 18 & 25, 26, 28
Load capability of relay contact AC:	250V/8A, max.2 kVA
Load capability of relay contact DC:	24V 8A 500mW min
Mechanical life:	3x10 ⁶ by rated load
Electrical life (AC1):	7 x 10 ⁶
ANSI no.:	49
Operating temperature:	-20 +55°C
Storage temperature:	-30 +70°C
Electric strength (supplying -contact relay):	4kV/1min.
Overvoltage category:	III.
Pollution degree:	2
Enclosure integrity:	IP40 from the front panel/IP20 terminals
Enclosure style:	DIN-rail, 1 module
Case material:	Flame retardant polycarbonate
Connecting conductors profile (mm ²):	max.2x1.5mm ² /1x2.5mm ²
Dimensions:	H90xW17.6xD64mm
Weight:	83g approx
Standards:	EN 60255-6, EN 60255-27, EN61000-6-2, EN6100-6-4

Protector Overview PMM/T



Connection PMM/T



SPEED SENSING



The Speed Sensing protector trip relay monitors rotating equipment using a magnetic pick-up and provides three output contacts which can be used to initiate alarms or shutdown signals. The relay also provides a tachometer output for speed indication.

Basic Parameters

- Magnetic pick up input
- 1mA output signal
- 3 adjustable rotation set points
- Power on LED (green)

Part number	Type	Protection
PH3	Speed sensing	Crank 10 to 50% Under-speed 50 to 100% Over-speed 100 to 130%

Operation

The Speed Sensing relay will detect under-speed, over-speed and stop conditions, the set points can be used to raise an alarm or shut down the monitored equipment. The front panel provides three user set trip levels with relay LED state indication and a speed indicator analogue output signal in the form of 0-1mA.

The relay can be calibrated such that the standard 100% of the relay represents the required nominal engine speed. This is achieved by supplying the appropriate input to the sensor input terminals and pressing the adjust button for more than 3 seconds thus tripping the relay to become 100% reference.

Cranking Trip

The cranking function detects if the engine is running or stopped. This function can be used to ensure the cranking motor is disconnected once the engine has started running. The crank yellow LED illuminates and the relay energises when the engine speed exceeds the cranking setting. This is normally set just above the cranking speed of the crank motor to indicate the engine has started.

Under-Speed Trip

The under speed red LED illuminates and the relay de-energises when the engine speed falls below the under-speed control setting minus the fixed 2% differential.

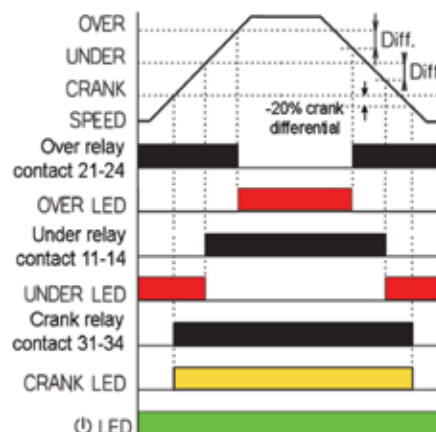
Over-Speed Trip

Should the engine speed exceed the over-speed control setting, the over relay de-energises and the red over LED illuminates.

Fail Safe Operation

Should the sensor become disconnected (open circuit) the over red LED flashes, the over relay de-energises and the crank and under relays energise (crank and under LED's illuminate).

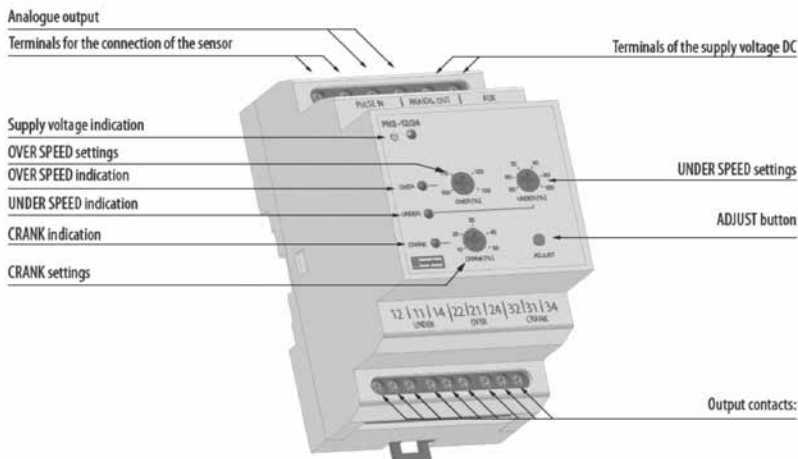
Characteristics



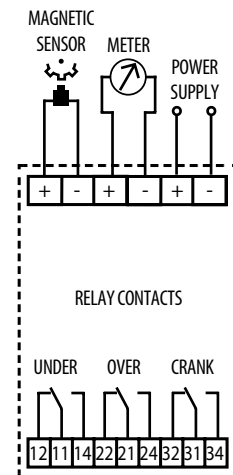
SPEED SENSING

Technical parameters	PH3-12/24
Magnetic pick-up:	•
System type:	Speed sensing
Supply terminals:	AUX (+/-)
Sensor terminals:	PULSE IN (+/-)
Supply voltage:	12-24V DC
Supply voltage burden (max):	2.5VA/1.4W
Supply voltage tolerance:	+20/-10%
Input pulse amplitude:	5-75V p-p
Frequency range:	0-1kHz min, 0-10kHz max
Trip settings:	
Cranking:	10-50%
Under-speed:	50-100%
Over-speed:	100-130%
Differential:	Fixed at 2%
Analogue (meter) output:	0-1 mA
at 100% rated speed:	0.75 mA
at 133% rated speed:	1.0 mA
Output relay-contact; for general switching operation:	3x change over (AgNi) plated, volt-free
Output relay-contact terminals:	11, 12, & 14, 21, 22 & 24, 31, 32 & 34
Load capability of relay contact AC:	250V/8A, max.2 kVA
Load capability of relay contact DC:	30V 8A
Mechanical life:	3x10 ⁶ by rated load
ANSI no.:	12/14
Operating temperature:	-20 +55°C
Storage temperature:	-30 +70°C
Electric strength (supplying -contact relay):	4kV/1min.
Overvoltage category:	III.
Pollution degree:	2
Enclosure integrity:	IP40 from the front panel/IP20 terminals
Enclosure style:	DIN-rail, 3 module
Case material:	Flame retardant polycarbonate
Connecting conductors profile (mm ²):	Max 2x1.5mm ² /1x2.5mm ²
Dimensions:	H90xW52xD64mm
Weight:	145g approx
Standards:	EN 60255-6, EN 60255-27, EN61000-6-2, EN6100-6-4

Protector Overview PH3



Connection PH3



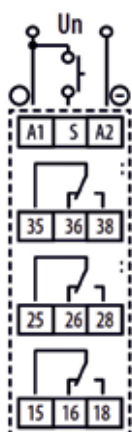
MULTIFUNCTION TIMER RELAY



Connection diagrams DRT2-1P



DRT2-3P



Possibility to connect load onto controlling input

It is possible to connect the load (e.g.: contactor) between terminals S-A2, without any interruption of correct relay function.

