

Features

- High speed operation
- High and low burden alternatives
- Low burden models suitable for ac and dc operation
- Models surge proof against high capacitance discharge currents in the dc supply system, are available
- Control relays immune to ac can be supplied

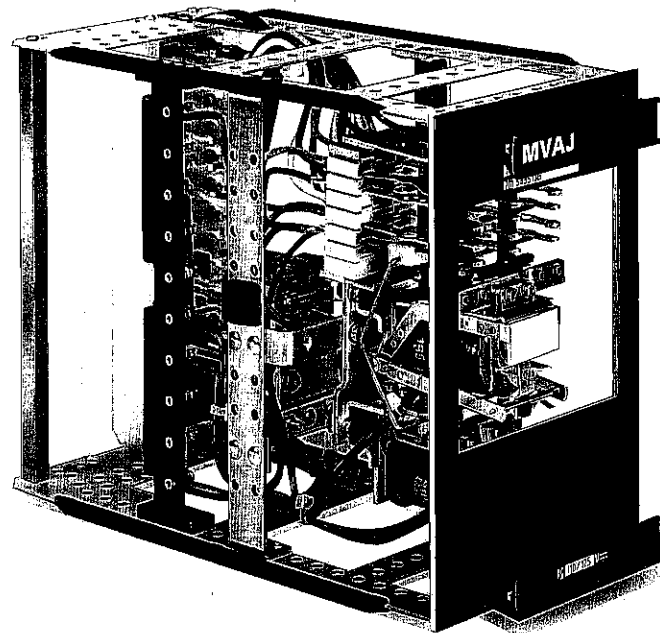


Figure 1: Type MVAJ relay withdrawn from case

Models Available

Type MVAJ relays may broadly be divided into three groups:

- High burden tripping relays complying with ESI 48-4 Class EB2
- Low burden tripping relays which comply with ESI 48-4 Class EB1
- Control relays which meet the requirements of National Grid Company SPEC.NGTS 2.19:1996

Table 1 lists the general characteristics and includes information on how the relay burden is modified at, or just after operation. 'Economy' indicates that the burden is reduced to a low value.

Instantaneous cut off is a feature of some hand and electrically reset elements and reduces the burden to

zero, whilst others incorporate a time delay to enable to series elements to operate. This time delay is 40ms to 60ms in all cases except that of the types MVAJ 26 and 56 in which the delay is 2s. All low burden relays are suitable for ac or dc operation. All high burden relays are for dc operation only.

Application

High Burden Tripping Relays Types MVAJ 21, 23, 24, 25, 26, 27, 28, 29, 51, 53, 54, 55, 56, 57, 58 and 59

These relays are suitable for use in high security circuit breaker tripping circuits. In particular they can be used in distributed tripping or control relay contact logic schemes, where the initiating contact may be remote from the relay. The relays have a high

burden which is either cut off at operation or economised to a low figure, either instantaneously or after a time delay.

The high burden provides immunity to capacitance discharge currents, which can result at the inception of an earth fault on battery wiring and immunity to the subsequent leakage current.

The high burden also permits the use of supervision relays such as type MVAX where the wiring is at risk and provides reliable operation of series elements such as repeat relays type MCAA. For the latter purpose type MVAJ relays can be provided with a time delayed economising feature.

