



## Features

- Rugged modular construction
- Rack or flush mounting
- Range of function types
- Draw out module
- M4 screw terminals
- Operating & reset coils are available for 24, 32, 48, 110, 125 or 250V DC nominal
- Fine silver contacts designed & manufactured to ensure low resistance & high reliability
- Magnetic blowouts to further enhance contact breaking capability may be specified
- Custom contact configuration
- High visibility electro-mechanical flag indication
- Made in Australia

## Application

The 6R MATRIX range has been developed to provide design engineers with a modular system of auxiliary relays to meet a wide variety of system configurations. Based on our well proven 6R heavy duty control relay, the 6R MATRIX system offers numerous benefits:

- ▶ Modular configuration to simplify panel layout & circuit design
- ▶ High packing density to reduce panel space requirements
- ▶ Standard component design to reduce delivery lead times
- ▶ Case suitable for both flush panel & 19 inch rack mounting
- ▶ Standard draw out module
- ▶ Heavy duty M4 screw terminals

Refer also to the following RMS data sheets for detailed information on product applications & technical specifications:

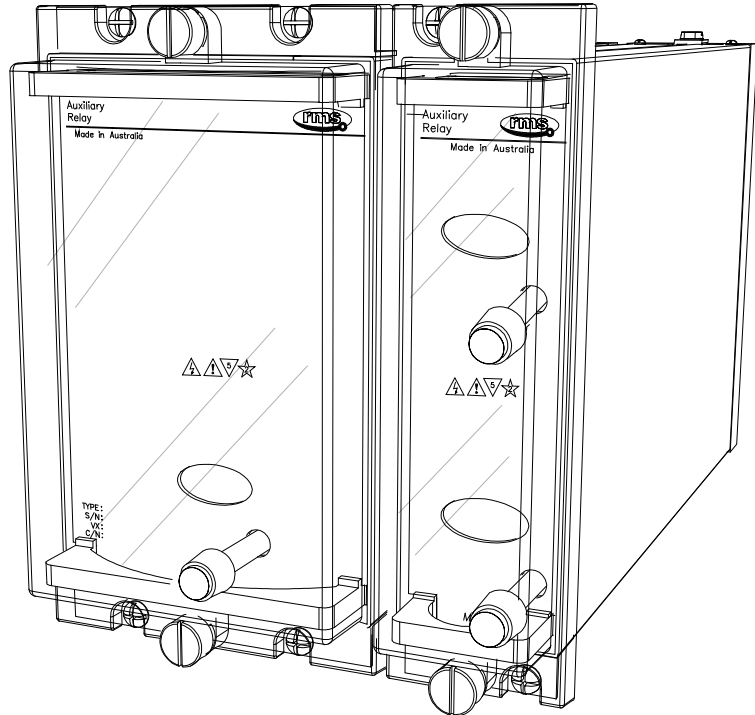
<https://www.morssmitt.com/product-categories/201478/6r-series-trip-auxiliary-and-supervision>

<https://www.morssmitt.com/products/201556/6r-m-quad-four-element-flag-relays>

Technical Bulletin

## 6R MATRIX System

### Modular Auxiliary, Trip & Supervision Relays



## Functional Elements

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## Cases

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## Introduction

Made in Australia

The effect of a fault on a power system is dependent on the speed with which the fault can be detected & isolated. Modern protection schemes incorporate ever increasing functionality through the application of digital techniques to protection relay technology. The requirement for highly reliable tripping & control relay elements does however remain & often constitutes a significant cost & space requirement for protection panel designs. The 6R MATRIX system fulfils this need by providing a compact, flexible & cost effective solution.

## Specification Process

- ▶ Select the functional elements required to meet system design requirements;
- ▶ Complete the options section for each functional element & complete details;
- ▶ Select case & accessories;
- ▶ Group functional elements to fill cases such that panel space is minimized.

## 6R MATRIX Construction

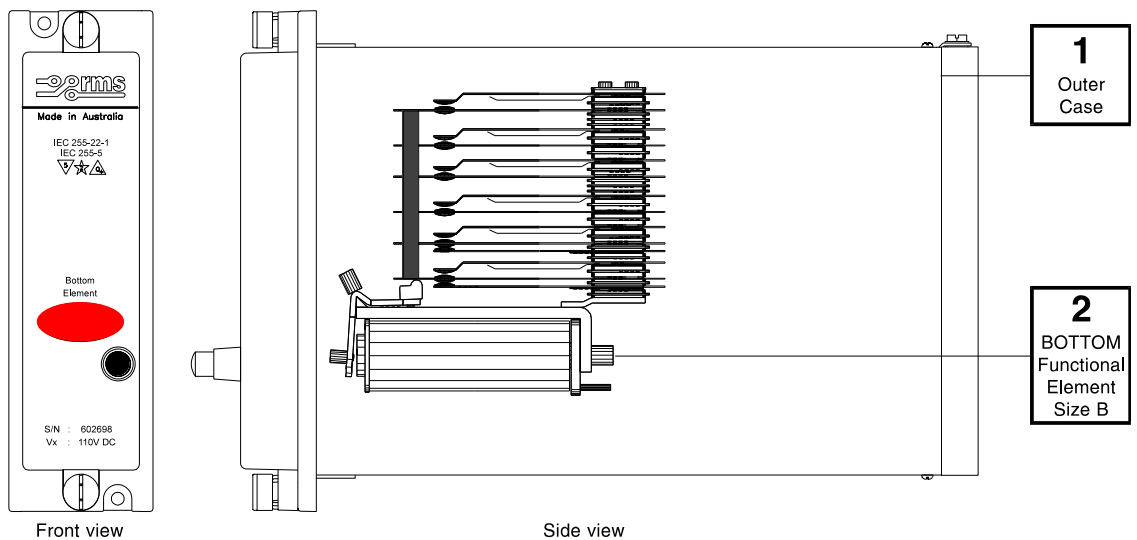
Each 6R MATRIX relay is comprised of two main parts:

1. Outer casing
2. Functional element(s)

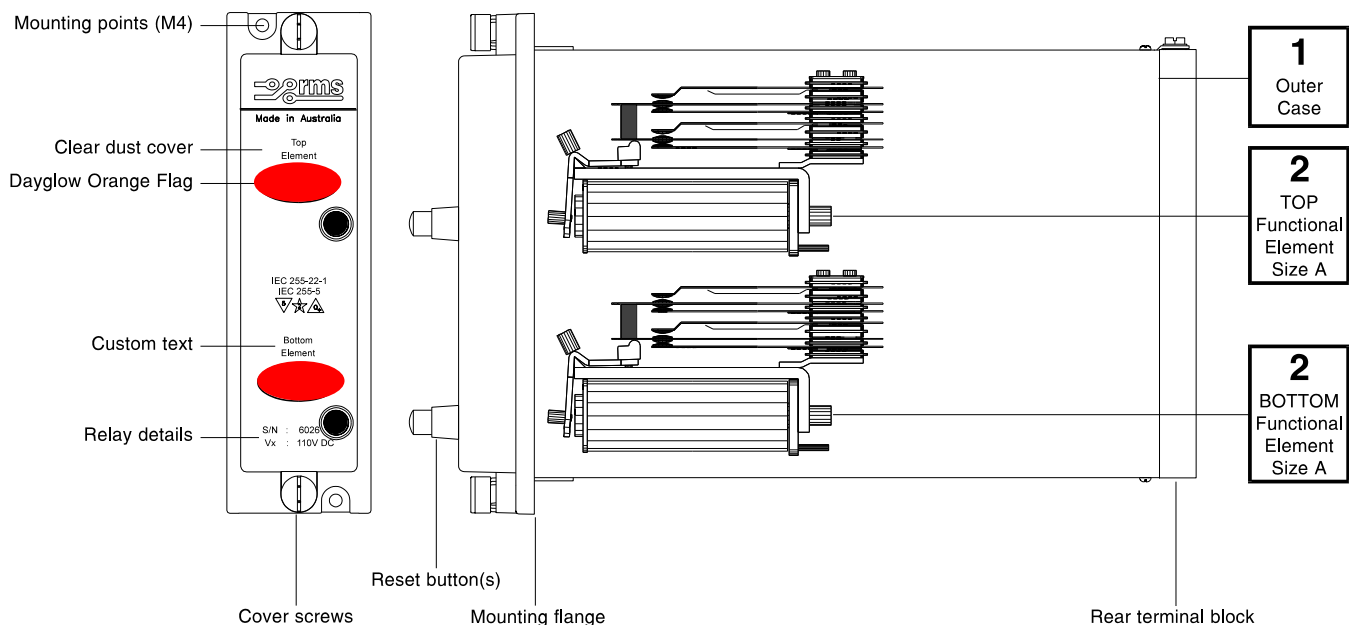
The completed relay is shipped from the factory fully assembled but for flexibility, each part is specified & numbered separately.