Multifunction timer relay can be used for electrical appliances, control of lights, heating, motors, pumps and fans.

- 10 functions: - 5 time functions controlled by supply voltage
- 4 time functions controlled by control input
- 1 function of latching relay
- Time scale 0.1 s - 10 days divided into 10 ranges: (0.1s - 1s/1s - 10s/0.1 min - 1 min/1 min - 10 min/0.1 hrs - 1 hrs/1 hrs - 10 hrs/0.1 day - 1 day/1 day - 10 days/only ON/only OFF)
- Universal supply voltage AC/DC 12 - 240 V
- Output contact: DRT2-1P: 1x changeover 16A; DRT2-3P: 3 x changeover 8A
- Multifunction red LED output indicator

Technical parameters	DRT2-1P	DRT2-3P
Number of functions:	10	
Supply terminals:	A1 - A2	
Voltage range:	AC/DC 12 - 240 V (AC 50 - 60 Hz)	
Burden:	AC 0.7 - 3 VA/DC 0.5 - 1.7 W	
Consumption (apparent/loss):	AC max. 12VA/1.3W	AC max. 12VA/1.9W
Supply voltage tolerance:	-15%; +10%	
Supply indication:	green LED	
Time ranges:	0.1 s - 10 days	
Time setting:	rotary switch and potentiometer	
Time deviation:	5% - mechanical setting	
Repeat accuracy:	0.2% - set value stability	
Temperature coefficient:	0.01%/°C, at = 20°C (0.01%/°F, at = 68°F)	
Output		
Number of contacts:	1x changeover/SPDT (AgNi/Silver Alloy)	3x changeover/SPDT (AgNi/Silver Alloy)
Current rating:	16A/AC1	8A/AC1
Breaking capacity:	4000VA/AC1, 384W/DC	2000VA/AC1, 192W/DC
Inrush current:	30A/<3s	10A/<3s
Switching voltage:	250V AC1/24V DC	
Min. breaking capacity DC:	500mA	
Output indication:	multifunction red LED	
Mechanical life:	3x10 ⁷	
Electrical life (AC1):	0.7x10 ⁵	
Controlling		
Power on control input:	AC 0.025 - 0.2VA (AC 12 - 240V)	
Load between S-A2:	Yes	
Control terminals:	A1-S	
Impulse length:	min. 25ms/max. unlimited	
Reset time:	max. 150ms	
Other information		
Operating temperature:	-20°C to +55°C (-4°F to 131°F)	
Storage temperature:	-30°C to +70°C (-22°F to 158°F)	
Electrical strength:	4kV (supply-output)	
Mounting/DIN rail:	DIN rail EN 60715	
Protection degree:	IP 40 from front panel/IP 20 terminals	
Oversvoltage category:	III.	
Pollution degree:	2	
Max. cable size (mm ²):	solid wire max.1x 2.5 or 2x1.5/with sleeve max. 1x2.5 (AWG 12)	
Dimensions:	90 x 17.6 x 64 mm (3.5" x 0.7" x 2.5")	
Weight:	64g approx.	89g approx.
Standards:	EN 61812-1, EN 61010-1	

MULTIFUNCTION TIMER RELAY

Functions

On Delay (Power On)

When the input voltage U is applied, timing delay t begins. Relay contacts R change state after time delay is complete. Contacts R return to their shelf state when input voltage U is removed. Trigger switch is not used in this function.



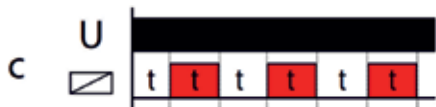
Off Delay

When input voltage U is applied, relay contacts R change state immediately and timing cycle begins. When time delay is complete, contacts return to shelf state. When input voltage U is removed, contacts will also return to their shelf state. Trigger switch is not used in this function.



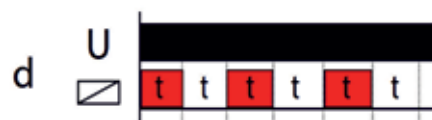
Repeat Cycle (Starting Off)

When input voltage U is applied, time delay t begins. When time delay t is complete, relay contacts R change state for time delay t. This cycle will repeat until input voltage U is removed. Trigger switch is not used in this function.



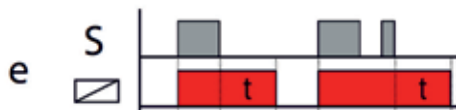
Repeat Cycle (Starting On)

When input voltage U is applied, relay contacts R change state immediately and time delay t begins. When time delay t is complete, contacts return to their shelf state for time delay t. This cycle will repeat until input voltage U is removed. Trigger switch is not used in this function.



Off Delay (S Break)

Input voltage U must be applied continuously. When trigger switch S is closed, relay contacts R change state. When trigger switch S is opened, delay t begins. When delay t is complete, contacts R return to their shelf state. If trigger switch S is closed before time delay t is complete, then time is reset. When trigger switch S is opened, the delay begins again, and relay contacts R remain in their energized state. If input voltage U is removed, relay contacts R return to their shelf state.



Single Shot

Upon application of input voltage U, the relay is ready to accept trigger signal S. Upon application of the trigger signal S, the relay contacts R transfer and the preset time t begins. During time-out, the trigger signal S is ignored. The relay resets by applying the trigger switch S when the relay is not energized.



Single Shot Trailing Edge (Non-Retriggerable)

Upon application of input voltage U, the relay is ready to accept trigger signal S. Upon application of the trigger signal S, the relay contacts R transfer and the preset time t begins. At the end of the preset time t, the relay contacts R return to their normal condition unless the trigger switch S is opened and closed prior to time out t (before preset time elapses). Continuous cycling of the trigger switch S at a rate faster than the preset time will cause the relay contacts R to remain closed. If input voltage U is removed, relay contacts R return to their shelf state.



