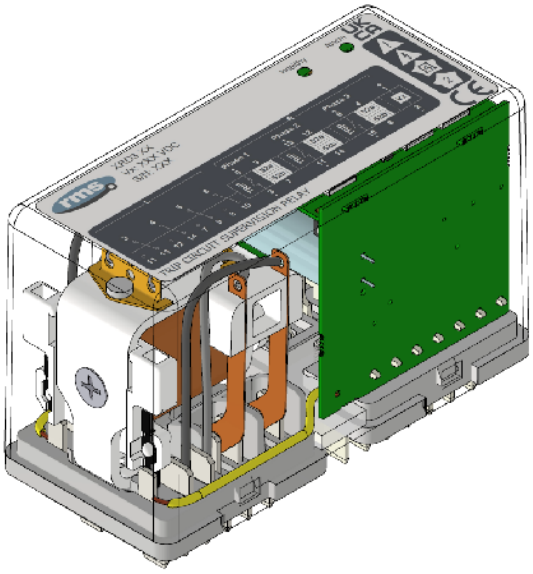
AUXILIARY | TRIPPING | SUPERVISION

XRD3

Trip Circuit Supervision Relay for the supervision of 3 phase trip circuits.



FEATURES

- 4 C/O Alarm contacts
- Supervision HEALTHY green LED
- Alarmed state red LED
- Wide range of nominal voltages
- Wide temperature range
- DIN rail or panel mount
- Sturdy design
- Long life span

Functional Description

DESCRIPTION

The XRD3 provides trip circuit supervision of single phase circuit breakers with three trip coils.

The trip circuits are supervised from the positive supply to the negative supply whilst the circuit breaker is in the open or closed position.

Supervision is undertaken using a low supervision current in each circuit thus avoiding unwanted operation of the trip coil. Healthy circuits are indicated by a green LED and a red LED indicates a failed trip circuit.

APPLICATION

The XRD3 Relay is low burden electro-mechanical supervision relays for application on high security tripping and auxiliary supply circuits.

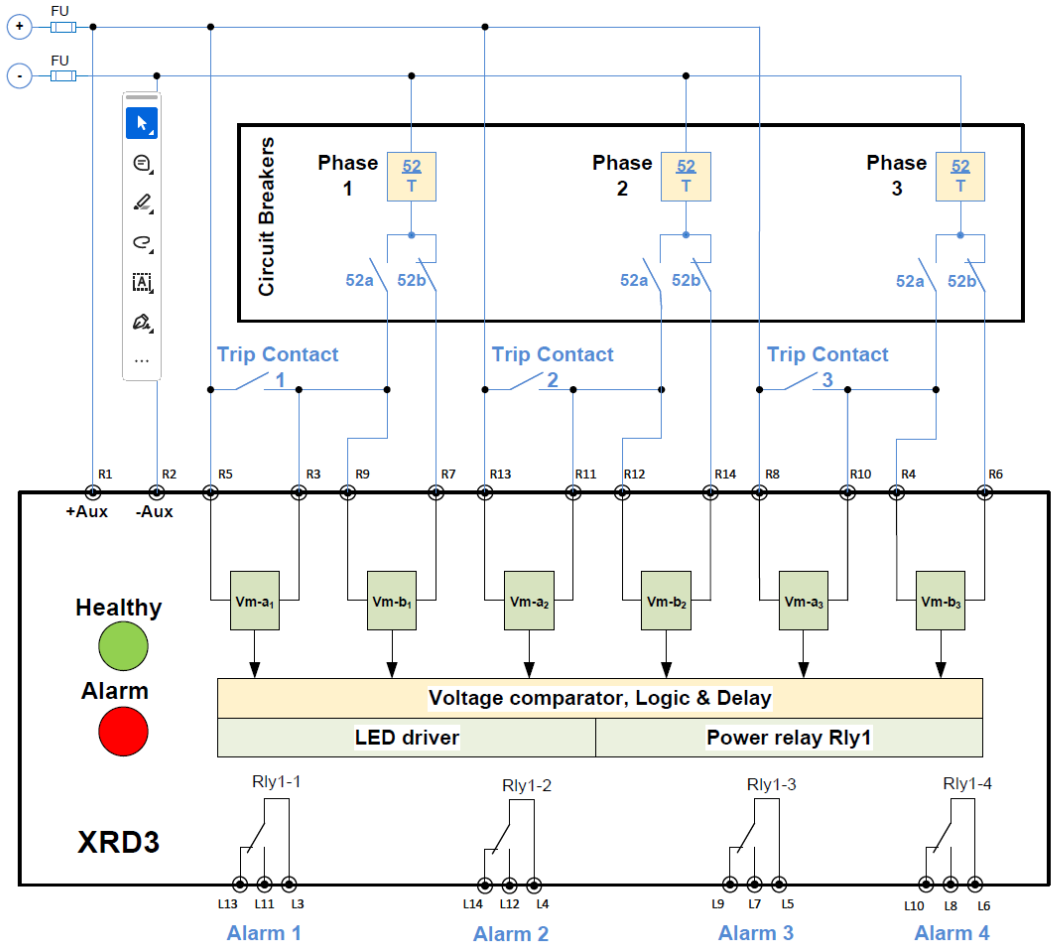
The XRD3 relay has been designed to provide a balance of low burden to minimize the possibility of circuit breaker maloperation while maintaining a minimum contact whetting current to avoid nuisance alarm conditions.