The main components & features are depicted below for a single element & a double element both mounted in a size 2 M Series case:

### One element per case



### Two elements per case



## Case Mounting

The following standard features are provided:

- RACK & FLUSH MOUNTING
- DRAW OUT RELAY MODULE
- REAR M4 SCREW TERMINALS

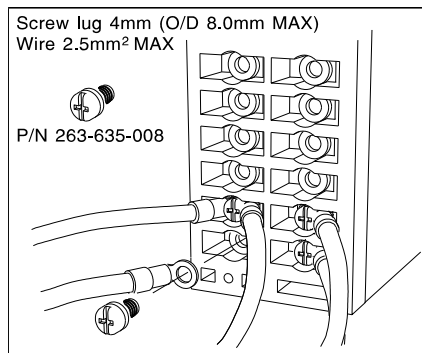
## Case Construction

The outer case is manufactured from zincalume steel providing considerable strength & corrosion protection. Relay elements are mounted on fabricated fiberglass & Acetal components to provide reliable electrical isolation & simple cost effective construction.

## Terminal Blocks

High quality moulded terminal block(s) are utilized. The draw out function is made possible through the use of inner & outer terminal blocks, each with silver plated contact fingers to provide high current rating & very low electrical resistance.

M4 screw terminals allow 2x crimp lug connections per point. Space efficient design allows 28 contact points per terminal block.



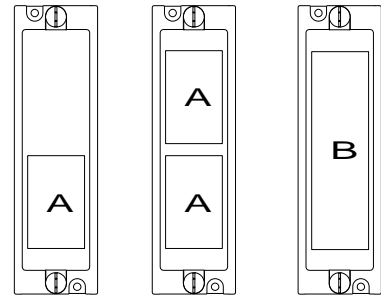
## Reset Buttons

Latching relays are provided with front mounted reset buttons.

## Flag Indicators

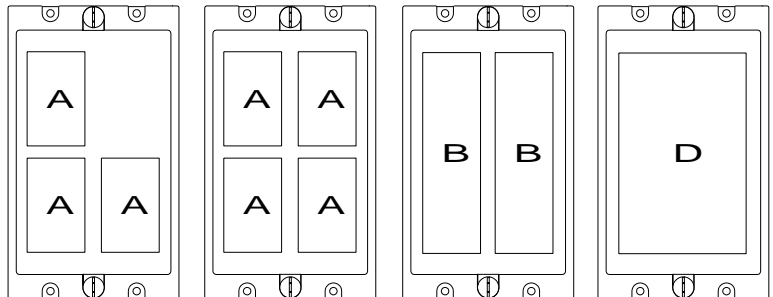
Each relay element is supplied with an operation (target) indicator. The indicator consists of a high visibility solid day glow orange mechanical flag which drops on energization or de-energization.

## Case System Summary



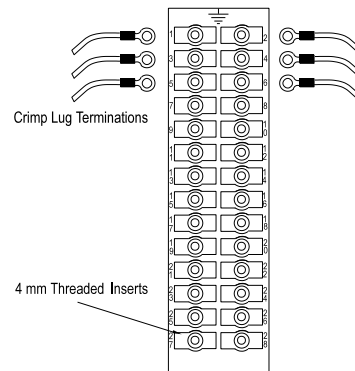
1 X A Element 2M28-S-1 case  
2 x A Element 2M28-S-2 case  
1 x B Element 2M28-S-1 case

### Size 2M Case Element Fitment

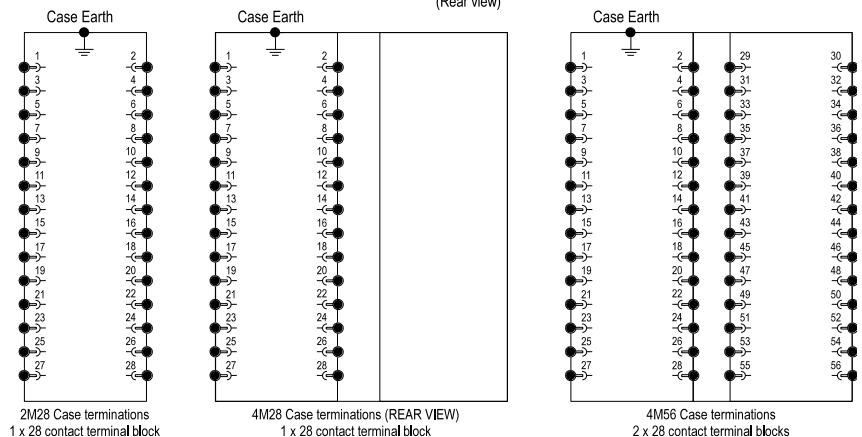


3 x A Element 4M28-S-3 or 4M56-S-3 case  
4 x A Element 4M28-S-4 or 4M56-S-4 case  
2 x B Element 4M28-S-2 or 4M56-S-2 case  
1 x D Element 4M28-S-1 or 4M56-S-1 case

### Size 4M Case Element Fitment



Case terminations (Rear view)



## Application

The effect of a fault on a power system is dependent on the speed with which the fault can be detected & isolated. The 2HS Series multi-contact high-speed trip relays are used for this isolating function providing simultaneous tripping outputs.

The operating element for the 6R MATRIX High Speed Trip functional elements are designated 2HSM. A high speed coil provides fast operation (<10ms at nominal DC operating voltage, AC models may be delayed by a further ¼ cycle), with specially constructed anti bounce buffers ensuring effective damping of the contacts to avoid excessive bounce.

The Type 2HSM relays may be broadly divided into two groups:

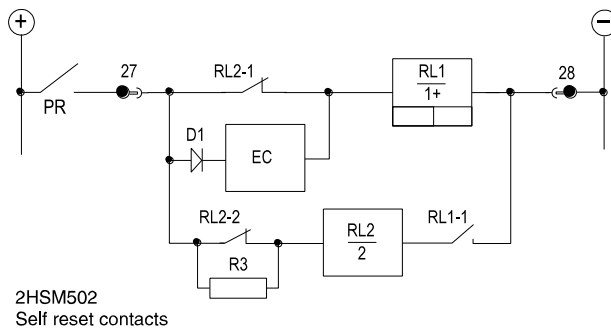
- Low burden tripping relays
- High burden tripping relays

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 nominal operating voltage is applied across the coil of the relay.

## Low Burden Trip Relays

**2HSM 502, 503, 504, 506, 507, 508, 509**

These are low burden versions of types 2HSM relays respectively & are suitable for applications where immunity to capacitance discharge & high minimum operation currents are not required. Circuit diagrams for types 2HSM504, 506, 508, 509 are as per 2HSM514, 516, 518, 519 without C1, R1 or R2 loaded. Circuit diagrams for types 2HSM503 are as per 2HSM502 without the flag.



## High Burden Trip Relays

These relays are suitable for application in high security circuit breaker tripping circuits & in particular where the initiating contact may be remote from the relay. The high burden may also allow the satisfactory operation of external series elements.

These relays have a high burden to provide immunity to capacitance discharge currents & power to the coil is cut off at operation or is economized to a low figure to provide thermal protection.