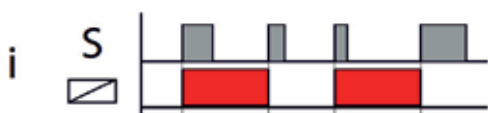
On/Off Delay

Input voltage U must be applied continuously. When trigger switch S is closed, time delay t begins. When time delay t is complete, relay contacts R change state and remain transferred until trigger switch S is opened. If input voltage U is removed, relay contacts R return to their shelf state.



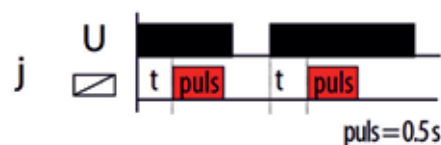
Latching Relay

Input voltage U must be applied continuously. Output changes state with every trigger switch S closure. If input voltage U is removed, relay contacts R return to their shelf state.



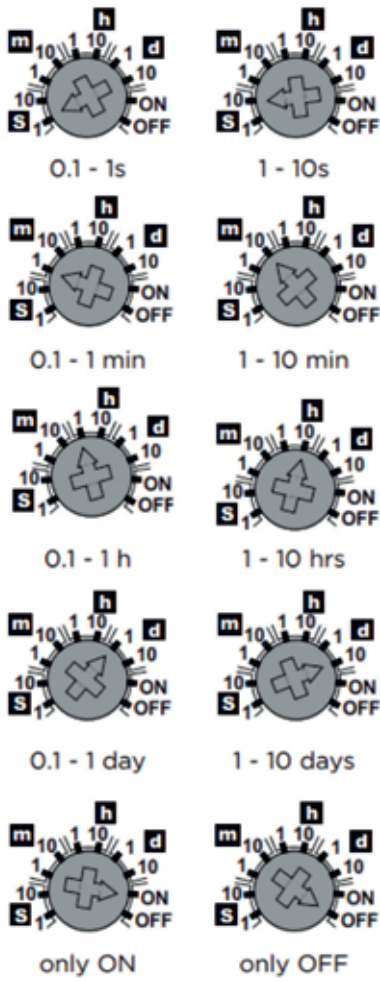
Pulse Generator

Upon application of input voltage U, a single output pulse of 0.5 seconds is delivered to relay after time delay t. Power must be removed and reapplied to repeat pulse. Trigger switch is not used in this function.

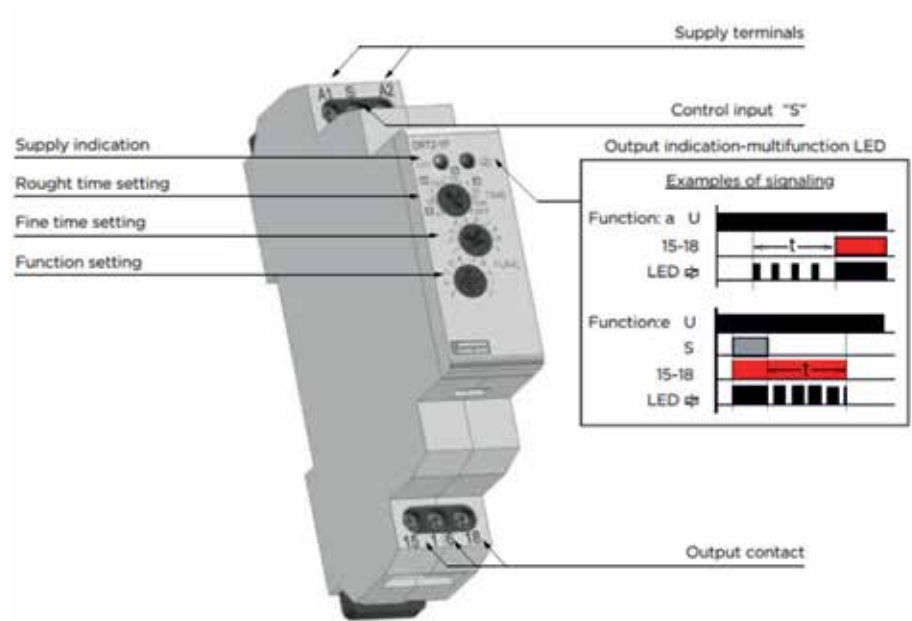


MULTIFUNCTION TIMER RELAY

Time Ranges



Protector Overview



Notes

1) Output contacts of DRT2-3P do not allow switching of different phases or 3-phase voltages (voltage > 250V)

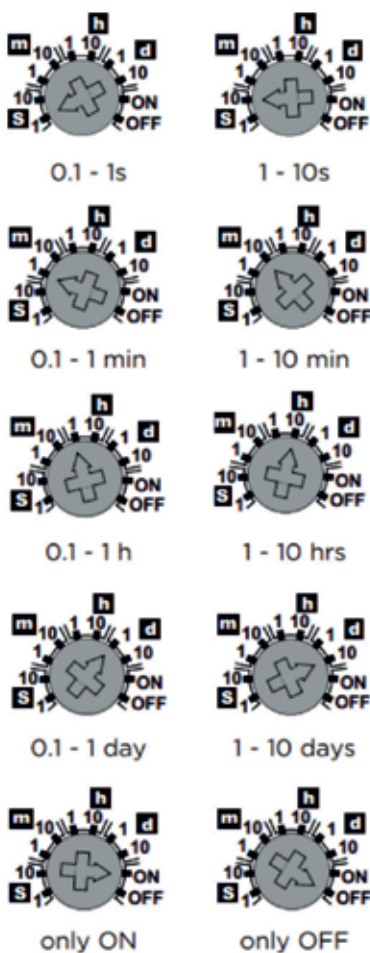
DOUBLESTAGE TIMER RELAY



Two stage timer relay for gradual switching of high power.