A key feature of the design is a high visibility healthy and alarm indicators. A green Healthy LED is standard. Failure of the circuit or supply being supervised will cause the main relay element to drop out, an alarm signalled via the red LED and the alarm contacts to change state.

XRD3 WORKS WITH CIRCUIT BREAKER COILS DOWN TO 4.5W

	Maximum CB Trip Coil Resistance
24V	130Ω
30/32V	230Ω
48V	520Ω
60V	800Ω
110/125V	3.5kΩ
220/250V	14kΩ

CONNECTION SCHEME

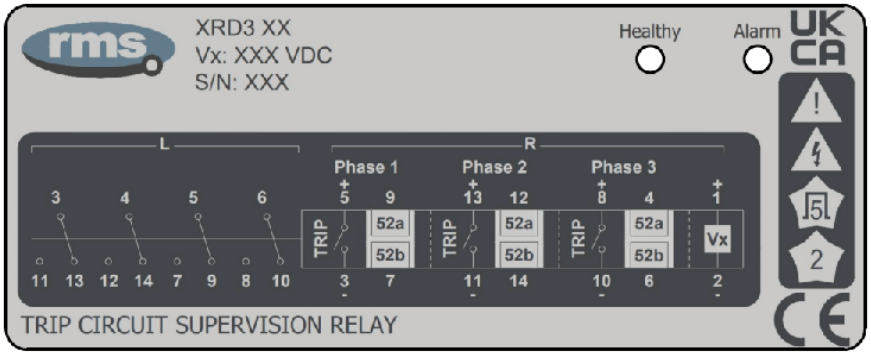


Circuit Breakers shown in the open position

Relay shown in the de-energised state

PRODUCT FRONT PANEL VIEW

L - Left side, output alarm contacts.
R - Right side, supervised lines and auxiliary input Vx.



Technical Data

Nominal voltages Vnom	24, 30/32, 48, 60, 110/125 and 220/250 VDC
Voltage range	75% to +110% of Vnom
Guaranteed drop-out voltage	60% of Vnom
Drop-out time @23^{O} C	Trip circuit fail drop-out time: 400 - 600 ms
	Loss of supply drop-out time: 200 - 400 ms

	Nominal Voltage	Auxiliary: Healthy	Auxiliary: Alarmed	Supervision Per Phase: Trip Contact Open	Supervision Per Phase: Trip Contact Closed
Max burden XRD3	24V	2.5W	0.20W	0.10W	0.20W
	30/32V	3.0W	0.25W	0.15W	0.25W
	48V	3.0W	0.30W	0.20W	0.25W
	60V	3.5W	0.30W	0.20W	0.30W
	110/125V	4.0W	0.50W	0.40W	0.60W
	220/250V	4.5W	0.80W	0.45W	1.00W

