GE Energy Connections
Grid Solutions

# PRIMA

**Technical Data**
**Plug-in Auxiliary Relays for Electrical Substations**

Publication reference: PRIMA/EN TD/C

# PRIMA: Plug-in rapid-wire integrated multi-mount auxiliary relays

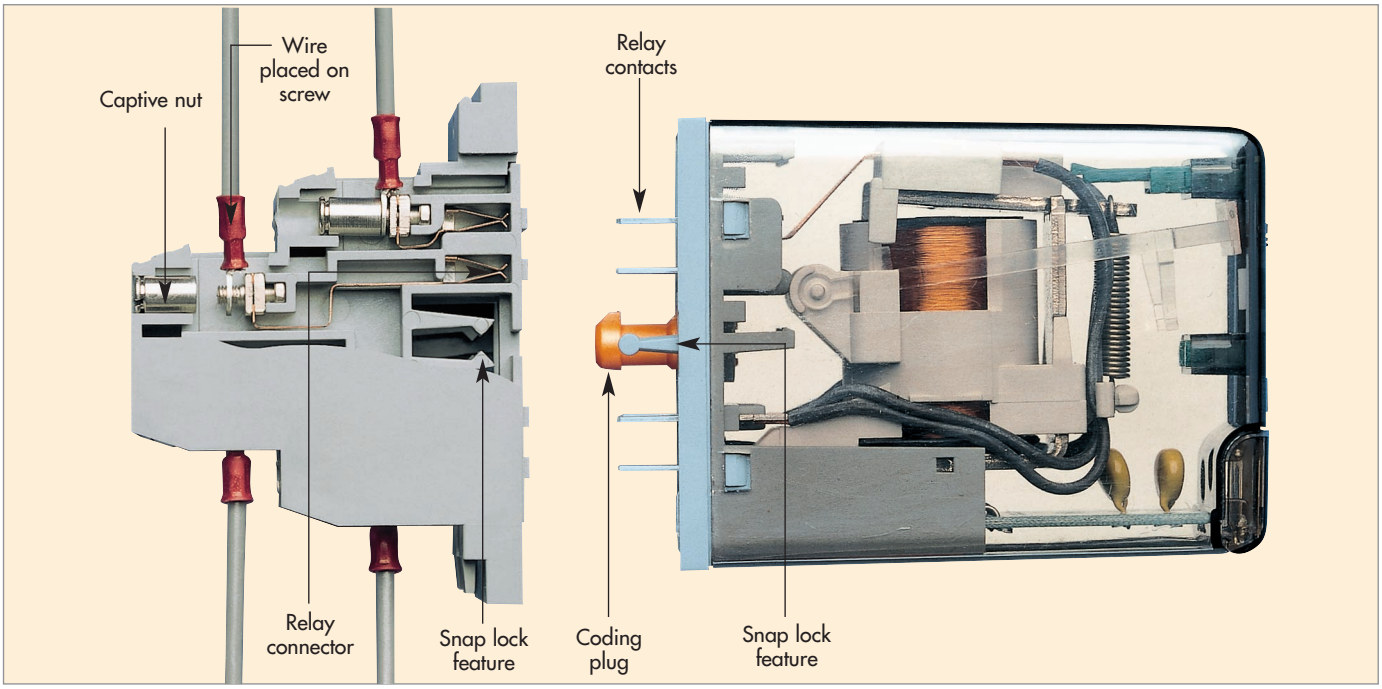



Figure 1 | Relay and cross section of socket shown actual size

## Features

- Compact design – 12 relays per 19 inch rack
- Wide operative voltage range
- Optional test feature
- Self-reset flag as standard
- Optional timer
- Built-in snap lock feature automatically locks the relay to its socket
- Unique terminal design ensures rapid wiring – (time saving of up to 75%)
- Choice of two types of terminal
- DIN rail, panel or rack mounting
- Simple mechanical coding for relay to socket connection
- Manufactured from flame-retardant materials

## Models Available

- PRE electrical reset relays
- PRH hand/electrical reset relays
- PRS self reset relays

## Application

Prima, is a compact, voltage-operated, attracted armature auxiliary relay with instantaneous and time delayed auxiliary functions. It is specifically designed for electrical power generation installations, electrical substations and electrical utility control systems. Great emphasis has been placed on making it as easy as possible to specify, order, configure and install.

## Description

Ease of installation is ensured by the two-part design in which the relay plugs into a socket which may be specified with front or rear connected terminals. A snaplock feature between relay and socket, eliminates the need for separate wire clips. The front-connected socket, mainly for DIN rail mounting, may alternatively be mounted on a solid panel via a single fixing screw, whilst the rear- connected design clips or screw fixes to suitable panel cut-outs or may be accommodated on a special rack mounting frame.

The two types of terminal available include a unique captive nut design which makes for wiring time reductions of up to 75%.

The relays are available as either self-reset, electrical reset or hand/electrical reset types. The range includes a mechanical operation indicator as standard and an optional integrated timer to minimise panel space requirements.

All the contacts are changeover type, designed to the latest IEC 255 standards, ensuring maximum flexibility with simplified ordering.

## Relay

### Contacts

Self reset (PRS) models have 4 changeover contacts except those with delayed drop-off timer which have only 3 contacts. Hand/electrical reset models (PRH) and electrical reset models (PRE) have 3 changeover contacts. All have silver contact tips to provide long life and reliability over a wide range of duties.