- Function: 2x timer delay
- Time scale 0.1s - 10 days divided into 10 time ranges:
0.1s - 1s/1s - 10s/0.1min - 1min/1min - 10min/0.1h - 1h/1h - 10 hrs/0.1 day - 1 day - 10 days/ON/OFF
- Times t1 and t2 are independantly adjustable
- Rough/fine time setting via rotary switch
- Universal supply voltage: AC/DC 12-240V
- Output contact: 2 x changeover /DPDT 16A

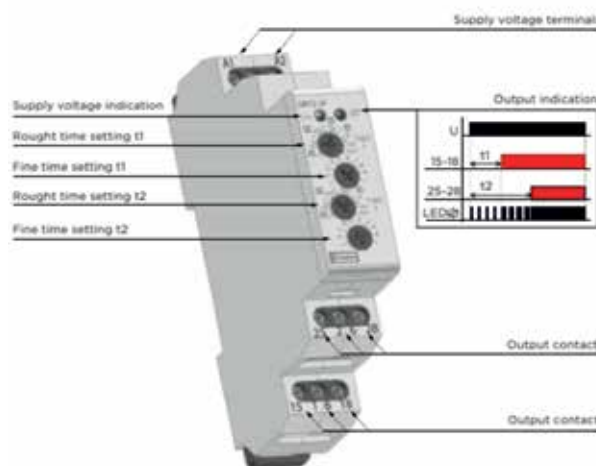
Time Ranges



Technical parameters	DRT3-1P
Number of functions:	2x delay
Supply terminals:	A1 - A2
Voltage range:	AC/DC 12 - 240 V (AC 50 - 60 Hz)
Burden:	AC 0.7 - 3VA/DC 0.5 - 1.7W
Power input (apparent/loss):	AC max. 12 VA/1.3W
Supply voltage tolerance:	-15%; +10%
Supply indication:	green LED
Time ranges:	0.1s - 10 days
Time deviation:	5% - mechanical setting
Repeat accuracy:	0.2% - set value stability
Temperature coefficient:	0.01 %/°C, at = 20°C (0.01 %/°F, at = 68 °F)
Output	
Number of contacts:	2x changeover/DPDT (AgNi/Silver Alloy)
Current rating:	16A/AC1
Breaking capacity:	4000VA/AC1, 384W/DC
Inrush current:	30A/<3 s
Switching voltage:	250V AC1/24V DC
Min. breaking capacity DC:	500mW
Output indication:	multifunction red LED
Mechanical life:	3x10 ⁷
Electrical life (AC1):	0.7x10 ⁵
Reset time:	max. 150 ms
Other information	
Operating temperature:	-20°C to +55°C (-4°F to 131°F)
Storage temperature:	-30°C to +70°C (-22°F to 158°F)
Electrical strength:	4kV (supply-output)
Mounting/DIN rail:	DIN rail EN 60715
Protection degree:	IP 40 from front panel/IP 20 terminals
Overvoltage category:	III.
Pollution degree:	2
Max. cable size (mm ²):	solid wire max.1x2.5 or 2x1.5/with sleeve max. 1x2.5 (AWG 12)
Dimensions:	90 x 17.6 x 64mm (3.5" x 0.7" x 2.5") (3.5" x 0.7" x 2.5")
Weight:	88g approx
Standards:	EN 61812-1, EN 61010-1

Protector Overview

Connection diagram

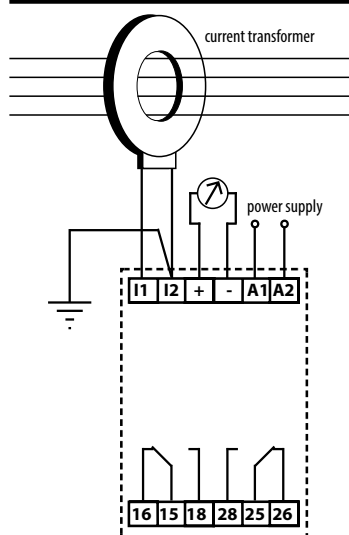


ELR EARTH LEAKAGE PROTECTOR RELAY



Connections

The grounding device must lead outside the current transformer.



Residual current devices are used to detect dangerous ground fault currents before damage is caused to expensive power assets. The ELRP/S monitors the earth leakage current and compares it with the user selectable trip level. Should this level be exceeded, the relay will trip and with a response time of under 40ms, the supply can be disconnected before serious damage can occur.

Basic Parameters

- Continuous monitoring of the current value using an external current transformer
- Response time (<40ms)
- Adjustable trip current settings
- Adjustable time delay set point
- Selectable pre-alarm relay functions - ELRP or ELRS
- For each function the relay state in case of failure may be set - ON or OFF
- RESET & TEST button for the return to the initial state or device test
- Analogue output 0...1mA for the control meter

ELRP (Pre-alarm) function

- 2 levels of monitored current - MAIN ALARM (set current value) and PRE-ALARM (60% of set current value)
- Each current level has a dedicated LED indicator
- When the current value PRE-ALARM is exceeded the relay 1 (contact 15-18) responds - without delay
- When the MAIN ALARM current value is exceeded relay 2 (contact 25-28) responds - with preset delay

ELRS (Main alarm) function

- Both relays respond at the same time only when the MAIN ALARM current value is exceeded
- In other cases, the device behaves as in the case of ELRP function

Part number	Type	Protection
ELRP/S	Earth Leakage	Over current (adjustable set point)

Operation

After the connection of the supply voltage to the supply terminals (A1-A2) the green LED goes on. The device is monitoring the value of the leakage current (at terminals I1, I2) by means of external current transformer. If the current value exceeds 60% of the set value the red LED TRIP 60% goes on and relay 1 responds. If the current value exceeds the set value (100%) the red LED TRIP 100% goes on after the delay timing elapses and relay 2 responds. The red LED is flashing during the timing. If the current range is set to 30mA, relay 2 responds without delay. The relay also responds if the set current value is exceeded 5 times. If the current value drops below the set value, relay 2 remains unchanged. If the current value drops below 60% of the set value and the difference is overridden the state of relay 1 changes. Relay 2 returns into the idle state by briefly pressing the RESET & TEST button. It can also be reset by disconnecting the supply voltage.

(ELRS) function description

Both relays respond at the same time only when the set current value (100%) is exceeded. In other cases, the device behaves as in the case of the ELRP function.

By pressing and holding (for longer than 1s) the button the device test is activated - both the relays respond in the same way as in the case of exceeding the set current value. After releasing the button the relay returns to the initial state.

