



Energy Division

## Crompton Instruments Protector Trip Relays

# Protector Trip Relays

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 point limit, the relay will operate to prevent damage to the power asset. Designed to suit a wide variety of applications the range offers both traditional and technologically advanced products, from single parameter units through to multifunctional microprocessor based protection relays.

This versatile range features a host of DIN-rail or wall mounted protectors offering numerous trip functions for single and three-phase power systems, including over and under-voltage, current, frequency, three-phase sequence, phase failure and phase balance. For the specific protection of generator sets, the range offers unbalanced current, reverse power flow, reverse VAr, syncro-check and under/over-speed trip relay functions. Various dc models provide protection of battery and UPS systems and a range of temperature protection products is ideal to prevent the damaging effects of overheating.



## Features

- Continuous monitoring of any electrical parameter
- Monitoring for under and over-current conditions
- Ensures load current is within generator capacity
- DIN-rail or wall mounted
- Range of outputs and configurations
- Adjustable trip points, time delay and differentials
- LED trip indication
- 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
- Generator sets
- Control panels
- Energy management
- Building management
- Utility power monitoring
- Process control
- Motor protection
- Equipment and network protection

## Contents

### 250 Series DIN-rail and Wall Mounted

Single and three-phase protector relays offering continuous surveillance of electrical parameters with adjustable set point limits, differentials and time delay settings. Provide an alarm or initiation signal when the measured parameter moves outside the set point limit.

### 373-ELR Earth Leakage Protection

For the continuous monitoring of fault current compared with user selectable leakage level. These DIN-rail units offer single set point, relay contacts and LED earth leakage level indicators or alarms.

### CBT-94F Core Balanced Current Transformers

Designed for use with the 373-ELR earth leakage protection relay, the range offers various case widths and apertures with a measurement range of up to 10A and a maximum 720V rated system voltage.

### 373-GFR Ground Fault Relay

This compact DIN-rail ground fault relay allows the fault current to be continuously monitored and compared with the user selectable trip level. Ideally suited for any type of electrical equipment, specifically switchboards, generator sets and transformers.

### Vector Shift and ROCOF Relay

A choice of DIN-rail or panel mounted units offering ROCOF (rate of change of frequency) and Vector Shift protection against loss of mains at the generator site.

### SPR System Protection Relay

Cost effective and space saving microprocessor based relay, offering system protection, control and measurement of three-phase voltage and current, with 12 user definable relay outputs.

### RS232 to RS485 Serial Converter

Allows direct connection from the SPR system protection relay to SCADA or PC based systems.

## Page

2 - 33

34 - 35

36

37 - 38

39 - 42

43 - 47

48

# 250 Series DIN-rail and Wall Mounted Relays



## Features

- Single and three-phase options
- Adjustable set point
- Adjustable time delay
- Internal differential
- LED trip indication
- Double-pole relay contacts
- Automatic reset

## Benefits

- Ideal for any electrical load detection
- Over and under-current monitoring
- Suitable for electric heating systems
- Ensures load current is within generator capacity
- Detects broken drive belts on machinery
- Nuisance tripping avoidance
- Customised options

## Applications

- Marine panels
- Switchgear
- Distribution systems
- Generator sets
- Control panels
- Process control
- Motor protection
- Transformers
- Overload protection

## AC Current with Adjustable Time Delay

250 series ac current protectors provide continuous surveillance of the monitored circuit. When the current moves outside the set point limit for longer than the time delay, the relay operates. The protector can be used to monitor over and under-current conditions, load detection and for monitoring electric heating systems. An illuminated LED indicates when the relay is energised. For three-phase systems, the sequence of connection is not important.

## Operation

AC current protectors provide continuous surveillance of the monitored circuit. These products offer user adjustable trip point (set point) and time delay settings. The set point adjustment range is between 40% and 120% of the nominal current. Input currents can be via current transformers or direct up to 10A. An internal differential setting of 1% reduces nuisance tripping if the measured signal is noisy or unstable. When the measured current moves outside the set point limit the relay will operate, giving an alarm or initiation signal. An adjustable time delay is provided to prevent the relay from tripping for a predetermined period to prevent nuisance tripping. The units draw their operating power from a separate auxiliary supply input. Single-phase and three-phase products are available. Three-phase products monitor the current level for each phase and are not phase sequence sensitive. Combined units offer under and over-current trips in one compact unit. Single function units are also available.

## Over-Current Models

When the monitored current exceeds the set point, the relay will energise and the red LED will illuminate to indicate the trip condition. The relay will automatically reset once the monitored current falls below the set point minus the differential. When reset, the LED will extinguish and the relay de-energises.

## Under-Current Models

When the monitored current falls below the set point, the relay will de-energise and the red LED will extinguish to indicate the trip condition. The relay will automatically reset once the monitored current rises above the set point plus the differential. When reset, the LED will illuminate and the relay energises.

## Options

250 series protector relays offer various customised options to suit individual requirements. Please consult factory.

- Adjustment ranges – different adjustment ranges are possible for the set point and differential controls.
- Relay operation – standard models are fail safe, but the relays can be customised to energise or de-energise on trip.

## Product Codes

Relay	Protection	ANSI no.	Cat. no.
1-phase	Under-current 40-120%	37	252-PAU
1-phase	Over-current 40-120%	51	252-PAO
1-phase	Under and over-current	37/51	253-PAD
3-phase 3- or 4-wire	Under-current 40-120%	37	253-PAV
3-phase 3- or 4-wire	Over-current 40-120%	51	253-PAP

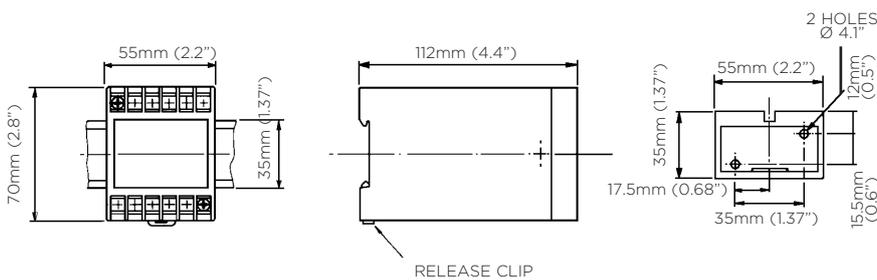
Please specify system voltage, system current, frequency and required options at time of ordering.

## Specifications

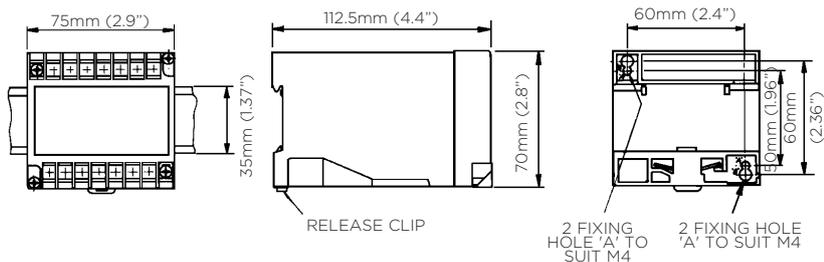
Nominal input current	1A or 5A from CT secondary. 0.2A to 10A available on request
Nominal frequency	50, 60 or 400Hz
Input current burden	0.5VA per phase
Overload	2 x rating continuously, 10 x rating for 3 seconds
Set point repeatability	>0.5% of full span
Differential (hysteresis)	Pre-set at 1%. Values 1% to 10% available on request
Trip level adjustment	40 to 120%. Customised adjustment available
Time delay adjustable	0 to 10 seconds
AC auxiliary supply voltage	100V, 110V, 120V, 208V, 220V, 240V, 480V, $\pm 20\%$
DC auxiliary supply voltage	12V, 24V, 48V, 110V or 125V, $\pm 20\%$ . Including ripple
Auxiliary voltage burden	4VA (max)
Output relay	2-pole change over
Relay contact rating	AC: 240V 5A, non inductive DC: 24V 5A resistive
Relay mechanical life	0.2 million operations at rated loads
Relay reset	Automatic
Operating temperature	0°C to +60°C (0°C to +40°C for UL models)
Storage temperature	-20°C to +70°C
Temperature co-efficient	0.05% per °C
Interference immunity	Electrical stress surge withstand and non-function to ANSI/IEEE C37 90a
Enclosure style	DIN-rail with wall mounting facility
Material	Flame retardant polycarbonate/ABS
Enclosure integrity	IP50
Model 252 dimensions	55mm (2.2") wide x 70mm (2.8") high x 112mm (4.4") deep
Model 253 dimensions	75mm (2.9") wide x 70mm (2.8") high x 112mm (4.4") deep
Weight	Model 252: 0.4Kg approx. Model 253: 0.6Kg approx.

## Dimensions

### Model 252

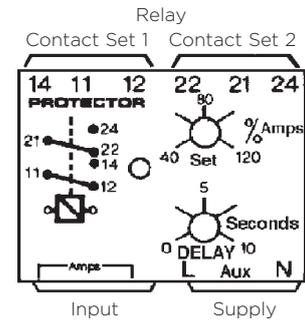


### Model 253

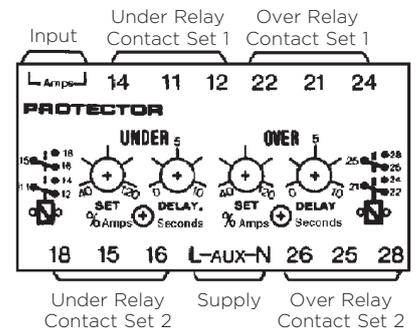


## Connections

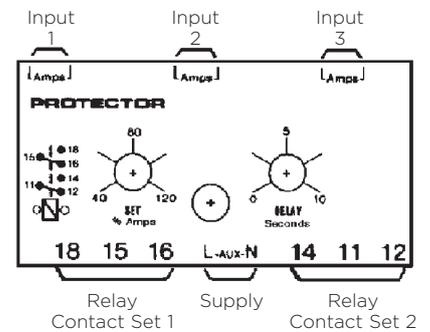
### 252-PAU 252-PAO



### 253-PAD



### 253-PAP 253-PAV



# 250 Series DIN-rail and Wall Mounted Relays



## AC Voltage with Adjustable Differential

The ac voltage protectors provide continuous surveillance of the monitored circuit. When the measured voltage moves outside the set point limit for longer than the time delay, the relay will operate giving an alarm or initiation signal.

The protector can be used for under and over-voltage detection, start standby generators, operation of mains failure units and switching standby supplies. An illuminated LED indicates when the relay is energised. The three-phase, three or four-wire models, protect each phase independently.

## Description

AC voltage protectors offer user adjustable trip point (set point) and differential (hysteresis) settings. The set point adjustment range is 25%, operating between 75% and 100% of the nominal supply for under-voltage units and between 100% and 125% for the over-voltage units. The differential setting adjustment range is 1% to 15% and it can be used to reduce nuisance tripping if the measured signal is noisy or unstable. When the measured voltage moves outside the set point limit, the relay will operate, giving an alarm or initiation signal.

As soon as the monitored signal moves outside of the set point limit, a trip will occur. A fixed time delay is available as a factory option, preventing the relay from tripping for a predetermined period to prevent nuisance tripping. The units draw their operating power from the measuring inputs, although a separate auxiliary supply input option is available on some models. Three-phase products monitor the voltage level for each phase and are not phase sequence sensitive. Combined units offer under and over-voltage trips in one compact unit. Single function units are also available.

## Over-Voltage Models

When the monitored voltage exceeds the set point, the relay will energise and the red LED will illuminate to indicate the trip condition. The relay will automatically reset once the monitored voltage falls below the set point minus the differential. When reset, the LED will extinguish and the relay de-energises.

## Under-Voltage Models

When the monitored voltage falls below the set point, the relay will de-energise and the red LED will extinguish to indicate the trip condition. The relay will automatically reset once the monitored voltage rises above the set point plus the differential. When reset, the LED will illuminate and the relay energises.

## Options

250 series protector relays offer various customised options to suit individual requirements. Please consult factory.

- Time delay – internal fixed time delay before a trip occurs.
- Separate auxiliary supply – sometimes required to maintain a time delay or energised relay when the monitored signal fails.
- Adjustment ranges – different adjustment ranges are possible for the set point and differential controls.
- Relay operation – standard models are fail safe, but the relays can be customised to energise or de-energise on trip.

## Product Codes

Relay	Protection	ANSI no.	Cat. no.
1-phase	Under-voltage 75-100%	27	252-PVU
1-phase	Over-voltage 100-125%	59	252-PVO
1-phase	Under and over-voltage	27/59	253-PVB
3-phase 3-wire	Under-voltage 75-100%	27	252-PVK
3-phase 3-wire	Over-voltage 100-125%	59	252-PVA
3-phase 3-wire	Under and over-voltage	27/59	253-PVM
3-phase 4-wire	Under-voltage 75-100%	27	252-PVV
3-phase 4-wire	Over-voltage 100-125%	59	252-PVP
3-phase 4-wire	Under and over-voltage	27/59	253-PVE

Please specify system voltage, frequency and required options at time of ordering.

## Features

- Single and three-phase models
- Adjustable set point
- Adjustable differential
- Internal time delay
- LED trip indication
- Double-pole relay contacts
- Automatic reset

## Benefits

- Over and under-voltage monitoring
- Start standby generators
- Operation of mains failure units
- Switching standby supplies
- Monitors genset AVR and excitation systems
- Nuisance tripping avoidance
- Customised options

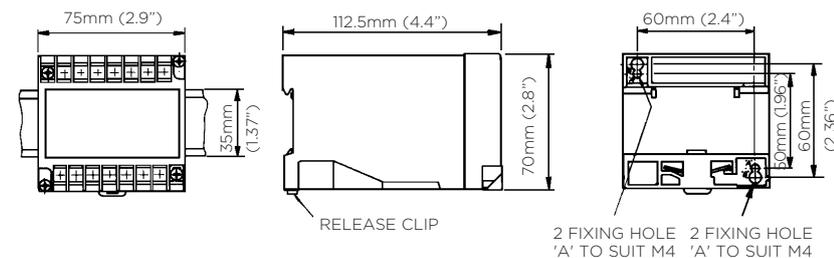
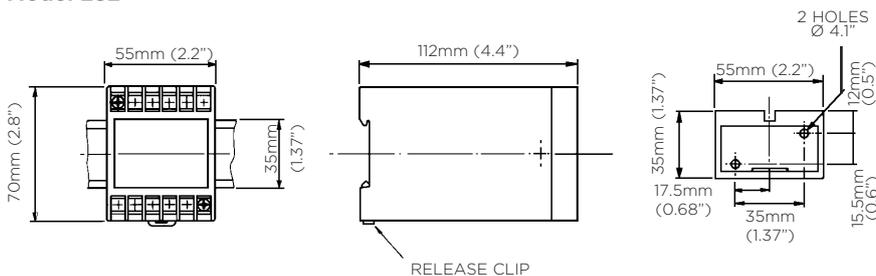
## Applications

- Marine panels
- Switchgear
- Distribution systems
- Generator sets
- Control panels
- Process control
- Motor protection
- Transformers
- Overload protection

## Specification - AC Voltage with Adjustable Differential

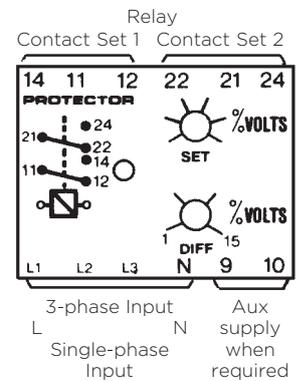
Nominal voltage	100V, 110V, 120V, 208V, 220V, 270V, 280V, 400V, 415V or 440V
System frequency	45/65Hz or 360/440Hz
Voltage burden	0.3VA approx.
Overload	1.2 x rating continuously, 1.5 x rating for 10 x seconds
Set point repeatability	>0.5% of full span
Differential (hysteresis)	Adjustable range 1 to 15%
Trip level adjustment	Under-voltage: 75 to 100% Over-voltage: 100 to 125% of nominal input voltage
Time delay	Factory pre-set up to 30 seconds
AC auxiliary supply voltage	100V, 110V, 120V, 208V, 220V, 240V, 480V, $\pm 20\%$
DC auxiliary supply voltage	12V, 24V, 48V, 110V or 125V, $\pm 20\%$ . Including ripple
Auxiliary voltage burden	4VA (max)
Output relay	2-pole change over
Relay contact rating	AC: 240V 5A, non inductive DC: 24V 5A resistive
Relay mechanical life	0.2 million operations at rated loads
Relay reset	Automatic
Operating temperature	0°C to +60°C (0°C to +40°C for UL models)
Storage temperature	-20°C to +70°C
Temperature co-efficient	0.05% per °C
Interference immunity	Electrical stress surge withstand and non-function to ANSI/IEEE C37 90a
Enclosure style	DIN-rail with wall mounting facility
Material	Flame retardant polycarbonate/ABS
Enclosure integrity	IP50
Model 252 dimensions	55mm (2.2") wide x 70mm (2.8") high x 112mm (4.4") deep
Model 253 dimensions	75mm (2.9") wide x 70mm (2.8") high x 112mm (4.4") deep
Weight	Model 252: 0.4Kg approx. Model 253: 0.6Kg approx.

