

AUXILIARY | **TRIPPING** | SUPERVISION

Delta TRD4

Compact high burden, high speed electro-mechanical tripping relays for power utility protection and control applications.

- > ANSI code 86 and 94 versions
- > Less than 10ms operate time
- > High burden operation
- > Hand reset flag
- > Surface or rail mount
- > Flush panel or rack mount
- > Made in Australia





Features

- > Less than 10ms operate time
- > High burden operation to comply with capacitor discharge test requirements
- > 4 heavy duty contacts
- > Self-reset contact version
- > Latching contact version with hand and electrical reset
- > Hand-reset electro-mechanical flag
- > Rated operate voltages available for 24, 30/32, 48, 110, 125, 220, 240 or 250 Volts DC nominal auxiliary supplies
- > Panel, rack or rail mount options
- > Compact size 2, 2U high case
- > Plug-in terminal block
- > M4 screw terminals
- > Relay operate LED standard
- > Magnetic arc blowouts standard

Description

The Delta TRD4 is a high speed, high burden electro-mechanical tripping relay for power utility protection and control applications.

The TRD4 is built on the Delta relay platform providing high performance and reliability while reducing production and supply lead times.

Application of the Delta TRD4 multi-contact high-speed trip relays to ensure fast operation of less than 10 ms.

Model Designation

DELTA TRD4 MODELS:

- > TRD4-1 Self-Reset Contacts and Hand Reset Flag
- > TRD4-4 Hand and Electrical Reset Contacts and Hand Reset Flag

Application

The Delta TRD4 relay provides a robust and reliable high speed interface between the protection system and the circuit breaker.

A more economical alternative to traditional tripping relays the Delta TRD4 provides a compact, flexible and high performance solution while meeting relevant IEC standards.

A wide voltage range, high burden operation and standard hand reset flag reduces the number of model variations. The Delta range is packaged in a size 2, 2U high case that may be flush panel, rack or rail mounted.

A plug in terminal block is provided to allow panel pre-wiring.

Where more than 4 contacts are required refer to the Alpha Range Technical Bulletin.

Front Panel Layout

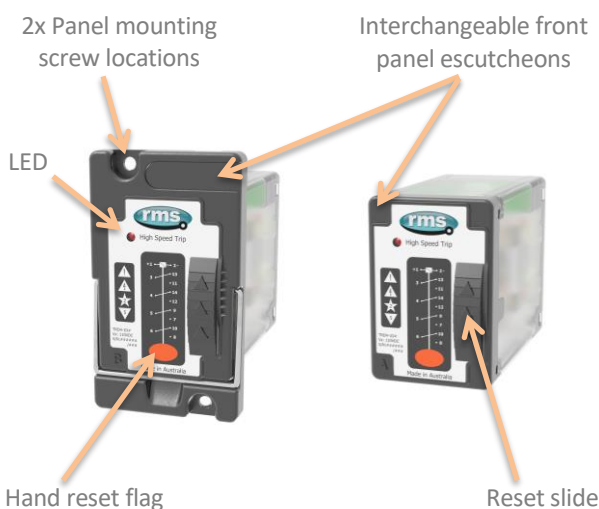


Figure: 1: TRD4 front panel
 Left – Panel mount Right – Rail mount

Front Panel Configuration

Delta relays can be easily converted from a rail mount to a flush mount configuration. This is achieved by un-clipping the front rail mount escutcheon, securing a metal panel mount plate with four (4) screws and clipping on a panel mount escutcheon. This process may be reversed to convert from a panel mount to a rail mount version.

Delta relays may be ordered with the desired configuration or converted by the user using one of the conversion kits listed in the ordering section.



Coil Operation LED

A front panel LED is provided to indicate when a voltage is applied to the operate coil terminals.

Contact Configuration

Self-reset contacts: 4 C/O
 Latching contacts: 3 C/O + 1 N/O

Self-Reset Contacts

All contacts operate when a voltage in the specified range is applied to the relay coil and reset when this voltage is removed.