Optional magnetic blow-out contacts are recommended for heavy or highly inductive loads.

See Technical Data for contact ratings.

### Operation indicators

All relays are fitted with an operation indicator that follows the contact operation, with the exception of self-resetting instantaneous relays type PRS which, when required, can be fitted with a hand reset indicator.

### Test/reset buttons

Relays other than the electrical reset model are available with an optional test button to check contact and following indicator operation.

A reset button is fitted on all models except the electrical reset and self reset relays with a following flag.

Both test and reset buttons are flush with the cover and cannot be accidentally operated.


Figure 2 | Timer control adjustment

### Time delays

The dc self-reset relays can be fitted with adjustable timers for delayed operation or delayed reset. These have a wide range, from 0.1 to 270s, to be set by the customer in 4 ranges with overlapping adjustment. By installing rectifier type PA01 in series with a dc relay, time delayed relays can be used on ac supplies. Timers are supplied set to their minimum values.

The controls are behind a hinged cover. Adjustment is by screwdriver, see Figure 2. The rotary switch, on the right hand side, allows the customer to select from 4 timing ranges. The trimpot is then used for adjustment within the time range selected, (see Technical Data).

The cover has provision for the customer to affix an identification label.

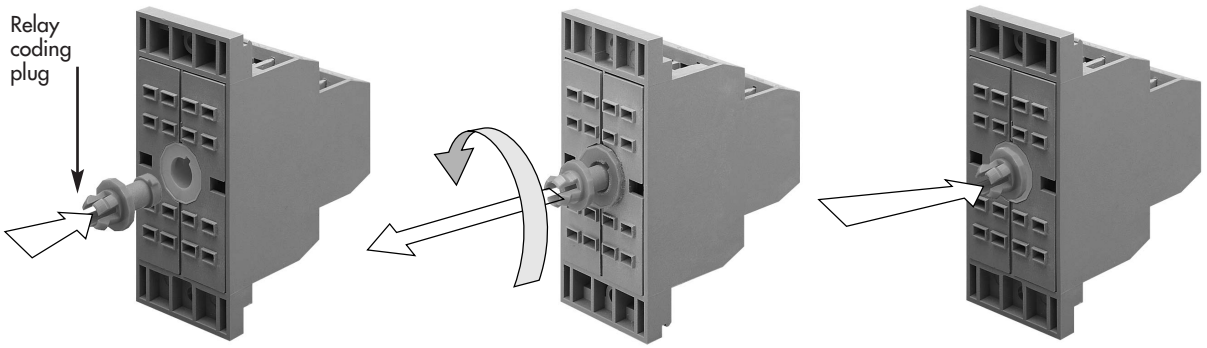



Figure 3 | Operation of relay to socket coding

## Socket

### Relay connector

Connection between the relay blades and the socket input and output terminals is by means of pre-formed phosphor bronze strips.

### Terminal options:

- M3 screw suitable for crimped pre-insulated ring tongue connectors
- Cage clamp, suitable for crimped pre-insulated connectors (flat blade or boot-lace ferrule) or wires with stripped ends are considered to be the least preferred due to wire settlement with time. Where two wires are used in the same terminal they must be of the same size.

Both M3 and cage clamp terminals will accept two standard crimped wired connectors per way.
Terminals will accept wire sizes of 0.5 - 2.5mm$^2$.

### Mounting

Prima relays are generally suitable for mounting side by side, with no gap between adjacent sockets. This allows multiple schemes to be installed in the minimum of panel space. However, PRIMA relays which are permanently energised at elevated ambient temperature (greater than 40°C) should have a vacant space, equivalent to the width of one PRIMA, between adjacent relays. Panels designed should always consider thermal gradients, and where PRIMA relays are installed near the top of non-ventilated panels, at least 100mm air gap must be allowed between the top of the relays and the underside of panel roof.

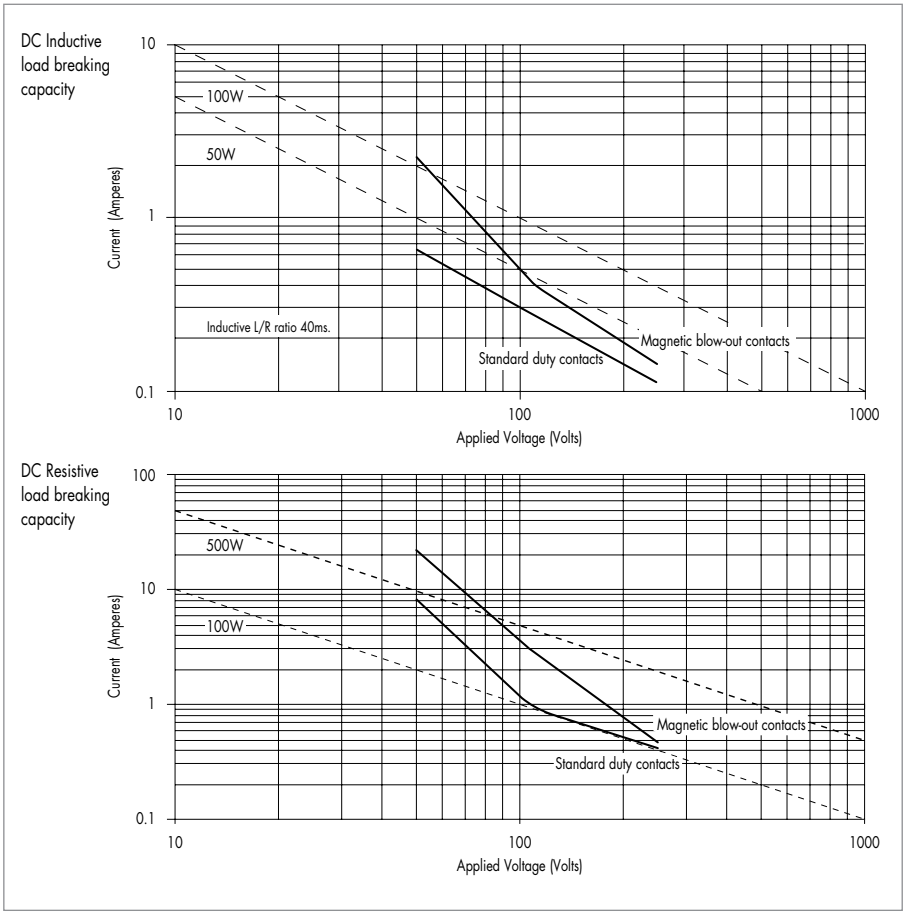
PRiMA relays are ruggedised and specifically designed for operation and to be part of large scale electrical fixed installations, where robustness, reliability and compliance with substation norms are paramount.