Relay type	Contact mechanism	Operation indicator	Cut off	Specifications	Group	Outgoing contacts		Case size	
						single stack	double stack	single stack	double stack
MVAJ 11	SR	H/R	Economy	ESI48-4 EB1	Low burden	5	10	4	4
MVAJ 13	HR	H/R	Instantaneous	ESI48-4EB1	Low burden	5	10	2	4
MVAJ 14	ER	H/SR	Instantaneous	ESI48-4EB1	Low burden	5*	10*	2	4
MVAJ 15	H/ER	H/R	Instantaneous	ESI48-4EB1	Low burden	5*	10*	2	4
MVAJ 17	SR	H/R	Economy	NGC SPEC. NGTS 3.6.3:1992	Low burden	5	-	4	-
MVAJ 21	SR	H/R	Economy	ESI48-4EB2	High burden	5	10	4	4
MVAJ 23	HR	H/R	Instantaneous	ESI48-4EB2	High burden	4	10	2	4
MVAJ 24	ER	H/R	Instantaneous	ESI48-4EB2	High burden	4*	9	2	4
MVAJ 25	H/ER	H/R	Instantaneous	ESI48-4EB2	High burden	4*	9	2	4
MVAJ 26	SR	H/R	Time delay Economy	ESI48-4EB2	High burden	5	10	4	4
MVAJ 27	HR	H/R	Time delay	ESI48-4EB2	High burden		9		4
MVAJ 28	ER	H.R	Time delay	ESI48-4EB2	High burden		8		4
MVAJ 29	H/ER	H/R	Time delay	ESI48-4EB2	High burden		8		4
MVAJ 34	ER	S/R	Instantaneous	NGC SPEC. NGTS 2.19:1996	Control in/out		7		4
						4 stacks		All in size 8 cases	
MVAJ 41	SR	H/R	Economy	ESI48-4EB1	Lowburden		20 Contacts		
MVAJ 43	HR	H/R	Instantaneous	ESI48-4EB1	Low burden		20 Contacts		
MVAJ 44	ER	H/SR	Instantaneous	ESI48-4EB1	Lowburden	*	18 Contacts		
MVAJ 45	H/ER	H/R	Instantaneous	ESI48-4EB1	Lowburden	*	18 Contacts		
MVAJ 51	SR	H/R	Economy	ESI48-4EB2	Highburden		20 Contacts		
MVAJ 53	HR	H/R	Instantaneous	ESI48-4EB2	High burden		20 Contacts		
MVAJ 54	ER	H/R	Instantaneous	ESI48-4EB2	High burden		18 Contacts		
MVAJ 55	H/ER	H/R	Instantaneous	ESI48-4EB2	High burden		18 Contacts		
MVAJ 56	SR	H/R	Time delay Economy	ESI48-4EB	High burden		20 Contacts		
MVAJ 57	HR	H/R	Time delay	ESI48-4EB2	High burden		18 Contacts		
MVAJ 58	ER	H/R	Time delay	ESI48-4EB2	High burden		16 Contacts		
MVAJ 59	H/ER	H/R	Time delay	ESI48-4EB2	High burden		16 Contacts		

KEY SR - Self reset HR - Hand reset ER - Electrical reset H/ER - Hand/electrical reset H/SR - Hand/self reset

Note: Relay types indicated * do not have continuously rated reset coils or internally wired cut-off contacts. If required, one pair of outgoing contacts may be wired externally for this duty; this will obviously reduce the number of available contacts.

Table 1: List of MVAJ types available

Low Burden Tripping Relays Types MVAJ 11, 13, 14, 15, 41, 43, 44, 45

These relays are suitable for applications where immunity to capacitance discharge and high minimum operation currents are not required.

Low Burden Self-reset Tripping Relay Type MVAJ 17

The type MVAJ 17 is a low burden self-resetting tripping relay which complies with the provisions of NGC SPEC. NGTS.3.63:1992. Its main feature is the facility which allows the economising element circuit to be

connected directly to the dc supply via case terminals.

Since this reduces the necessary break duty on the associated protection output relay, this feature is particularly useful when several tripping relays are operated in parallel.

Control Relay Type MVAJ 34

This is a dual-rated electrically reset relay, the main function of which is to switch protection and auto-reclosing equipment in and out of service from a remote point via pilot wires. It complies with NGC. SPEC. NGTS 2.19:1996.

Description

High Burden Tripping Relays Types MVAJ 21, 23, 24, 25, 26, 27, 28, 29, 51, 53, 54, 55, 56, 57, 58 and 59

All relays use common standardised parts. Versions have one, two or four contact stacks depending upon the number of output contacts required.

Types MVAJ 21, 51 high burden self-resetting relays

These relays use a contact on the main contact stack to energise a separate, rear-mounted economising element. After operation this reduces the burden by switching in resistance in series with the main element and switching out shunt resistance.

Figure 2 shows a typical circuit diagram for self-resetting relays of this type with high speed economy. When the main attracted armature unit RL1 is energised by the protection contact PR, a contact RL1-a energises auxiliary element RL2. When contacts RL2-a and RL2-b open, resistor R4 is put in series with RL1 while the circuit to resistor R2 is broken.

Types MVAJ 23, 24, 25, 53, 54, 55 high burden tripping relays with instantaneous cut-off

These relays incorporate a break contact in series with the operate coil. Located on 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 as soon as mechanical latching of the contacts has occurred.

Types MVAJ 23 and 53 hand reset whilst the types MVAJ 24 and 54 have a second coil which, when energised, unlatches the relay resetting mechanism. Types MVAJ 25 and 55 may be reset either by hand or electrically, by means of the same design of mechanism. See Figure 3.