Hand and Electrical Reset Contacts

All contacts operate and mechanically latch when a voltage in the specified range is applied to the relay coil. The contacts reset when the reset button located on the front of the relay is pressed. A voltage applied to the reset coil may also be used to reset the contacts.

Care should be taken to avoid holding the Contact Hand Reset actuator in the reset position during the presence of a relay operate signal.

Hand Reset Flag

A high visibility mechanical flag drops when the contacts are first operated and remains visible until it is manually hand reset using the reset slide button located on the front of the relay. Note that this flag will only remain reset with the contacts are in the reset position.

Electrical Reset Interlock

In traditionally designed tripping relays, if the reset circuit is held energized while the relay operate input also remains energized, the relay will oscillate between the operated and reset states. The reset interlock feature eliminates this condition and protects the relay from thermal damage by locking out the reset command when a relay operate voltage is applied.

Magnetic Arc Blowouts

Magnetic arc blowouts are a standard feature on all Delta TRD4 relays. Their fitment provides greatly enhanced switching capabilities for inductive DC loads by extinguishing the electrical arcs initiated when the load is broken.

Operating Time

Make contacts: <10 ms to first touch at nominal rated operating voltage.

Break contacts: <6 ms transition

High Burden Operation

The TRD4 tripping relay is suitable for application in high security circuit breaker tripping circuits and in particular where the initiating contact may be remote from the relay. The high burden can also be used to facilitate the satisfactory operation of external series elements. The high burden configuration provides maximum immunity to electrical disturbance and noise.

High burden tripping relays are designed to withstand the 10uF capacitor discharge test such that the relay will not operate when a 10uF capacitor charged to 120% of the nominal operating voltage is applied across the operate input of the relay.

Operating Burden

ENA TS 48-4 2016 Table 1 - High burden

Average Operate and Reset burden during pick-up at nominal	
High burden	150 W maximum

Operated Burden

Burden after pick-up at nominal		
Self-reset relays		3 W maximum
Latching relays:	24V dc	<0.10W
Operate and Reset	32V dc	<0.12W
	48V dc	<0.18W
	110V dc	<0.40W
	125V dc	<0.45W
	220V dc	<0.80W
	240V dc	<0.88W
	250V dc	<0.90W

Minimum Operating Current

High burden	50 mA minimum
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Time Delayed Cut Off

Economizing delay -Operate	< 60 ms
-Reset	10-15 ms

Pickup Operating Voltage

Guaranteed operation between 70% and 120% of nominal rated DC operating voltage.

Non Operate Voltage

Non-Operating voltage for all models <55% of nominal

Reset Voltage

Self-reset relays will reset at not less than 20% of nominal rated operate voltage. Reset typically occurs at 50% of nominal.

Operation of Series Elements

External relay elements are sometimes employed for additional flagging and alarm functions. These elements are typically much slower than the primary high speed tripping relay so care must be taken to ensure reliable operation of all series element before the series trip signal is cut off or economized. The incorporation of a 50 ms time delay cut off in the TR relay provides for such circumstances.

Coil Thermal Rating

All operate, reset and time delayed circuits are designed to withstand continuous application of 120% of the nominal rated voltage.

The high speed operate coil element (150 W max.) has a thermal rating of 30 seconds, however the TRD4 tripping relays automatically economizes within 60 ms of operation to provide inherent thermal protection.

Electrical Reset

Reset voltage: As per rated pickup voltage.

Reset cut off: Instantaneous with main relay reset.