### Front-connected

This is designed primarily for DIN rail mounting. The wire clip area of the socket must first be hooked onto the DIN rail. Pressure should then be applied to the top of the socket until the bottom of the socket clips into place. To remove the socket, pressure should be applied to the top of the socket; the bottom of the socket can then be pulled away from the DIN rail and lifted off. It can also be panel mounted using a single No 6 self-tapping screw. Two location pegs are moulded into the housing to prevent rotation. See Figure 11.

Figure 4

DC breaking duties



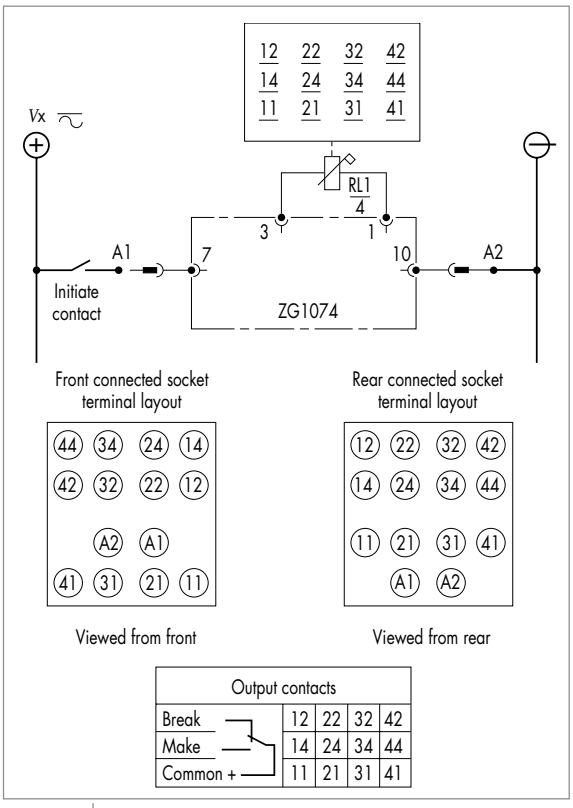
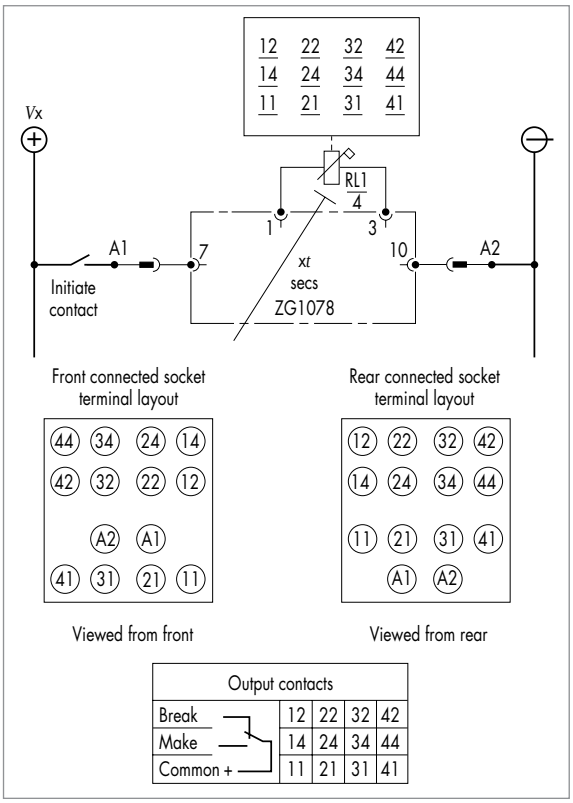



Figure 5 | Type PRS – Instantaneous self reset relay

Figure 6 | Type PRS – Self reset relay with time delayed operation




## Rear-connected

This is designed to be rack mounted using the clip-on mounting feature as follows: The wire clip area of the socket must be placed on the rack first, and pressure should then be applied to the top of the socket until it clips into place. To remove the socket, apply pressure to the top of the socket and push away from the rack. Alternatively, it may be panel mounted using two No 6 self-tapping screws or the clip-on mounting feature as described above. The socket can then be lifted from the rack. See Figure 10 for details of the required cut-outs.