## Dimensions Model 252

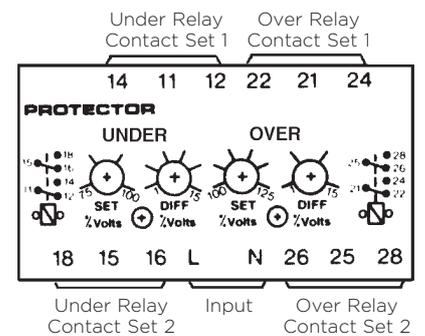


## Connections

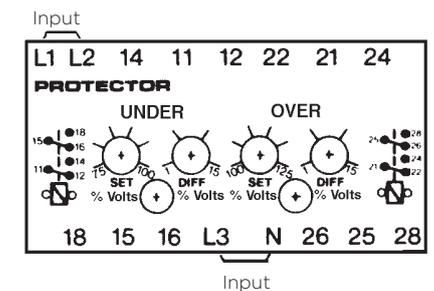
252-PVU  
252-PVO  
252-PVV  
252-PVP  
252-PVK  
252-PVA



## 253-PVB



## 253-PVM 253-PVM



**Note:** The neutral connection is always used on four-wire systems.

# 250 Series DIN-rail and Wall Mounted Relays



## AC Voltage with Adjustable Time Delay

The ac voltage protectors provide continuous surveillance of the monitored circuit. When the measured voltage moves outside the set point limit, the relay will operate after the selected time delay, giving an alarm or initiation signal. Relays normally energise on overvolts and de-energise on undervolts. An illuminated LED indicates when the relay is energised.

## Operation

AC voltage protectors offer user adjustable trip point (set point) and time delay settings. The set point adjustment range is 25%, operating between 75% and 100% of the nominal supply for under-voltage units and between 100% and 125% for the over-voltage units. The time delay setting adjustment range is typically 0 to 10 seconds, although longer delays are available. As soon as the monitored signal moves outside of the set point limit, the time delay is activated, after which a trip will occur. The time delay prevents the relay from tripping for a predetermined period to prevent nuisance tripping.

The products also feature an internal differential (hysteresis) setting of 1% to reduce nuisance tripping if the measured signal is noisy or unstable. The units draw their operating power from the measuring inputs, although a separate auxiliary supply input option is available on some models. Single-phase and three-phase products are available. Three-phase products monitor the voltage level for each phase and are not phase sequence sensitive.

## Features

- Adjustable set point
- Adjustable time delay
- Internal differential
- LED trip indication
- Double-pole relay contacts
- Automatic reset

## Benefits

- Over and under-voltage monitoring
- Close voltage control
- Start standby generators
- Operation of mains failure units
- Switching standby supplies
- Protecting computer supplies
- Monitors genset AVR and excitation systems
- Nuisance tripping avoidance
- Customised options

## Applications

- Switchgear
- Distribution systems
- Generator sets
- Control panels
- Process control
- Motor protection
- Transformers
- Overload protection

## Over-Voltage Models

When the monitored voltage exceeds the set point, the time delay is started. When the time has elapsed, the relay will energise and the red LED will illuminate to indicate the trip condition. The relay will automatically reset once the monitored voltage falls below the set point minus the differential. When reset, the LED will extinguish and the relay de-energises. The time delay is not active when resetting.

## Under-Voltage Models

When the monitored voltage falls below the set point, the time delay is started. When the time has elapsed, the relay will de-energise and the red LED will extinguish to indicate the trip condition. The relay will automatically reset once the monitored voltage rises above the set point plus the differential. When reset, the LED will illuminate and the relay energises. The time delay is not active when resetting.

## Options

250 series protector relays offer various customised options to suit individual requirements. Please consult factory.

- Adjustment ranges – different adjustment ranges are possible for the set point and differential controls.
- Separate auxiliary supply – sometimes required to maintain a time delay.
- Differential – internally fixed value between 1% and 15%.
- Relay operation – standard models are fail safe, but the relays can be customised to energise or de-energise on trip.

## Product Codes

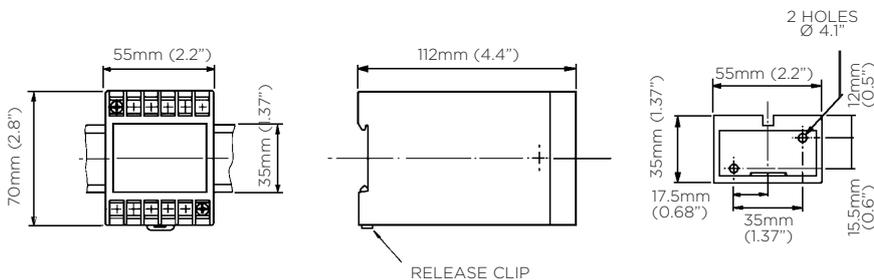
Relay	Protection	ANSI no.	Cat. no.
1-phase	Under-voltage 75-100%	27	252-PVZ
1-phase	Over-voltage 100-125%	59	252-PVH
3-phase 3-wire	Under-voltage 75-100%	27	252-PVJ
3-phase 3-wire	Over-voltage 100-125%	59	252-PVC
3-phase 4-wire	Under-voltage 75-100%	27	252-PVX
3-phase 4-wire	Over-voltage 100-125%	59	252-PVS

Please specify system voltage, frequency and required options at time of ordering.

## Specification - AC Voltage with Adjustable Time Delay

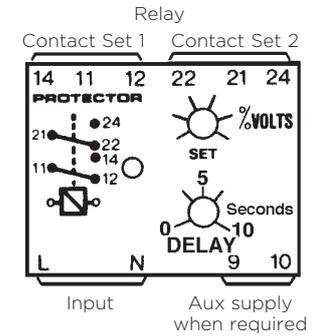
Nominal voltage	100V, 110V, 208V, 240V, 277V, 400V, 415V, 440V or 480V
System frequency	45/65Hz or 360/440Hz
Voltage burden	0.3VA
Overload	1.2 x rating continuously, 1.5 x rating for 10 x seconds
Set point repeatability	>0.5% of full span
Differential (hysteresis)	Pre-set at 1%. Other values 1% to 10% to order
Trip level adjustment	Under-voltage: 75 to 100% Over-voltage: 100 to 125% of nominal input voltage
Time delay	Adjustable up to 10 seconds
AC auxiliary supply voltage	100V, 110V, 120V, 208V, 220V, 240V, 480V, $\pm 20\%$
DC auxiliary supply voltage	12V, 24V, 48V, 110V or 125V, $\pm 20\%$ . Including ripple
Auxiliary voltage burden	4VA (max)
Output relay	2-pole change over
Relay contact rating	AC: 240V 5A, non inductive DC: 24V 5A resistive
Relay mechanical life	0.2 million operations at rated loads
Relay reset	Automatic
Operating temperature	0°C to +60°C (0°C to +40°C for UL models)
Storage temperature	-20°C to +70°C
Temperature co-efficient	0.05% per °C
Interference immunity	Electrical stress surge withstand and non-function to ANSI/IEEE C37 90a
Enclosure style	DIN-rail with wall mounting facility
Material	Flame retardant polycarbonate/ABS
Enclosure integrity	IP50
Dimensions	55mm (2.2") wide x 70mm (2.8") high x 112mm (4.4") deep
Weight	0.4Kg approx.

## Dimensions Model 252

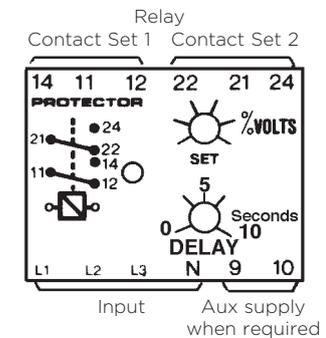


## Connections

### 252-PVZ 252-PVH



### 252-PVX 252-PVS 252-PVC 252-PVJ



**Note:** The neutral connection is always used on four-wire systems.

# 250 Series DIN-rail and Wall Mounted Relays



## Features

- Adjustable set point
- Adjustable differential
- LED trip indication
- Double-pole relay contacts
- Automatic reset

## Benefits

- Over and under-frequency monitoring
- Over and under-speed monitoring
- Start standby generators
- Operation of mains failure units
- Switching standby supplies
- Protection of control gear
- Nuisance tripping avoidance
- Customised options

## Applications

- Marine panels
- Switchgear
- Distribution systems
- Generator sets
- Control panels
- Process control
- Motor protection
- Transformers
- Overload protection

## Frequency

Crompton frequency protectors give continuous surveillance of the monitored circuit. When the frequency moves outside the set point limit for longer than the time delay, the relay will operate giving an alarm control or tripping signal. An illuminated LED indicates when the relay is energised. Since speed is proportional to the frequency, this protector can be used to monitor over and under-speed and to protect mains supplies, computer supplies and standby supplies for industrial, hospital or marine use.

## Operation

Frequency protectors offer user adjustable frequency trip point (set point) and differential (hysteresis) settings. The set point adjustment range is centred around the nominal 50Hz, 60Hz or 400Hz system frequency. The differential setting adjustment can be used to reduce nuisance tripping if the measured signal is noisy or unstable. When the measured frequency moves outside the set point limit, the relay will operate, giving an alarm or initiation signal. As soon as the monitored frequency moves outside of the set point limit, a trip will occur. The units draw their operating power from the measuring inputs. Combined units offer under and over-frequency trips in one compact unit. Single function units are also available.

## Over-Frequency Models

When the monitored frequency exceeds the set point, the relay will energise and the red LED will illuminate to indicate the trip condition. The relay will automatically reset once the monitored frequency falls below the set point minus the differential. When reset, the LED will extinguish and the relay de-energises.

## Under-Frequency Models

When the monitored frequency falls below the set point, the relay will de-energise and the red LED will extinguish to indicate the trip condition. The relay will automatically reset once the monitored frequency rises above the set point plus the differential. When reset, the LED will illuminate and the relay energises.

## Options

250 series protector relays offer various customised options to suit individual requirements. Please consult factory.

- Adjustment ranges – different adjustment ranges are possible for the set point and differential controls.
- Time delay – internal fixed time delay before a trip occurs.
- Relay operation – standard models are fail safe, but the relays can be customised to energise or de-energise on trip.

## Product Codes

Relay	Protection	ANSI no.	Cat. no.
1-phase	Under-frequency	81U	252-PHU
1-phase	Over-frequency	81O	252-PHO
1-phase	Under and over frequency	81O/U	253-PHD

Please specify system voltage, frequency and required options at time of ordering.

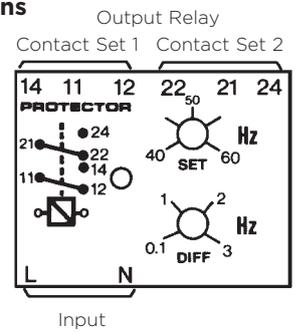
## Specification - Frequency

Nominal voltage	100V, 110V, 120V, 208V, 220V, 230V, 240V, 277V, 380V, 400V, 415V, 440V or 480V ±20%
System frequency	40/60Hz, 50/70Hz or 360/440Hz
Voltage burden	3VA
Overloads	1.2 x rating continuously, 1.5 x rating for 10 x seconds
Set point repeatability	>0.5% of full span
Differential (hysteresis)	40/60Hz, 50/70Hz: Adjustable 0.1 to 3.0Hz 360/440Hz: Adjustable 10 to 30Hz
Output relay	2-pole change over
Relay contact rating	AC: 240V 5A, non inductive DC: 24V 5A resistive
Relay mechanical life	0.2 million operations at rated loads
Relay reset	Automatic
Operating temperature	0°C to +60°C (0°C to +40°C for UL models)
Storage temperature	-20°C to +70°C
Temperature co-efficient	0.05% per °C
Interference immunity	Electrical stress surge withstand and non-function to ANSI/IEEE C37 90a
Enclosure style	DIN-rail with wall mounting facility
Material	Flame retardant polycarbonate/ABS
Enclosure integrity	IP50
Model 252 dimensions	55mm (2.2") wide x 70mm (2.8") high x 112mm (4.4") deep
Model 253 dimensions	75mm (2.9") wide x 70mm (2.8") high x 112mm (4.4") deep
Weight	Model 252: 0.4Kg approx. Model 253: 0.6Kg approx.

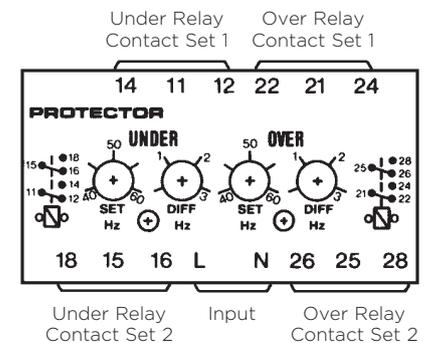


## Connections

**252-PHU**  
**252-PHO**

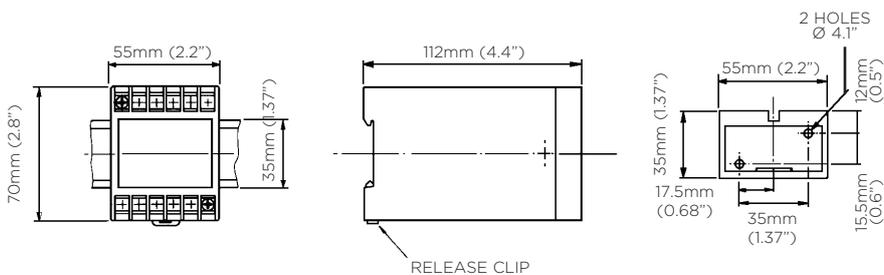


**253-PHD**

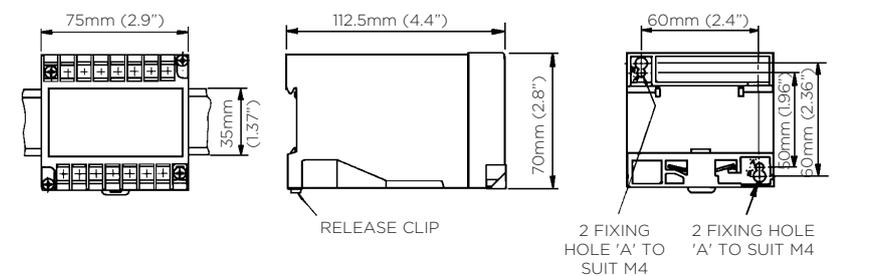


## Dimensions

### Model 252



### Model 253



# 250 Series DIN-rail and Wall Mounted Relays



## Features

- Adjustable set point
- Adjustable time delay
- Internal differential
- LED trip indication
- Double-pole relay contacts
- Automatic reset

## Benefits

- Over and under-voltage monitoring
- Over and under-speed monitoring
- Start standby generators
- Operation of mains failure units
- Switching standby supplies
- Monitors genset AVR and excitation systems
- Nuisance tripping avoidance
- Customised options

## Applications

- Switchgear
- Distribution systems
- Generator sets
- Control panels
- Process control
- Motor protection
- Transformers
- Overload protection

## Combined Under/Over-Voltage and Frequency

The 250 series combined voltage and frequency protectors provide continuous surveillance of the monitored circuit. When the voltage or frequency moves outside the set point limit for longer than the time delay, the respective relay will operate giving an alarm, control or tripping signal. An illuminated LED indicates when the relay is energised. This protector can be used to protect against over and under-speed and over and under-voltage.

## Operation

Combined voltage and frequency protectors provide the most popular relay functions in one convenient package. The products offer user adjustable trip point (set point) for voltage and frequency, plus adjustable time delay settings. 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 over-voltage. The frequency set point adjustment range is centred around the nominal 50Hz, 60Hz or 400Hz system frequency. The time delay setting adjustment range is typically 0 to 10 seconds, although longer delays are available.

As soon as the monitored signal moves outside of the set point limit, the time delay is activated, after which a trip will occur. The time delay prevents the relay from tripping for a predetermined period to prevent nuisance tripping. The products also feature an internal differential (hysteresis) setting of 1% to reduce nuisance tripping if the measured signal is noisy or unstable. The product is available for single-phase systems only and draws its operating power from the measuring input.

## Over-Voltage and Frequency

When the monitored value exceeds the set point and the time delay has elapsed, the relay will energise and the red LED will illuminate to indicate the trip condition.

## Under-Voltage and Frequency

The relay will de-energise after the time delay has elapsed and the red LED will extinguish to indicate the trip condition.

## Options

250 series protector relays offer various customised options to suit individual requirements. Please consult factory.

- Adjustment ranges - different adjustment ranges are possible for the set point and time delay controls.
- Differential - internally fixed value between 1% and 15%.
- Relay operation - standard models are fail safe, but the relays can be customised to energise or de-energise on trip.

## Product Codes

Relay	Protection	ANSI no.	Cat. no.
1-phase	Over and under-voltage, over and under-frequency	27/59, 81O/U	256-PHV

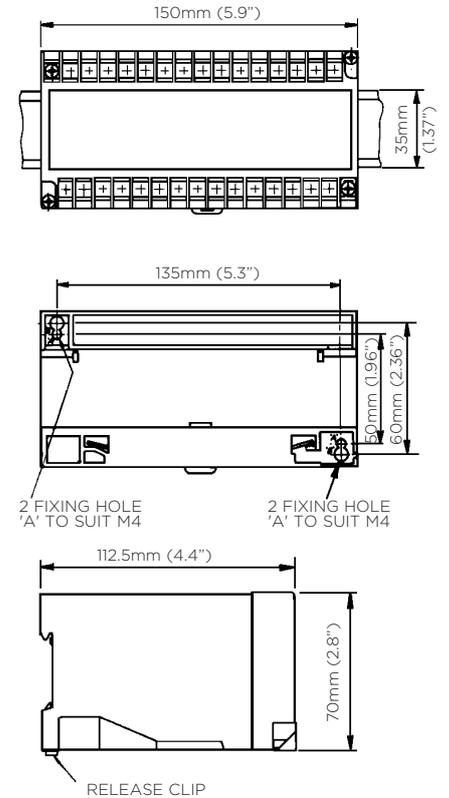
Please specify system voltage, frequency and required options at time of ordering.