Type MVAJ 26 and 56 time delay on drop-off relays

The types MVAJ 26 and 56 relays have been specially designed for applications requiring a tripping relay which is self-resetting after a nominal delay of 2 seconds.

This relay may be used, for example, for intertripping between the higher voltage and lower voltage circuit breakers of a large three phase power transformer. This may become necessary when the higher voltage circuit breaker is tripped after a heavy internal fault, by protection which

cannot conveniently provide an auxiliary contact with a dwell time long enough to ensure correct tripping of the lower voltage circuit breaker.

Typically the relay is initiated by transformer protection, such as overall differential, restricted earth fault, and Buchholz relays, in arrangements where both the HV and LV circuit breakers are to be tripped simultaneously.

The HV circuit breaker may be expected to trip more quickly than the LV breaker. So the tripping signal is maintained by the delayed resetting, to ensure complete clearance by the LV circuit breaker, even though the fault may have been cleared largely by the HV circuit breaker and the protection has started to reset.

The MVAJ 26 and 56 relays can accept either a fleeting initiation or persistent initiation. With the latter, the relay will provide a tripping signal of corresponding duration plus the 2 seconds delay.

The relay consists of a main attracted

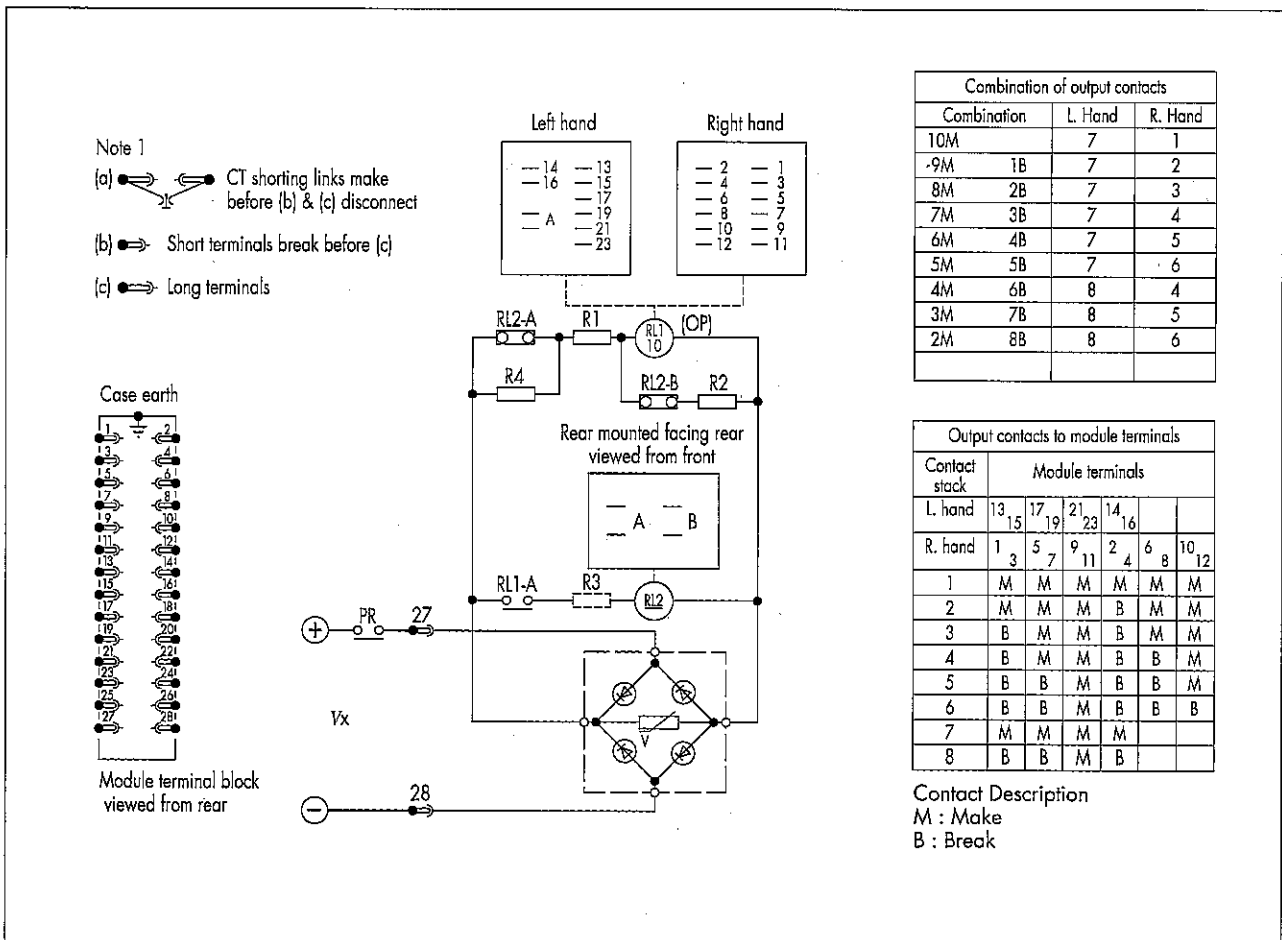


Figure 2: MVAJ 21 self-reset with instantaneous economy (high burden)

armature element with a hand reset operation indicator and one electromagnet with two contact stacks.

Types MVAJ 27, 28, 29, 57, 58, 59 relays with time delayed drop-off.

These relays are hand reset, electrically reset and hand/electrically reset respectively and all have time delayed cut-off circuits. The burden is reduced to zero 40/60ms after energisation by the use of a second attracted armature element mounted in the rear of the case. This time delay allows ample time for any flagging or auxiliary element in series with the tripping relay to operate before cut-off.

Figure 4 shows a typical circuit diagram for an electrically reset trip relay with time delayed cut-off feature.

When the contact PR is closed, relays RL1 (operate) and RL2(t) operate.

After operation the current in the coil of RL1 (operate) is maintained by contact RL2-a; contacts RL1-a and RL1-b open, whilst RL1-c closes. The opening of RL1-a causes relay RL2(t) to start to reset. This resetting is

delayed by 40-60ms by means of a copper slug fitted to the front of RL2(t). When RL2(t) resets, RL2-a opens, reducing the current through RL1 (operate) coil to zero.

The relay is now latched mechanically into the operated state. It may now be reset via an external contact or push-button which energises the RL1 (reset) coil via the closed contact RL1-c.

Low Burden Tripping Relays Types MVAJ 11, 13, 14, 15, 41, 43, 44, 45

These are low burden versions of types MVAJ 21, 23, 24, 25, 51, 53, 54 and 55 relays respectively. They comply with the less onerous requirements of ESI 48-4, Class EB1.

Where self-reset reverse flags are fitted, a maximum of 8 output contacts is available. The operating time is not greater than 15ms