A custom designed 483mm (19 inch) rack is available into which 12 relays will fit. See Figure 9 for rack assembly and blanking plate details.

## Relay to socket coding

A simple mechanical relay to socket coding system offering twelve combinations is employed to prevent the relay being plugged into the wrong socket.

See Figure 3.

## Contact wetting

In SCADA or alarm applications, the minimum recommended "wetting" values to ensure reliable making of contacts are 24V and 0.5VA. Where PRiMA relays are installed such that breaking of contacts will initiate the alarm, it is recommended that the SCADA has an alarm initiation delay of at least 2ms.

This prevents spurious alarming when cubicle doors are closed, and continuity may be broken for a fleeting instant due to the transmitted mechanical shock.

In the most onerous application of relays being mounted directly on swing-frame cubicle doors, it is strongly recommended that any "break to alarm" circuits utilise 1VA load for better contact wetting.

## Rectifier Units

A PA01 rectifier unit may be used with relays with timer or the

24/27V rated relays to allow their use on ac supplies. The PA01 is housed in a standard Prima case and must be used in conjunction with a socket suitable for the application.

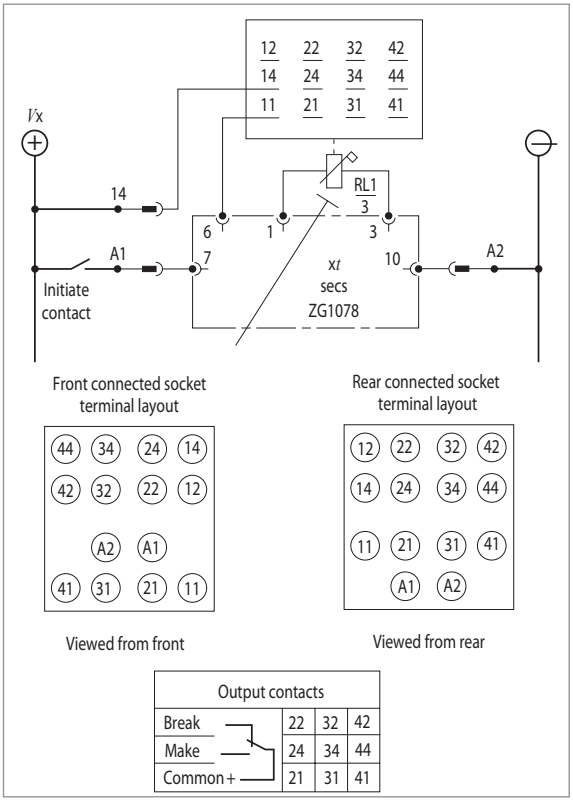



Figure 7 Type PRS – Self reset relay with time delayed reset

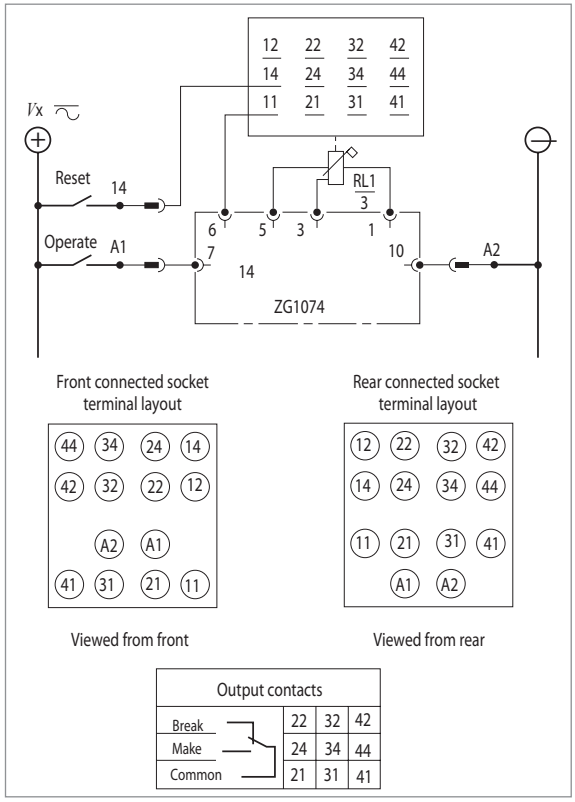



Figure 8 Types PRH – Hand and electrically reset and PRE – Electrically reset

The polarity indicated for the output contacts is recommended where magnetic blow-out contacts are used.