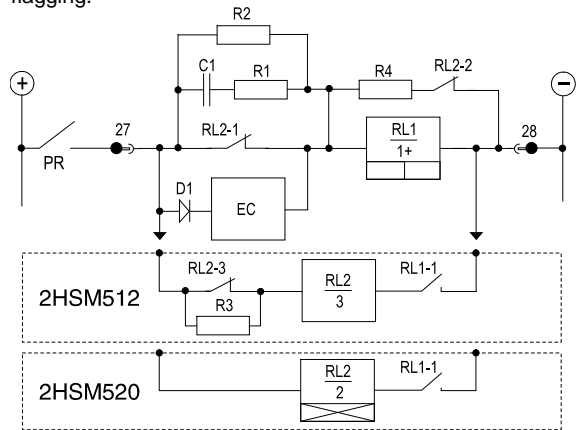
## Operation of Series Elements

External relay elements are often employed for additional flagging & 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 the series element before the series trip signal is cut off or economized. In these circumstances a 2HSM relay with a time delayed (TD) cut off should be employed.

## 2HSM High Speed Tripping Relay Elements

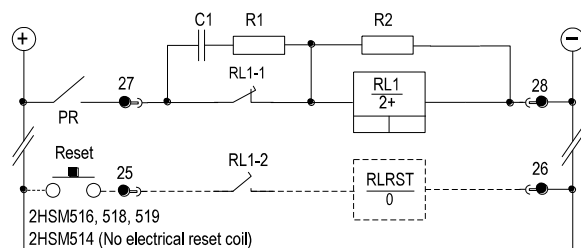
**HIGH BURDEN SELF-RESETTING TYPE**  
**2HSM 511, 512, 513, 520**

This type uses a contact on the main contact stack (RL1-1), to energize a separate economizing element. After operation this reduces the burden by switching a second coil in series with the main element. The 2HSM520 version has a "slug" delay relay element fitted to provide time for series relays to operate. Types 2HSM511 and 2HSM513 are similar to 2HSM512 with altered flagging.



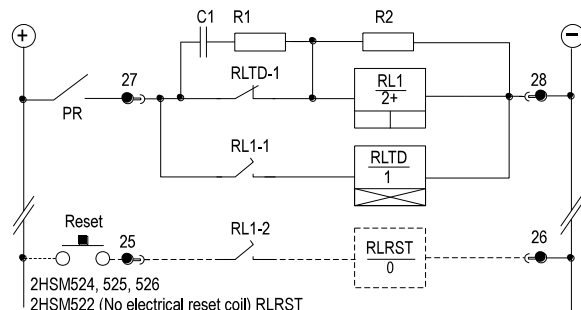
**HIGH BURDEN LATCHING TYPE WITH INST. CUT OFF**  
**2HSM 514, 516, 517, 518, 519**

These relays incorporate a break contact (RL1-1), in series with the operate coil. Located below the main contact stack, it is arranged to break the coil circuit once the relay mechanism has completely operated. This reduces the relay burden to zero when the mechanical latching of the contact has occurred. An arc suppression circuit (R1 & C1), is used to protect RL1-1.



**RELAYS WITH TIME DELAYED CUT OFF**  
**2HSM 521, 522, 524, 525, 526** (See also 2HSM520 above)

These relays have time delayed cut off circuits such that the burden is reduced to zero 40 to 100ms), after energization by the use of a second attracted armature "slug" delay element. This delay allows ample time for any flagging or auxiliary elements in series with the tripping relay to operate before cut off. Contact RL1-1 is fitted to ensure the latching contacts & flag cannot be reset until the initiate voltage has been removed. The 2HSM521 is a special version requiring an auxiliary supply to provide a 2s delay on drop off.





**2HSM Standard Elements**

**Table 1**

Relay Type	Contact Refer note 1	Flag	Cut off	Burden	Element Size	Minimum Case
2HSM503	SR	NF	Econ.	Low	B	2M28-S1
2HSM504		HR	Inst.	Low	B	2M28-S1
2HSM506	ER	HR	Inst.	Low	B	2M28-S1
2HSM507		ER	Inst.	Low	B	2M28-S1
2HSM508		H/ER	Inst.	Low	B	2M28-S1
2HSM509	H/ER	HR	Inst.	Low	B	2M28-S1
2HSM511	SR	SR	Econ.	High	B	2M28-S1
2HSM512	SR	HR	Econ.	High	B	2M28-S1
2HSM513	SR	NF	Econ.	High	B	2M28-S1
2HSM514		HR	Inst.	High	B D	2M28-S1 4M56-S1
2HSM516	ER	HR	Inst.	High	B D	2M28-S1 4M56-S1
2HSM517		ER	Inst.	High	B D	2M28-S1 4M56-S1
2HSM518		H/ER	Inst.	High	B D	2M28-S1 4M56-S1
2HSM519	H/ER	HR	Inst.	High	B D	2M28-S1 4M56-S1
2HSM520	SR	HR	TD Econ.	High	B D D	2M28-S1 4M28-S1 4M56-S1
2HSM521	SR	HR	TD Econ.	High	B D D	2M28-S1 4M28-S1 4M56-S1
2HSM522		HR	TD	High	B D D	2M28-S1 4M28-S1 4M56-S1
2HSM524	ER	HR	TD	High	B D D	2M28-S1 4M28-S1 4M56-S1
2HSM525		H/ER	TD	High	B D D	2M28-S1 4M28-S1 4M56-S1
2HSM526	H/ER	HR	TD	High	B D D	2M28-S1 4M28-S1 4M56-S1

Maximum Contacts	
Magnetic Blowouts M or B*	Heavy Duty M or B*
1	2
9	13
9	13
10	13
9	12
9	12
9	12
9	12
9	12
9	12
9	13
9	13
10	13
20	20
9	12
20	20
9	12
20	20
9	12
20	20
9	12
20	20
5	8
10	13
-	20
4	6
10	12
-	20
-	5
10	13
-	20
-	3
10	12
-	20
-	3
10	12
-	20
-	3
10	12
-	20

**KEY:** H/ER - Hand / electrical reset      SR - Self reset      HR - Hand reset  
 TD - Time delay 40 to 100ms      ER - Electrical reset      Econ. - Economy element  
 M - Make (N/O) contacts      B - Break (N/C) contacts      Inst. - Instantaneous cut off  
 Cont. - Continuously rated coil      C/F - Consult factory      NF - No flag

**NOTES:** 1. The Contact & Flag code should be read in conjunction with the section on flag & contact reset function on the following page.  
 2. C/O - Changeover contacts may be specified but each C/O contact replaces 1.5 M or B contacts.

**EXAMPLE:** 2HSM512-B2 represents a high burden high speed relay with a maximum of 13 M or 13 B (without magnetic blowouts), hand reset contacts and a self-reset flag. As the relay is an element size B, one of these elements may be fitted in a size 2M28-S1 case.



## Contact Stack Arrangement

The number of contacts indicated in Table 1 are the maximums that can be fitted for the element size. Fewer contacts may be specified to save cost. The operate time for relay elements with 14 to 20 contacts is <12ms at nominal operate voltage.

## Mixed Contacts Stacks

Mixed M & B contact arrangements may be specified provided the total number does not exceed the maximum indicated in table 1 for the relay element size specified above. Changeover contacts (C/O), are also available but must be counted as 1.5 M or B contacts & the result rounded down to the nearest integer & not exceed the maximum indicated in table 1.

## Flag & Contact Reset Function

### COMBINED OPERATION & COMBINED RESET

Types: 2HSM504, 507, 508, 514, 517, 518, 522, 525

With these types the flag & contacts operate & reset together. I.e.

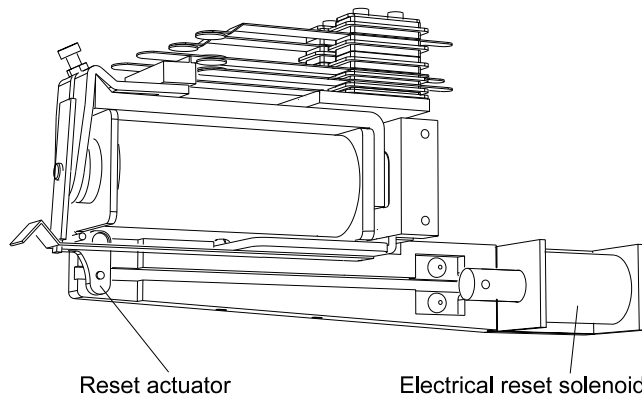
When the relay is tripped the flag changes state & the contacts latch. Both the flag & contacts are reset if either the reset button is pressed or the electrical reset coil is energized.