CONTACT RATING

Contact material	Ag
Operating voltage	Voltage free
Isolation across open contacts	1 KV rms
Make and carry	7 A all contacts; 10 A any two contacts
Peak inrush current	200 A for 10 ms, 40 A for 0.5 s, 30 A for 1 s
AC break capacity	10 A/230 VAC
DC break capacity	1 A/110 V
	0.7 A/220 V
Maximum switching voltage	250 VDC/440 VAC
Minimum switching voltage	12 V
Minimum switching current	10 mA
Weld no transfer	No
Mechanical endurance	20 million operations

Compliance Data

ATMOSPHERIC ENVIRONMENT

TEMPERATURE

Standard	IEC 60068-2-1, IEC 60068-2-2
Test identification	Auxiliary power supply voltage
Operating range - Min and Max	-10 to + 55^{O} C
Non-energized condition temperature range	-25 to + 70^{O} C
Test duration	16 hours at top and bottom temperatures

DAMP HEAT (HUMIDITY)

Standard	IEC 60068-2-78 ENA TS 48-5, Issue 5, 2023
Test identification	Test specification
Operating range	40^{O} C and 93% RH non condensing
Test duration	16 hours

IP RATING (INCLUDES OPTIONAL FEATURES)

Standard	IEC 60529 ENA TS 48-5, Issue 5, 2023
Test identification	Test specification
IP rating	IP4x, relay on socket

ELECTRICAL ENVIRONMENT

CLEARANCES AND CREEPAGE DISTANCES

Standard	IEC 60255-27, #9.6.3
Test identification	Test specification
Pollution degree	2
Overvoltage category	III
Rated insulation voltage	300 VDC
Clearances and creepage compliance	CAD drawings assessment

SAFETY-RELATED ELECTRICAL TESTS

Standard	IEC 60255-27, #9.6.4
Test identification	Test specification
Between independent circuits	5 kV 1.2/50 µs 0.5 J
	3 pulses of each polarity
	2.2 kV AC rms for 1 minute
Any terminal and earth	5 kV 1.2/50 µs 0.5 J
	3 pulses of each polarity
	2.2 kV AC rms for 1 minute
Across normally open contacts	1 kV AC rms for 1 minute

REVERSE POLARITY AND SLOW RAMP TEST

Standard	IEC 60255-27, #9.6.6
Test identification	Test specification
Maximum voltage dc	V start-up + 20%
Minimum voltage dc	V shut-down - 20%
Ramp down/up gradient	1 V/min

ELECTRICAL ENVIRONMENT AND FLAMMABILITY

Standard	IEC 60255-27, #9.6.5
Test identification	Test specification
Single-fault condition	Assessment for opened and closed-circuit cases
Maximum temperature of accessible parts at ambient temperature +40^{O} C	< 80^{O} C
Flammability of insulating materials, components and fire enclosures	Assessment

Compliance Data

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 endu-rance 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 2	
Test identification	Test specification	Variation
Seismic response horizontal, on each axis	7.5 mm/2.0 gn, 1 sweep cycle 1-35Hz	<=5%
Seismic response vertical	3.5 mm/1.0 gn, 1 sweep cycle 1-35Hz	<=5%

APPLICATION DIAGRAMS SHOWING ONE POLE (PHASE 1) OF THE CIRCUIT BREAKER

DESCRIPTION

The operating element of the XRD3 comprises two supervision elements A and B, which combine to hold in a heavy duty 4 contact attracted armature relay. Supervision is active with the circuit breaker in the open or closed position via the “a and b” CB auxiliary contacts. Supervision also remains active during tripping operations and irrespective of the status of the tripping relay contact An important characteristic of the design is the low level of current required to flow through the CB coil for correct operation of the supervision scheme. A constant low supervision current is maintained irrespective of the circuit breaker open or closed position. This results in low power dissipation in the XRD3 circuit and the circuit breaker coil which reduces the possibility of nuisance tripping.