Contact Ratings

Contact material	Ag
Isolation across open contacts	1 kV rms
Make and carry	7 A all contacts 10 A any two contacts
Peak inrush current (make and carry)	200 A for 10 ms 40 A for 0.5 s 30 A for 1 s
DC break capacity (rated load)	Resistive (DC1)
	Inductive (L/R = 40 ms)
	7 A / 110 V 3 A / 220 V
	0.5 A / 110 V 0.15 A / 220 V
Maximum switching voltage	250 VDC / 440 VAC
Minimum switching voltage	12 V
Minimum switching current	10 mA

ATMOSPHERIC ENVIRONMENT

Temperature

Standard	IEC 60068-2-1, IEC 60068-2-2	
Test Identification	Test specification	Auxiliary power Supply voltage
Operating Range	-10 to +55°C	Min and Max
Storage Range	-25 to +70°C	Non-energized
Test duration	16 hours at top and bottom temperatures	

Damp Heat (Humidity)

Standard	IEC 680068-2-78	
Test Identification	Test specification	
Operating Range	40°C and 93% RH non condensing	
Test duration	16 hours	

IP Rating

Standard	IEC 60529	
Test Identification	Test specification	
Installed	IP5x	

EMC EMISSIONS

Emission Enclosure

Standard	IEC 60255-26, #5.1	
Test Identification	Frequency range	Limits, dB ($\mu\text{V}/\text{m}$)
Radiated emission <1 GHz	30 - 230 MHz	40, quasi peak at 10 m 50, quasi peak at 3 m
	230 - 1000 MHz	47, quasi peak at 10 m 57, quasi peak at 3 m
Radiated emission >1 GHz	1 - 3 GHz	56, average 76, peak at 3 m
	3 - 6 GHz	60, average 80, peak at 3 m

ELECTRICAL ENVIRONMENT

Clearances and Creepage Distances

Standard	IEC 60255-26, #10.6.3	
Test Identification	Test specification	
Pollution degree	2	
Overvoltage category	III	
Rated insulation voltage	300 V d.c.	
Clearances and Creepage Compliance	CAD drawings assessment	

Safety-related Electrical Tests

Standard	IEC 60255-27, #10.6.4	
Test Identification	Test specification	
Between Independent Circuits	5 kV 1.2/50 μs 0.5 J 3 pulses of each polarity 2.0 kV ac rms for 1 minute	
	5 kV 1.2/50 μs 0.5 J 3 pulses of each polarity 2.0 kV ac rms for 1 minute	
Any Terminal and Earth	5 kV 1.2/50 μs 0.5 J 3 pulses of each polarity 2.0 kV ac rms for 1 minute	
Across Normally Open Contacts	1 kV ac rms for 1 min	

Electrical Environment and Flammability

Standard	IEC 60255-27, #10.6.5	
Test Identification	Test specification	
Single-fault condition	Assessment for Opened and Closed circuit cases	
Maximum temperature of accessible parts at ambient temperature +40°C	< 80°C	
Flammability of insulating materials, components and fire enclosures	Assessment	

Reverse Polarity and Slow Ramp Test

Standard	IEC 60255-27, #10.6.6	
Test Identification	Test specification	
Maximum voltage d.c.	V start-up + 20%	
Minimum voltage d.c.	V shutdown - 20%	
Ramp down/up gradient	1 V/min	

MECHANICAL ENVIRONMENT

Vibration - Sinusoidal

Standard	IEC 60255-21-1 Class 1	
Test Identification	Test specification	Variation
Vibration Response in each of 3 axes	0.035 mm/0.5 gn peak 1 sweep cycle 10-150 Hz	≤5%
Vibration Endurance in each of 3 axes	1.0 gn peak 20 sweep cycles 10-150 Hz	Non-energized

Shock and Bump

Standard	IEC 60255-21-2 Class 1	
Test Identification	Test specification	Variation
Shock Response in each of 3 axes	5 gn, 11 ms, 3 pulses in each direction	≤5%
Shock Withstand in each of 3 axes	15 gn, 11 ms, 3 pulses in each direction	Non-energized
Bump Test in each of 3 axes	10 gn, 16 ms, 1000 bumps in each direction	Non-energized

Seismic

Standard	IEC 60255-21-3 Class 1	
Test Identification	Test specification	Variation
Seismic Response Horizontal, on each axis	3.5 mm/1.0 gn, 1 sweep cycle 1-35Hz	≤5%
Seismic Response Vertical	1.5 mm/0.5 gn, 1 sweep cycle 1-35Hz	≤5%