### COMBINED OPERATION & INDEPENDENT RESET

Types: 2HSM502, 506, 509, 512, 516, 519, 520, 521, 524, 526

With these types the flag & contacts operate together but may be reset independently i.e., when the relay is tripped the flag changes state & the contacts latch. The contacts only are reset if the electrical reset coil is energized or the contact reset button is pressed. In both cases the flag is not reset. The flag can only be reset if the independent flag reset button is pressed.

## Electrical Reset Mechanism



On relays fitted with an electrical reset mechanism the relay operate input must not be energised at the same time as the reset input is energised (or contact reset button is depressed).

Simultaneous energisation of the operate input and attempted resetting of the relay may lead to relay coil overheating and thermal damage.

## 2HSM High Speed Tripping Relay Elements

### Flag Indicators

On applicable models each relay element is supplied with an operation (target) indicator. The indicator consists of a high visibility solid day glow orange mechanical flag which drops on energization (Type 2F).

Flags may only be reset when the contacts are in the reset position.

### Magnetic Blowouts

Heavy duty contacts may be optionally fitted with magnetic blowouts to further increase the DC breaking capacity. This feature is particularly useful for breaking highly inductive loads such as that presented by high voltage circuit breaker trip coils.

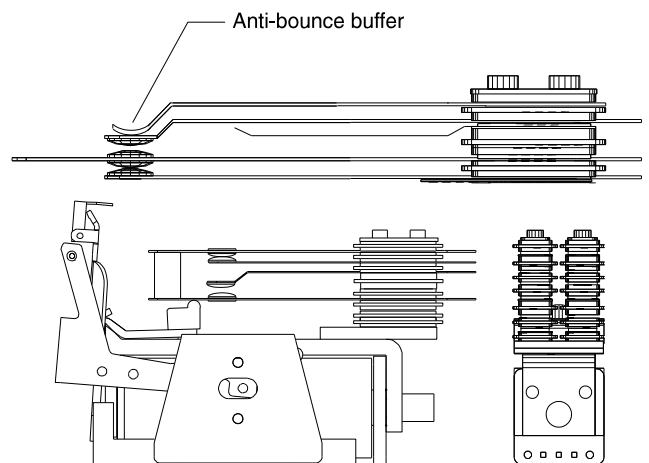
### Contact Bounce & Self Cleaning

Contact bounce occurs due to the speed at which the contacts meet. If too much coil power is used, then the contacts will come together with too much force causing excessive bounce. It is therefore important to only fit relay coils with adequate power to provide the force required to switch the relay at the minimum operate voltage 65% of nominal.

In addition, contact bounce can be greatly reduced through the addition of anti-bounce buffers. These components are added to each contact to provide a damping wiping motion when the contacts meet thus dissipating the force which would otherwise produce bounce.

Contacts are constructed from silver / copper alloy, shaped & positioned to ensure very reliable, low resistance operation. Over travel of the contacts during each operation causes a wiping action ensuring a clean "make".

The design of the contact surface is spherical such that when the contacts are driven to an over travel position they actually wipe. This wiping motion is part of the damping action mentioned above but also provides a wiping action which serves to clean the contact area.

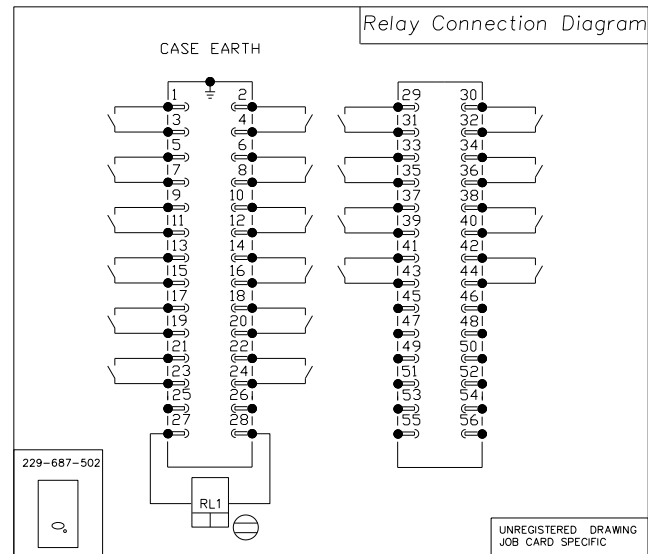




## 2HSM High Speed Tripping Relay Elements

### Wiring Diagram Example

6R MATRIX relays have custom wiring determined by the number & configuration of the contacts. To convey this information a label is attached to the internal side plate depicting the wiring information. As this stays with the product (unlike the paper wiring diagram also supplied), it cannot be lost.



DESC: 2HSM512D		DESC:	
AUX: 125VDC	FLAG: 2F	AUX:	FLAG:
CONTACTS: 20 N/O		CONTACTS:	
FLAG LABEL:		FLAG LABEL:	
TOPLINE:		TOPLINE:	
BTM LINE:		BTM LINE:	
ENCLOSURE: 4M28	QTY: 10	WIRING SPECIFICATION: 902-200-072	
High Speed Trip			
DRAWN	DATE	CHECK	DATE
ERL	15/08/01		
TESTED	DATE	JOB NUMBER	
			SHEET 1 OF 1



**OPERATING BURDEN** (Burden during pick up at nominal)

Low burden relays: 50W Maximum  
High burden relays: 150W Maximum  
Reset coils: 40W Maximum

**OPERATED BURDEN** (Burden after pick up at nominal)

Self reset relays: 6W Maximum\*  
Latching relays: Zero  
Reset coils: Zero

\*2HSM521 relays with 2 sec drop out delay have a 15W Maximum operated burden

Add 2 Watts for relays fitted with time delayed cut-off contact.

**COIL THERMAL RATING**

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

**OPERATING TIME**

< 10ms at nominal rated operating voltage: <14 contacts  
< 12ms at nominal rated operating voltage: 14 - 20 contacts

**OPERATING VOLTAGE**

Between 65%\*\* & 120% of nominal rated operating voltage.

\*\*Note: The 65% of nominal value allows for correct operation of the tripping systems even when there is a loss of battery charger supply for considerable periods.

To ensure guaranteed operation at 65% of nominal voltage the relay is manufactured to operate at a lower level to guarantee operation if voltage falls to 65% of nominal voltage. Consequently, it will be found that these relays will operate below 65% of nominal voltage, this is normal and correct.

The 65% of nominal voltage figure does not indicate the relay pickup voltage.

**AC VOLTAGES**

2HSM relays specified for DC voltage are not intended for operation with AC voltages. Application of continuous AC voltage below the pick up level will cause excessive power dissipation in the capacitor discharge resistor & likely result in thermal damage to the device.

**MINIMUM OPERATING CURRENT**

Low burden relays: 50mA  
High burden relays: 100mA

**ELECTRICAL RESET**

Operate voltage: As per specified operate voltage.  
Reset cut off: Instantaneous with main relay reset.

**6R RELAY CONTACT RATINGS**

**Make & Carry Continuously**

3,000 VA AC resistive with maximums of 660V & 12A  
3,000 W DC resistive with maximums of 660V & 12A

**Make & Carry for 3 Seconds**

7,500 VA AC resistive with maximums of 660V & 30A  
7,500 W DC resistive with maximums of 660V & 30A

**AC Break Capacity**

3,000 VA AC resistive with maximums of 660V & 12A

**DC Break Capacity (Amps)**

Voltage		24V	48V	125V	300V
Resistive rating	1	12	12	10	5
	2	12	2	0.5	0.3
L/R=40ms	Maximum break	1	30	15	5.5
	1K operations (N3 Rating)	2	12	1	0.25
		1	12	12	5

1 = With magnetic blowouts 2 = Without magnetic blowouts

**INSULATION WITHSTAND** in accordance with IEC 60255:

2kV RMS & 1.2/50 5kV impulse between:

- ◆ all input terminals & frame
- ◆ all output terminals & frame
- ◆ all input & output terminals
- ◆ each input group
- ◆ each output group

1KV RMS between open contacts.