- All trip circuits need to be healthy for the XRD3 to give an overall healthy indication
- A fault in any of the trip circuits will cause the XRD3 to drop out and indicate a trip circuit failure

SUPERVISION WITH CIRCUIT DE-ENERGIZED

Circuit breaker open and trip contact open

Figure 1 shows a typical tripping circuit with the XRD3 employed to supervise the circuit continuity, the circuit breaker coil and the auxiliary supply. The blue lines depict the supervised circuits and red arrows the path of the supervision current through supervision element A with the auxiliary supply applied and the circuit breaker open.

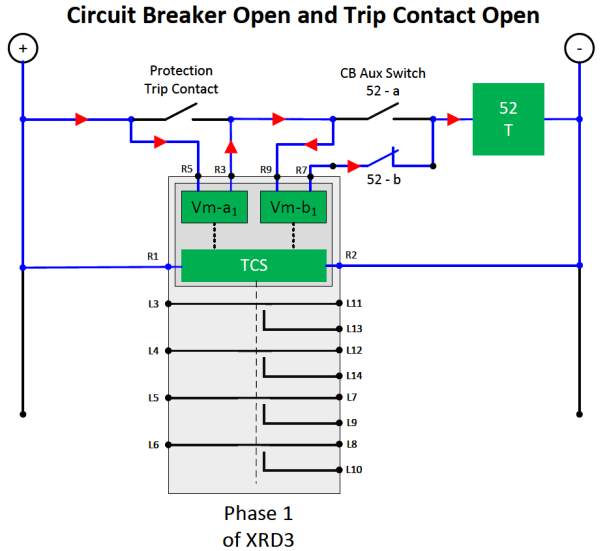


Figure 1

FUNCTIONAL DIAGRAMS

Figures 1 to 6 depict how the supervision elements A and B monitor circuit continuity under all conditions:

Figure 1	CB open	Trip contact open	Auxiliary supply available
Figure 2	CB closing	Trip contact open	
Figure 3	CB closed	Trip contact open	
Figure 4	CB opening	Trip contact closed	
Figure 5	CB open	Trip contact closed	
Figure 6	Alarm condition		

SUPERVISION DURING CIRCUIT BREAKER CLOSURE

Circuit breaker closing and trip contact open

Figure 2 Closure of the circuit breaker could cause the supervision circuits to be interrupted for the duration of the circuit breaker operate time. During this interval a >400 ms time delay holds in the alarm relay contacts. Figure 2 shows the loss of supervision current through both the A and B supervision elements for the duration of the circuit breaker operating period.

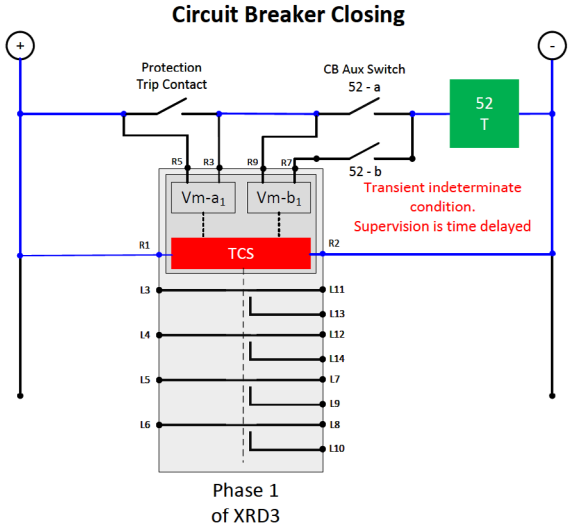


Figure 2

SUPERVISION WITH CIRCUIT ENERGIZED

Circuit breaker closed and trip contact open

Figure 3 shows a typical tripping circuit with the XRD3 employed to supervise the circuit continuity, the circuit breaker coil and the auxiliary supply. The blue lines depict the supervised circuits and red arrows the path of the supervision current through supervision element A with the auxiliary supply applied and the circuit breaker closed.