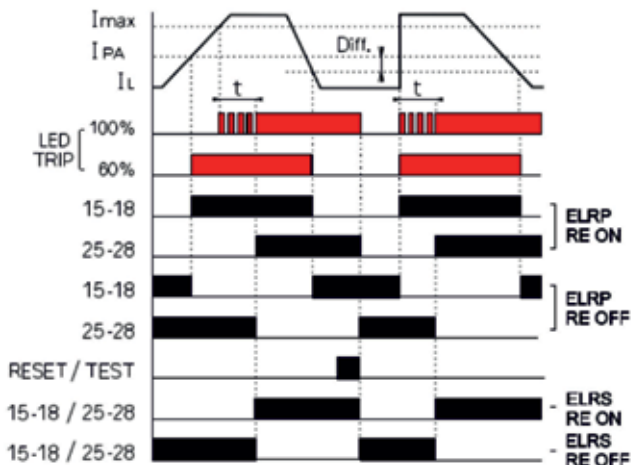
ELR EARTH LEAKAGE PROTECTOR RELAY

Core Balanced current transformer

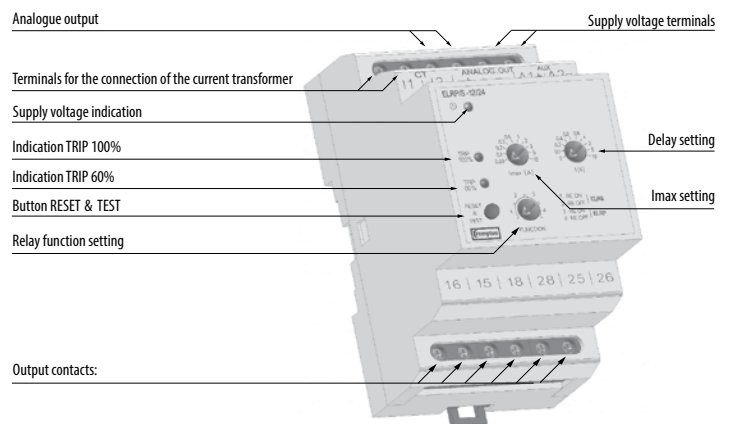
Function principle: all phase conductors (also the neutral conductor, if connected) lead through the Core Balanced core of the current transformer. In the ideal case, the currents flowing through the conductors into the load and back become neutral due to their mutual effect and there is no signal on the secondary coil of the current transformer. If other undesirable current leakage is detected (e.g.: in case of insulation defect) the balance is disrupted and the current transformer evaluates the current difference.)

Technical parameters	ELRP/S-12/24	ELRP/S-24/240
Supply voltage:	12-24V DC	24V/240V AC/DC
Burden on supply:	1W	3VA/0.9W
AC supply frequency:	45-65 Hz	
Supply voltage tolerance:	±10%	
Adjustable current levels (Imax):	0.03A, 0.1A, 0.2A, 0.3A, 0.5A, 1A, 2A, 3A, 5A, 10A	
Overload capacity:	20x set value (Imax) 1s max	
Pre-Alarm (Ipa) Current level:	60% (Imax)	
Pre-Alarm difference:	10% (Imax)	
Adjustable delay t(s):	0s, 0.1s, 0.2s, 0.4s, 0.6s, 0.8s, 1s, 2s, 5s, 10s*	
Analogue Output:	0-1mA = 100% set value (Imax)	
Response time:	<40ms	
Relay contacts: for general switching operations:	2 x changeover, volt-free	
Load capacity - a.c.:	250V @ 8A, 2 kVA	
Load capacity - d.c.:	30V 8A	
Insulation:	4kV/1 min	
Mechanical endurance:	30x10 ⁶ operations	
Other Data:		
Dimensions:	90 x 52 x 64mm	
Weight:	135g approx.	
Maximum conductor size:	2 x 1.5mm ² or 1 x 2.5mm ²	
Operating temperature:	-20 to +55 °C	
Storage temperature:	-30 to +70 °C	
Over-voltage category:	III	
Pollution degree:	2	
Environmental protection:	IP40 for front panel IP20 for terminals	
Standards:	EN 60255-6, EN 60255-27, EN 61000-6-2, EN 61000-6-4	

Characteristics



Protector Overview



CORE BALANCED CURRENT TRANSFORMERS

Features

- Leakage measurement range 0-10 amps
- 6 models available
- Integral wire sealable terminal cover
- Flame retardant high impact moulded case

Benefits

- Reduction of high currents for ease of metering
- Wide operating temperature -10°C to +50°C
- Steel mounting feet supplied
- Long product life

Applications

- Switchgear
- Distribution systems
- Generator sets
- Control panels
- Motor protection
- Transformer protection
- Overload protection

Applications

- Switchgear

Approvals

- Switchgear

The CBT-94F series of core balanced current transformers are exclusively for use with our ELRP/S earth leakage protection relay. The extremely sensitive toroidal core and secondary winding are encapsulated by a self extinguishing case providing excellent mechanical strength, protection from damage and electrical insulation

Description

Residual current devices are used to detect potentially dangerous earth fault currents before damage is caused. An undetected fault current may lead to cables overheating, which could start a fire. If high fault currents are involved, hazardous voltages may also appear on earthed equipment, putting lives at risk. An earth leakage protection relay is intended to provide a high degree of protection and monitoring for any electrical equipment, specifically motors and their control gear, generator sets and transformers. The leakage current is determined by passing the phase conductors (and neutral if present) through a core balanced current transformer.

Operation

Primary conductors should be grouped together and fed through the current transformer aperture. It is essential that each conductor passes through the device in the same direction. Each phase conductor (and neutral if present) must pass through the current transformer. The current transformers sum the currents flowing into and back from the load. Ideally, the load will have no leakage current, so current flow through the CT will completely cancel out. For example, 100 Amps flowing into load and 97 Amps flowing back provides an output of 3 Amps.

The equipment grounding conductor must always bypass the current transformer. The connections between the current transformer and protector should be kept as short as possible to minimise signal noise. For best results, use screened cable, with the screen grounded at the protector.

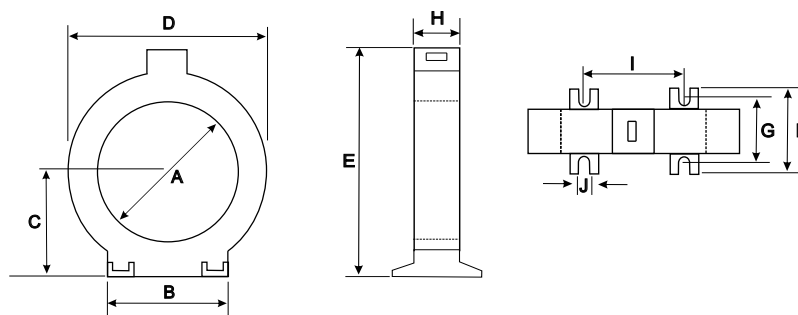
Specifications

System voltage:	720V maximum
Test voltage:	3kV AC for 1 minute
System frequency:	50Hz or 60Hz
Primary ratings:	From 30mA to 10A
Secondary terminals:	Protected to IP20
Operating temperature:	-10°C to +50°C
Enclosure:	UL94V0 flame retardant plastic
Compliant with:	IEC 60044-1, VDE 0414
Mounting hardware:	Steel mounting feet for wall or base mounting