EMC IMMUNITY

Electrostatic Discharge (ESD)

Standard	IEC 60255-26, #7.2.3, Acceptance criterion B	
Port	Enclosure	
Test Identification	Test specification	Variation
Air Discharge	8 kV	≤5%

Radiated Electromagnetic Field

Standard	IEC 60255-26, #7.2.4, Acceptance criterion A	
Port	Enclosure	
Test Identification	Test specification	Variation
Frequency sweep	10 V rms, 80 to 1000 MHz 1400 to 2700 MHz	≤5%
Spot frequencies	10 V rms, 80, 160, 380, 450, 900, 1850 & 2150 MHz	≤5%

Fast Transients (EFT)

Standard	IEC 60255-26, #7.2.5, Acceptance criterion B	
Port	Input and Output ports	
Test level	Test specification	Variation
Zone A	4 kV peak, 5/50 ns, 5 kHz	≤5%

Slow Damped Oscillatory Wave (HFD)

Standard	IEC 60255-26, #7.2.6, Acceptance criterion B	
Port	Auxiliary power supply, Input and Output	
Test Identification	Test specification	Variation
Common Mode	1 MHz 2.5 kV peak	≤5%
Differential Mode	1 MHz 1.0 kV peak	≤5%

Surge

Standard	IEC 60255-26, #7.2.7, Acceptance criterion B	
Port	Auxiliary power supply, Input and Output	
Test Identification	Test specification	Variation
Line-to-earth	4 kV peak	≤10%
Line-to-line	2 kV peak	≤10%

Conducted Disturbance Induced by RF Fields

Standard	IEC 60255-26, #7.2.8, Acceptance criterion A	
Port	Auxiliary power supply, Input and Output	
Test Identification	Test specification	Variation
Frequency sweep	10 V rms, 0.15 to 80 MHz	≤5%
Spot frequencies	10 V rms, 27 & 68 MHz	≤5%

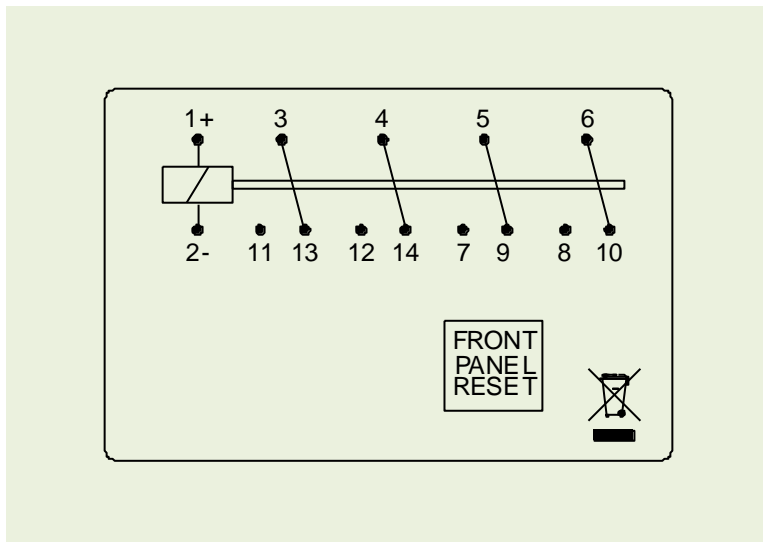
Power Frequency Magnetic Field

Standard	IEC 60255-26, #7.2.10	
Port	Enclosure only	
Test Identification	Test specification	
Continuous ≥ 60 s	30 A/m - Acceptance criterion A	
Short time 1 s to 3 s	300 A/m - Acceptance criterion B	