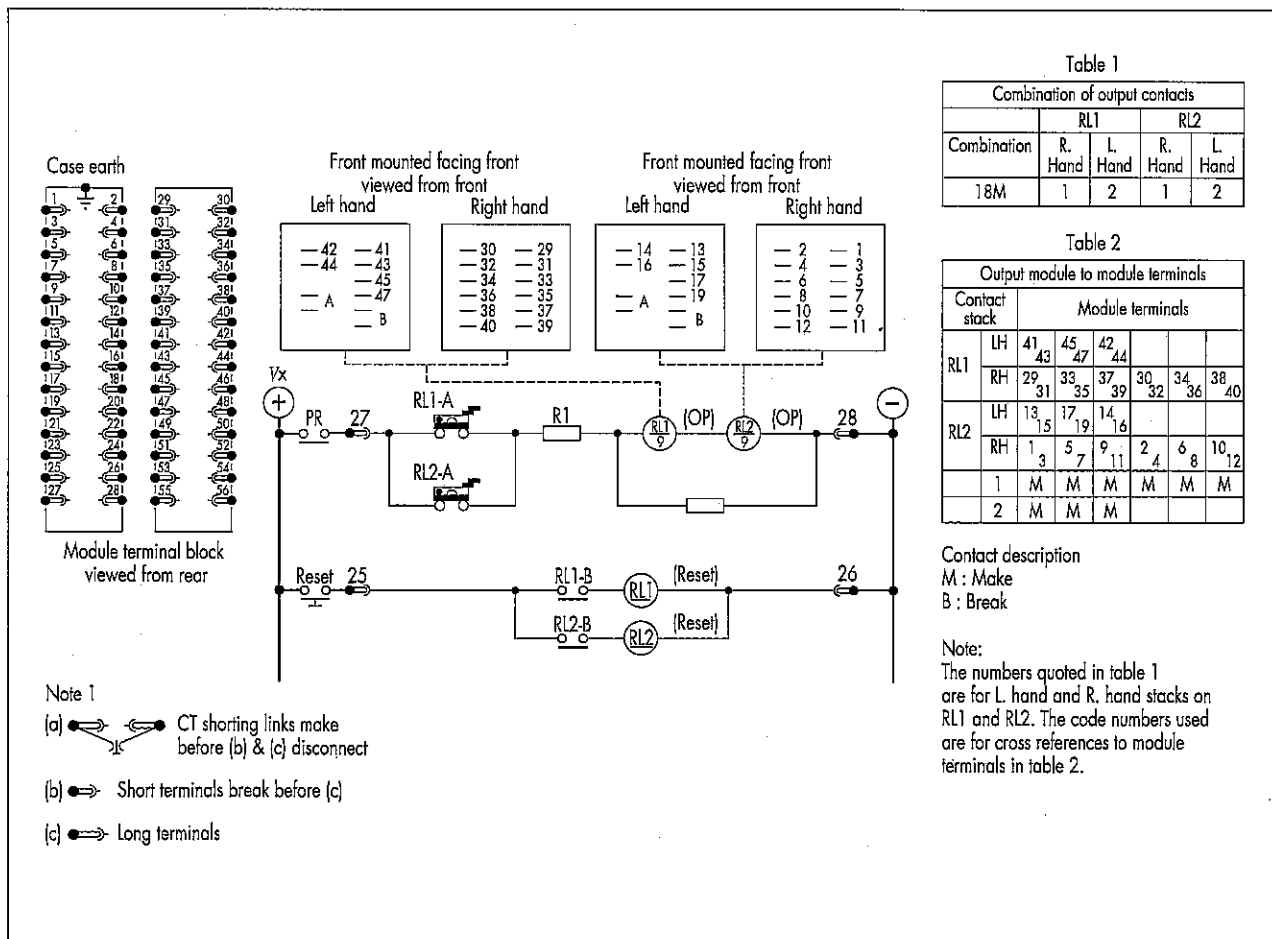


Figure 3: MVAJ 55 hand and electrically reset (high burden)