**2HSM Ordering Codes**

Generate the required ordering code as follows:  
e.g. 2HSM514B1-D-8M2B-2M28S1

General Class	Order Code					
	1	2	3	4	5	6
2HSM	-					

**1 RELAY FUNCTION**

Specify relay functional number from table 1.

**2 ELEMENT SIZE**

B Size B Up to 1 element in a 2M case  
D Size D Up to 1 element in a 4M case

**3 CONTACT DUTY**

1 Heavy duty contacts – magnetic blowouts fitted  
2 Heavy duty contacts

**4 NOMINAL OPERATE VOLTAGE**

A 24V DC L 110V AC  
B 32V DC N 220V AC  
C 48V DC P 240V AC  
D 110V DC  
E 125V DC  
G 220V DC  
H 240V DC  
F 250V DC

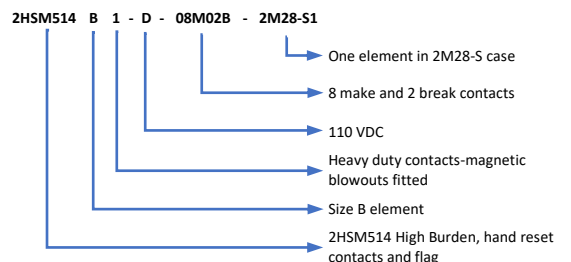
**5 CONTACT ARRANGEMENT**

Specify the number of "MAKES" followed by M; i.e. 10M  
Specify the number of "BREAKS" followed by B; i.e. 2B  
Specify the number of "CHANGEOVER" followed by C; i.e. 3C

**6 CASE CONFIGURATION**

- Element only – No case  
2M28-S1 One element in a 2M28-S case  
4M28-S1 One element in a 4M28-S case  
4M56-S1 One element in a 4M56-S case  
4M28-S2 Two identical size B elements in a 4M28-S case  
4M56-S2 Two identical size B elements in a 4M56-S case

Example ordering code:





## Application

The operating element for the 6R MATRIX Auxiliary Relay functional elements are designated 6RM & are based on our 6R Series relays.

The type 6RM Series elements are low burden auxiliary relays which can be used where a scheme demands several contacts for event recording, alarm initiation, contact logic arrangements, etc.

The relay can be supplied fitted with heavy duty contacts & with heavy duty magnetic blow-outs fitted.

Contacts are constructed from silver / copper alloy, shaped & positioned to ensure very reliable, low resistance operation. Over travel of the contacts during each operation causes a wiping action ensuring a clean "make".

Heavy duty make, break & changeover contacts & heavy duty contacts fitted with magnetic blow-outs are available in various combinations. See table 3 below.

Heavy duty contacts fitted with magnetic blow-out are recommended for breaking heavy or highly inductive DC loads. When these are fitted, the number of contacts available may be reduced.

## Flag Indicators

Each relay element is supplied with a flag (target) indicator. The indicator consists of a high visibility solid dayglow orange mechanical flag which can be specified to drop on energization or de-energization.

## Resets

On applicable models resetting of flags & contacts may be either manual at the relay panel or electrical via a remote signal or both. The provision to separately reset the flag & contacts is also possible.

## Electrical Reset Function

### COMBINED CONTACT / FLAG OPERATION & RESET 6RM210

With these types the flag & contacts operate & reset together. i.e.

When the relay is operated the flag changes state & the contacts latch. Both the flag & contacts are reset if either the reset button is pressed, or the electrical reset coil is energized.

### COMBINED CONTACT / FLAG OPERATION & INDEPENDENT RESET 6RM211

With these types the flag & contacts operate together but may be reset independently. i.e.

When the relay is operated the flag changes state & the contacts latch. The contacts only are reset if the electrical reset coil is energized, or the contact reset button is pressed. In both cases the flag is not reset.

The flag can only be reset if the independent flag reset button is pressed.

## Coil Operating Power

Relay elements may be specified with 1W or 2W operating power for relay elements with up to 9 contacts. 2W coils have the advantage of faster operation for armature operated contacts but obviously generate more heat when continuously energized. A second advantage which is particularly useful in high humidity climate installations is that the thicker gauge copper wire used in 2W coils is less susceptible to corrosion & going open circuit.

Relay elements with 10-20 contacts are fitted with a 5W nominal coil.

## 6RM Auxiliary Elements

### Operating Times

#### INSTANTANEOUS OPERATING TIMES (6RM2xx Series)

Contact Stack	Pick up* 1W coil	Pick up* 2W coil	Drop out* 1W coil	Drop out* 2W coil
1 N/O	25	22	34	35
2 N/O	32	25	24	25
3 N/O	35	25	18	19
4 N/O	40	30	14	15
6 N/O	50	35	12	13
9 N/O	65	45	10	11
1 N/C	25	22	38	38
2 N/C	40	25	25	26
3 N/C	52	35	20	21
4 N/C	62	40	18	19
6 N/C	70	52	13	14
1 C/O	35	22	26	27
2 C/O	45	25	20	21
3 C/O	60	40	13	14
4 C/O	75	45	12	13
6 C/O	90	50	10	11
7 C/O	110	55	9	10

Table 2

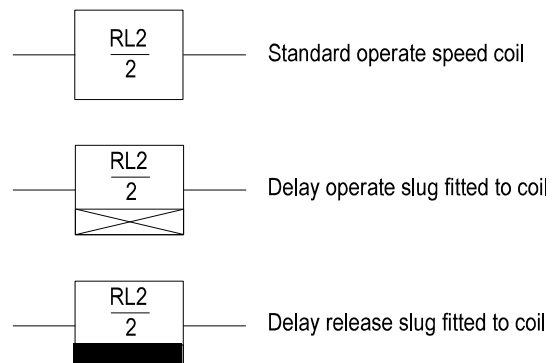
#### \* NOTES ON OPERATING TIMES:

1. Tolerance on stated operate times: +/-10%
2. Operate times are in ms & refer to armature operated contacts at nominal stated coil operating voltage.
3. For flag operated contacts operate time is typically 60ms & is independent of the coil power.
4. 1W nominal coils are used as the default coil specification up to 9 N/O contacts. 5W coils are used for 10 to 20 contacts.

#### OPERATING TIMES WITH TIME DELAY SLUGS FITTED

**DELAY ON DROP OFF** Heel end slugs (HES)  
Heel end slugs can be specified to provide delayed drop out times of up to 300ms. The more contacts specified the faster the drop out time.

**DELAY ON PICK UP** Armature end slugs (AES)  
Armature end slugs can be specified to provide delayed pick up times of up to 150ms. The more contacts specified the slower the pick up time.





## 6RM Standard Versions

- ◆ There are 9 basic 6RM versions without a slug time delay.
- ◆ There are 4 versions with a slug delay release function.
- ◆ There are 9 versions with a slug delay operate function.

All versions are defined by the operation of the contact & flag reset mechanism & may be specified with contact configurations as described in table 3.

6R Element Part Numbers Timing Function			Maximum Contacts						
No Time Delay	Delay Release	Delay Operate	Contact	Flag	Element Size	Minimum Case	Magnetic Blowouts M or B* 1	Heavy Duty M or B* 2	
6RM201	6RM301	6RM401	SR	NF	A	2M28-S1	4	6	
					B	2M28-S1	10	13	
					D	4M56-S1	20	20	
6RM202	6RM302	6RM402	SR	HR	A	2M28-S1	4	6	
					B	2M28-S1	10	13	
					D	4M56-S1	20	20	
6RM203	6RM303	6RM403	SR		A	2M28-S1	4	6	
					B	2M28-S1	10	13	
					D	4M56-S1	20	20	
6RM204	6RM304	6RM404	H/SR	HR	A	2M28-S1	1SR / 1HR	2SR / 2HR	
					D	4M28-S1	2SR / 2HR	4SR / 4HR	
6RM206	-	6RM406	HR		A	2M28-S1	4	6	
					B	2M28-S1	10	13	
					D	4M56-S1	20	20	
6RM207	-	6RM407	ER		A	2M28-S1	1	2	
					B	2M28-S1	9	12	
					D	4M56-S1	19	19	
6RM208	-	6RM408	ER	HR	B	2M28-S1	9	12	
					D	4M56-S1	19	19	
6RM210	-	6RM410	H/ER		A	4M28-S1	1	2	
					B	2M28-S1	9	12	
					D	4M56-S1	19	19	
6RM211	-	6RM411	H/ER	HR	B	2M28-S1	9	12	
					D	4M56-S1	19	19	

Table 3

**KEY:** H/ER - Hand / electrical reset      SR - Self reset      HR - Hand reset  
H/SR - Hand / self reset      ER - Electrical reset      C/F - Consult factory  
M - Make (N/O) contacts      B - Break (N/C) contacts      NF - No flag

\*C/O - Changeover contacts may be specified but EACH C/O contact replaces 1.5 M or B contacts.