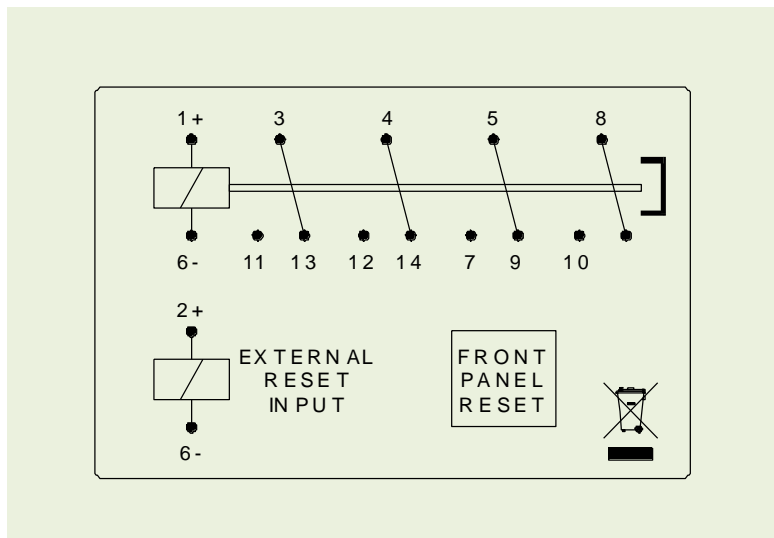
Capacitive Discharge Immunity

Standard	ENA TS 48-4, Issue 4, 2010	
Port	Operate port of a High Burden relay	
Test Identification	Nominal voltage	Criterion
Capacitor 10 μF charged to 120% x Vnom (275 V Maximum)	48, 110, 125, 220, 240 and 250 VDC	No mal-operation

TRD4-1 Self-Reset Contacts and Hand Reset Flag



TRD4-4 Hand and Electrical Reset Contacts and Hand Reset Flag



Terminal Block

- TBD-R1 / R2 Rear connect terminal block
Suitable for flush mount relay version
- TBD-F Front connect terminal block
Suitable for rail mount relay version

Mounting and Dimensions

19 Inch Rack Mount Rear Connect (TBD-R Terminal Block)



19 inch rack mount
2U x 2U



Adapter plate for 2x units
in a 2U x 4U rack frame



Adapter plate for 4x units
in a 4U x 4U rack frame

Surface Mount Rear Connect (TBD-R Terminal Block)



Panel cut-out to mount surface rear
connect base

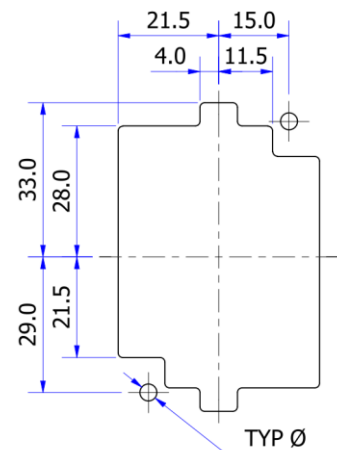
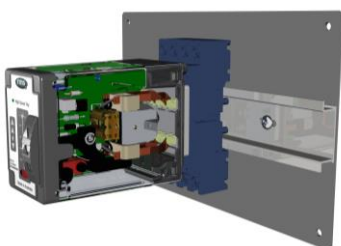


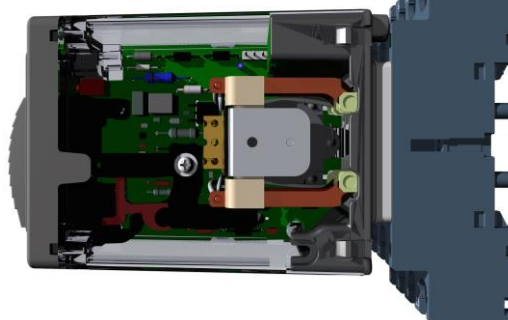
TABLE 1 - HOLE DIA

PANEL THICKNESS (T)	HOLE DIA (Ø)
1mm < T < 2mm	3.6mm
T > 2mm	3.7mm

Surface or Rail Mount Front Connect (TBD-F Terminal Block)