Dimensions

Dim A	Dim B	Dim C	Dim D	Dim E	Dim F	Dim G	Dim J	Cat no.
35	64	32	64	74	40	31	4	CBT-94F-035
70	64	52	105	117	40	31	4	CBT-94F-070
120	94	80	155	170	40	31	4	CBT-94F-105
160	150	120	241	254	93*	80*	11*	CBT-94F-140
210	152	146	290	304	93*	80*	11*	CBT-94F-210

* Dimension with metal feet fitted to CTB160 and CTB210



GROUND FAULT RELAY



Features

- Precision digital settings
- LED bar graph display
- 10 selectable trip levels – 100 to 1200 amps
- 16 selectable time delay – 0ms to 10 seconds
- Less than 40ms response time
- 0-1mA analogue output
- User selectable input range of 0.2m ohms or 2m ohms
- User selectable latching/ self-resetting
- Single-pole change over relay
- 8 amp 250V rated relay contacts

Benefits

- DIN-rail 43880 enclosure
- Switched mode supply accepts a wide range of auxiliary voltages
- Isolation of faulty circuits
- Insulation monitoring
- Advanced warning of faults
- Protection of expensive power assets
- Current transformer not required

Applications

- Switchgear
- Distribution systems
- Generator sets
- Control panels
- Utility power monitoring
- Transformer protection

The 373-GFR is designed to detect dangerous ground fault currents before damage is caused to expensive power assets. The 373-GFR continuously monitors the fault current and compares it with the user selectable trip level. When this level is exceeded, the relay will trip. With a very fast response time of under 40ms, the supply can be disconnected before serious damage can occur. This product is intended to provide a high degree of ground fault protection and monitoring for any type of electrical equipment, specifically switchboards, generator sets and transformers.

Operation

The 373-GFR offers a single-pole change over relay contact incorporating a single set point, which will de-energise on trip. The relay senses the ground current by measuring the voltage developed across the N-G link impedance under a fault condition. We offer link selection of two standard N-G impedances, 0.2m ohms or 2m ohms. This is a very cost effective method, since a current transformer is not required. The 373-GFR features two incremental rotary selector switches on the front panel and a series of LED annunciators. The trip current switch offers selectable settings from 100 to 1200 amps and the time delay set point switch offers additional delay for fault discrimination, selectable from 0 to 10 seconds.

Once the trip current and time delay selections have been made, a green LED provides indication of mains healthy supply. The red LED will automatically illuminate if the pre-set fault level has been exceeded, (after any selected time delay). The unit also incorporates five yellow LEDs to indicate the level of leakage in 20% increments. With all five LEDs lit, the leakage level has reached 100% of the setting.

The unit features a combined reset and test button. A short press of the button will reset the unit after a trip and one long press initiates an electronic confidence check. The relay latches on to a fault until the test/reset button is pressed or the auxiliary power is removed. However, automatic reset can be achieved by fitting a wire between two terminals. The relay will de-energise on trip (fail safe) as standard.

Analogue Outputs

The 373-GFR unit incorporates a 0/1mA analogue output which equals 0% to 100% of the selected tripping level. It can be used to drive an external meter, thus providing measurements for test commissioning and indication of potential problems. The analogue output also enables fault level diagnosis to be communicated into building management or intelligent SCADA systems.

Product Codes – Single-pole change over relay

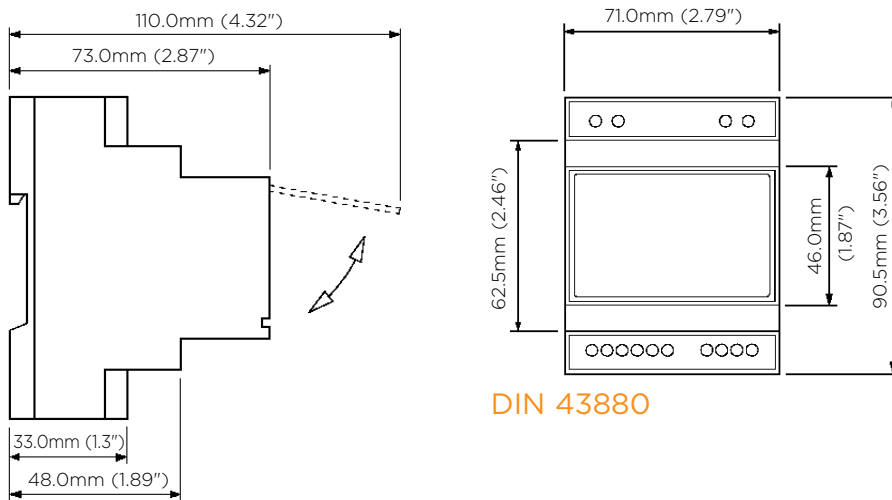
Frequency	Dim A	Part number
50Hz	12-48V DC	373-GFRW-SHC5-A1-SP
50Hz	24-48V AC/DC	373-GFRW-SHC5-A2-SP
50Hz	100-250V AC/DC	373-GFRW-SHC5-A3-SP
60Hz	12-48V DC	373-GFRW-SHC6-A1-SP
60Hz	24-48V AC/DC	373-GFRW-SHC6-A2-SP
60Hz	100-250V AC/DC	373-GFRW-SHC6-A3-SP

GROUND FAULT RELAY

Specifications

Measuring input:	AC voltage developed across N-G link
Measuring range:	0.2 mΩ or 2 mΩ shunt impedance link selectable
Overload:	Maximum input voltage 600V
Frequency:	50/60Hz
Auxiliary voltage:	12-48V DC, 24-48V AC and DC or 100-250V AC and DC
Auxiliary burden:	Less than 1.5 watts
Trip current settings:	Selectable 100A, 150A, 200A, 250A, 300A, 450A, 600A, 750A, 800A, 1200A
Trip accuracy:	50% <trip point current <100% in accordance with IEC 1543
Trip response time:	<40ms (at 5 x rated trip current, ignoring the selected time delay)
Time delay set points:	Selectable 0ms, 50ms, 100ms, 150ms, 200ms, 300ms, 400ms, 500ms, 600ms, 700ms, 800ms, 900ms. 1 second, 2 seconds, 5 seconds, 10 seconds.
Indication:	5 yellow LED bar graph for fault levels. Red LED indicated trip function Green LED indicated auxiliary power presence
Relay contacts:	1-pole change over (SPCO or NO+NC) contacts
Relay contact rating:	8 amps at 250V AC. 8 amps at 30V DC resistive
Relay mechanical life:	>100,000 operations
Analogue output:	0 to 1mA = 0 to 100% of selected tripping level. Compliance 1V, accuracy 10%
Enclosure style:	DIN 43880, rail width 70mm
Material:	Flame retardant UL94V0
Terminals:	1 to 4mm ² solid or stranded conductors. IP20 protection
Operating temperature:	-10°C to +60°C
Storage temperature:	-20°C to +70°C
Relative humidity:	<95% non condensing
Weight:	<250g
Dimensions:	71mm wide x 90.5mm high x 73mm deep 2.79" wide x 3.56" high x 2.87" deep