## Specification - Combined Under/Over and Frequency

Nominal voltage	100V, 110V, 120V, 208V, 220V, 270V, 280V, 400V, 415V or 440V
System frequency	40/60Hz, 50/70Hz or 360/440Hz
Frequency differential	Pre-set at 0.1Hz (10Hz for 400Hz unit)
Voltage burden	3VA
Overloads	1.2 x rating continuously, 1.5 x rating for 10 x seconds
Set point repeatability	>0.5% of full span
Differential (hysteresis)	Fixed internally at 1%
Trip level adjustment	Over-voltage: 100 to 125% Under-voltage: 75 to 100% of nominal input voltage
Time delay	Adjustable 1 to 30 seconds
Output relay	4 independent 2-pole change over
Relay contact rating	AC: 240V 5A non inductive DC: 24V 5A resistive
Relay mechanical life	0.2 million operations at rated loads
Relay reset	Automatic
Operating temperature	0°C to +60°C (0°C to +40°C for UL models)
Storage temperature	-20°C to +70°C
Temperature co-efficient	0.05% per °C
Interference immunity	Electrical stress surge withstand and non-function to ANSI/IEEE C37 90a
Enclosure style	DIN-rail with wall mounting facility
Material	Flame retardant polycarbonate/ABS
Enclosure integrity	IP50
Dimensions	150mm (5.9") wide x 70mm (2.8") high x 112mm (4.4") deep
Weight	1.0Kg approx.

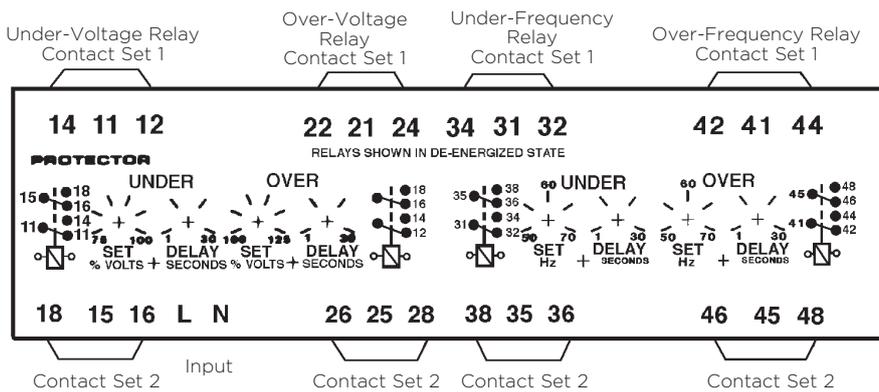
## Dimensions

### Model 256



## Connections

### 256-PHV



# 250 Series DIN-rail and Wall Mounted Relays



## Phase Sequence and Phase Failure

The Crompton phase sequence and phase failure protector relays are designed to monitor the correct phase rotation or sequence of three-phase, three or four-wire supply systems and provide protection against incorrect phase sequence, loss of one phase and under-voltage.

## Operation

Rotating machines are particularly vulnerable to incorrect phase sequence. Three-phase motors can rotate in the wrong direction, potentially leading to physical damage or the risk of injury to personnel, yet voltage and current readings may 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 cannot tolerate reverse rotation or pose significant risk to personnel under this condition should be individually protected with this relay. The possibility of incorrect supply connection is much more likely in portable equipment or marine applications.

The phase sequence and phase failure protectors continuously monitor the three-phase supply. With the correct phase sequence applied, the front panel LED will illuminate and the output relay will be energised. An incorrect sequence or missing phase will de-energise the relay and the LED will be extinguished. If the supply drops below 85% of its nominal voltage, this condition 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 the open phase is less than 70% of the nominal supply voltage. If there is the possibility of a higher regenerated voltage, the phase balance relay 252-PSF should be used.

## Features

- Three-phase, three or four-wire
- LED trip indication
- Double-pole relay contacts
- Automatic reset

## Benefits

- Monitoring of correct phase rotation
- Protection against incorrect phase sequence and loss of phase
- Under-voltage monitoring
- Prevents reverse rotation of motor driven equipment
- Ensures correct engine rotation
- Protects portable electrical equipment

## Applications

- Marine panels
- Switchgear
- Distribution systems
- Generator sets
- Control panels
- Process control
- Motor protection
- Transformers
- Overload protection

## Product Codes

Relay	Protection	ANSI no.	Cat. no.
3-phase 3- or 4-wire	Phase sequence, under-voltage 85%	47	252-PVR

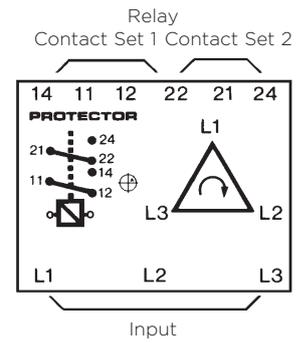
Please specify system voltage, frequency and required options at time of ordering.

## Specification - Phase Sequence and Phase Failure

Nominal voltage	110V, 120V, 208V, 220V, 230V, 240V, 277V, 380V, 400V, 415V, 440V or 480V
Nominal frequency	50, 60 or 400Hz
Voltage burden	3VA approx.
Overload	1.2 x rating continuously, 1.5 x rating for 10 x seconds to symmetric
Trip level adjustment	Pre-set at 85% of nominal
Auxiliary voltage burden	4VA (max)
Output relay	2-pole change over
Relay contact rating	AC: 240V 5A, non inductive DC: 24V 5A resistive
Relay mechanical life	0.2 million operations at rated loads
Relay reset	Automatic
Operating temperature	0°C to +60°C (0°C to +40°C for UL models)
Storage temperature	-20°C to +70°C
Temperature co-efficient	0.05% per °C
Interference immunity	Electrical stress surge withstand and non-function to ANSI/IEEE C37 90a
Enclosure style	DIN-rail with wall mounting facility
Material	Flame retardant polycarbonate/ABS
Enclosure integrity	IP50
Model 252 dimensions	55mm (2.2") wide x 70mm (2.8") high x 112mm (4.4") deep
Weight	0.4Kg approx.

## Connections

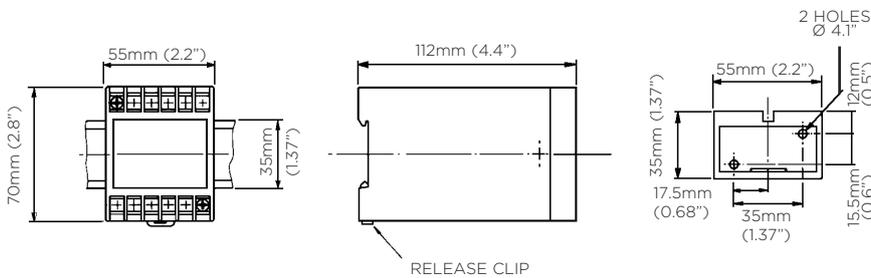
### 252-PVR



**Note:** No neutral connection is required.

## Dimensions

### Model 252



# 250 Series DIN-rail and Wall Mounted Relays



## Phase Balance

The 250 series phase balance protector module provides continuous surveillance of a three-phase, three- or four-wire system and monitors the correct phase rotation or sequence of three-phase supply systems. The module protects against phase loss, reversal or sequence, phase unbalance and system under-voltage.

## Operation

Rotating machines are particularly vulnerable to incorrect phase sequence. Three-phase motors can rotate in the wrong direction, potentially leading to physical damage or the risk of injury to personnel, yet voltage and current readings may 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. This relay has the added advantage that it will detect the phantom or regenerated phase that can be caused by a single-phase failure on some equipment or when running motors at low load levels.

An unbalanced supply voltage can lead to temperature rises in motors. An unbalanced voltage as little as 10% can increase operating temperature to 150% of normal. 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 cannot tolerate reverse rotation or pose significant risk to personnel under this condition should be individually protected with this relay. The possibility of incorrect supply connection is much more likely in portable equipment or marine applications.

The protector continuously monitors the three-phase supply. With the correct phase sequence applied and all three voltages balanced within the required limits, the front panel LED will illuminate and the output relay will be energised. An incorrect sequence, missing phase, out of balance or under-voltage condition will de-energise the relay and the LED will be extinguished.

The set point control allows adjustment of the voltage matching between 5% and 15%. The time delay function operates only for the voltage unbalance condition. The delay can be used to prevent nuisance tripping due to short term unbalance situations. Incorrect phase rotation, a missing phase or an under-voltage condition trip the relay immediately.

## Product Codes

Relay	Protection	ANSI no.	Cat. no.
3-phase 3- or 4-wire	Phase loss and unbalance 5-15%	47	252-PSF
3-phase 3- or 4-wire	Phase loss, unbalance and under-voltage 5-15%	47/27	252-PSG

Please specify system voltage, frequency and required options at time of ordering.

## Features

- Three-phase, three or four-wire
- Adjustable set point
- Adjustable time delay
- Internal differential
- LED trip indication
- Double-pole relay contacts
- Automatic reset

## Benefits

- Monitoring of correct phase rotation
- Protects against phantom or regenerated phase voltage
- Protection against phase loss, reversal or sequence
- Under-voltage and unbalanced voltage monitoring
- Prevents reverse rotation of motor driven equipment
- Ensures correct engine rotation
- Protects portable electrical equipment
- Nuisance tripping avoidance

## Applications

- Marine panels
- Switchgear
- Distribution systems
- Generator sets
- Control panels
- Process control
- Motor protection
- Transformers
- Overload protection



# 250 Series DIN-rail and Wall Mounted Relays



## Reverse Power (current)

The reverse power protector provides continuous surveillance for ac generators operating in parallel or for boosting mains supplies. On site adjustment of the trip point and time delay ensures accurate protection against 'motoring' in the event of engine failure and prevents tripping from surges during synchronising.

## Operation

Reverse power protectors provide 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 point between 2% and 20% of nominal power and time delay adjustment range of 0 to 20 seconds.

As soon as the reverse power level increases above the set point limit, the time delay is activated, after which a trip will occur. The time delay prevents the relay from tripping for a predetermined period to prevent nuisance tripping. The products also feature an internal differential (hysteresis) setting of 1% to reduce nuisance tripping if the measured signal is noisy or unstable. These units are powered from the measuring supply.

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, the time delay is started. When the time has elapsed, the relay will energise and the red LED will illuminate to indicate the trip condition. The relay will automatically re-set once the power level falls below the set point minus the differential. The LED will extinguish and the relay de-energises.

The time delay is not active when resetting. The reverse power level will trip as expected at the calibrated point for unity power factor. However, the system power factor does affect the trip point calibration. The relay becomes more sensitive at lagging power factors, as almost all systems exhibit inductance. At leading power factors, this relay is less sensitive.

## Setting Up

The '% set' potentiometer trimmer on the front label is calibrated as a percentage of the input current rating e.g. of 5A and not of the forward kW. Adjust the '% set' trimmer to the required tripping value, 7.5% to 10% is normal. Setting accuracy can be checked by reversing the current lead connections and, with forward power, measuring the trip point value on a suitable ammeter (reconnect leads on completion). Adjust the 'Delay' to the required time delay, 10 seconds is normally adequate.

## Options

250 series protector relays offer various customised options to suit individual requirements. Please consult factory.

- Adjustment ranges - different adjustment ranges are possible for the set point and time delay controls.
- Relay operation - standard models are fail safe, but the relays can be customised to de-energise on trip.

## Product Codes

Relay	Protection	ANSI no.	Cat. no.
1-phase or 3-phase 4-wire	Reverse power 2 - 20%	32	256-PAS
1-phase or 3-phase 4-wire. Push to test	Reverse power 2 - 20%	32	256-PAQ
3-phase 3-wire Push to test	Reverse power 2 - 20%	32	256-PAR
3-phase 3-wire	Reverse power 2 - 20%	32	256-PAT

Please specify system voltage, frequency and required options at time of ordering.

## Features

- Three-phase, three or four-wire
- Adjustable set point
- Adjustable time delay
- Internal differential
- LED trip indication
- Double-pole relay contacts
- Automatic reset

## Benefits

- Current and power factor measurement
- Protects generators against 'motoring'
- Detects reverse power under fault conditions
- Customised options
- Nuisance tripping avoidance

## Applications

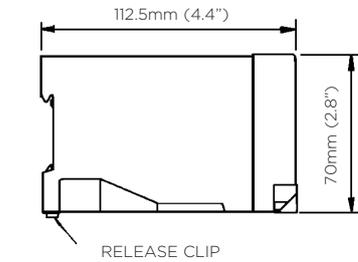
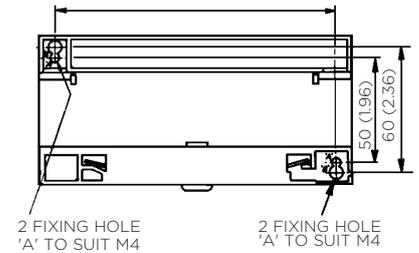
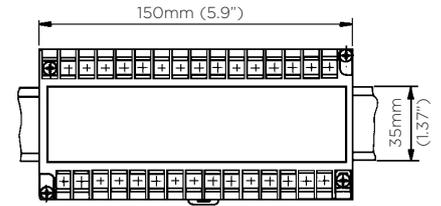
- Marine panels
- Switchgear
- Distribution systems
- Generator sets
- Control panels
- Process control
- Motor protection
- Transformers
- Overload protection

## Specification - Reverse Power (Current)

Nominal voltage	100V, 110V, 120V, 220V, 230V, 240V, 277V, 380V, 400V, 415V, 440V or 480V
Nominal current	5A or 2, 3, 4, 6, 8 and 10A
System frequency	50, 60 or 400Hz
Burden	Voltage: 3VA maximum Current: 2VA maximum
Current overload	2 x rating continuously, 10 x rating for 3 seconds
Voltage overload	1.2 x rating continuously, 1.5 x rating for 10 seconds
Monitoring range capacitive	Power factor: 0.5 inductive/unity/0.2
Set point repeatability	>0.5% of full span
Differential (hysteresis)	Pre-set at 1%
Trip level adjustment	2 to 20%. Customised adjustment available
Time delay adjustable	0 to 20 seconds
Output relay	2-pole change over
Relay contact rating	AC: 240V 5A, non inductive DC: 24V 5A resistive
Relay mechanical life	0.2 million operations at rated loads
Relay reset	Automatic
Operating temperature	0°C to +60°C (0°C to +40°C for UL models)
Storage temperature	-20°C to +70°C
Temperature co-efficient	0.05% per °C
Interference immunity	Electrical stress surge withstand and non-function to ANSI/IEEE C37 90a
Enclosure style	DIN-rail with wall mounting facility
Material	Flame retardant polycarbonate/ABS
Enclosure integrity	IP50
Dimensions	150mm (5.9") wide x 70mm (2.8") high x 112mm (4.4") deep
Weight	1.0Kg approx.

## Dimensions

### Model 256



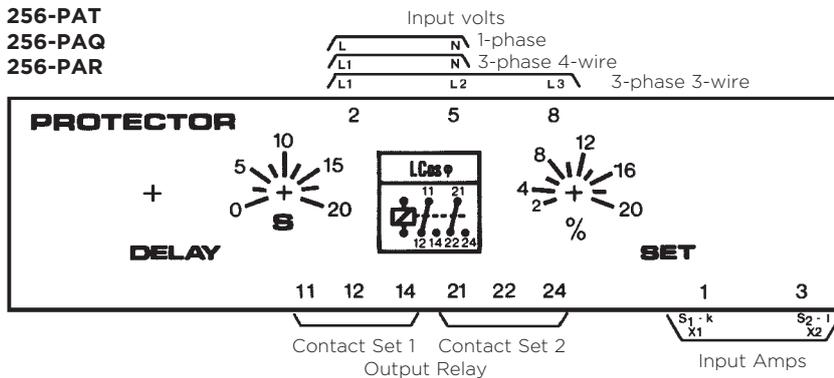
## Connections

256-PAS

256-PAT

256-PAQ

256-PAR



**Note:** Only one CT connection is required, from the same phase as the voltage connection to terminal 2.

# 250 Series DIN-rail and Wall Mounted Relays

## Synchro-Check (parallelling)

The synchro-check relay can be used to assist in the semi-automatic parallelling of two ac power systems. The volt-free relay contacts change state when the voltage level, phase relationship and frequency are within the selected synchronising limits. Connecting two electrical systems that are not closely matched can cause expensive damage and disturbance to the electrical system. Using this relay will ensure that damage will not occur.

## Operation

As part of a manual control system, the operator will make adjustments to the 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 the two systems are closely matched before permitting the breaker to close. As part of an automatic synchronising arrangement, this relay can be used as an independent backup or checking device to ensure the two systems are suitably matched before the breaker can close.

## Model 256-PLL

The relay continuously monitors the voltage, phase displacement and frequency of two supplies. A single set point adjustment permits selection of suitable matching and a red LED illuminates when the relay is energised, indicating that the two supplies are well matched and it is safe to close the breaker.

## Model 256-PLD

This version operates in the same way as model 256-PLL but includes an additional 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 bus voltage will cause the relay to energise.

## Product Codes

Relay	Protection	ANSI no.	Cat. no.
1-phase, or 3-phase 3- or 4-wire	Phase angle and voltage	25	256-PLL
1-phase, or 3-phase 3- or 4-wire	Phase angle and voltage Dead bus	25	256-PLD

Please specify system voltage, frequency and required options at time of ordering.