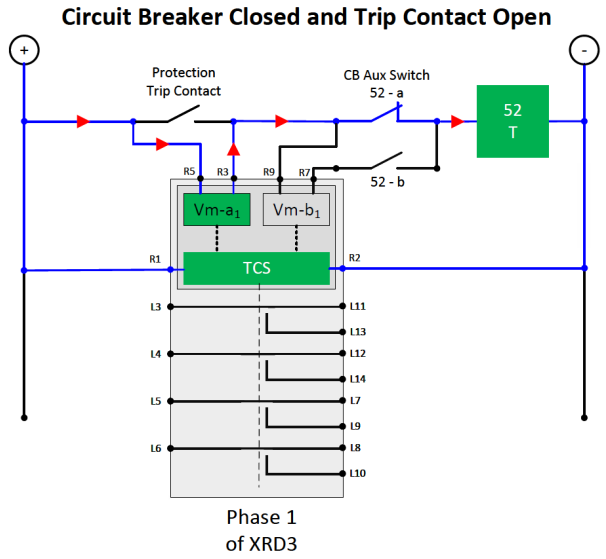


Figure 3

SUPERVISION DURING CIRCUIT BREAKER OPERATION

Circuit breaker opening and trip contact closed

Figure 4 Operation of the protection relay trip contact will cause the supervision circuits to be interrupted for the duration of the circuit breaker operate time. During this interval a >400ms time delay holds in the XRD3 alarm relay contacts. Figure 4 shows the loss of supervision current through both the A and B supervision elements for the duration of the circuit breaker operating period.

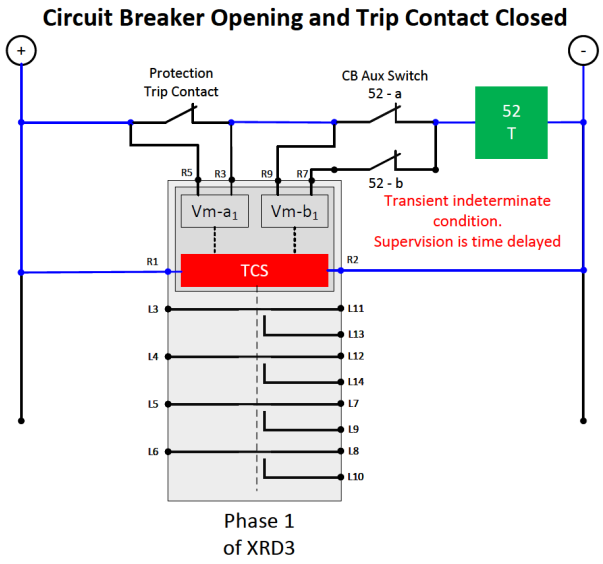


Figure 4

Trip Circuit Supervision - XRD3

SUPERVISION WITH CIRCUIT TRIPPED

Circuit breaker open and trip contact closed

Figure 5 shows the path of the supervision current with the auxiliary supply applied and the circuit breaker in the open condition. The blue lines depict the supervised circuits and red arrows the path of the supervision current through supervision element B. Note that the supervision element A is shorted out by the closed trip relay contact. Supervision will also function with the trip relay contact reset (Open), as shown in figure 1.

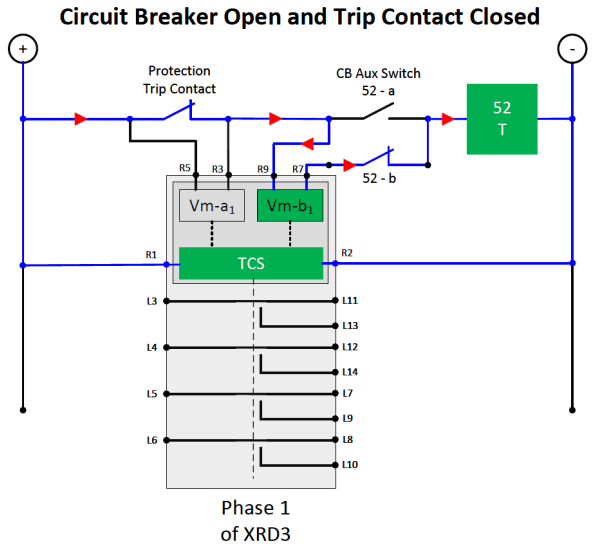


Figure 5

NORMAL OPERATING CONDITIONS

Trip circuit and auxiliary supply healthy

Normal operating condition is indicated on the front panel via a green LED and the alarm contact being picked up.