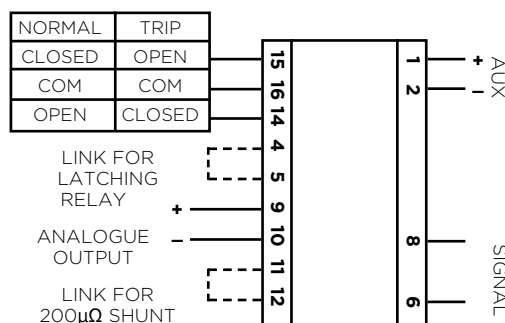
Dimensions



DIN 43880

Connections

Install the neutral to ground shunt resistor in a suitable location. Connect the shunt sense wires directly to terminals N (neutral side) and G (ground side) on the relay. Cabling between the shunt resistor and the ground fault relay should be kept to a minimum.



Terminal No.

- 8 Neutral input
- 6 Ground input
- 2 Fused auxiliary supply (-)
- 1 Fused auxiliary supply (+)
- 4 Default operation is non-latching
- 5 Fit link to enable relay latch on trip
- 9/10 Analogue output 0/1mA
- 11 Default input range is for 2 mΩ shunt
- 12 Link to select 200μΩ shunt input
- 14 Relay (NO)
- 15 Relay (COM)
- 16 Relay (NC)

Part Numbers

Part number	Protection	System	Page
AC current with adjustable time delay			2-5
PAU-1	Under current	Single-phase, 1A AC, 50/60Hz, Aux 24/240V AC/DC	
PAU-5	Under current	Single-phase, 5A AC, 50/60Hz, Aux 24/240V AC/DC	
PAO-1	Over current	Single-phase, 1A AC, 50/60Hz, Aux 24/240V AC/DC	
PAO-5	Over current	Single-phase, 5A AC, 50/60Hz, Aux 24/240V AC/DC	
PAD-1	Under/over current (2 output relays)	Single-phase, 1A AC, 50/60Hz, Aux 24/240V AC/DC	
PAD-5	Under/over current (2 output relays)	Single-phase, 5A AC, 50/60Hz, Aux 24/240V AC/DC	
PAP/V-1	Under/over current (2 output relays)	3-phase, 3 or 4-wire, 1A AC, 50/60Hz, Aux 24/240V AC/DC	
PAP/V-5	Under/over current (2 output relays)	3-phase, 3 or 4-wire, 5A AC, 50/60Hz, Aux 24/240V AC/DC	
AC voltage with adjustable differential and time delay			6-11
PVU/Z-100/120	Under voltage	Single-phase, 57.7/69.3V L-N AC, 50/60Hz	
PVU/Z-173/240	Under voltage	Single-phase, 100/139V L-N AC, 50/60Hz	
PVU/Z-380/480	Under voltage	Single-phase, 220/277V L-N AC, 50/60Hz	
PVO/H-100/120	Over voltage	Single-phase, 57.7/69.3V L-N AC, 50/60Hz	
PVO/H-173/240	Over voltage	Single-phase, 100/139V L-N AC, 50/60Hz	
PVO/H-380/480	Over voltage	Single-phase, 220/277V L-N AC, 50/60Hz	
PVB-100/120	Under/over voltage (2 output relays)	Single-phase, 57.7/69.3V L-N AC, 50/60Hz	
PVB-173/240	Under/over voltage (2 output relays)	Single-phase, 100/139V L-N AC, 50/60Hz	
PVB-380/480	Under/over voltage (2 output relays)	Single-phase, 220/277V L-N AC, 50/60Hz	
PVK/J-100/120	Under voltage	3-phase 3-wire, 100/120V L-L AC, 50/60Hz	
PVK/J-173/240	Under voltage	3-phase 3-wire, 173/240V L-L AC, 50/60Hz	
PVK/J-380/480	Under voltage (2 output relays)	3-phase 3-wire, 380/480V L-L AC, 50/60Hz	
PVA/C-100/120	Over voltage	3-phase 3-wire, 100/120V L-L AC, 50/60Hz	
PVA/C-173/240	Over voltage	3-phase 3-wire, 173/240V L-L AC, 50/60Hz	
PVA/C-380/480	Over voltage (2 output relays)	3-phase 3-wire, 380/480V L-L AC, 50/60Hz	
PVM-100/120	Under/over voltage (2 output relays)	3-phase 3-wire, 100/120V L-L AC, 50/60Hz	
PVM-173/240	Under/over voltage (2 output relays)	3-phase 3-wire, 173/240V L-L AC, 50/60Hz	
PVM-380/480	Under/over voltage (2 output relays)	3-phase 3-wire, 380/480V L-L AC, 50/60Hz	
PVV/X-100/120	Under voltage	3-phase 4-wire, 57.7/69.3V L-N (100/120V L-L) AC, 50/60Hz	
PVV/X-173/240	Under voltage	3-phase 4-wire, 100/139V L-N (173/240V L-L) AC, 50/60Hz	
PVV/X-380/480	Under voltage (2 output relays)	3-phase 4-wire, 220/277V L-N (380/480V L-L) AC, 50/60Hz	
PVP/S-100/120	Over voltage	3-phase 4-wire, 57.7/69.3V L-N (100/120V L-L) AC, 50/60Hz	
PVP/S-173/240	Over voltage	3-phase 4-wire, 100/139V L-N (173/240V L-L) AC, 50/60Hz	
PVP/S-380/480	Over voltage (2 output relays)	3-phase 4-wire, 220/277V L-N (380/480V L-L) AC, 50/60Hz	
PVE-100/120	Under/over voltage (2 output relays)	3-phase 4-wire, 57.7/69.3V L-N (100/120V L-L) AC, 50/60Hz	
PVE-173/240	Under/over voltage (2 output relays)	3-phase 4-wire, 100/139V L-N (173/240V L-L) AC, 50/60Hz	
PVE-380/480	Under/over voltage (2 output relays)	3-phase 4-wire, 220/277V L-N (380/480V L-L) AC, 50/60Hz	
Frequency with adjustable differential and time delay			12-13
PHD-100/120	Under/over frequency (2 relays)	Single-phase, 57.7/69.3V L-N AC (50, 60 and 400Hz)	
PHD-173/240	Under/over frequency (2 relays)	Single-phase, 100/139V L-N AC (50, 60 and 400Hz)	
PHD-380/480	Under/over frequency (2 relays)	Single-phase, 220/277V L-N AC (50, 60 and 400Hz)	
PHD-280/860	Under/over frequency (2 relays)	Single-phase, 161/500V L-N AC (50, 60 and 400Hz)	
Phase sequence and phase failure			14-15
PVR3-100/120	Phase sequence under voltage	3-phase 3-wire, 100/120V L-L AC, 50/60Hz	
PVR3-173/240	Phase sequence under voltage	3-phase 3-wire, 173/240V L-L AC, 50/60Hz	
PVR3-380/480	Phase sequence under voltage (2 output relays)	3-phase 3-wire, 380/480V L-L AC, 50/60Hz	
PVR4-100/120	Phase sequence under voltage	3-phase 3-wire, 100/120V L-L AC, 50/60Hz	
PVR4-173/240	Phase sequence under voltage	3-phase 3-wire, 173/240V L-L AC, 50/60Hz	
PVR4-380/480	Phase sequence under voltage (2 output relays)	3-phase 3-wire, 380/480V L-L AC, 50/60Hz	
Phase balance and under voltage relay with adjustable time delay and unbalance			16-17
PSF/G3-100/120	Phase loss, unbalanced and under voltage	3-phase 3-wire, 100/120V L-L AC, 50/60Hz	
PSF/G3-173/240	Phase loss, unbalanced and under voltage	3-phase 3-wire, 173/240V L-L AC, 50/60Hz	
PSF/G3-380/480	Phase loss, unbalanced and under voltage	3-phase 3-wire, 380/480V L-L AC, 50/60Hz	
PSF/G4-100/120	Phase loss, unbalanced and under voltage	3-phase 4-wire, 57.7/69.3V L-N (100/120V L-L) AC, 50/60Hz	
PSF/G4-173/240	Phase loss, unbalanced and under voltage	3-phase 4-wire, 100/139V L-N (173/240V L-L) AC, 50/60Hz	
PSF/G4-380/480	Phase loss, unbalanced and under voltage	3-phase 4-wire, 220/277V L-N (380/480V L-L) AC, 50/60Hz	