## Features

- Single-phase or three-phase, three or four-wire
- Live and dead bus versions
- Adjustable set point
- LED trip indication
- Volt free relay contacts

## Benefits

- Monitors voltage phase displacement and frequency of 2 supplies
- Frequency matching
- Voltage matching
- Phase angle matching
- Synchronisation of Gen-Bus and Bus-Bus
- Monitors auto synchronising systems
- Assists in manual synchronisation

## Applications

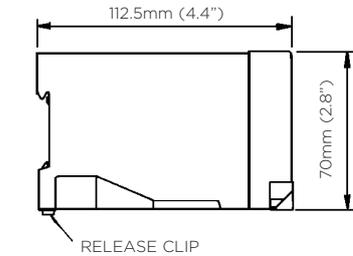
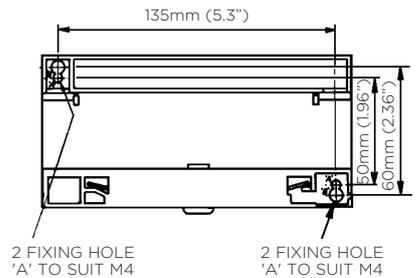
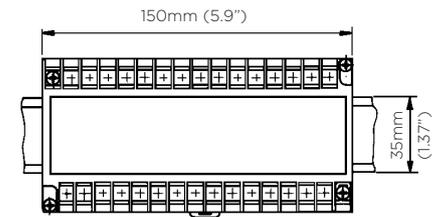
- Marine panels
- Switchgear
- Distribution systems
- Generator sets
- Co-generation
- Control panels

## Specification - Synchro-Check (paralleling)

Nominal voltage	100V, 110V, 120V, 208V, 220V, 230V, 240V, 277V, 380V, 400V, 415V, 440V or 480V
System frequency	45, 50, 55, 60 or 65Hz
Burden	Bus: 2VA Generator: 4VA
Overload	-25 to +30% of the nominal voltage
Set point repeatability	>0.5% of full span
Differential (hysteresis)	Pre-set at 1%. Values 1 to 10% available on request
Trip level	10 to 30% of the nominal voltage 6° to 20° electrical adjustment
Output relay	1 pair NO (normally open), 1 pair NC (normally closed) 2 pair NO and 2 pair NC available on request
Relay contact rating	AC: 240V 5A non inductive DC: 24V 5A resistive
Relay mechanical life	0.2 million operations at rated loads
Relay reset	Automatic
Operating temperature	0°C to +60°C (0°C to +40°C for UL models)
Storage temperature	-20°C to +70°C
Temperature co-efficient	0.05% per °C
Interference immunity	Electrical stress surge withstand and non-function to ANSI/IEEE C37 90a
Enclosure style	DIN-rail with wall mounting facility
Material	Flame retardant polycarbonate/ABS
Enclosure integrity	IP50
Dimensions	150mm (5.9") wide x 70mm (2.8") high x 112mm (4.4") deep
Weight	1.0Kg approx.

## Dimensions

### Model 256

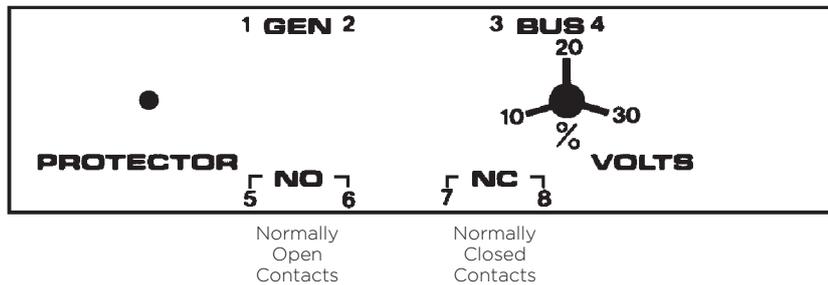


## Connections

### 256-PLL

### 256-PLD

System	Generator Connections	Busbar Connections
3-phase 4-wire	1 2 L1 N	3 4 L1 N
3-phase 3-wire	L1 L2	L1 L2
1-phase 2-wire	L1 N	L1 N



# 250 Series DIN-rail and Wall Mounted Relays

## DC Voltage

DC voltage protectors provide continuous surveillance of the monitored voltage circuit, typically a battery supply or charging circuit. When the measured voltage moves outside the set point limits, the relay will operate after the selected time delay or differential, giving an alarm and/or initiation signal. The protectors offer protection for under-voltage, over-voltage and battery level control.

## Operation

DC voltage protectors offer user adjustable trip point (set point) and time delay settings. The time delay setting adjustment range is typically 0 to 10 seconds, although longer delays up to 30 seconds are available. As soon as the monitored signal moves outside of the set point limit, the time delay is activated, after which a trip will occur. The time delay prevents the relay from tripping for a predetermined period to prevent nuisance tripping. The products also feature an internal differential (hysteresis) setting of 1% to reduce nuisance tripping if the measured signal is noisy or unstable. The units draw their operating power from the measuring inputs.

## Over-Voltage Models

When the monitored voltage exceeds the set point, the time delay is started. When the time has elapsed, the relay will energise and the red LED will illuminate to indicate the trip condition. The relay will automatically reset once the monitored voltage falls below the set point minus the differential. When reset, the LED will extinguish and the relay de-energises. The time delay is not active when resetting.

## Under-Voltage Models

When the monitored voltage falls below the set point, the time delay is started. When the time has elapsed, the relay will de-energise and the red LED will extinguish to indicate the trip condition. The relay will automatically reset once the monitored voltage rises above the set point plus the differential. When reset, the LED will illuminate and the relay energises. The time delay is not active when resetting.

## Options

250 series protector relays offer various customised options to suit individual requirements. Please consult factory.

- Adjustment ranges - different adjustment ranges are possible for the set point and time delay controls.
- Differential - internally fixed value between 1% and 15%.
- Relay operation - standard models are fail safe, but the relays can be customised to energise or de-energise on trip.

## Product Codes

Relay	Protection	ANSI no.	Cat. no.
DC voltage	Under-voltage external time delay	27	252-PDU
DC voltage	Under-voltage differential	27	252-PDE
DC voltage	Over-voltage external time delay	59	252-PDO
DC voltage	Over and under-voltage external time delay	27/59	253-PDC

Please specify system voltage, frequency and required options at time of ordering.



## Features

- Adjustable set point
- Adjustable time delay
- Internal differential
- LED trip indication
- Automatic reset
- Double-pole relay contacts

## Benefits

- Over and under-voltage monitoring
- Monitors correct terminal voltage on battery supplies
- Monitors charging voltage on battery chargers
- Battery level control
- Nuisance tripping avoidance
- Customised options

## Applications

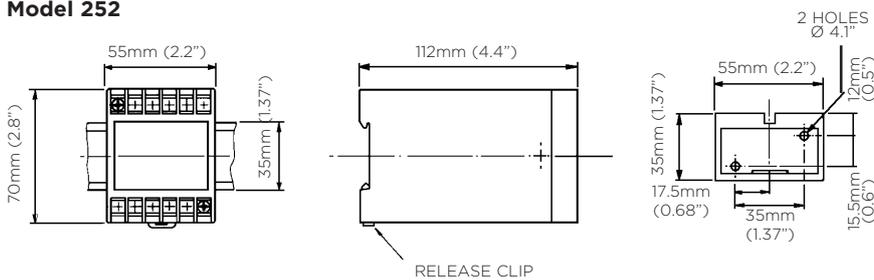
- Marine panels
- Switchgear
- Distribution systems
- Generator sets
- Control panels
- Process control
- Overload protection

## Specification - DC Voltage

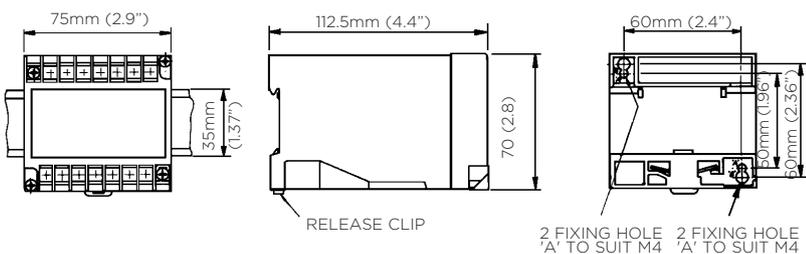
Nominal voltage	18 to 20V dc or 20 to 32V dc
Voltage burden	<3VA
Overload	1.2 x rating continuously
Set point repeatability	>0.5% of full span
Differential (hysteresis)	Models 252-PDU, 252-PDO and 253-PDC: Pre-set at 1% Values 1 to 15% available on request Model 252-PDE: Adjustable 1 to 15%
Time delay adjustment	Models 252-PDU, 252-PDO & 253-PDC: 0-10, 0-20, 0-30 seconds Model 252-PDE: Factory pre-set up to 30 seconds.
AC auxiliary supply voltage	100V, 110V, 120V, 208V, 220V, 240V, 480V, $\pm 20\%$
DC auxiliary supply voltage	12V, 24V, 48V, 110V or 125V, $\pm 20\%$ . Including ripple
Auxiliary voltage burden	4VA (max)
Output relay	2-pole change over
Relay contact rating	AC: 240V 5A non inductive DC: 24V, 5A resistive
Relay mechanical life	0.2 million operations at rated loads
Relay reset	Automatic
Operating temperature	0°C to +60°C (0°C to +40°C for UL models)
Storage temperature	-20°C to +70°C
Temperature co-efficient	0.05% per °C
Interference immunity	Electrical stress surge withstand and non-function to ANSI/IEEE C37 90a
Enclosure style	DIN-rail with wall mounting facility
Material	Flame retardant polycarbonate/ABS
Enclosure integrity	IP50
Model 252 dimensions	55mm (2.2") wide x 70mm (2.8") high x 112mm (4.4") deep
Model 253 dimensions	75mm (2.9") wide x 70mm (2.8") high x 112mm (4.4") deep
Weight	Model 252: 0.4Kg approx. Model 253: 0.6Kg approx.

## Dimensions

### Model 252

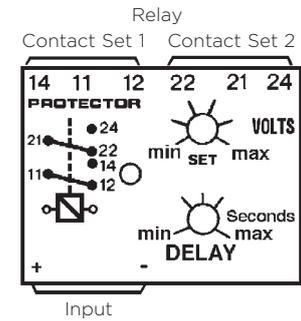


### Model 253

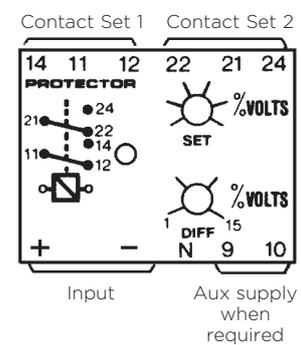


## Connections

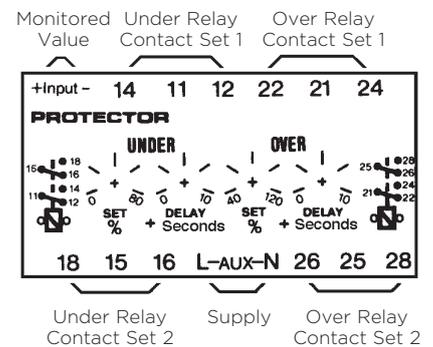
### 252-PDU 252-PDO



### 252-PDE



### 253-PDC



# 250 Series DIN-rail and Wall Mounted Relays



### Features

- Trip range 2500 to 3500 ohms
- Reset range 1500 to 2300 ohms
- LED trip indication
- Automatic or manual reset options
- Double-pole relay contacts

### Benefits

- High temperature protection
- Sustained overload protection
- Single phasing protection
- Locked rotor protection
- Blocked ventilation protection

### Applications

- Switchgear
- Distribution systems
- Generator sets
- Control panels
- Process control
- Motor protection
- Transformers
- Overload protection

### Thermistor Trip

Many motors, transformers and generators are fitted with positive temperature co-efficient thermistor temperature sensors. The addition of a thermistor trip relay will provide full protection against sustained overload, single phasing, locked rotor, blocked ventilation and high ambient temperature. Thermistor trip relays continuously monitor the working temperature inside electrical equipment. When the temperature exceeds a safe limit, the relay can be used to shut down equipment until it regains a safe operating temperature.

### Operation

Thermistors are simple low cost temperature sensors. The thermistor trip protector operates by de-energising a relay when the thermistors detect a critical temperature condition. An illuminated green LED indicates when the temperature is within normal working limits. Any number of thermistors may be used in series connection providing the resistance at normal working temperature is less than 1500 ohms.

There are no user adjustments on this relay.

Model 252-PMT will automatically reset when temperature returns to normal. For model 252-PMM, fitting a link between terminals R1 and R2 will latch the product in its tripped state when an over-temperature condition is detected. The relay can be reset by pressing the front panel reset switch, opening the R1-R2 link, or interrupting the auxiliary supply.

### Product Codes

Relay	Protection	ANSI no.	Cat. no.
PTC thermistors	Over-temperature, manual reset	49	252-PMM
PTC thermistors	Over-temperature, automatic reset	49	252-PMT

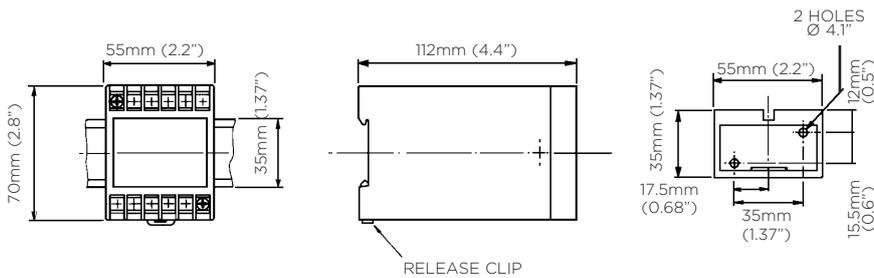
Please specify system voltage, frequency and required options at time of ordering.

## Specification - Thermistor Trip

Nominal voltage	110V, 120V, 220V, 230V or 240V ac $\pm 20\%$
Input	Positive temperature coefficient thermistors (series connected 1500 $\Omega$ at normal temperature)
System frequency	50/60Hz
Voltage burden	2VA approx.
Overload	1.2 x rating continuously
Trip level	2500 to 3500 $\Omega$ reset 1500 to 2300 $\Omega$
AC auxiliary supply voltage	100V, 110V, 120V, 208V, 220V, 240V, 480V, $\pm 20\%$
DC auxiliary supply voltage	12V, 24V, 48V, 110V or 125V, $\pm 20\%$ . Including ripple
Auxiliary voltage burden	4VA (max)
Output relay	2-pole change over
Relay contact rating	AC: 240V 5A non inductive DC: 24V, 5A resistive
Relay mechanical life	0.2 million operations at rated loads
Relay reset	Model 252-PMT: Automatic Model 252-PMM: Manual
Operating temperature	0°C to +60°C (0°C to +40°C for UL models)
Storage temperature	-20°C to +70°C
Temperature co-efficient	0.05% per °C
Interference immunity	Electrical stress surge withstand and non-function to ANSI/IEEE C37 90a
Enclosure style	DIN-rail with wall mounting facility
Material	Flame retardant polycarbonate/ABS
Enclosure integrity	IP50
Model 252 dimensions	55mm (2.2") wide x 70mm (2.8") high x 112mm (4.4") deep
Weight	0.4Kg approx.

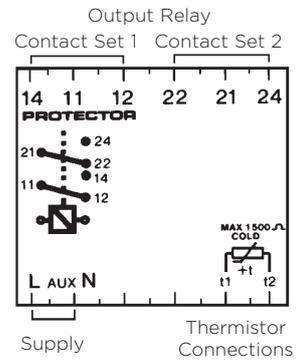
## Dimensions

### Model 252

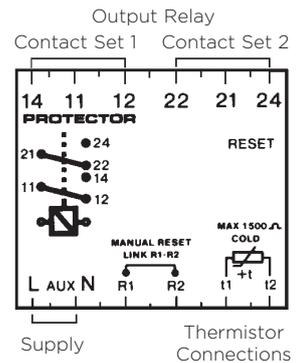


## Connections

### 252-PMT



### 252-PMM



# 250 Series DIN-rail and Wall Mounted Relays

## Hot Spot 3 Temperature Relay

The Hot Spot 3 relay accepts up to three inputs from resistance temperature detectors (RTD) and provides up to three user adjustable trip points which can be used to initiate alarms, cooling systems or shutdown. The relay is ideally suited for the protection of electric motor windings, transformers, generator windings and bearing temperature. The analogue output can be used for remote monitoring of high temperatures.

### Operation

RTD temperature sensors are often fitted inside electric motors to detect hot spots in the windings or the bearings. RTD sensors are popular because they offer a good accuracy for a reasonable price. The same sensors can be used inside transformers, generator sets, gas turbines or as part of a process control system. Hot spots can be caused by many conditions such as overloads, over-voltage, unbalanced supply, worn bearings, ineffective cooling, poor ventilation, shorted turns, insulation breakdown, single phasing etc..

The Hot Spot 3 protector continuously monitors the three RTD temperature sensors and offers up to three user adjustable set points and relay contacts. These can be used to raise alarms, switch on cooling systems or shut down the affected equipment. The highest temperature is indicated with a yellow LED and can be accurately measured or remotely displayed using the 0/1mA analogue output signal.