Figure 9 Types PRS and PA – Self reset ac relay with time delayed operation

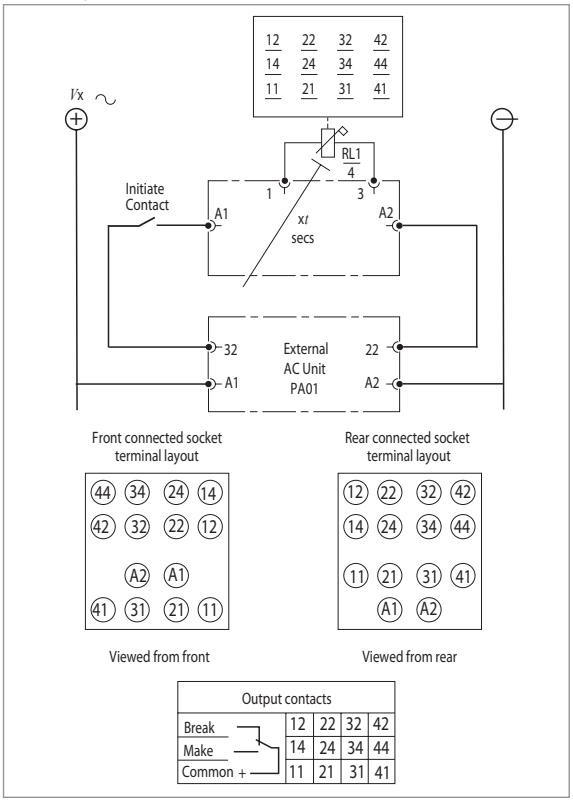
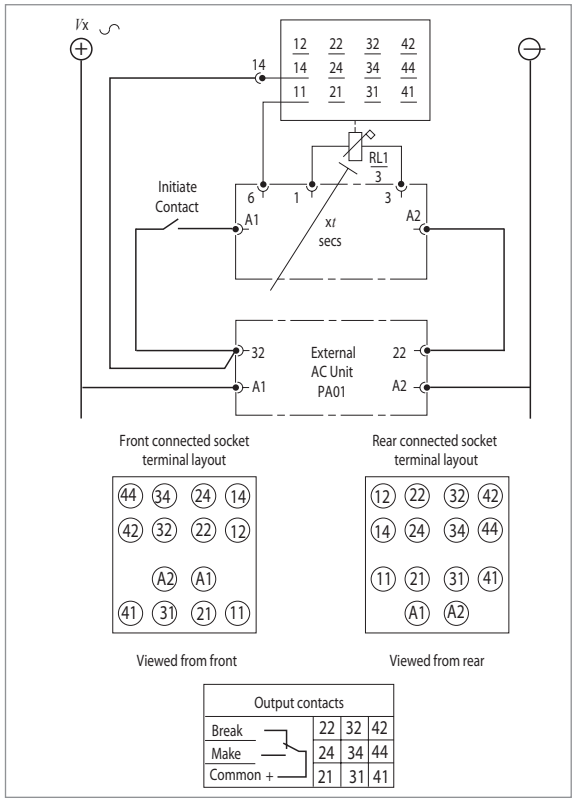



Figure 10 Types PRS and PA – Self reset ac relay with time delayed reset



# Technical Data

## Ratings

All models are for ac/dc operation except for the following which are dc only:

- self reset relays with timers
- 24/27V hand/electrical reset models

The use of rectifier unit PA01 will allow all dc only models to be used on ac supplies.

| | |
|---|---|
| Standard coil ratings | 24/27V, 30/34V, 48/54V, 110/125V, 220/250V |
| PA01 | 24/250V ac |

## Operative ranges

| Voltage rating (V) | Continuous operating voltage range (V) | Maximum DC + peak ripple voltage |
|---|---|---|
| 24/27 | 19 - 32.4 | 35.5V |
| 30/34 | 24 - 41 | 45V |
| 48/54 | 37.5 - 65 | 71.5V |
| 110/125 | 87.5 - 150 | 165V |
| 220/250 | 175 - 275 | 330V |

## Frequency

50/60Hz

## Burdens

| (specified at lower rated voltage) | Operate DC(W) | Operate AC(VA) | Reset/timing DC(W) | Reset/timing AC(VA) |
|---|---|---|---|---|
| Self reset | <3 | <3 | n/a | n/a |
| Hand/electrical reset | <4 | <4 | <12* | <12 |
| Self-reset timer - DPU | <4 | n/a | <1 | n/a |
| Self-reset timer - DDO | <4 | n/a | <3 | n/a |

*Cut-off after approximately 30ms.

## Operating time

For a normally open contact to close at lower rated voltage: 30ms typically for ac operated relays; 25ms typically for dc operated relays

Reset time
For a normally closed contact to reset: <100ms typically

## Timer range (seconds)

The timer ranges shown here are approximate, and for the lower rated voltage

| Switch position | DPU mode | DDO mode |
|---|---|---|
| 1 | 0.10 - 0.15 | 0.10 - 0.20 |
| 2 | 0.13 - 1.6 | 0.18 - 2.0 |
| 3 | 1.0 - 17.0 | 1.2 - 20.0 |
| 4 | 16.0 - 270.0 | 16.0 - 270.0 |

Note1: Timer setting instructions on reverse of blank identification labels provided with each relay.

Note 2: Adjustments to the potentiometer and switch should be made using an insulated tool.

**Repeatability** ±2%

**Variation of timing over the operative voltage range**

±15% or 20ms whichever is the greater

**Variation of timing with temperature over the operative temperature range**

±10% or 20ms whichever is the greater

**Contacts**

All relay types are fitted with changeover contacts (break before make) only. The number of contacts available for customer use varies with relay type. See Figures 5 - 8.