65



94

30

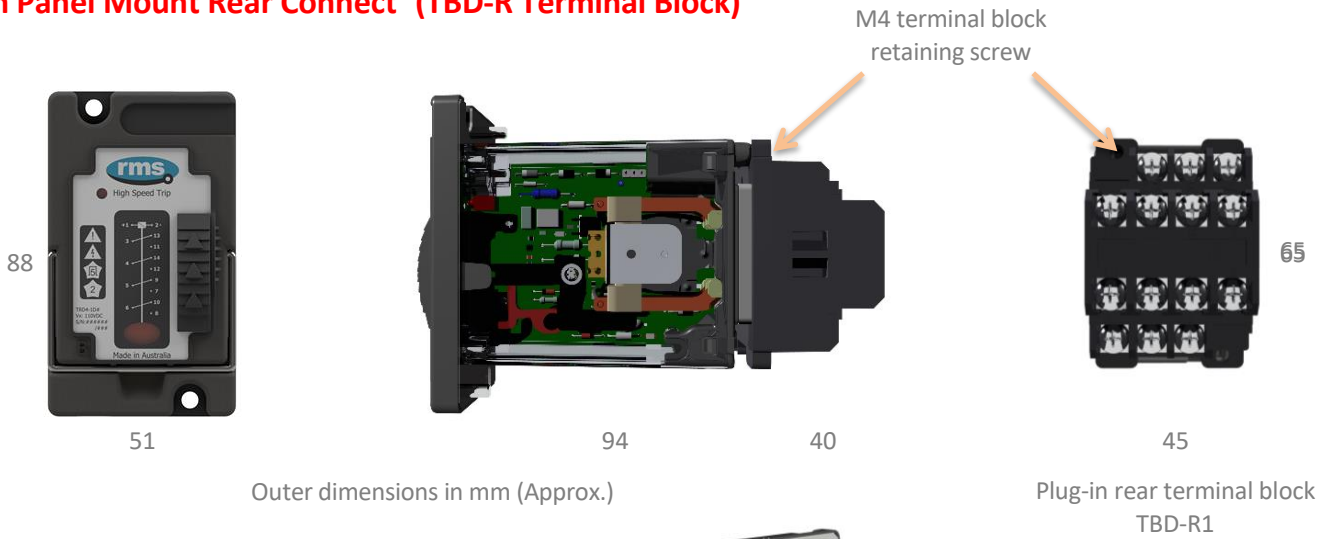


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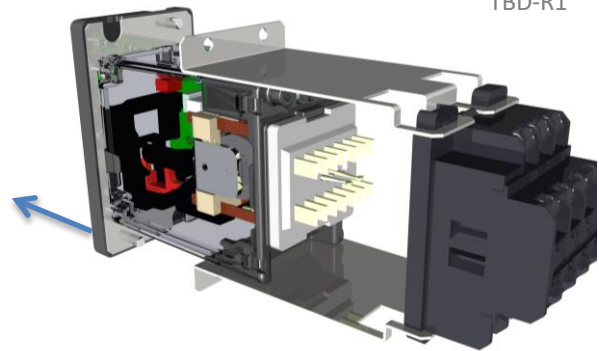
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Mounting and Dimensions

Flush Panel Mount Rear Connect (TBD-R Terminal Block)



Flush panel mounting
Rear connect terminal block



Rear connect terminal base secured to the front panel with optional retention plates - TBD-R2. Relay shown partially drawn-out of the panel.

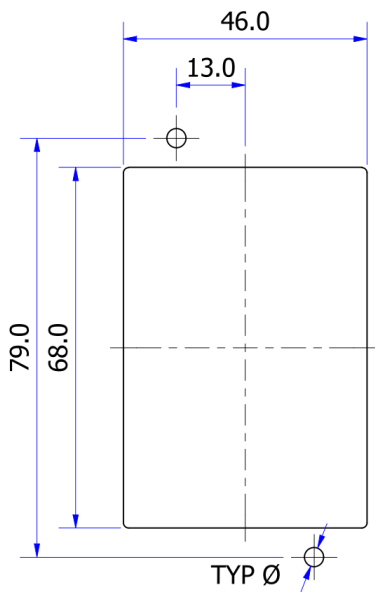


TABLE 1 - HOLE DIA	
PANEL THICKNESS (T)	HOLE DIA (Ø)
1mm < T < 2mm	3.6mm
T > 2mm	3.7mm