Part Numbers continued

Part number	Protection	System	Page
Syncro-check with dead bus facility			18-19
PLL/D-100/120	Phase angle and voltage dead bus	Single or 3-phase, 4-wire, 57.7/69.3V, L-N, L-L AC, 50/60Hz	
PLL/D-173/240	Phase angle and voltage dead bus	Single or 3-phase, 4-wire, 100/139V, L-N, L-L AC, 50/60Hz	
PLL/D-380/480	Phase angle and voltage dead bus	Single or 3-phase, 4-wire, 220/277V, L-N, L-L AC, 50/60Hz	
PLL/D-277/500	Phase angle and voltage dead bus	Single or 3-phase, 4 wire, 277/500V, L-N, L-L AC, 50/60Hz	
Reverse power (current) with adjustable time delay			20-21
PAS-100/120	Reverse power	Single or 3-phase, 4-wire, 57.7/69.3V L-N (100/120V L-L) AC, 0-6A AC, 50/60Hz	
PAS-173/240	Reverse power	Single or 3-phase, 4-wire, 100/139V L-N (173/240V L-L) AC, 0-6A AC, 50/60Hz	
PAS-380/480	Reverse power	Single or 3-phase, 4-wire, 220/277V L-N (380/480V L-L) AC, 0-6A AC, 50/60Hz	
PAT-100/120	Reverse power	3-phase, 3-wire, 100-120V AC, 0-6A AC, 50/60Hz	
PAT-173/240	Reverse power	3-phase, 3-wire, 173-240V AC, 0-6A AC, 50/60Hz	
PAT-380/480	Reverse power	3-phase, 3-wire, 380-480V AC, 0-6A AC, 50/60Hz	
DC volts, millivolts and transducer with adjustable time delay			22-23
PBT/S-24/240	High/low trip (2 output relays)	50, 75, 100mV DC, 24/240V AC/DC Aux	
PBT/S-12/24	High/low trip (2 output relays)	50, 75, 100mV DC, 12/24V DC Aux	
PBV-24/240	High/low trip (2 output relays)	0/1, 0/10, 0/20, 4/20mA DC, 24/240V AC/DC Aux	
PBV-12/24	High/low trip (2 output relays)	0/1, 0/10, 0/20, 4/20mA DC, 12/24V DC Aux	
PDU/E 24/240	High/low trip (2 output relays)	10, 20, 40, 80, 120V DC, 24/240V AC/DC Aux	
Thermistor trip with over trip relay and manual/remote reset			24-25
PMM/T-24/240	Over temperature	Input PTC thermistors, 24/240V AC/DC Aux	
Speed sensing			26-27
PH3-12/24	3 Setpoints, 1 relay	Input. Magnetic pickup, 12/24V DC Aux	
Multifunction Timer Relay			28-30
DRT2-1P	Timer delay relay 10 functions, 10 time ranges 0.1s-10 days	1x output 16A changeover/SPDT, Auxiliary 12-240 AC/DC VOLTS	
DRT2-3P	Timer delay relay 10 functions, 10 time ranges 0.1s-10 days	3x output 8A changeover/SPDT, Auxiliary 12-240 AC/DC VOLTS	
Doublestage Timer Relay			31
DRT3-1P	Two-state Timer delay relay 2 x 10 time delay ranges, 0.1s-10 days	2x output 16A changeover/SPDT Auxiliary 12-240 AC/DC VOLTS	
ELR Earth Leakage Protector Relay			32-33
ELRP/S-12/24	Earth Leakage Over current	selectable trip setting, 12/48V DC Aux	
ELRP/S-24/240	Earth Leakage Over current	selectable trip setting, 24/240V AC/DC Aux	
Core Balanced Current Transformers			34-35
CBT-94F	Core Balanced	35, 70, 105, 140, 210 and 300mm apertures available	
Ground Fault Relay			35-36
373-GFR	Ground fault relay protection	Selectable trip settings	

Notes

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