**EXAMPLE:** 6RM206-A1 represents an auxiliary relay with a maximum of 4 heavy duty M or B (Magnetic blowouts fitted), hand reset contacts.

As the relay element is a size A, two of these elements may be fitted in a size 2M28-S2 case.





**NUMBER OF OUTPUT RELAY CONTACTS**

The number of contacts & configuration are specified in table 3. The number of enclosure terminals available is the limiting factor necessitating some contacts to be connected to a common circuit.

**OPERATING BURDEN** (Burden during pick up at nominal)  
Operate coils: 1 or 2W Up to 9 contacts  
5W 10-20 contacts  
Reset coils: 40W Maximum

**OPERATED BURDEN** (Burden after pick up at nominal)  
Self reset relays: 5W Maximum  
Latching relays: 1W \*  
Reset coils: Zero

\* Where a zero operated burden is required a break contact should be wired in series with the relay operate circuit.

**OPERATING VOLTAGE**

75% to 120% of nominal rated DC operating voltage.

**OPERATING TIME**

Refer table 2

**THERMAL RATING**

All operate & reset circuits are designed to withstand continuous application of 120% of nominal voltage

**ELECTRICAL RESET**

Operate voltage: As per specified operate voltage.  
Reset cut off: Instantaneous with main relay reset.

Continuous simultaneous voltage application to both the operate and reset coils will result in overheating & thermal damage to both coils.

**INSULATION WITHSTAND** in accordance with IEC 60255:

2kV RMS & 1.2/50 5KV impulse between:

- ◆ all input terminals & frame
- ◆ all output terminals & frame
- ◆ all input & output terminals
- ◆ each input group
- ◆ each output group

1kV RMS between open contacts.

**6R RELAY CONTACT RATINGS**

**Make & Carry Continuously**

3,000 VA AC resistive with maximums of 660V & 12A  
3,000 W DC resistive with maximums of 660V & 12A

**Make & Carry for 3 Seconds**

7,500 VA AC resistive with maximums of 660V & 30A  
7,500 W DC resistive with maximums of 660V & 30A

**AC Break Capacity**

3,000 VA AC resistive with maximums of 660V & 12A

**DC Break Capacity (Amps)**

Voltage			24V	48V	125V	300V
Resistive rating	1	12	12	10	5	
	2	12	2	0.5	0.3	
L/R=40ms	Maximum break	1	30	15	5.5	3.5
	1K operations (N3 Rating)	2	12	1	0.25	0.15
		1	12	12	5	2.5

1 = With magnetic blowouts 2 = Without magnetic blowouts

**6RM Ordering Codes**

Generate the required ordering code as follows:  
e.g. 6RM202B1-D-8M2B-AA-4M28S2

General Class	Order Code							
	1	2	3	4	5	6	7	8
6RM	-							

**1 RELAY FUNCTION**

Specify relay functional number from table 3.

**2 ELEMENT SIZE**

A Size A Up to 2 elements in a 2M case  
B Size B Up to 1 element in a 2M case  
D Size D Up to 1 element in a 4M case

**3 CONTACT DUTY**

1 Heavy duty contacts – magnetic blowouts fitted  
2 Heavy duty contacts

**4 NOMINAL OPERATE VOLTAGE**

A 24V DC H 240V DC  
B 32V DC K 60V AC  
C 48V DC L 110V AC  
D 110V DC N 220V AC  
E 125V DC P 240V AC  
G 220V DC  
F 250V DC

**5 CONTACT ARRANGEMENT**

Specify the number of "MAKES" followed by M; i.e. 10M  
Specify the number of "BREAKS" followed by B; i.e. 2B  
Specify the number of "CHANGEOVER" followed by C; i.e. 3C

**6 FLAG OPERATION**

- No flag  
A Flag drops on energization (Factory default)  
B Flag drops on de-energization

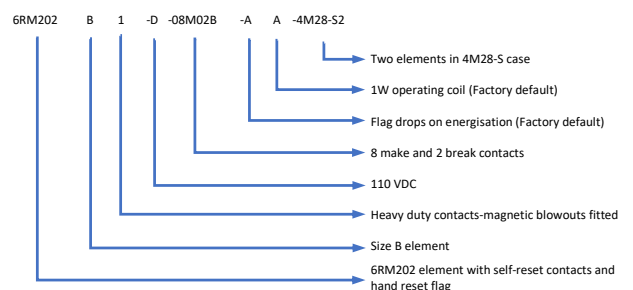
**7 OPERATING TIME** (Refer table 2)

A 1W operating coil (Factory default) (5W for 10-20 contacts)  
B 2W operating coil

**8 CASE CONFIGURATION**

- Element only – No case  
2M28-S1 One element in a 2M28-S case  
2M28-S2 Two identical elements in a 2M28-S case  
4M28-S2 Two identical elements in a 4M28-S case  
4M28-S3 Three identical elements in a 4M28-S case  
4M28-S4 Four identical elements in a 4M28-S case  
4M56-S1 One element in a 4M56-S case  
4M56-S2 Two identical elements in a 4M56-S case  
4M56-S3 Three identical elements in a 4M56-S case  
4M56-S4 Four identical elements in a 4M56-S case

Example ordering code:





## 1TM Supervision Elements

### Application

The 1TM Series Relays provide fail safe supervision of CB trip circuits. Three models are available depending on the degree of supervision required & wiring configuration.

Supervision	Model Number			
	1TM10	1TM11	1TM12	1TM13
CB 52a contact	Yes	No	Yes	No
CB 52b contact	Yes	No	Yes	No
Trip supply	Yes	Yes	Yes	Yes
Trip coil continuity	Yes	No	Yes	No
Trip wiring continuity	Yes	No	Yes	No
Trip relay circuit	No	No	No	Yes

**Table 4**

The relay can be supplied fitted with heavy duty contacts & with magnetic blow-out fitted.

A significant safety feature is the fitting of internal resistors to limit the trip coil current to well below the circuit breaker trip coil operate current, should the relay be accidentally short circuited.

#### STANDARD SUPERVISION RELAYS AVAILABLE

Relay Type	Function	Flag	Element Size	Case	Alarm Contacts
1TM10	Trip Circuit Supervision	Hand reset	B	2M28-S1	2 C/O
1TM11	Trip Supply Supervision	Hand reset	B	2M28-S1	2 C/O
1TM12	Trip Circuit Supervision	Hand reset	D	4M28-S1	2 C/O
1TM13	Trip Relay Supervision	Hand reset	B	2M28-S1	2 C/O

**Table 5**

#### FLAG OPERATION

Each relay element is supplied with a flag (target) indicator. The indicator consists of a high visibility solid dayglow orange mechanical flag.

Operation: Drops on coil de-energization.  
Reset: Hand reset.

#### NOMINAL OPERATING VOLTAGES

24, 32, 48, 110, 125, 220, 240 & 250V DC available.

#### THERMAL RATING

All 1TM relay element circuits are designed to withstand continuous application of 120% of nominal voltage.

#### CONTACTS

2 C/O standard

#### 6R RELAY CONTACT RATINGS

Refer 6RM data.