The temperature is compared with the user adjustable set points. When the measured temperature exceeds the set point, the relay will de-energise and a red LED will illuminate to indicate the trip condition. When the temperature drops below the set point, the relay will reset to the energised condition and the LED will extinguish. The range consists of three product models which offers one, two or three adjustable set points.

### Product Codes

Relay	Protection	ANSI no.	Cat. no.
3 RTD inputs	3 set points	49	256-PRA
3 RTD inputs	2 set points	49	256-PRB
3 RTD inputs	1 set point	49	256-PRC

When ordering please supply the following information:

- System voltage, frequency and required options.
- The type of temperature sensor being used, e.g. Platinum PT100.
- The maximum temperature or meter scale, e.g. 100% = 1mA = 150°C.
- The set point adjustment range, e.g. 0°C to 150°C.



### Features

- Up to three RTD inputs
- 1mA analogue output
- Three adjustable set points
- Internal differential
- LED trip indication
- Automatic reset
- Three single-pole relay contacts

### Benefits

- Temperature monitoring
- Unbalanced supply protection
- Sustained overload protection
- Single-phasing protection
- Blocked ventilation protection
- Protection against ineffective cooling
- Protection of bearing temperature

### Applications

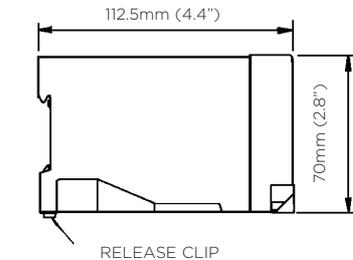
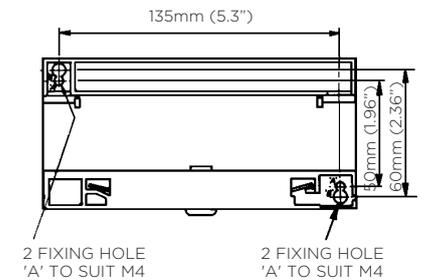
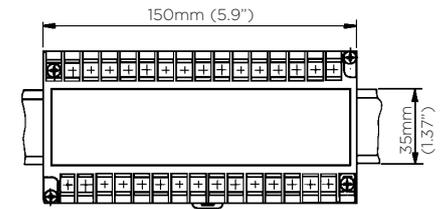
- Switchgear
- Distribution systems
- Generator sets
- Control panels
- Process control
- Motor monitoring
- Transformers
- Overload protection

## Specification - Hot Spot 3 Temperature Relay

Input	Up to 3 resistance temperature detectors (RTD). Either 10Ω copper or 100Ω platinum minimum span 100°C
Nominal voltage	AC: 110V, 120V, 220V, 230V, or 240V ±20% DC: Consult factory
System frequency	50/60Hz
Overload	1.2 x rating continuously
Set point repeatability	0.5% of full span
Differential (hysteresis)	Pre-set at 2% of range
AC auxiliary supply voltage	100V, 110V, 120V, 208V, 220V, 240V, 480V, ±20%
DC auxiliary supply voltage	12V, 24V, 48V, 110V or 125V, ±20%. Including ripple
Auxiliary voltage burden	4VA (max)
Analogue output	1mA into 0/4kΩ load
Output relay	1-pole change over
Relay contact rating	AC: 240V 5A, non inductive DC: 24V 5A resistive
Relay mechanical life	0.2 million operations at rated loads
Relay reset	Automatic
Operating temperature	0°C to +60°C (0°C to +40°C for UL models)
Storage temperature	-20°C to +70°C
Temperature co-efficient	0.05% per °C
Interference immunity	Electrical stress surge withstand and non-function to ANSI/IEEE C37 90a
Enclosure style	DIN-rail with wall mounting facility
Material	Flame retardant polycarbonate/ABS
Enclosure integrity	IP50
Dimensions	150mm (5.9") wide x 70mm (2.8") high x 112mm (4.4") deep
Weight	1.0Kg approx.

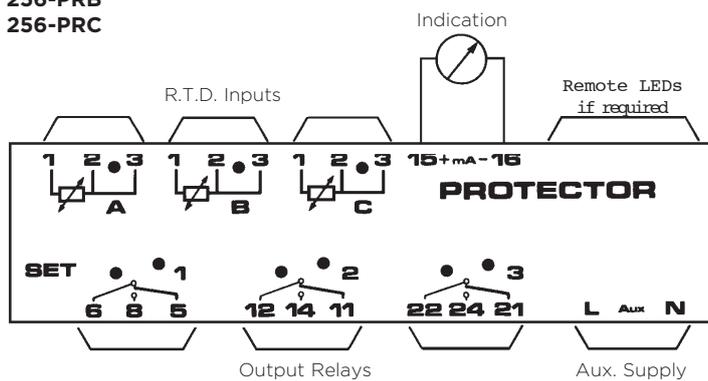
## Dimensions

### Model 256



## Connections

256-PRA  
256-PRB  
256-PRC



# 250 Series DIN-rail and Wall Mounted Relays

## Hot Spot 6 Temperature Relay

The Hot Spot 6 protector is a temperature trip relay accepting up to six inputs from resistance temperature detector (RTD) elements and provides one user adjustable trip point which can be used to initiate alarms, cooling or shutdown when the monitored temperature exceeds the set limit. The relay is ideally suited for the protection of electric motor windings, transformers, generator windings and bearing temperature.

### Operation

RTD temperature sensors are often fitted inside electric motors to detect hot spots in the windings or bearings. RTD sensors are popular because they offer a good accuracy for a reasonable price. The same sensors can be used inside transformers, generator sets, gas turbines or as part of a process control system. Hot spots can be caused by many conditions such as overloads, over-voltage, unbalanced supply, worn bearings, ineffective cooling, poor ventilation, shorted turns, insulation breakdown, single phasing etc.

The Hot Spot 6 protector continuously monitors the six RTD temperature sensors and offers a user adjustable set point and relay contacts. This can be used to raise alarms, switch on cooling systems or shut down the affected equipment. The temperature is compared with the user adjustable set point. There is a red alarm indicator associated with each temperature sensor. When the measured temperature exceeds the set point on one or more inputs the red alarm indicators associated with temperature sensor(s) exceeding the set point temperature will illuminate to indicate which sensors are above the set point. When any input is above the set point, the relay will de-energise, the overall red "Alarm" will illuminate and the green "Safe" will extinguish.

When the temperature on all inputs drops below the set point the relay will reset to the energised condition, the overall red "Alarm" will extinguish and the green "Safe" will illuminate.

### Product Codes

Relay	Protection	ANSI no.	Cat. no.
6 RTD inputs	1 set point	49	256-PCC

When ordering please supply the following information:

- System voltage, frequency and required options.
- The type of temperature sensor being used, e.g. Platinum PT100.
- The maximum temperature or meter scale, e.g. 100% = 1mA = 150°C.
- The set point adjustment range, e.g. 0°C to 150°C.



### Features

- Up to 6 RTD inputs
- Adjustable set point
- Internal differential
- LED trip indication
- Automatic reset
- Single-pole relay contacts

### Benefits

- Unbalanced supply protection
- Sustained overload protection
- Single-phasing protection
- Blocked ventilation protection
- Protection against ineffective cooling
- Protection of bearing temperature

### Applications

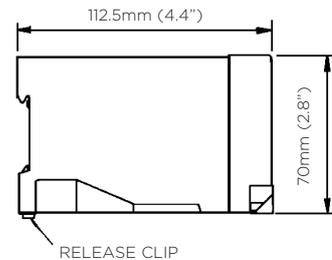
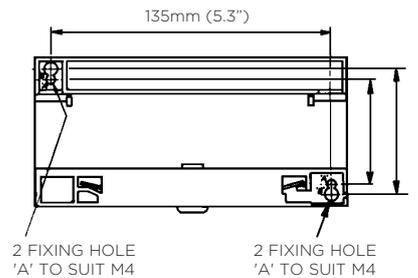
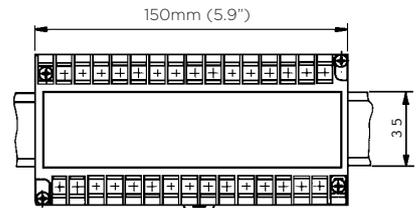
- Switchgear
- Distribution systems
- Generator sets
- Control panels
- Process control
- Motor monitoring
- Transformers
- Overload protection

## Specification - Hot Spot 6 Temperature Relay

Input	Up to 6 resistance temperature detectors (RTD). Either 10 $\Omega$ copper or 100 $\Omega$ platinum minimum span 100°C
Nominal voltage	AC: 110V, 120V, 220V, 230V, or 240V $\pm$ 20% DC: Consult factory
System frequency	50/60Hz
Voltage burden	6VA maximum
Overload	1.2 x rating continuously
Set point repeatability	Within 1°C
Differential (hysteresis)	4°C of nominal
Trip level adjustment	100°C (e.g.: 50 to 150°C, 100 to 200°C etc)
Time delay	Typically 250ms
AC auxiliary supply voltage	100V, 110V, 120V, 208V, 220V, 240V, 480V, $\pm$ 20%
DC auxiliary supply voltage	12V, 24V, 48V, 110V or 125V, $\pm$ 20%. Including ripple
Auxiliary voltage burden	4VA (max)
Output relay	1-pole change over
Relay contact rating	AC: 240V 5A non inductive DC: 24V 5A resistive
Relay mechanical life	0.2 million operations at rated loads
Relay reset	Automatic
Operating temperature	0°C to +60°C (0°C to +40°C for UL models)
Storage temperature	-20°C to +70°C
Temperature co-efficient	0.05% per °C
Interference immunity	Electrical stress surge withstand and non-function to ANSI/IEEE C37 90a
Enclosure style	DIN-rail with wall mounting facility
Material	Flame retardant polycarbonate/ABS
Enclosure integrity	IP50
Dimensions	150mm (5.9") wide x 70mm (2.8") high x 112mm (4.4") deep
Weight	1.0Kg approx.

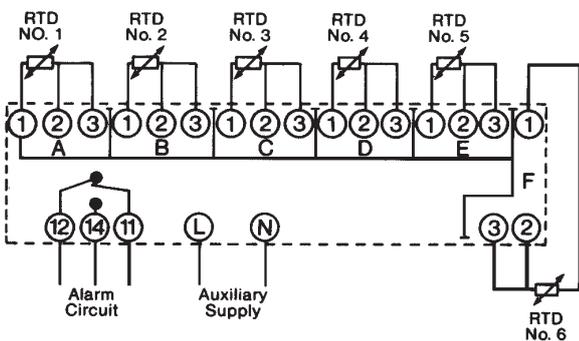
## Dimensions

### Model 256



## Connections

### 256-PCC



When used for less than 6 RTD inputs the unused terminals 1, 2 and 3 must be linked together.

# 250 Series DIN-rail and Wall Mounted Relays



## DC Millivolts/Thermocouple

The 250 series millivolt protectors provide continuous surveillance of high dc currents when used with current shunts, or can be used to monitor temperatures in conjunction with thermocouples. The protector incorporates a user adjustable trip and time delay which can be set to initiate an alarm when the input exceeds the desired level.

## Operation

When used in conjunction with current shunts the millivolt protector can be used to monitor battery charging currents, current drain or under/over-current. Monitoring of under/over-temperature and detection of hotspots can be achieved in applications using thermocouples. All industry standard shunts and all popular thermocouples are supported.

The millivolt protector relays offer user adjustable trip point (set point) and time delay settings. The time delay setting adjustment range is typically 0 to 10 seconds, although longer delays are available. As soon as the monitored signal moves outside of the set point limit, the time delay is activated, after which a trip will occur. The time delay prevents the relay from tripping for a predetermined period to prevent nuisance tripping. These products also feature an internal differential (hysteresis) setting of 1% to reduce nuisance tripping if the measured signal is noisy or unstable. These units require an auxiliary power supply.

## Features

- High and low trip models
- Adjustable set point
- Adjustable time delay
- Internal differential
- LED trip indication
- Automatic reset
- Double-pole relay contacts
- Supports all industry standard shunts and popular thermocouples

## Benefits

- Under/over-temperature monitoring
- Under/over-current monitoring
- Monitoring of battery charging currents and current drain
- Detection of hotspots
- Nuisance tripping avoidance
- Customised options

## Applications

- Switchgear
- Distribution systems
- Generator sets
- Control panels
- Process control
- Motor protection
- Transformers
- Overload protection

## Over High Trip Models

When the monitored signal exceeds the set point, the time delay is started. When the time has elapsed, the relay will energise and the red LED will illuminate to indicate the trip condition. The relay will automatically reset once the monitored signal falls below the set point minus the differential. When reset, the LED will extinguish and the relay de-energises. The time delay is not active when resetting.

## Under Low Trip Models

When the monitored signal falls below the set point, the time delay is started. When the time has elapsed, the relay will de-energise and the red LED will extinguish to indicate the trip condition. The relay will automatically reset once the monitored signal rises above the set point plus the differential. When reset, the LED will illuminate and the relay energises. The time delay is not active when resetting.

## Options

250 series protector relays offer various customised options to suit individual requirements. Please consult factory.

- Adjustment ranges – different adjustment ranges are possible for the set point and time delay controls.
- Differential – internally fixed value between 1% and 15%.
- Relay operation – standard models are failsafe, but the relays can be customised to energise or de-energise on trip.
- Cold junction compensation available on request.

## Product Codes

Relay	Protection	ANSI no.	Cat. no.
DC millivolt	High trip 40 to 120%	74	252-PBT
DC millivolt	Low trip 0 to 80%	74	252-PBS
Thermocouple	Type J, K, R, S and T. High trip 40 to 120%	49	252-PTO
Thermocouple	Type J, K, R, S and T. Low trip 0 to 80%	49	252-PTU

For models 252-PBS and 252-PBT please specify millivolt input, auxiliary voltage and required options at time of ordering.

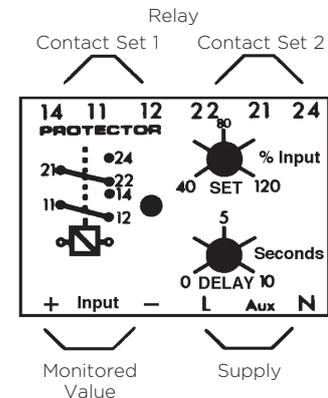
For models 252-PTO and 252-PTU please specify thermocouple type, nominal temperature, auxiliary voltage and required options at time of ordering.

## Specification - DC Millivolts/Thermocouple

DC input	10mV, 50mV, 60mV, 75mV, 100mV, 150mV
Input impedance	50K $\Omega$
Source impedance	100 $\Omega$ maximum
Thermocouple	Types J, K, R, S, T 10 to 50mV
Thermocouple TBP	Thermocouple break protection upscale drive as standard
Thermocouple CJC	Cold junction compensation available on request
Thermocouple overload	10 x rating continuously
Nominal frequency	50/60Hz
Voltage burden	3VA maximum
Voltage overload	1.2 x rating continuously, 1.5 x rating for 10 seconds
Set point repeatability	>0.5% of full span
Differential (hysteresis)	Pre-set at 1% Values 1 to 15% available on request
Trip level adjustment	Low trip: 0 to 80% High trip: 40 to 120%
Time delay adjustable	0 to 10 seconds
AC auxiliary supply voltage	100V, 110V, 120V, 208V, 220V, 240V, 480V, $\pm 20\%$
DC auxiliary supply voltage	12V, 24V, 48V, 110V or 125V, $\pm 20\%$ . Including ripple
Auxiliary voltage burden	4VA (max)
Output relay	2-pole change over
Relay contact rating	AC: 240V 5A non inductive DC: 24V 5A resistive
Relay mechanical life	0.2 million operations at rated loads
Relay reset	Automatic
Operating temperature	0°C to +60°C (0°C to +40°C for UL models)
Storage temperature	-20°C to +70°C
Temperature co-efficient	0.05% per °C
Interference immunity	Electrical stress surge withstand and non-function to ANSI/IEEE C37 90a
Enclosure style	DIN-rail with wall mounting facility
Material	Flame retardant polycarbonate/ABS
Enclosure integrity	IP50
Dimensions	55mm (2.2") wide x 70mm (2.8") high x 112mm (4.4") deep
Weight	0.4Kg approx.

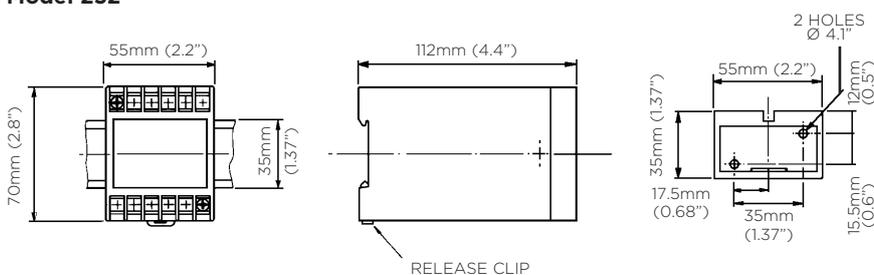
## Connections

**252-PBT**  
**252-PBS**  
**252-PTU**  
**252-PTO**



## Dimensions

### Model 252



# 250 Series DIN-rail and Wall Mounted Relays



## Features

- High and low trip models
- Adjustable set point
- Adjustable time delay
- Internal differential
- LED trip indication
- Automatic reset
- Double-pole relay contacts

## Benefits

- Accepts standard process voltage or current signals
- Monitors forward/reverse Watts, VAr and VA
- Monitors under/over Watts, VAr and VA
- Power factor monitoring and control
- Nuisance tripping avoidance
- Customised options

## Applications

- Switchgear
- Distribution systems
- Generator sets
- Control panels
- Process control
- Motor protection
- Transformers
- Overload protection

## DC Transducer Trip

DC transducer protectors provide continuous surveillance of the dc process voltage or current signal. When the standard process signals move outside the set point limit the relay will operate. Combining the protection relay with a measuring transducer such as the Crompton Paladin measuring transducers range can form specialised control products whenever self-contained relays are not available.