Panel cut-out to flush mount relay for use with rear connect TBD-R1 base

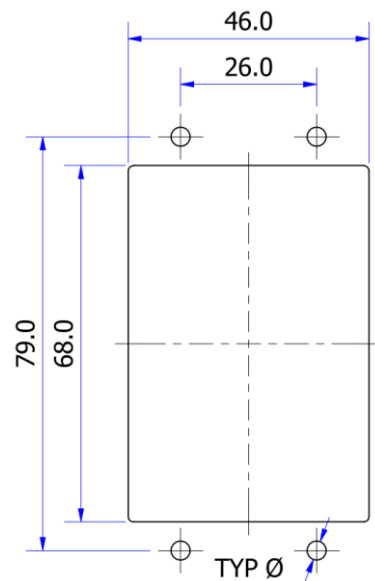


TABLE 1 - HOLE DIA	
PANEL THICKNESS (T)	HOLE DIA (Ø)
1mm < T < 2mm	3.6mm
T > 2mm	3.7mm

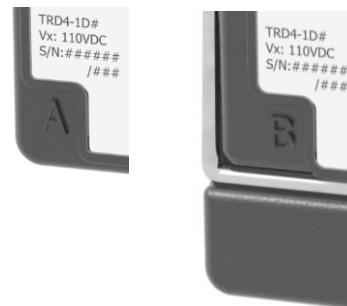
Panel cut-out to flush mount relay for use with rear connect TBD-R2 base

Delta TRD4 Relay Order Code

TRD4 -						
Contact Function	1					Self-reset contacts
	4					Latching contacts with hand and electrical reset
Nominal Operate Voltage	A					24 V dc
	B					32 V dc
	C					48 V dc
	D					110 V dc
	E					125 V dc
	F					220 V dc
	G					240 V dc
	H					250 V dc
Mounting Configuration	A					Surface or rail mounting without terminal block
	A-F					Surface or rail mounting including TBD-F terminal block
	A-F-IP2X					Surface or rail mounting including TBD-F-IP2X terminal block
	A-R1					Surface mount including TBD-R1 terminal block
	A-R1-IP2X					Surface mount including TBD-R1-IP2X terminal block
	B					Panel mounting without terminal block
	B-R1					Panel mounting including TBD-R1 terminal block
	B-R1-IP2X					Panel mounting including TBD-R1-IP2X terminal block
	B-R2					Panel mounting including TBD-R2 terminal block
						Panel mounting including TBD-R2-IP2X terminal block
Options				-		None
Non Standard Parameters					-	None
					NF	No Flag (Only available for TRD4-1 self-reset relay - refer to Appendix 1)

Refer note 1

NOTE 1 The Delta relay will be supplied for mounting as per the order code specified. However, the relay mounting can be changed from DIN rail mount (Code A) to Panel Mount (Code B) or vice versa using the TBD-AC Relay Mount Conversion Kit. This provides more flexibility to manage changes at site without returning to the factory for modification. The front panel relay ID employs a # code in place of the mounting configuration code to indicate that either mounting configuration is possible. The mounting configuration code A or B is shown on the escutcheon moulding – Refer to the two alternative escutcheon examples depicted.



Refer to Appendix 2 for further detail on IP2X terminal blocks.