**Number of output contacts**

| | |
|---|---|
| Self reset relay | 4 |
| Hand /electrical reset relay | 3 |
| Electrical reset relay | 3 |
| Self reset timer - DPU | 4 |
| Self reset timer - DDO | 3 |

**Contact ratings**

| Contact type | Current | Make and carry continuously | Make and carry for 3s | Break |
|---|---|---|---|---|
| Standard | AC | 1250VA with maxima of 10A and 300V | 7500VA with maxima of 30A and 300V | 1250VA with maxima of 10A and 300V |
| | DC | 1250W with maxima of 10A and 300V | 7500W with maxima of 30A and 300V | 120W (resistive) 30W* (inductive) at 100V. L/R = 40ms See Figure 4 for curves |
| Magnetic blow-out | DC | 1250W with maxima of 10A and 300V | 7500W with maxima of 30A and 300V | 350W (resistive) 50W* (inductive) at 100V. L/R = 40ms See Figure 4 for curves |

* Normally closed contacts breaking with positive potential applied to the moving contacts

| Contacts in use | Continuous rating per contact (amps) |
|---|---|
| 1 | 10 |
| 2 | 10 |
| 3 | 5 |
| 4 | 5 |

Maximum rate of operation, 600 per hour

**Durability**

| | |
|---|---|
| Loaded contact | 100,000 operations |
| Unloaded contact | 1,000,000 operations |

## High voltage withstand

Dielectric withstand

| | |
|---|---|
| IEC 60255-5: 1977 | 2kV rms for 1 minute between all terminals and case earth.<br>2kV rms for 1 minute between terminals of independent circuits including contact circuits, with terminals on each independent circuit connected together.<br>1kV rms for 1 minute across open contacts of output relays. |
| ANSI/IEEE C37.90:1989 | 1.5kV rms across open outgoing contact pairs. |
| High voltage impulse IEC 60255-5:1977 | Three positive and three negative impulses of 5kV peak, 1.2/50 µs, 0.5J between all independent circuits and between all terminals and earth. |
| Insulation resistance IEC 60255-5:1977 | >100MV when measured at 500V dc |

## Electrical environment

| | |
|---|---|
| DC supply interruption IEC 60255-11:1979 | The unit will withstand a 10ms interruption in the auxiliary supply, under normal operating conditions, without de-energising. |
| High frequency disturbances IEC 60255-22-1:1988 Class III | 2.5kV peak between independent circuits and case.<br>1.0kV peak across terminals of the same circuit. |
| Fast transient disturbance IEC 60255-22-4: 1992 Class IV | Applied directly to auxiliary supply. |
| EMC Compliance 89/336/EEC | Compliance to the European Commission Directive on EMC is claimed via the Technical Construction File route. |
| EN 50081-2:1994<br>EN 50082-2:1995 | Generic Standards were used to establish conformity. |
| Product safety 72/23/EEC | Compliance with the European Commission Low Voltage Directive. |
| EN61010-1: 1993/A2:1995<br>EN60950: 1992/A11: 1997 | Compliance is demonstrated by reference to generic safety standards. |
| File No. E194075 | UL Recognised component for the US and Canada. |

### Atmospheric environment

| | |
|---|---|
| Temperature<br>BS EN 60068-2-1:1983<br>IEC 68-2-2:1974 | Storage and transit -25°C to +70°C<br>Operating -25°C to +55°C |
| Humidity<br>IEC 68-2-3:1969 | 56 days at 93% RH and 40°C |
| Enclosure protection<br>BS EN 60529:1993 | |
| Relay | IP50 (dust protected) |
| Socket | IP20 |

### Mechanical environment

| | |
|---|---|
| Vibration<br>IEC 60255-21-1:1988 | Response Class I<br>Endurance Class I |
| Shock and bump<br>IEC 255-21-2:1988 | Shock response Class I<br>Shock withstand Class I<br>Bump Class I |
| Seismic<br>IEC 255-21-3:1993 | Class I |

### Weight

| | |
|---|---|
| Relay | 190g |
| Front-connected socket | 125g |
| Rear-connected socket | 90g |

## Housings

See Figures 10 and 11 for details of relay and socket outlines. Rack and DIN rail mounting details will be provided upon request.

### Dimensions

| | Height (mm) | Depth (mm) | Width (mm) |
|---|---|---|---|
| Relay | 65 | 85 | 34 |
| Front connected socket | 115 | 50 | 34 |
| Rear connected socket | 75 | 56 | 34 |
| Moulding material identity | All materials are flame retardant to specification UL94 (V-O). All major mouldings have their material identity moulded into them. | | |
| Relay cover | polycarbonate >PC< | | |
| Relay | polyphenylene oxide >PPO GF20< | | |
| Socket | polyphenylene oxide> PPO GF20< | | |