## Operation

The dc transducer protector relay offers user adjustable trip point (set point) and time delay settings. The time delay setting adjustment range is typically 0 to 10 seconds, although longer delays are available. As soon as the monitored signal moves outside of the set point limit the time delay is activated, after which a trip will occur. The time delay prevents the relay from tripping for a predetermined period to prevent nuisance tripping. The products also feature an internal differential (hysteresis) setting of 1% to reduce nuisance tripping if the measured signal is noisy or unstable. These units require an auxiliary power supply.

## Over High Trip Models

When the monitored signal exceeds the set point, the time delay is started. When the time has elapsed, the relay will energise and the red LED will illuminate to indicate the trip condition. The relay will automatically reset once the monitored signal falls below the set point minus the differential. When reset, the LED will extinguish and the relay de-energises. The time delay is not active when resetting.

## Under Low Voltage Models

When the monitored signal falls below the set point, the time delay is started. When the time has elapsed, the relay will de-energise and the red LED will extinguish to indicate the trip condition. The relay will automatically reset once the monitored signal rises above the set point plus the differential. When reset, the LED will illuminate and the relay energises. The time delay is not active when resetting.

## Options

250 series protector relays offer various customised options to suit individual requirements. Please consult factory.

- Adjustment ranges - different adjustment ranges are possible for the set point and time delay controls.
- Differential - internally fixed value between 1% and 15%.
- Relay operation - standard models are fail safe, but the relays can be customised to energise or de-energise on trip.

## Product Codes

Relay	Protection	ANSI no.	Cat. no.
DC transducer	Low trip 0 to 80%	74	252-PBA
DC transducer	High trip 40 to 120%	74	252-PBB
DC transducer	High and low trip	74	253-PBV

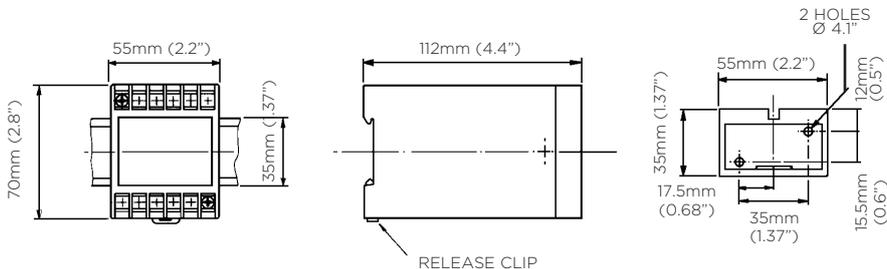
Please specify input current/voltage, auxiliary voltage and required options at time of ordering.

## Specification - DC Transducer Trip

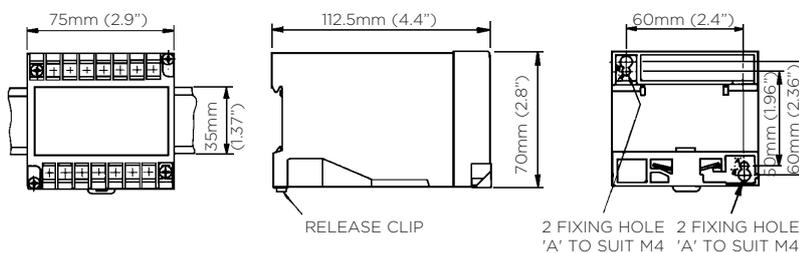
Nominal input current dc	0-1mA, 0-5mA, 0-10mA, 0-20mA, 4-20mA voltage drop 1V
Nominal input voltage dc	1V to 50V, input resistance 10k $\Omega$ /V
Voltage burden	3VA maximum
Overload	1.2 x rating continuously, 1.5 x rating for 10 seconds
Set point repeatability	>0.5% of full span
Differential (hysteresis)	Pre-set at 1%. Values 1 to 15% available on request
Trip level adjustment	Low trip: 0 to 80% High trip: 40 to 120%
Time delay adjustable	0 to 10 seconds
AC auxiliary supply voltage	100V, 110V, 120V, 208V, 220V, 240V, 480V, $\pm 20\%$
DC auxiliary supply voltage	12V, 24V, 48V, 110V or 125V, $\pm 20\%$ . Including ripple
Auxiliary voltage burden	4VA (max)
Output relay	2-pole change over
Relay contact rating	AC: 240V 5A non inductive DC: 24V 5A resistive
Relay mechanical life	0.2 million operations at rated loads
Relay reset	Automatic
Operating temperature	0°C to +60°C (0°C to +40°C for UL models)
Storage temperature	-20°C to +70°C
Temperature co-efficient	0.05% per °C
Interference immunity	Electrical stress surge withstand and non-function to ANSI/IEEE C37 90a
Enclosure style	DIN-rail with wall mounting facility
Material	Flame retardant polycarbonate/ABS
Enclosure integrity	IP50
Model 252 dimensions	55mm (2.2") wide x 70mm (2.8") high x 112mm (4.4") deep
Model 253 dimensions	75mm (2.9") wide x 70mm (2.8") high x 112mm (4.4") deep
Weight	Model 252: 0.4Kg approx. Model 253: 0.6Kg approx.

## Dimensions

### Model 252



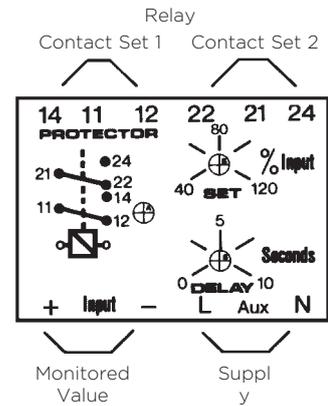
### Model 253



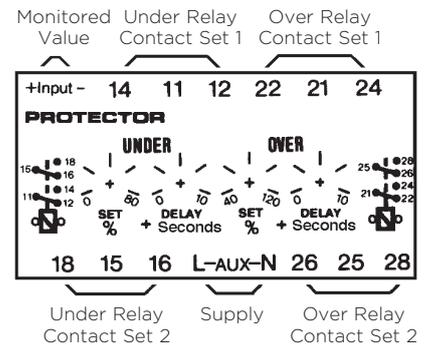
## Connections

### 252-PBB

### 252-PBA



### 253-PBV



# 250 Series DIN-rail and Wall Mounted Relays



## Features

- 1mA analogue output
- 3 adjustable set points
- Adjustable time delay
- Internal differential
- LED trip indication
- Automatic reset
- Three single-pole relays
- Magnetic pick up input

## Benefits

- Under/over-speed monitoring
- Speed indicator output signal
- Zero reset cranking
- Nuisance tripping avoidance
- Customised options

## Applications

- Marine panels
- Switchgear
- Distribution systems
- Generator sets
- Control panels
- Process control
- Motor protection
- Transformers
- Overload protection

## Speed Sensing

The 250 series speed sensing relay monitors rotating equipment and provides three output contacts which can be used to initiate alarm or shutdown signals. The relay also provides a tachometer output for speed indication. Speed sensing relays are ideally suited for engine and gas turbine monitoring and the protection of generator sets.

## Operation

The speed sensing protector monitors the speed of rotation using a low cost magnetic pickup. Speed sensors are often used in generator set engines, gas turbines, motors, gear boxes or any rotating machines. The relay will detect under-speed, over-speed and stopped conditions and the set point relays can be used to raise an alarm or shut down the equipment. The relay provides three user adjustable trip levels with LED relay state indication and a speed indicator output signal.

The product also offers an analogue output that can be used to monitor or display the speed. The product operates from the 12V or 24V dc battery supply and speed is measured and calculated from the number of sensor pulses per revolution. Since the sensor is magnetic, a rotating steel component such as the flywheel which has gear teeth can be used. This will result in a large number of pulses per revolution and lead to greater accuracy.

The protector continuously monitors the rotation speed and updates the analogue output signal. An output of 0.75mA indicates normal speed (100%) while 1mA indicates 133% of nominal speed. The calibration point can easily be user adjusted. Three set point control adjustments allow setting of the desired speed limits for cranking, under-speed and over-speed.

## Cranking Relay

The cranking relay detects if the engine is running or stopped. This relay can be used to ensure the cranking motor is disconnected once the engine has started running. Set the cranking set point just above the cranking motor speed. A red LED illuminates when the relay is energised, indicating a trip condition. The crank relay will only reset when the input frequency falls below 20% of the crank set point.

## Under-Speed Relay

The under-speed relay detects when the normal running speed has been achieved. This can be used to enable the generator's electrical protection. It can also be used to trigger load shedding. A red LED illuminates when an under-speed condition exists.

## Over-Speed Relay

The over-speed relay detects a stuck throttle or overshoot. A break in the sensor load will de-energise the over-speed relay and can be used to shut down the engine. A red LED indicates over-speed trip.

## Fail Safe Operation

The relay will detect an open circuit speed sensor and de-energise the over-speed relay.

## Product Codes

Relay	Protection	ANSI no.	Cat. no.
Speed sensing	Crank 10 to 50% Under-speed 50 to 100% Over-speed 100 to 130%	12/14	253-PH3

When ordering please supply the following information:

- The number of pulses per revolution, e.g. flywheel teeth = 30.
- The nominal running speed, e.g. 3600 RPM.
- The dc battery supply, e.g. 24V dc.

The protector speed sensing relay provides three user adjustable trip levels with LED relay state indication and a speed indicator output signal. Please specify:

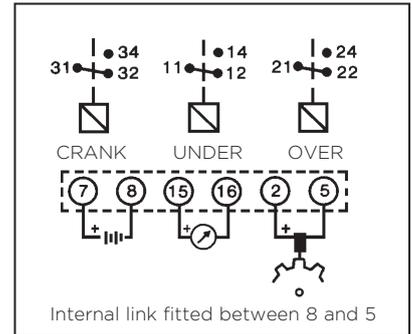
- SP1 - disengages the crank starter.
- SP2 - energises protection or under-speed alarm.
- SP3 - alarms or trips on over-speed.

## Specification - Speed Sensing

Pulse input (magnetic input)	5V - 75V peak to peak
Frequency input	0-1 to 0-10kHz
Overload	1.2 x rating continuously
Set point repeatability	>0.5% of full span
Differential (hysteresis)	Pre-set at 2% (SP1 version resets at 20% of setting)
Trip level adjustment	SP1 (crank): 10 to 50% SP2 (under-speed): 50 to 100% SP3 (over-speed): 100 to 130%
DC auxiliary supply voltage	12V or 24V $\pm$ 20%
Auxiliary voltage burden	3VA (max)
Analogue output	0.75mA for normal 100% speed 1mA for 133% of nominal speed
Calibration signal	0-1mA into 0-1000 $\Omega$
Output relay	3 1-pole change over relays
Relay contact rating	AC: 240V 5A non inductive DC: 24V 5A resistive
Relay mechanical life	0.2 million operations at rated loads
Relay reset	Automatic
Operating temperature	0°C to +60°C (0°C to +40°C for UL models)
Storage temperature	-20°C to +70°C
Temperature co-efficient	0.05% per °C
Interference immunity	Electrical stress surge withstand and non-function to ANSI/IEEE C37 90a
Enclosure style	DIN-rail with wall mounting facility
Material	Flame retardant polycarbonate/ABS
Enclosure integrity	IP50
Model 253 dimensions	75mm (2.9") wide x 70mm (2.8") high x 112mm (4.4") deep

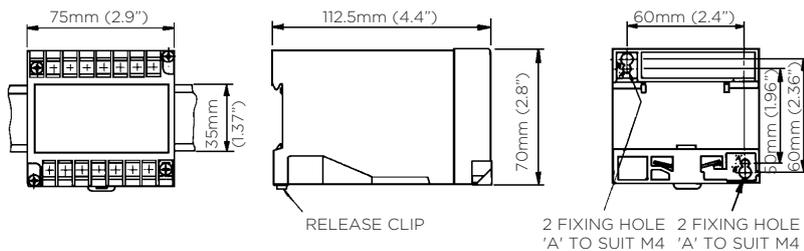
## Connections

### 253-PH3



## Dimensions

### Model 253



# 373-ELR Earth Leakage Protection Relay



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. The 373-ELR earth leakage protection relay allows the fault current to be continuously monitored and compared with the user selectable leakage level. Should the leakage exceed this level, the relay will trip to indicate a fault condition. 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 earth leakage protection and monitoring for any electrical equipment, specifically motors and their control gear, generator sets and transformers.

## Features

- Precision digital settings
- LED bar graph display
- 10 selectable trip levels - 30mA to 10A
- 16 selectable time delay - 0ms to 10 seconds
- Less than 40ms response time
- 0-1mA analogue output
- 8 amp 250V rated relay contacts
- User selectable energise or de-energise link
- Double-pole change over relay
- Single-pole pre-alarm option

## Benefits

- DIN-rail 43880 enclosure
- Switched mode supply accepts a wide range of auxiliary voltages
- Detects residual current flow
- Isolation of faulty circuits
- Insulation monitoring
- Advanced warning of faults
- Complementary range of core balanced CTs
- Protection of expensive power assets

## Applications

- Switchgear
- Distribution systems
- Generator sets
- Control panels
- Building management
- Utility power monitoring
- Process control
- Motor protection
- Transformer protection

## Description

The 373-ELR range offers a standard DPCO version, incorporating a single set point, LED leakage level indicator and double-pole change over relay contacts. The default relay operation is to de-energise on trip, however, relay operation can be reversed to energise on trip by fitting a wire link between two terminals. For additional functionality, an optional pre-alarm relay version is available where the main set point relay has two single-pole change over contacts, one which will de-energise on trip function and the other which will de-energise when the leakage level reaches 60% of the selected setting.

This protector does not check the continuity of any part of the earthing circuit. It is designed for secondary protection due to the externally connected current transformer and contactor components. Life protection devices require an integral CT and main contactor.

## Operation

The 373-ELR features two incremental rotary selector switches on the front panel and a series of LED annunciators. The 10 position trip current switch offers selectable earth leakage current settings from 30mA to 10 amps and the 16 position time delay set point switch offers additional delay for fault discrimination, selectable from 0 to 10 seconds. When the 30mA trip current leakage is selected, the time delay is disabled. 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 leakage level has been exceeded, after any selected time delay.

The unit also incorporates a bar graph of five yellow LEDs providing indication of the level of leakage in 20% increments. When all five LEDs are illuminated the leakage level has reached 100% of the set point setting. The enhanced pre-alarm single-pole change over relay contact version also incorporates a red LED providing indication that the level of leakage has reached 60% of the selected range and that the pre-alarm relay has operated.

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. The relay will de-energise on trip (fail safe) as standard. Fitting a link between two terminals will select energise on trip.

## Analogue Outputs

The 373-ELR 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 test meter or panel meter, thus providing measurements for test commissioning and a useful indication of potential problems. The analogue output also enables fault level diagnosis to be communicated into building management or intelligent SCADA systems, whereby insulation deterioration can be monitored over a period of time and preventative maintenance arrangements made prior to expensive equipment failure.

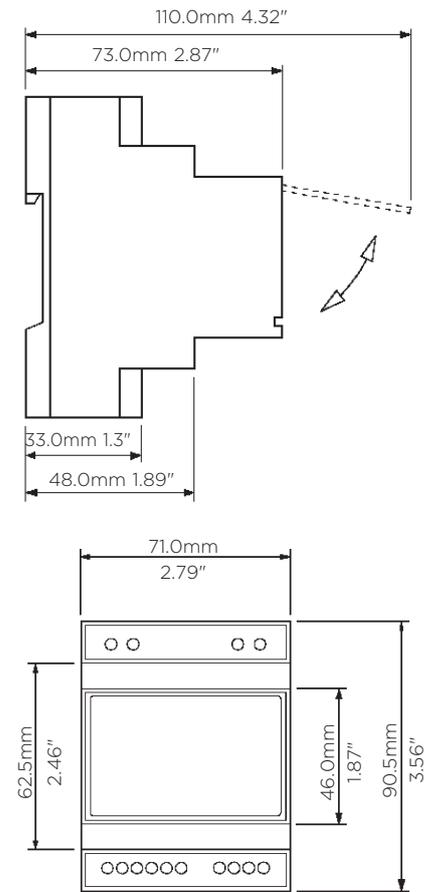
## Core Balanced Current Transformers

The leakage current is determined by passing the phase conductors (and neutral if present) through a core balanced current transformer. All supply cables must pass through the same aperture. 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. Crompton offers a full range of core balanced current transformers suitable for use with 373-ELR earth leakage protection relays.