#### INSULATION WITHSTAND in accordance with IEC 60255:

2kV RMS & 1.2/50 5kV impulse between:

- ◆ all input terminals & frame
- ◆ all output terminals & frame
- ◆ all input & output terminals
- ◆ each input group
- ◆ each output group

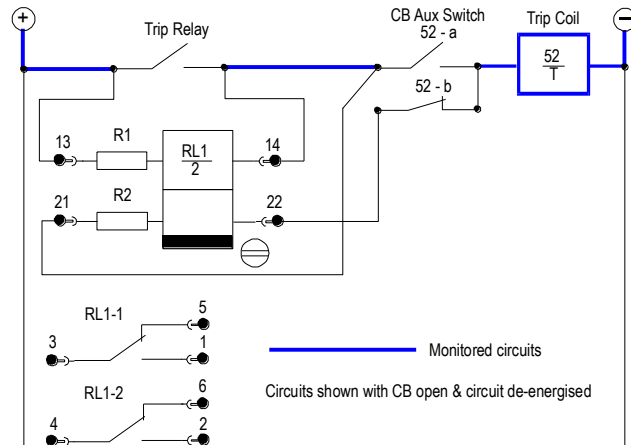
## 1TM10 Operation Trip Circuit Supervision Relay

The operating element of the 1TM10 comprises a single 6R heavy duty attracted armature control relay with two operating coils wound on a single core.

Supervision is active with the circuit breaker in the open or closed position via the 52a & b auxiliary contacts.

Under healthy conditions, with the CB in the closed position, winding 1 is energized & if the trip coil becomes open circuited or the supply fails, the relay will drop out initiating the local visual indicator & output contacts. Similarly, when the CB is in the open position, both coil windings 1 & 2 are energized enabling the relay to detect failure of the trip circuit coil or supply in the same manner as if closed. Once operated the electro-mechanical alarm flag must be hand reset.

The relay element is fitted with a slug to provide a delay of 300ms (approx.) on de-energization preventing a false alarm due to voltage dips in the supply rail, or the normal delays in the tripping operation, when the first coil winding is momentarily short circuited by the protection trip contact. If the protection trip contact should fail to reset, due to a failure of the circuit breaker tripping mechanism for example, the relay drops out initiating the local visual alarm indicator & output contacts.



### CIRCUIT RESISTANCE & BURDEN

The 1TM10 circuit design is optimized to minimize the supervision current in the CB trip coil to avoid the possibility of nuisance tripping. The total series resistance provided by R1 & RL1 - winding 1 is tabulated below. Resistance of the CB coil must be much less than this figure to ensure adequate supervision current flows through the 1TM10 element under normal conditions.

Nominal supply	~Resistance (ohms)	Current (mA)	Burden* (Watts)
32V DC	2,200	15	<0.5
48V DC	3,100	15	<0.8
110V DC	7,400	15	<1.7
125V DC	7,400	17	<2.2
220V DC	25,000	9	<2.0
240V DC	25,000	10	<2.4
250V DC	25,000	10	<2.5

### TRIP SUPPLY BURDEN

\* Actual operating burden is dependent on the CB coil resistance.

### OPERATING VOLTAGE RANGE

Guaranteed operation between 80% & 120% of nominal rated operating voltage.

### DROP OUT VOLTAGE

Drop out >15% of nominal rated operate voltage.

### RESET TIME (DROP OUT DELAY)

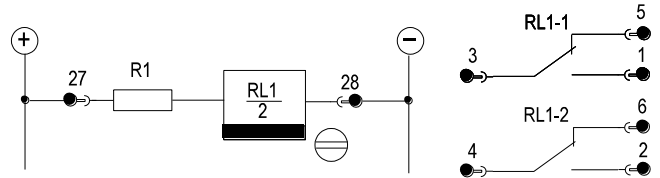
Not less than 300ms when supply is switched from 100% of nominal rated operating voltage to off.

## 1TM Supervision Elements

### 1TM11 Operation Trip Circuit Supply Supervision

The operating element of the 1TM11 comprises a single 6R heavy-duty attracted armature control relay with a single operating coil & delay slug. The relay is normally operated to indicate a healthy trip circuit supply while a slug is fitted to provide a delay on drop out & avoid nuisance tripping due to transients.

Under healthy conditions the coil is energized & if the supply fails, the relay will drop out after a short time delay (200ms approx.), to initiate a supply fail alarm.



Contacts shown with CB Open & circuit de-energised

### CIRCUIT RESISTANCE & BURDEN

The 1TM11 circuit design is optimized to minimize the supervision current to minimize the burden on the supervised supply. The total series resistance provided by R1 & RL1 is tabulated below.

Nominal supply	~Resistance (ohms)	Current (mA)	Burden (Watts)
24V DC	1,200	20	<0.6
32V DC	1,600	20	<1.0
48V DC	2,400	20	<1.0
110V DC	11,000	10	<1.2
125V DC	11,000	11	<1.5
220V DC	22,000	10	<2.5
240V DC	24,000	10	<2.5
250V DC	24,000	11	<2.7

### OPERATING VOLTAGE RANGE

Guaranteed operation between 65% & 120% of nominal rated operating voltage.

### DROP OUT VOLTAGE

Drop out between 25 & 40% of nominal rated operate voltage.

### RESET TIME (DROP OUT DELAY)

Not less than 200ms when supply is switched from 100% of nominal rated operating voltage to off.





## 1TM13 Operation Trip Relay Circuit Supervision

The 1TM13 relay is designed to supervise trip relay circuits utilizing high burden trip relays such as the 6RJ & 2HSM series available from RMS.

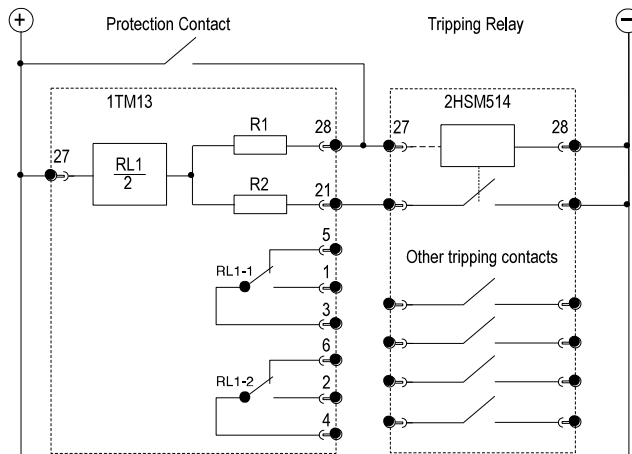
The operating element comprises a single 6R heavy-duty attracted armature control relay with a single operating coil & delay slug. It has two dropping resistors R1 & R2 of equal ohmic value, connected in series with the coil.

If the circuit being supervised becomes open circuited or if the supply fails, the relay will become reenergized, and an alarm or visual indication will be given.

Under healthy conditions the relay coil is energized via the dropping resistor R1 as shown below (Tripping relay circuit). If the circuit being supervised becomes open circuit or if the supply fails, the relay will become de-energized & an alarm is given (2 C/O contacts & flag indication).

To prevent the alarm being given when the circuit being supervised is operated the relay coil is maintained via the dropping resistor R2. For this purpose, an additional normally open contact is required from the latching tripping relay as depicted at right. A short time delay (>100ms), is incorporated to hold up the alarm relay during a normal trip relay operation.

Contacts are constructed from silver, shaped & positioned to ensure reliable, low resistance operation. Over travel of the contacts during each operation causes a wiping action ensuring a clean "make".



### CIRCUIT RESISTANCE & BURDEN

The 1TM13 circuit design is optimized to minimize the supervision current in the tripping relay coil to avoid the possibility of nuisance tripping. The total series resistance provided by the combination of RL1/R1 & RL1/R2 is tabulated below. Resistance of the CB coil must be much less than this figures to ensure adequate supervision current flows through the 1TM13 element under normal conditions.

Nominal supply	~Resistance (ohms)	Burden * (Watts)
32V DC	2,200	<0.6
48V DC	3,100	<0.9
110V DC	8,000	<1.7
125V DC	8,000	<2.2

### TRIP SUPPLY BURDEN

\* Actual operating burden is dependent on the tripping relay coil resistance.

### OPERATING VOLTAGE RANGE

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

### DROP OUT VOLTAGE

Drop out voltage: >10% of nominal rated operate voltage.

## 1TM Ordering Codes

Generate the required ordering code as follows:  
e.g. 1TM10-D2-2M28S1

General Class	Order Code			
	1	2	3	4
1TM	-			

### 1 RELAY FUNCTION

Specify relay functional number from table 5.