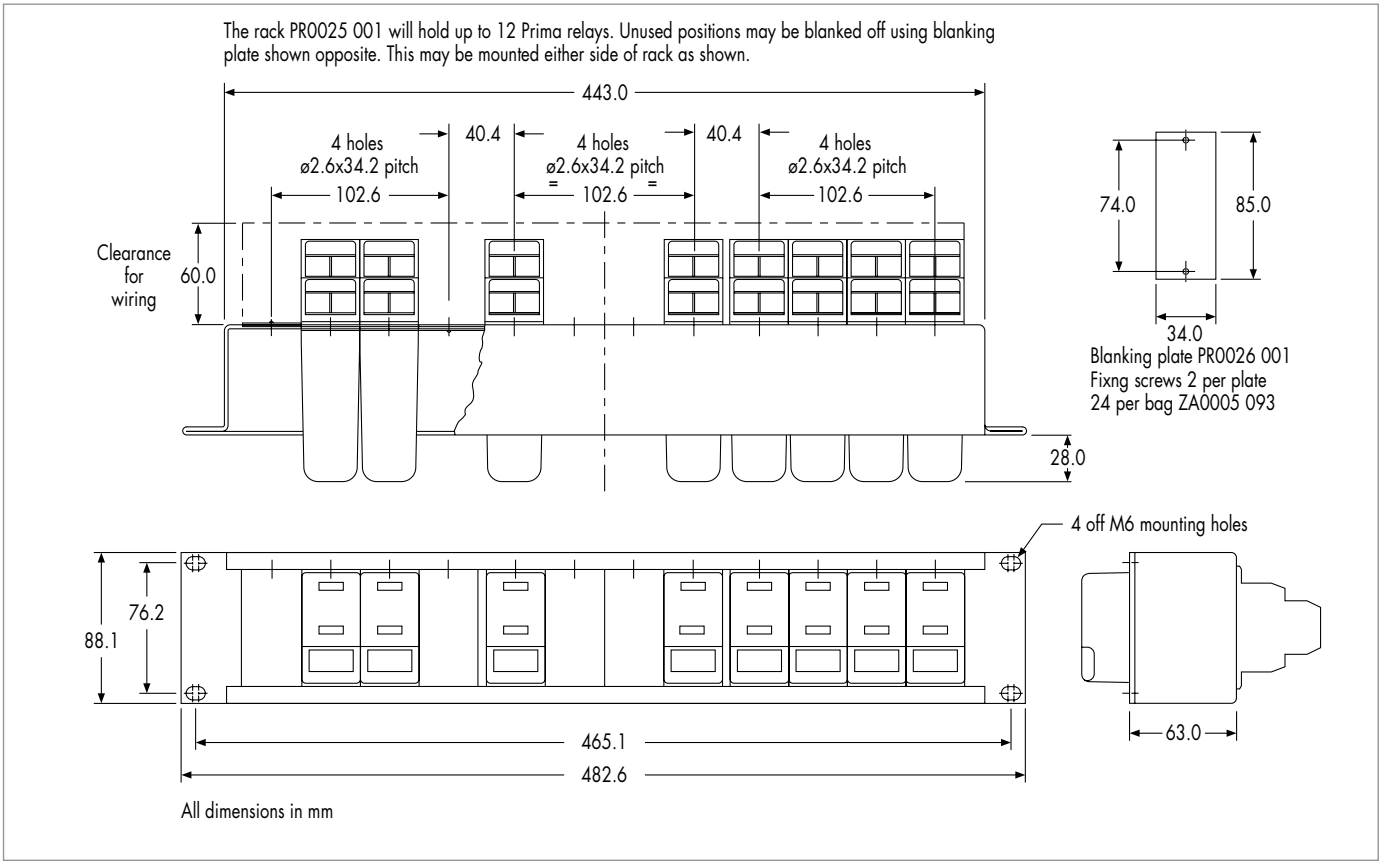



Figure 11 | Outline and mounting details for rack and blanking plate

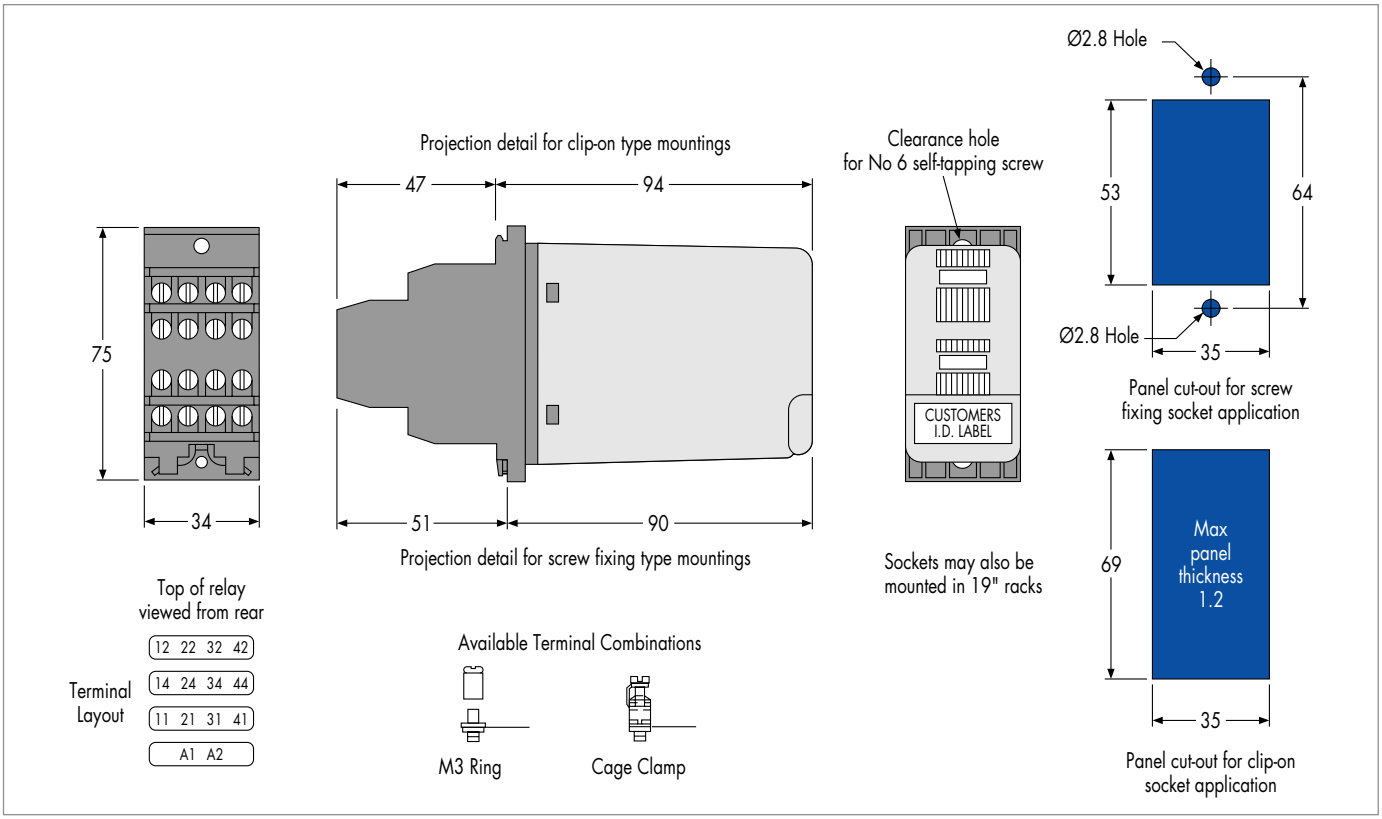



Figure 12 | Case outline for rear connected relay

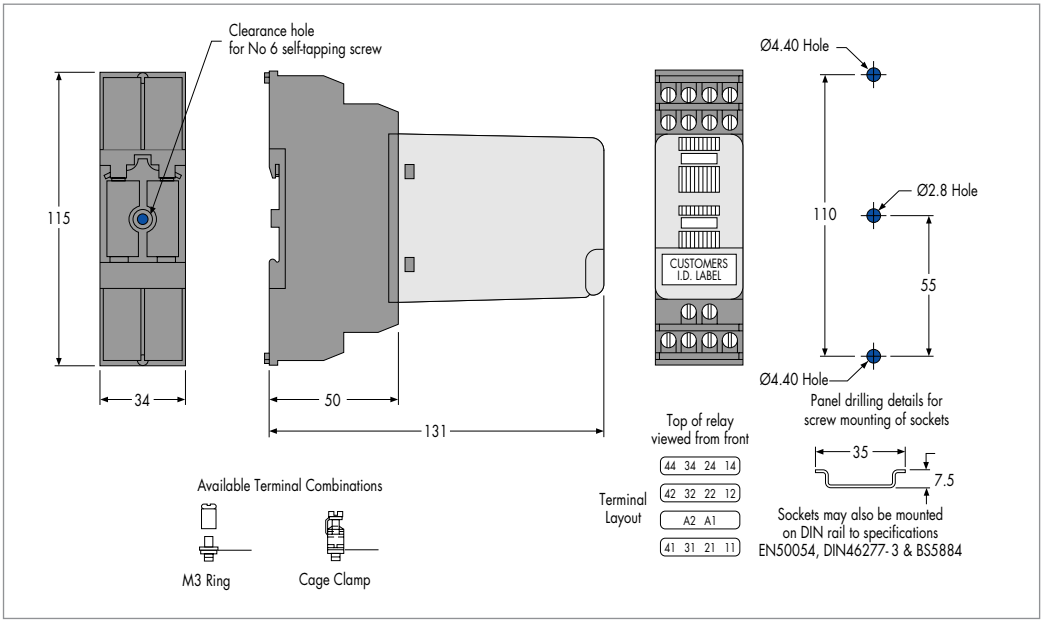



Figure 13

Case outline
for front connected relay

## Information required with order

### Relay

**Voltage**

| Electrical or Self-reset ac/dc Hand/electrical reset dc | | Electrical or Hand/electrical reset ac |
|---|---|---|
| 24/27 | 01 | |
| 30/34 | 02 | 12 30/34 |
| 48/54 | 03 | 13 48/54 |
| 110/125 | 04 | 14 110/125 |
| 220/250 | 05 | 15 220/250 |

**Timer**

- Delay on drop-off (self-reset dc only) . . . D
- Delay on pick-up (self-reset dc only) . . . P
- No delay (instantaneous) . . . N

**Self test**

- T . . . Test button fitted
- B . . . No test button

**Flag**

- Following flag . . . 1
- Hand-reset flag (self-reset instantaneous only) . . . 2

**Contacts**

- Standard contacts . . . 1
- Magnetic blow-out contacts . . . 2

**Contact Type (changeover)**

- 4 self-reset contacts . . . S
- (3 contacts DDO timer) . . . S
- 3 hand/electrical-reset contacts . . . H
- 3 electrical-reset contacts . . . E

Quantity | PR

Quantity | PR

Quantity | PR

### Socket

**Terminal type**

- Cage clamp 1
- M3 screw 3

**Socket type**

- Front-connected F
- Rear-connected R

Quantity | PS

Quantity | PS

### Rack

Quantity | P R 0 1

### Rectifier

Quantity | P A 0 1

### Blanking Plate

Quantity | P B 0 1

### Fixing screws

(24 screws per bag)

Quantity (bags) | P F 0 1

## Imagination at work

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PRIMA/EN TD/C