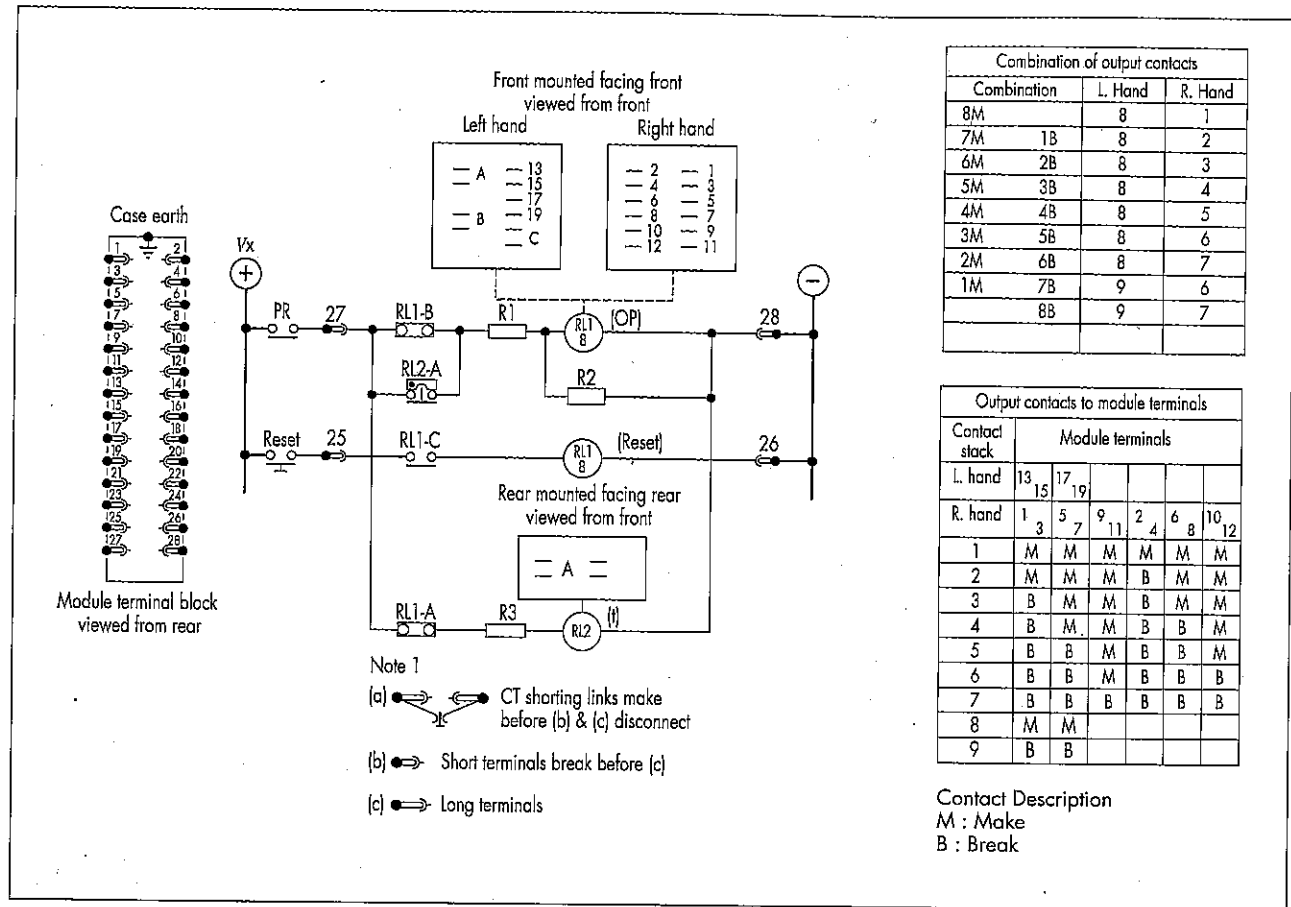


Figure 4: MVAJ 28 electrically reset with time delayed cut off (high burden)