### 2 NOMINAL OPERATE VOLTAGE

A	24V DC	E	125V DC
B	32V DC	F	250V DC
C	48V DC	G	220V DC
D	110V DC	H	240V DC
I	60V DC		

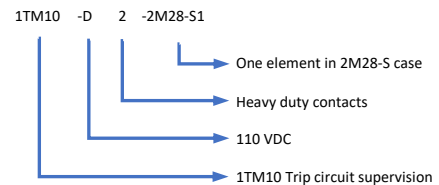
### 3 CONTACT DUTY

- 1 Heavy duty contacts – magnetic blowouts fitted
- 2 Heavy duty contacts

### 4 CASE CONFIGURATION (refer Table 5 for case sizing)

- Element only – No case
- 2M28-S1 One element in a 2M28-S case
- 4M28-S1 One element in a 4M28-S case

Example ordering code:



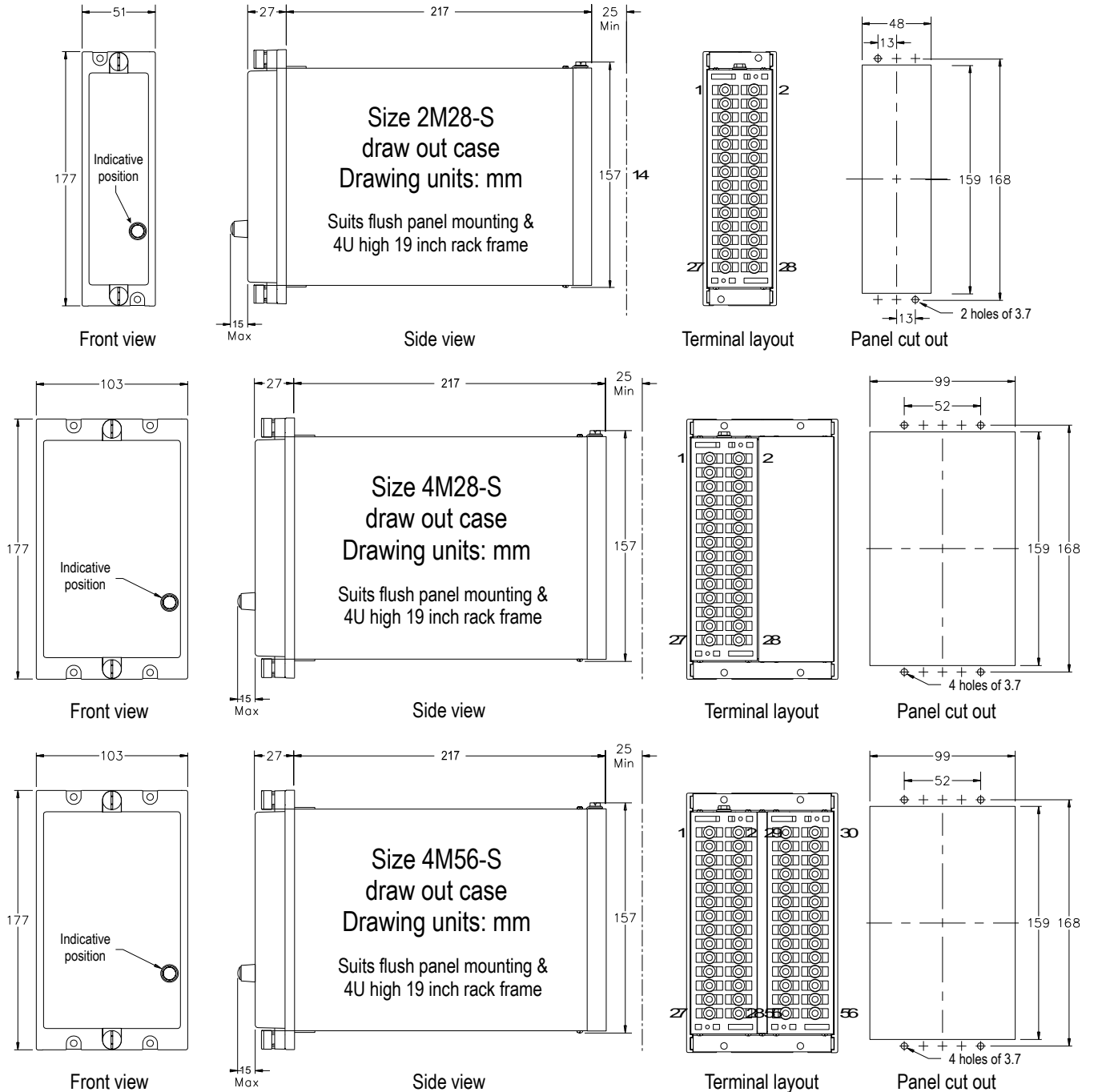
# M Series Case System

The M Series case range has been specifically designed to meet the demanding & varied requirements for applications in power utility sub-station environments. The standard 4U high 19 inch rack mounting modular configuration simplifies panel design & installation.

Mounting points & overall panel dimensions meet international standards such that the cases may be installed in the existing panel cut out of similar relay types available on the market.

The MATRIX-S version was released in mid August 2005 with the length reduced by 18mm to improve compatibility with shallow cubicles.

Care should be taken when ordering spare relay modules to ensure compatibility with existing units.





## Technical Data

### CURRENT RATINGS

CT terminals:	20A	continuous
	400A	1s
Other terminals:	10A	continuous
	200A	1s

### VOLTAGE RATINGS

All circuits & terminals:	600V AC	continuous
	350V DC	continuous

### AUXILIARY INSULATION WITHSTAND

In accordance IEC 60255:  
2kV RMS between all terminals & all terminals & frame.  
1.2/50 5kV impulse between all terminals & all terminals & frame.

### IP RATING

IP5X category 2 dust protected and IP4X for solid ingress to IEC60529.

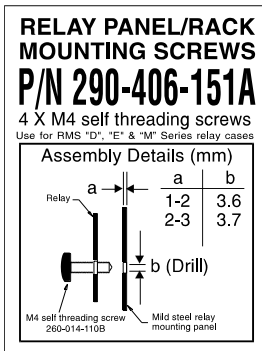
## M Series Case Accessories

Refer to the M Series Technical Bulletin for:

- Sub rack mount frames
- Blanking plates
- Mounting screw kits
- Termination ring lugs
- Stud terminal kits
- Semi projection mount kits
- Earth bars

<https://www.morssmitt.com/products/400857/m-series-modular-rack-mount-protection-relay-cases?catId=200001>

## Case Mounting Screws



M Series cases may be flush mounted to mild steel panels up to 3mm thick using the M4 self-threading screws provided with the case. Panel mounting is simplified due to the location of the fixing screws at the front face of the relay. Alternatively, the cases may be 19 inch rack mounted using a 4U high sub rack. The M4 self-threading screws are suitable for application with RMS 4M800 series sub rack frames.

## Case Ordering Codes

Generate the required order code as follows: e.g. 2M28-S1

Order Code		
1	2	3
M		-S

### 1 CASE SIZE

- 2 Size 2
- 4 Size 4

### M M SERIES CASE

### 2 NUMBER OF TERMINALS

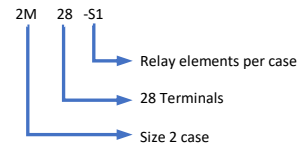
- 28 28 Terminals
- 56 56 Terminals (Size 4 case only)

### S SHORT CASE VERSION

### 3 RELAY ELEMENTS PER CASE

- 1 One
- 2 Two
- 3 Three
- 4 Four

Example ordering code:





**RMS Mors Smitt**

A *Wabtec* Company

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**RMS Mors Smitt**  
19 Southern Court  
Keysborough, VIC 3173, Australia  
Tel: +61 (0)3 8544 1200  
sales.rms@wabtec.com

**Wabtec Netherlands B.V.**  
Darwinstraat 10  
6718 XR Ede, Netherlands  
Tel: +31 (0)88 600 4500  
sales.msbv@wabtec.com



**RMS Mors Smitt**

A *Wabtec* Company



Visit [www.morssmitt.com/rms](http://www.morssmitt.com/rms) for the latest product information.

Due to RMS continuous product improvement policy this information is subject to change without notice

6RMATRIX/ BI / 25/06/2024 - 18/18