ABNORMAL CONDITIONS

- TRIP CIRCUIT FAIL
- TRIP SUPPLY FAIL
- CB TRIP COIL FAIL

Figure 6 under abnormal trip circuit or CB trip coil conditions, supervision elements A and B will be unable to detect supervision current. After a time delay of >400 ms the XRD3 alarm relay will drop out and the hand reset flag activated. Under abnormal trip supply conditions, the XRD3 alarm relay will drop out after a time delay of >200 ms. Loss of supply will cause the green HEALTHY LED to be extinguished.

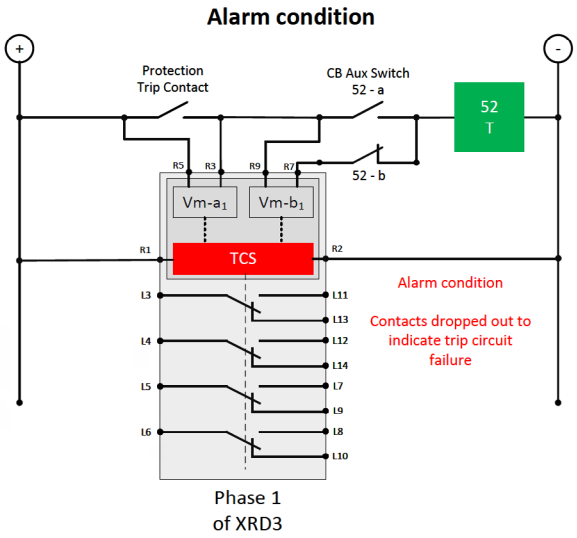
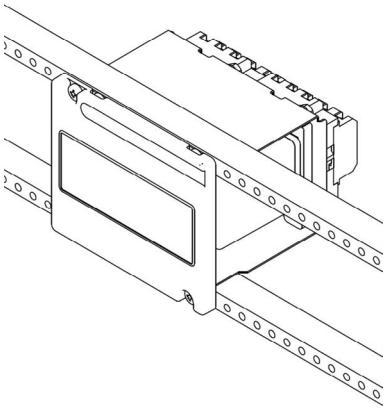
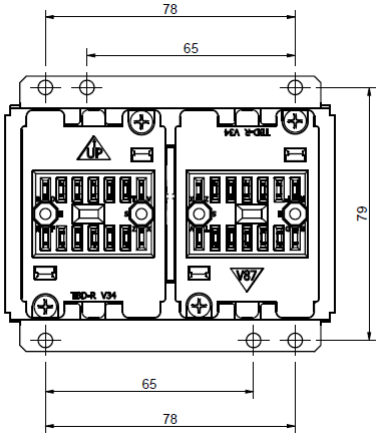
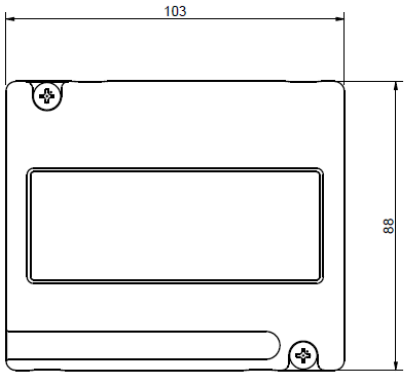