Delta Terminal Block Order Codes

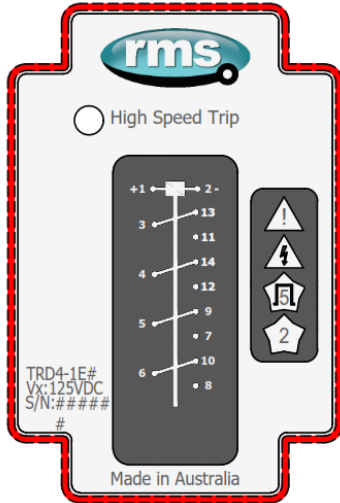
TBD -	<input type="text"/>	
Terminal Block Connection	F	Front connect
	F-IP2X	Front connect with IP2X covers
	R1	Rear connect
	R1-IP2X	Rear connect with IP2X covers
	R2	Rear connect using terminal block retention plates
	R2-IP2X	Rear connect with IP2X covers and terminal block retention plates

Delta Accessories

Relay mount components	TBD-AC	Relay mount conversion kit (Excludes terminal block)
Panel mount frames	TBD-AD	Dual - 4U x 2U frame to rack mount 2 high x 1 wide Delta relays
	TBD-AQ	Quad - 4U x 4U frame to rack mount 2 high x 2 wide Delta relays

Appendix 1

NF - No Flag option example front label
(Only available for TRD4-1 self-reset relay)

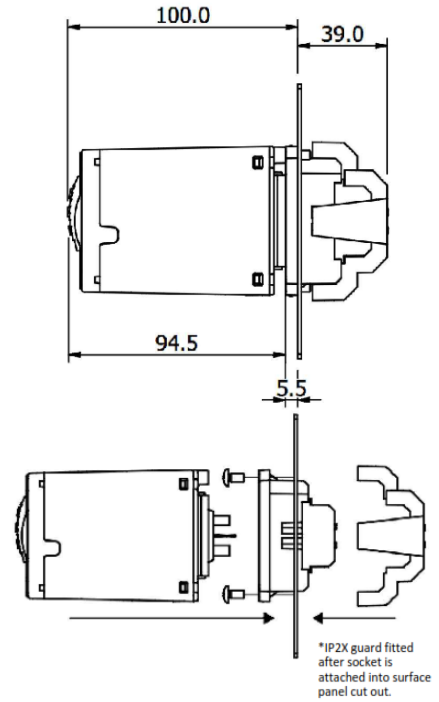


IP2X Terminal Options

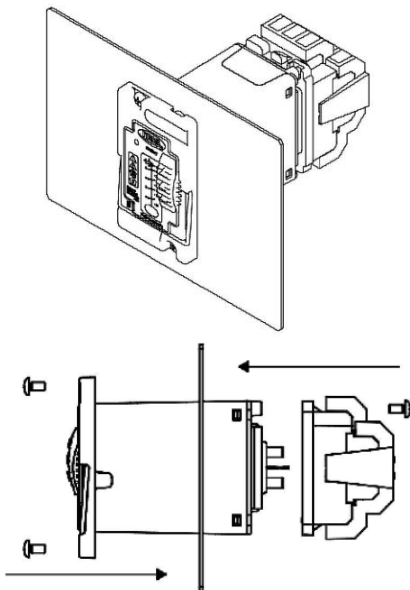
Surface or Rail Mount Front Connect (TBD-F-IP2X Terminal Block)



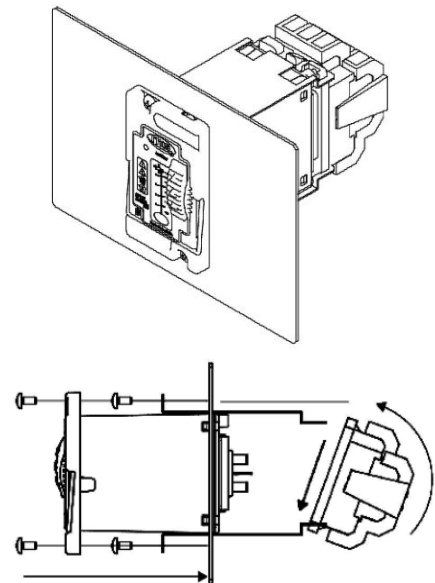
Surface Mount Rear Connect (TBD-R1-IP2X Terminal Block)



Flush Panel Mount Rear Connect (TBD-R1-IP2X Terminal Block)



Flush Panel Mount Rear Connect (TBD-R2-IP2X Terminal Block)



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