## Specification - Earth Leakage

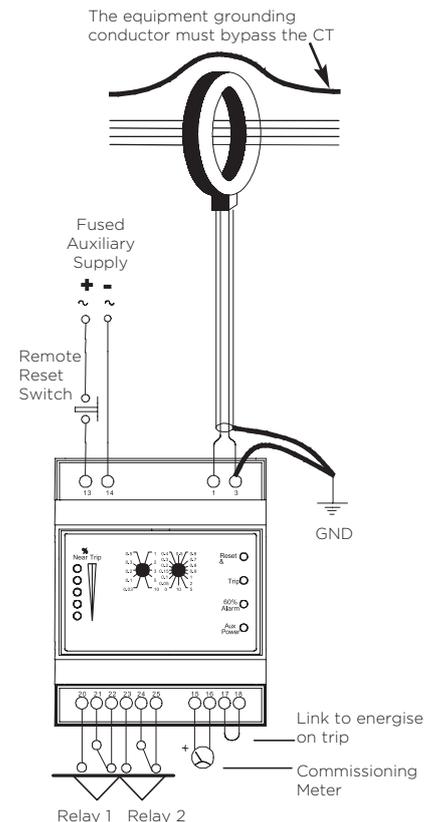
Measuring input	From core balanced current transformer
Overload	20 x nominal for 1 second
Frequency	50Hz or 60Hz 310%
Auxiliary voltage	12-48V dc, 24-48V ac and dc or 100-250V ac and dc
Auxiliary burden	Less than 1.5 Watts
Trip current settings	Selectable 30mA, 100mA, 200mA, 300mA, 500mA, 1A, 2A, 3A, 5A, 10A
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. When 30mA leakage is selected, the time delay is disabled
Indication	5 yellow LED bar graph for leakage levels Red LED indicated trip function Green LED indicated auxiliary power presence Red LED pre-alarm indication (SPCO version only)
Relay contacts	Standard: 2-pole change over Option: 2 1-pole change over (pre-alarm and main alarm)
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 <sup>2</sup> 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



## Product Codes - Double-pole Change Over Relay

Relay	Protection	Cat. no.
50Hz	12-48V dc	373-ELRW-CBC5-A1-ST
50Hz	24-48V ac and dc	373-ELRW-CBC5-A2-ST
50Hz	100-250V ac and dc	373-ELRW-CBC5-A3-ST
60Hz	12-48V dc	373-ELRW-CBC6-A1-ST
60Hz	24-48V ac and dc	373-ELRW-CBC6-A2-ST
60Hz	100-250V ac and dc	373-ELRW-CBC6-A3-ST

## Product Codes - Pre-Alarm Single-pole Change Over Relay

Relay	Protection	Cat. no.
50Hz	12-48V dc	373-ELRW-CBC5-A1-PA
50Hz	24-48V ac and dc	373-ELRW-CBC5-A2-PA
50Hz	100-250V ac and dc	373-ELRW-CBC5-A3-PA
60Hz	12-48V dc	373-ELRW-CBC6-A1-PA
60Hz	24-48V ac and dc	373-ELRW-CBC6-A2-PA
60Hz	100-250V ac and dc	373-ELRW-CBC6-A3-PA



# CBT-94F Core Balanced Current Transformers

The CBT-94F series of core balanced current transformers are exclusively for use with our 373-ELR 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.

## 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

## Approvals

IEC 60044-1

## 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.

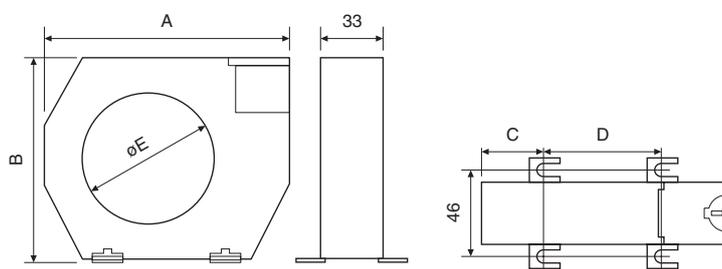
The equipment grounding conductor must always bypass the current transformer. The connections between the current transformer and protector should be kept as short as possible to minimise signal noise. For best results, use screened cable with the screen grounded at the protector.

## Specification

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

## Product Codes

Aperture Dim E	Dim A	Dim B	Dim C	Dim D	Cat no.
35mm	100mm	79mm	26mm	48.5mm	CBT-94F-035
70mm	130mm	110mm	32mm	66mm	CBT-94F-070
105mm	170mm	146mm	38mm	94mm	CBT-94F-105
140mm	220mm	196mm	49mm	123mm	CBT-94F-140
210mm	299mm	284mm	69mm	161mm	CBT-94F-210
300mm	400mm	380mm	-	-	CBT-94F-300



# 373-GFR Ground Fault Relay

The 373-GFR is designed to detect dangerous ground fault currents before damage is caused to expensive power assets. 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 grounded equipment, putting lives at risk. The 373-GFR ground fault relay allows the fault current to be continuously monitored and compared with the user selectable trip level. Should the fault exceed this level, the relay will trip to indicate a fault condition. 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 10 position trip current switch offers selectable ground fault current settings from 100 to 1200 amps and the 16 position 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 a bar graph of 5 yellow LEDs providing indication of the level of fault in 20% increments. When all 5 LEDs are illuminated the fault level has reached 100% of the set point 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 an 0/1mA analogue output which equals 0% to 100% of the selected tripping level. It can be used to drive an external test meter or panel meter, thus providing measurements for test commissioning and a useful indication of potential problems. The analogue output also enables fault level diagnosis to be communicated into building management or intelligent SCADA systems, whereby insulation deterioration can be monitored over a period of time and preventative maintenance arrangements made prior to expensive equipment failure.

## Product Codes - Single-pole change over relay

Frequency	Auxiliary supply	Cat. no.
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



## 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

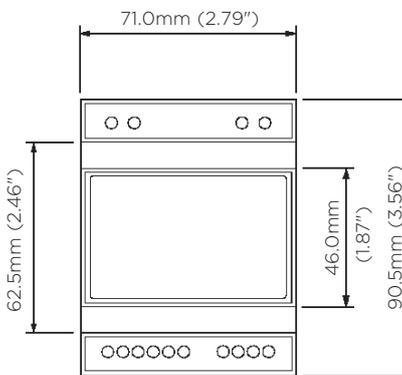
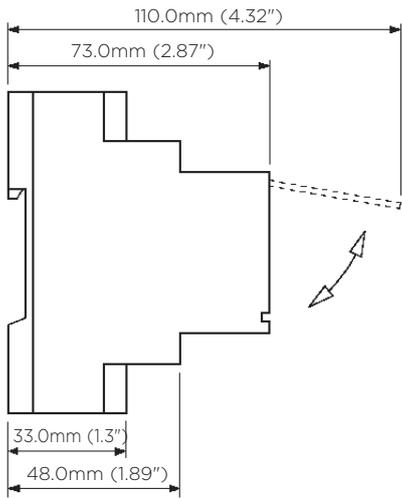
## Benefits

- 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

## Dimensions



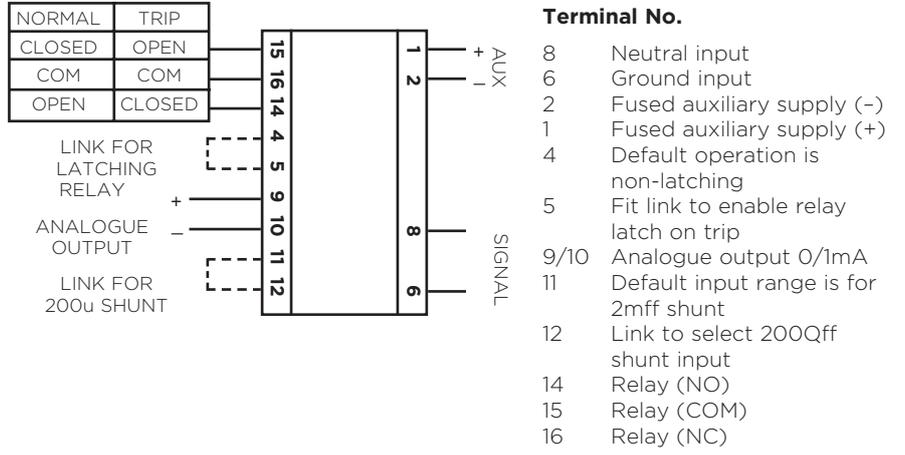
**DIN 43880**

## Specifications

Measuring input	AC voltage developed across N-G link
Measuring range	0.2Ω or 2Ω 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 1 mA = 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 <sup>2</sup> 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

## 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.



# SPR System Protection, Control and Measurement Relay

The SPR system protection relay is a microprocessor based panel mounted device offering protection, control, measurement and communication of up to 37 power parameters in a single package. The SPR monitors three-phases of voltage and current and provides up to 12 user definable relay outputs. The high contrast 80 character backlit LCD display allows the user to monitor any of the measured parameters, inspect set point details and relay contact status. The set points and configuration are all fully programmable via the simple menu driven user interface. Remote monitoring of status information is achievable via the integral RS485 communication port which supports Modbus® RTU protocol. SPR is suitable for many diverse applications, providing cost effective protection of expensive power assets.

## Operation

Using an alphanumeric display, the SPR is simple to operate via four buttons which configure and control the product. All parameters can be inspected or modified through front of panel menu selections. For security, alterations of any parameters can be disabled with up to four levels of password protection. The default display is the status screen where the status of each of the relay contacts can be clearly identified, but a user defined screen can be easily configured to display four lines of metering information. SPR can also be remotely monitored and fully controlled over the RS485 Modbus® connection.

## Output Relays

The SPR has up to 12 sets of form C change-over (NO+NC) relay contacts, each rated at 8 amps 250V ac. These do not have fixed functions, allowing each relay to be configured to suit a specific application. Flexibility is the key to this product and any function, or combination of functions, can be assigned to any relay. With a choice of up to 18 protective trip functions and 9 logical functions, SPR provides a cost-effective method of protection combined with significant space savings. If additional contact sets are required for any function, programmable logic allows the parallelling of as many additional contacts as are available. The standard product has 8 relays, but for the most demanding applications four additional relays can be supplied as an option. Each relay can be configured to energise or de-energise on trip (failsafe or non-failsafe operation), latch or self-reset, have its activity recorded in the event log, or trigger a common alarm, as required.

## Watchdog Relay

Follows comprehensive self diagnostic checks at power-up and once correct operation has been verified, the dedicated change-over (NO+NC) relay contacts energise to indicate product availability. The microprocessor continuously monitors the relay system for healthy operation and the contacts will de-energise if an internal fault is detected or the auxiliary supply is lost.

## Event History Log

Every trip event can be selectively recorded in the history log. Up to 50 events are itemised by date and time stamp to a time resolution of 100ms, ideal for analysing the sequence of events leading up to a system fault. The internal real time clock has battery backup to maintain the correct time and date for many years, even if the product is not powered up.

## Power Metering

True rms measurements of up to 37 power measurements are continuously updated. The voltage, current and frequency signals are measured directly, while other parameters, such as Watts, VAr and VA, are computed from this data. Current inputs are given a very wide dynamic range in order to process overloads for time over-current functions. Since the readings are true rms, distorted waveforms are accurately measured, leading to excellent harmonic performance.

## Digital Communications

The built-in RS485 communication port supports Modbus® RTU protocol and offers metering of Phase Voltages, Phase Currents, Watts, VAr, VA, Phase Angle, Power Factor, Gen and Bus frequency, plus accessibility to all other features and functions available through the front panel. Relay status and system measurements can be interrogated and relay parameters can be modified remotely. Remote metering is available using Crompton software.



## Features

- Integrated protection, control, measurement and communication of up to 37 power parameters
- Digital communications
- Fully programmable VT and CT ratios
- Simple menu driven interface
- High quality backlit LCD display
- True rms measurement
- Three-phase, three-wire or four-wire unbalanced load options
- 18 protection relay functions
- 12 relay contacts outputs
- Trip event history log
- Watchdog relay

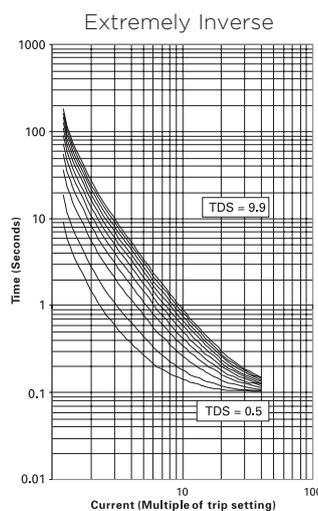
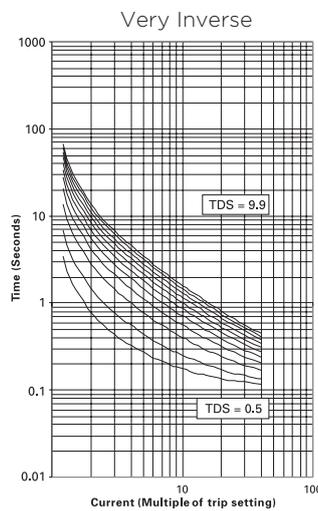
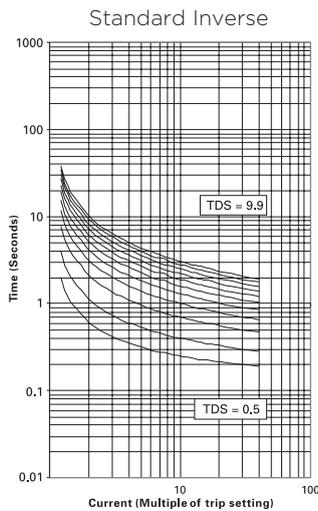
## Benefits

- Replaces numerous traditional protection relays
- Significant cost savings
- High accuracy
- Remote monitoring
- Investment protection
- Delinquency avoidance
- Compact and easy to configure
- Time and space saving

## Applications

- G.59/1 protection
- General purpose system protection
- Switchgear
- Distribution systems
- Generator sets
- Control panels
- Utility power monitoring
- Motor protection
- Cable protection
- Feeder protection
- Automatic transfer switches
- Railway applications

## Time Curves



## Relay Trip Parameters and Functions

ANSI	Description	Parameter	Range/Resolution/Accuracy
25	Synchronism-check monitoring	Phase difference Slip frequency Voltage difference Minimum volts level	2 to 20 degrees/0.1 degrees/±1° 0.1 to 1Hz/0.01Hz/±0.03Hz of nominal 0 to 20%/0.1 V/±2% of nominal 5 to 119%/0.1 V/±1% of nominal
25D	Synchronism-check monitoring with dead bus feature	Phase difference Slip frequency Voltage difference Minimum volts level Dead bus voltage	2 to 20 degrees/0.1 degrees/±1° 0.1 to 1Hz/0.01Hz/±0.03Hz of nominal 0 to 20%/0.1 V/±2% of nominal 5 to 119%/0.1 V/±1% of nominal 5 to 50%/0.1 V/±1% of nominal
27	Under-voltage relay	Voltage set point Diff	5 to 119% V/0.1 V/±1% of nominal 1 to 15% V/0.1 V/±1% of nominal
32O	Directional active power (forward watts)	Power set point Diff	3 to 120% W/0.1 W/±3% of nominal 1 to 15% W/0.1 W/±1% of nominal
32R	Directional active power (reverse watts)	Power set point Diff	3 to 120% W/0.1 W/±3% of nominal 1 to 15% W/0.1 W/±1% nominal
37	Under-current relay	Current set point Diff	30 to 300% A/0.01 A/±2.5% of nominal 1 to 15% A/0.01 A/±1% of nominal
40Q	Directional reactive power nominal (Loss of excitation/reverse VAR)	Power set point Diff	3 to 120% VArS/0.1 VArS/±4% of nominal 1 to 15% VArS/0.1 VArS/±1% of nominal
46	Unbalanced current relay	Current set point Diff	5 to 120% A/0.01 A/±2.5% of nominal 1 to 15% A/0.01 A/±1% of nominal
47	Phase sequence relay	No parameters	
47	Unbalanced voltage relay	Voltage set point Diff	1 to 25% V/0.1 V/±2% of nominal 1 to 15% V/0.1 V/±1% of nominal
50	Instantaneous over-current relay	Current set point Diff	30 to 300% A/0.01 A/±2.5% of nominal 1 to 15% A/0.01 A/±1% of nominal
50N	Instantaneous neutral over-current relay	Current set point Diff	30 to 300% A/0.01 A/±2.5% of nominal 1 to 15% A/0.01 A/±1% of nominal
51	AC time over-current relay with 3 time curves	Current set point Time dial Time curves	5 to 120% A/0.01 A/±2.5% of nominal 0.1 to 9.9 sec/0.1 seconds/- Standard inverse, very inverse, extremely inverse
51V	AC time over-current with voltage restraint	Current set point Restraint voltage Time dial Time curve	5 to 120% A/0.01 A/±2.5% of nominal 80 to 120%/0.1 V/±1% of nominal 0.1 to 9.9 sec/0.1 seconds/- Standard inverse, very inverse, extremely inverse
51G	Neutral ground fault relay	Current set point Time dial Time curve	5 to 120% A/0.01 A/±3% of nominal 0.1 to 9.9 sec/0.1 seconds/- Long time standby earth fault curve
59	Over-voltage relay	Voltage set point Diff	5 to 120% V/0.1 V/±1% of nominal 1 to 15%/0.1 volts/±1% of nominal
81O	Over-frequency relay	Frequency set point Diff	40 to 70Hz/0.01Hz/±0.03Hz of nominal 0.1 to 10Hz/0.01Hz/±0.03Hz of nominal
81U	Under-frequency relay	Frequency set point Diff	40 to 70Hz/0.01Hz/±0.03Hz of nominal 0.1 to 10Hz/0.01Hz/±0.03Hz of nominal

All trip functions feature latching, alarm and invert controls, plus adjustable time delay 0 to 30 seconds, resolution 0.1 seconds.