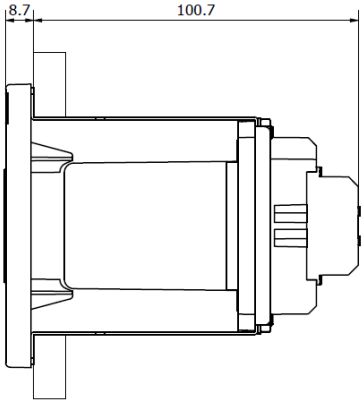
Figure 6

Rack Mount Rear Connect B-V87-1 with Flush Mounting Socket and Kit

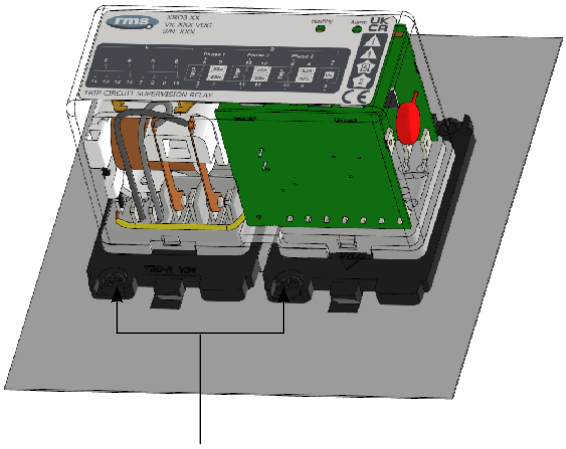






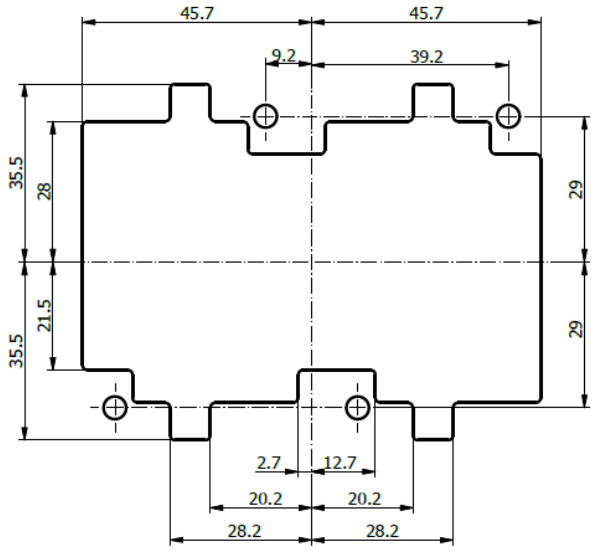


Surface Mount Rear Connect B-V87 with Flush Mounting Socket



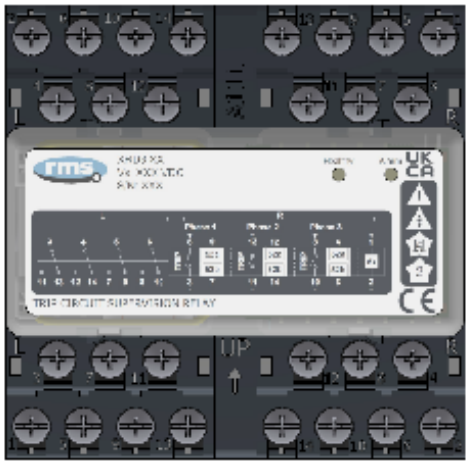
4x M4 terminal block retaining screw

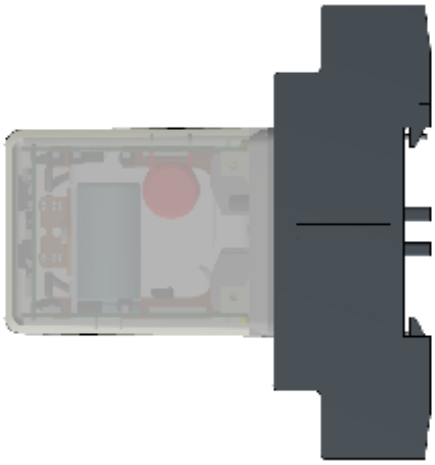
Panel cut-out to mount surface rear connect base.