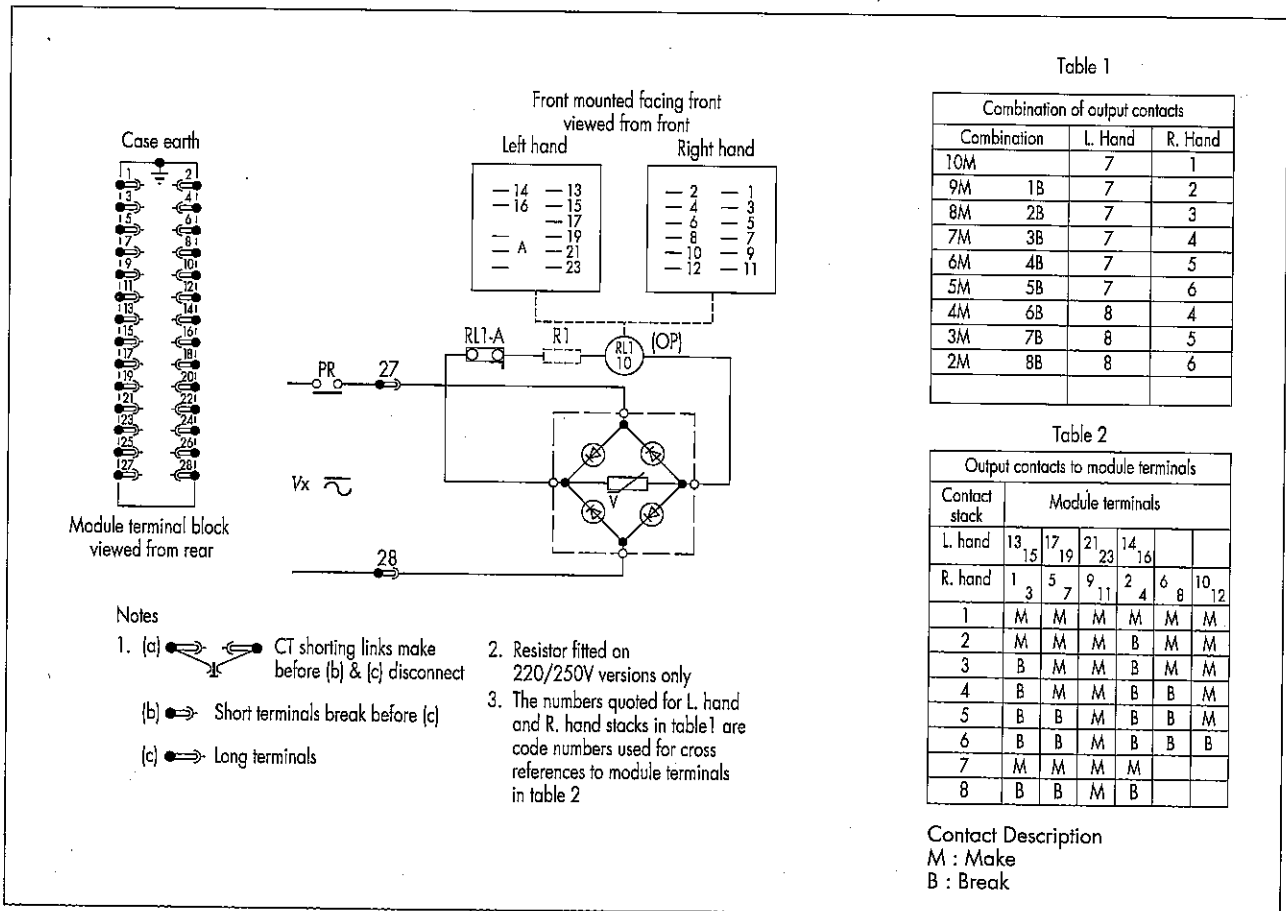


Figure 5: MVAJ 13 hand reset (low burden)

Technical Data

Ratings

All relays except MVAJ 17. and MVAJ 34	Rated voltage (Vx)	Operative range (V)
	24/27	14.4–32.4
	30/34*	18–40.8
	48/54*	28.8–64.8
	110/125*	66–150
	220/250	122–300
MVAJ 17	110/125	66–150
MVAJ 34 dual rated	0Ω pilot	200Ω pilot
	48/54	37.5–60 46–56
	110/125	87.5–137.5 87.5–137.5
	220/250	122–286 175–275

*These ranges only are applicable to ESI 48-4

Burdens

Relay type	Burden (W)		Operated	To reset		Minimum operating current (mA)
	To operate Single stack	Double stack		Single stack	Double stack	
MVAJ 11	25	50	10	–	–	25
MVAJ 13	25	50	–	–	–	25
MVAJ 14	25	50	–	15	25	25
MVAJ 15	25	50	–	15	25	25
MVAJ 17	25	(See Note 2 below)	–	–	–	25
MVAJ 21	150	150	10	–	–	100
MVAJ 23	150	150	–	–	–	100
MVAJ 24	150	150	–	50	50	100
MVAJ 25	150	150	–	50	50	100
MVAJ 26	150	150	12.5	–	–	100
MVAJ 27	–	150	–	–	–	100
MVAJ 28	–	150	–	–	50	100
MVAJ 29	–	150	–	–	50	100
MVAJ34		10	–		10	25
(See		25	–		25	25
Note 3 below)		50	–		25	25
MVAJ 41		50	12.5	–	–	25
MVAJ 43		50	–	–	–	25
MVAJ 44		50	–	–	45	25
MVAJ 45		50	–	–	45	25
MVAJ 51		150	15	–	–	100
MVAJ 53		150	–	–	–	100
MVAJ 54		150	–	–	70	100
MVAJ 55		150	–	–	70	100
MVAJ 56		150	12.5	–	–	100
MVAJ 57		150	–	–	–	100
MVAJ 58		150	–	–	70	100