In addition to the 18 electrical trip functions, SPR also offers 9 logical functions which can be used to create additional trip combinations, selective lockout, or to optimise the physical relay wiring in the application. Logic functions accept their input signals from the status of up to three trip relays. The following functions are available: Logical AND, OR, NAND, NOR, XOR, Vote, Discrepancy Alarm and Unacknowledged Alarm.

## Specification - System Protection

<b>Input</b>	
Nominal input voltage	57.7 to 277V L-N (100 to 480V L-L)
Max continuous input voltage	1.2 x nominal
Max short duration input voltage	2 x nominal (1 second)
System VT ratio (primary)	Any value up to 400kV
Nominal input voltage burden	<0.2VA
Nominal input current	5A (1A option)
System CT ratio (primary)	Any value up to 10kA
Max continuous input current	2 x nominal
Max short duration input current	20x nominal (1 second)
Nominal input current burden	<0.6VA
<b>Auxiliary</b>	
Nominal supply voltage	24V dc (10.6 to 55V dc absolute)
Supply burden	<20VA
RS485 communication	
Protocol	Modbus® RTU, two-wire half-duplex
Baud rates	2400, 4800, 9600, 19200
Parity/stop bits	Odd, even, none/1 or 2
Response time	Typical 80ms. Maximum 150ms
<b>Relay outputs</b>	
Watchdog relay outputs	1
User programmable relays	8 or 12
Relay contact type	Volts-free change-over (form C)
Relay contact rating	8 amp (resistive) 250V ac
Relay make current	30 amp (4 sec @ <10% duty cycle)
Rated breaking capacity	2000VA
Relay mechanical life	30 million operations
Relay contact life	B300/120V ac/70°C to UL508 B300/240V ac/70°C to UL508
<b>Measuring ranges</b>	
Voltage	20-120% of nominal
Current	20-120% of nominal (functional 5 .. 500%)
Frequency	45-66Hz
Power factor	0.5-1-0.5 importing or exporting
Watts	5-120%
<b>Enclosure</b>	
IP rating	IP54 with panel gasket (supplied)
Material	Zinc passivated steel with polycarbonate front panel
Terminals	Removable shrouded screw clamp terminals
Operating temperature	0°C to +50°C (optional -20°C to +60°C)
Storage temperature	-20°C to +70°C
Relative humidity	95% non-condensing
Shock	30g in 3 planes
Vibration	10 to 150Hz @ 1g amplitude
Dimensions	200mm (7.87") wide, 106mm (4.17") high, 176mm (6.93") deep
Panel cut-out	187mm wide (7.36") x 93mm (3.66") high
Weight	<3Kg approx.
Railtrack certificate of acceptance	PA05/1450 protective device on signalling power supply systems

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## Measurement, Display and Communication

SPR offers configuration, display and communication of up to 37 true rms power measurements

Voltage L1-L2  
Voltage L2-L3  
Voltage L3-L1  
Voltage L1-N  
Voltage L2-N  
Voltage L3-N  
System Voltage (average)

Current L1  
Current L2  
Current L3  
System Current (average)  
System Current (sum)  
Neutral Current  
Ground Current

System Watts  
Watts L1  
Watts L2  
Watts L3

System VAR  
VAr L1  
VAr L2  
VAr L3

System VA  
VA L1  
VA L2  
VA L3

Power Factor  
PF L1  
PF L2  
PF L3

Phase Angle  
PA L1  
PA L2  
PA L3

Gen Frequency  
Bus Frequency  
Gen-Bus Angle



## SPR-SOFT Communication and Programming Software

The software configuration package allows the user to configure and monitor the operation of the SPR system protection relay through a Windows style user interface. It allows the user to load and save the configuration to and from a hard disk on a PC and to send and retrieve configuration settings to and from up to 31 SPR units. Communication is achieved with a Modbus® connection to a COM port on the PC via an RS485/RS232 converter.

The software configurator is designed to display and set up the parameters of the SPR relays, to monitor the status of the selected SPR and to provide status of the power supplies the SPR is monitoring. A separate configuration page is provided for setting the parameters of each relay.

The configurator incorporates separate pages to display measurements, relays and event data. When one of these pages is selected in on-line mode the configurator interrogates the selected SPR every few seconds to obtain the data required for that page. In addition, there is an option to bring up the measurements page from any other page if the SPR raises an alarm.

### Order Code Example:

#### SPR-013W-PQLS-C5-BD-12-MB

SPR 3-phase 3-wire, 120V L-L, 5A, 50Hz, 24V dc auxiliary power with RS485 Modbus®, 12 relays

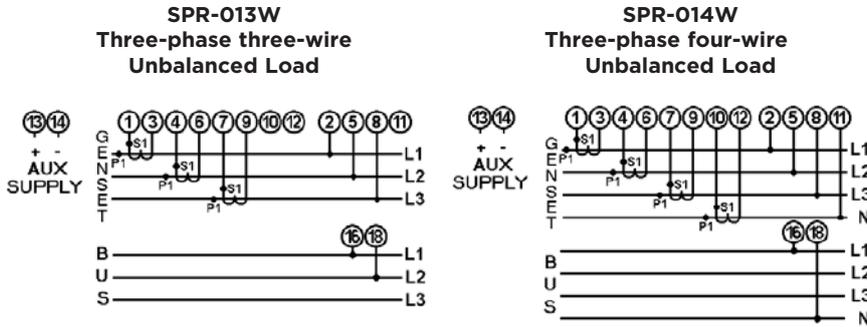
### Product Codes

Product code	Product configuration
SPR-013W-*LS-**-BD-***-MB	SPR 3-phase 3-wire, 5A, 24V dc auxiliary power with RS485 Modbus®
<b>Input voltage*</b>	
PK	100 volts L-L
PM	110 volts L-L
PO	115 volts L-L
PQ	120 volts L-L
RM	208 volts L-L
RU	380 volts L-L
RW	400 volts L-L
SB	415 volts L-L
SH	440 volts L-L
SE	480 volts L-L
SPR-014W-*LS-**-BD-***-MB	SPR 3-phase 4-wire, 5A, 24V dc auxiliary power with RS485 Modbus®
<b>Input voltage*</b>	
NV	57.7 volts L-N
NX	63.5 volts L-N
PA	69.0 volts L-N
PK	100 volts L-N
PM	110 volts L-N
PQ	120 volts L-N
P7	127 volts L-N
R4	220 volts L-N
RQ	230 volts L-N
RR	240 volts L-N
RS	250 volts L-N
R6	277 volts L-N
<b>Frequency**</b>	
C5	50Hz
C6	60Hz
<b>Relays***</b>	
08	8 x relays
12	12 x relays
Optional accessories	
SPR-POWER-A1	Auxiliary power supply unit 85-264V ac and 100-375V dc
SPR - SOFT 9D-485	Communication and programming software RS232 to RS485 serial converter

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### Connections

The four current transformer inputs are fully isolated from ground and from each other, allowing the SPR to be used as an intermediate device or connected to a common ground as required. All electrical connections are made using two-part removable connecting blocks.



### Auxiliary Supply

Designed to operate from 24V dc nominal engine batteries, operating normally at reduced voltage when the engine is cranking and increased voltage when the batteries are on charge. The switched mode auxiliary power supply has a very wide operating range of 10.6 to 55 volts. A separate auxiliary module is available for other auxiliary voltages.

### Safety/Ground Connections

The ground stud on the rear panel should be connected to a clean ground. For safety reasons, CT secondary connections should be grounded according to appropriate codes of practice.

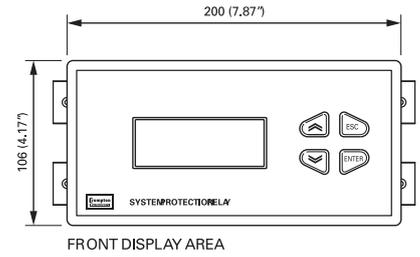
### SPR-POWER Switched Mode Power Supply

The SPR is designed to operate with a nominal 24 volt dc auxiliary supply, however, the SPR-POWER unit will derive a suitable supply for applications utilising 85 to 264V ac, 45-66Hz or 100 to 375V dc. This switched mode power supply is simply attached to the System Protection Relay (SPR) chassis via two threaded screws.

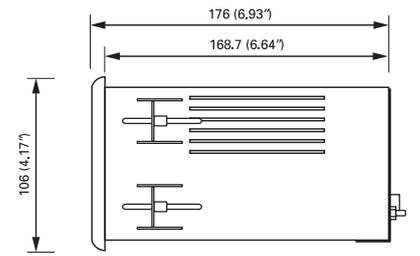
<b>Input</b>	
Input voltage	85 to 264V ac, 45-66Hz    100 to 375V dc
Burden	<36VA
<b>Output</b>	
Output voltage	24 volts dc @ 600mA
<b>Environmental</b>	
Operating temperature	-20°C to +50°C
Storage temperature	-30°C to +80°C
Relative humidity	0<95% non condensing
<b>Enclosure</b>	
Style	Custom design to mount directly on SPR
Material	Zinc passivated steel
Terminals	Barrier terminal strip 6-32 binding head screw
Grounding	Dedicated grounding stud provided

### SPR Dimensions

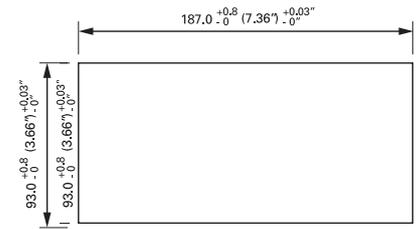
#### Front Display Area



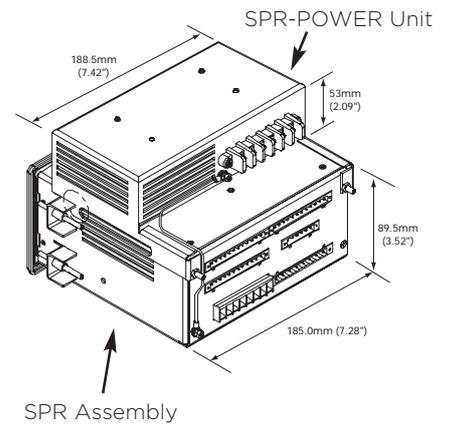
#### Side View

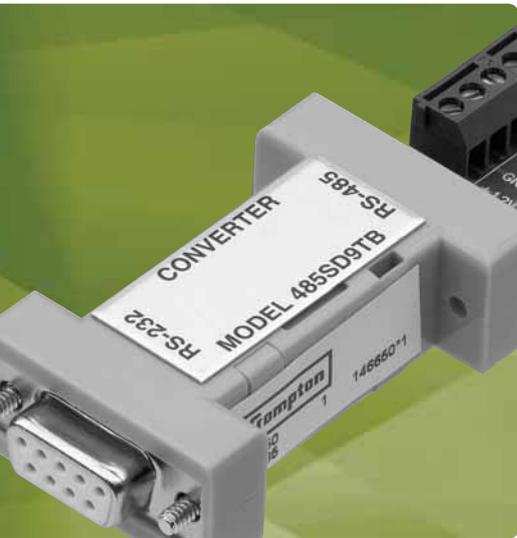


#### Panel cut-out



### Dimensions with Optional SPR-POWER Unit





## RS232 to RS485 Serial Converter

The SPR system protection relay features an integral RS485 communication port allowing direct connection to SCADA systems via Modbus® RTU protocol. However, the SCADA systems or PC based equipment used for remote monitoring of electrical and power parameters often incorporate RS232 communication ports, therefore conversion to RS485 is necessary. The 9D-485 module is a simple non-isolated two-wire half-duplex RS485 converter which fits into any PC based system.

This port powered two-channel module converts the TD and RD RS232 lines to balanced half-duplex RS485 signals via a 9-way female D type connector on the RS232 side and a screw clamp terminal block connector on the RS485 side. The module has an internal connection to prevent data transmitted from the RS232 port from being echoed back to the RS232 port.

### Features

- Direct connection to PC RS232 serial port
- Nine-way female D type connector
- Port powered or externally powered
- Balanced RS485 signals
- Very high noise immunity
- Two-wire half-duplex
- Prevents echo-back to RS232

### Compatible with

SPR System Protection Relay

### Applications

- PC based communication systems
- SCADA Systems
- PLC interfacing
- Energy management systems

### Operation

The 9D-485 module is powered from two RS232 output handshake lines. However, an external 12V dc power supply can be connected to two terminals on the RS485 connector if no handshake lines are available. When using an external supply the supply should be connected only to specifically labelled power inputs (power jack, terminal block, etc).

**Note:** Connecting an external power supply to the handshake lines may damage the unit.

Although the 9D-485 module uses handshake lines to power the converter no handshaking is required to control the RS485 driver. The RS485 driver is automatically enabled during each spacing state on the RS232 side. During the marking or idle state the RS485 driver is disabled and the data lines are held in the marking state by pull-up and pull-down resistors.

### Product Codes

Protocols supported	Modbus® RTU
Internal power	2 x RS232 handshake lines
External power	12V dc to RS485 side if handshake lines unavailable
Current draw	35mA max when externally powered
RS232 connector	9-way female D type
RS232 signals together	Passes through pins 3 (TD) and 2 (RD) Pins 7 (RTS) and 8 (CTS) are tied together Pins 4 (DTR), 6 (DSR) and 1 (CD) are tied
RS485 connector	Screw clamp terminal block
RS485 signals only	Automatic control circuit enables driver when transmitting
RS485 receiver	Disabled when transmitting to prevent echo back to RS232
RS485 communications	Half-duplex 2-wire operation
RS485 baud rate	Up to 115.2k baud
Maximum distance	Up to 1200 metres (4000 feet)
Multidrop connections	Up to 32
Dimensions	89mm long x 34mm wide x 17mm deep 3.50" long x 1.34" wide x 0.67" deep

### Product Codes

<b>9D-485</b>	89mm long x 34mm wide x 17mm deep
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## 250 Series Protectors CSA and UL Marking

Type	Signal Input *	Auxiliary Input *	Approvals			
			CSA LR52592	UL Listed E113067	UL Recognised E113067	American Bureau of Shipping
252-PA?	AC Current, 5 & 10 Amp	24V DC max or 300V AC max	•	•	•	•
252-PA?	All others	Any DC or 300V AC max		•		•
252-PA?	All others	AC >300V			•	•
252-PB?	Transducer trip, 50V DC, 20mA DC	125V DC max or 240V AC max	•	•		
252-PBS	150mV max	125V DC max or 240V AC max	•	•		
252-PBT	150mV max	125V DC max or 240V AC max	•	•		
252-PB?	Any	240-300V AC		•		
252-PB?	Any	AC > 300V			•	
252-PD?		300V AC max		•		
252-PD?		AC > 300V			•	
252-PH?	AC up to 300V max		•	•		•
252-PH?	> 300V AC < 600V AC				•	•
252-PM?	AC up to 240V max	125V DC max or 300V AC max	•	•		
252-PM?	AC up to 240V max	125V DC max AC > 300V			•	
252-PS?	AC up to 300V max		•	•		
252-PS?	AC > 300V		•		•	•
252-PT?	Any	300V AC Max		•		
252-PT?	Any	AC > 300V			•	
252-PV?	AC up to 300V max	125V DC max or 300V AC max	•	•		•
252-PV?	AC > 300V	AC > 300V			•	•

## 253- P Protectors

Type	Signal Input *	Auxiliary Input *	Approvals			
			CSA LR52592	UL Listed E113067	UL Recognised E113067	American Bureau of Shipping
253-PA?	AC Current, 5 & 10 Amp	24V DC max or 300V AC max	•	•		•
253-PA?	All others	Any DC or 300V AC max		•		•
253-PA?	All others	AC > 300V AC			•	•
253-PB?	Transducer trip, 50V DC, 20 mA DC	125V DC max or 240V AC max	•	•	•	
253-PB?	Any	AC 240-300V		•		
253-PB?	Any	AC > 300V			•	
253-PH?	AC up to 300V max		•	•		•
253-PH?	AC > 300V AC < 600V				•	•
253-PV?	AC up to 300V max	125V DC max or 300V AC max	•	•		•
253-PV?	AC > 300V AC < 600V	AC > 300V AC < 600V			•	•

## 256-P Protectors

Type	Signal Input *	Auxiliary Input *	Approvals			
			CSA LR52592	UL Listed E113067	UL Recognised E113067	American Bureau of Shipping
256-PA?	Up to 300V AC max	300V AC max	•	•		•
256-PA?	> 300V AC < 600V AC	AC > 300V AC < 600V max			•	•
256-PC?	240V AC max	125V DC max 300V AC max		•		
256-PC?	240V AC max	125V DC max AC > 300V			•	
256-PL?	Up to 300V AC max			•		•
256-PL?	> 300V AC < 600V AC				•	•
256-PR?	Up to 240V AC max	125V DC max 300V AC max		•		
256-PR?	Up to 240V AC max	125V DC max AC > 300V AC < 600V			•	

## 256-P Protectors

Type	Signal Input *	Auxiliary Input *	Approvals			
			CSA LR52592	UL Listed E113067	UL Recognised E113067	American Bureau of Shipping
373-GFR	Up to 600V AC max	100V to 250V AC & DC			•	
373-ELR	CT	100V to 250V AC & DC			•	

## 256-P Protectors

Type	Signal Input *	Auxiliary Input *	Approvals			
			CSA LR52592	UL Listed E113067	UL Recognised E113067	American Bureau of Shipping
SPR-013?	Up to 480V AC max	55V DC max			•	
SPR-014?	Up to 277V AC max	55 V DC max			•	

? = any letter

\* Rated voltage as stated on the product label.

Examples of Marking:



Canadian Standards Association



UL Listed (USA only)



Recognised - USA and Canada



American Bureau of Shipping

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