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

Surface or Rail Mount Front Connect with A-V93 Socket

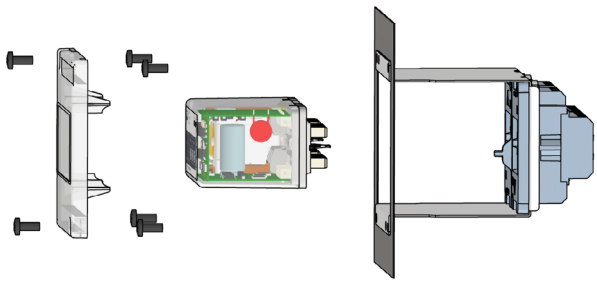


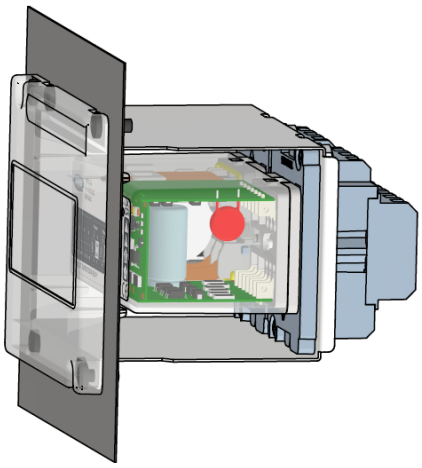


Mounting

The V87 panel mount design includes a cover to maintain IP4X at the front of the panel.

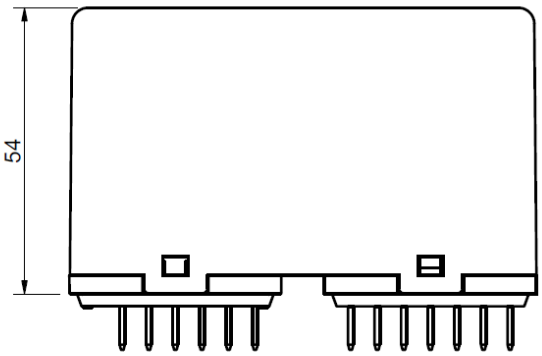
Relay is IP4X at product level with socket.

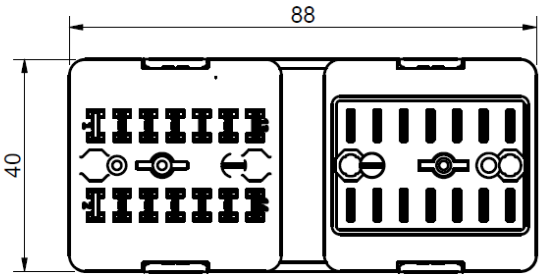




PRODUCT DIMENSIONS AND WEIGHT

Product weight before mounting is ~ 300 grams.





Order Codes

XRD3 -				
Nominal operate voltage	A			24 V dc
	B			30/32 V dc
	C			48 V dc
	D			60 V dc
	E			110/125 V dc
	F			220/250 V dc
Options		-		No option
		B		Magnetic arc blow out
		E		Gold plated contacts
		K		Extra dust protection IP50
Mounting Configuration			-	Plug in relay only (no terminal block or mounting hardware)
			A-V93	Surface or rail mounting including V93 terminal block
			B-V87	Surface mount rear connect B-V87 with flush mounting socket
			B-V87-1	Panel mount - V87 term block, retention bracket and cover

Safety Section

This safety section should be read before commencing any work on the equipment.

The information in the safety section of the product documentation is intended to ensure that products are properly installed and handled in order to maintain them in a safe condition. It is assumed that everyone who will be associated with the equipment will be familiar with the contents of the safety section.

Explanation of Symbols & Labels

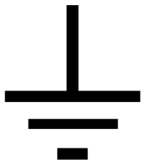
The meaning of symbols and labels which may be used on the equipment or in the product documentation is given below.

Caution: Refer to product information

Caution: Risk of electric shock

Functional earth terminal:

NOTE: This symbol may also be used for a protective/safety earth terminal if that terminal is part of a terminal block or sub-assembly eg. power supply.



PRODUCT WARNINGS AND END-USER CARE

Relays are shown in the non-powered (Alarm) condition. Note the connection polarity for correct DC operation. A wiring diagram is also printed on the front panel of the relay module for easy reference in the field.

To remove relays from the socket, employ up and down lever movements.

Sideway movement may cause damage to the coil wires.

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