MVAJ 59		150	–	–	70	100

Note 1: Minimum operating current for relays specified in ESI 48-4 Class EB1 is 25mA and in EB2 is 50mA for 110V dc rating

Note 2: The burden of the relay before it economises is less than 25W, reducing to 2.1W after. The auxiliary, which is fed from a separate supply, remains at 3.85W.

Note 3: The 3 sets of burdens quoted for MVAJ 34 apply to the 48/54, 110/125 and 220/250V versions respectively.

Operating time

MVAJ 11-15 fitted with
self reset reverse flags

All other types

15ms

Not greater than 10ms at rated
voltage

Operation indicator

MVAJ 34

The operation indicator follows the
relay operation.

Contacts

The number of contacts available is
shown in Table 1. They may be any
combination of make type and break
type but with a maximum of 8 break.

Contact ratings

Make and carry for 3s

ac 7500VA with maxima
of 30A or 300V

dc 7500W with maxima
of 30A or 300V

Make and carry continuously

ac 1250VA with maxima
of 5A or 300V

dc 1250W with maxima
of 5A or 300V

Break

ac 1250VA with maxima
of 5A or 300V

dc 100W resistive
50W inductive with maxima
of 5A or 300V

Withstand Ratings

MVAJ 17

The relay shall not operate when a
1 μ F capacitor charged to 150V is
discharged into its operate circuit.

The relay is continuously rated
at 150V dc.

MVAJ 34

Operation/resetting does not occur
when 100V ac rms 50/60Hz is
applied to the respective coil circuits.

The relay (at 50V range or above)
will operate with pilot wires
having a resistance of 200 Ω .

MVAJ 21-29 & 51-59

These relays will withstand without
operating, the discharge into their
operate circuits of a 10 μ F capacitor
charged to a voltage equal to the
highest in the operative range for the
relay

All relays are continuously rated with
the exceptions listed in Table 1.

Specifications

MVAJ 17

NGC SPEC.NGTS 3.6.3:1992

MVAJ 34

NGC SPEC.NGTS 2.19:1996

All other relays

IEC 255

High Voltage withstand

Dielectric withstand
IEC 255-5:1977

2kV rms for 1 minute between all terminals and case earth.

2kV rms for 1 minute between terminals of independent circuits including contact circuits, with terminals on each independent circuit connected together.

1kV rms for 1 minute across open contacts of output relays.

High voltage impulse
IEC 255-5:1977

Three positive and three negative impulses of 5kV peak, 1.2/50 μ s, 0.5J between all terminals and all terminals and case earth.

Electrical environment

High frequency disturbance
IEC 255-22-1:1988
Class III

2.5kV peak between independent circuits and case.

1.0kV peak across terminals of the same circuit.

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
EN 50082-2:1995

Generic Standards were used to establish conformity.

Product safety

72/23/EEC

EN 61010-1:1993/A2:1995
EN 60950:1992/A3:1995

Compliance with European Commission Low Voltage Directive

Compliance is demonstrated by reference to generic safety standards.

Atmospheric environment

Temperature
IEC 255-6:1988

Storage and transit -25°C to +70°C
Operating -25°C to +55°C

IEC 68-2-1:1990
IEC 68-2-2:1974

Cold

Dry Heat

Humidity
IEC 68-2-3:1969

56 days at 93% RH and 40°C

Enclosure protection
IEC 529: 1989

IP50 (dust protected)

Mechanical environment

Vibration
IEC 255-21-1:1988

0.5g between 10Hz and 150Hz

Mechanical durability
Loaded contact
Unloaded contact

10,000 operations minimum
100,000 operations minimum

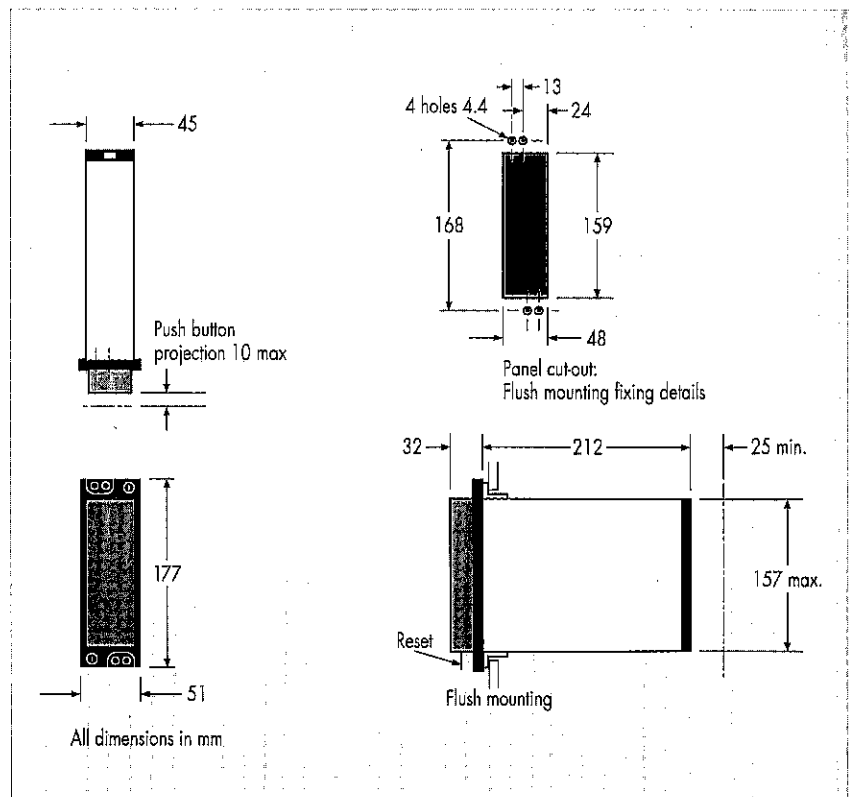


Figure 6: Case outline size 2

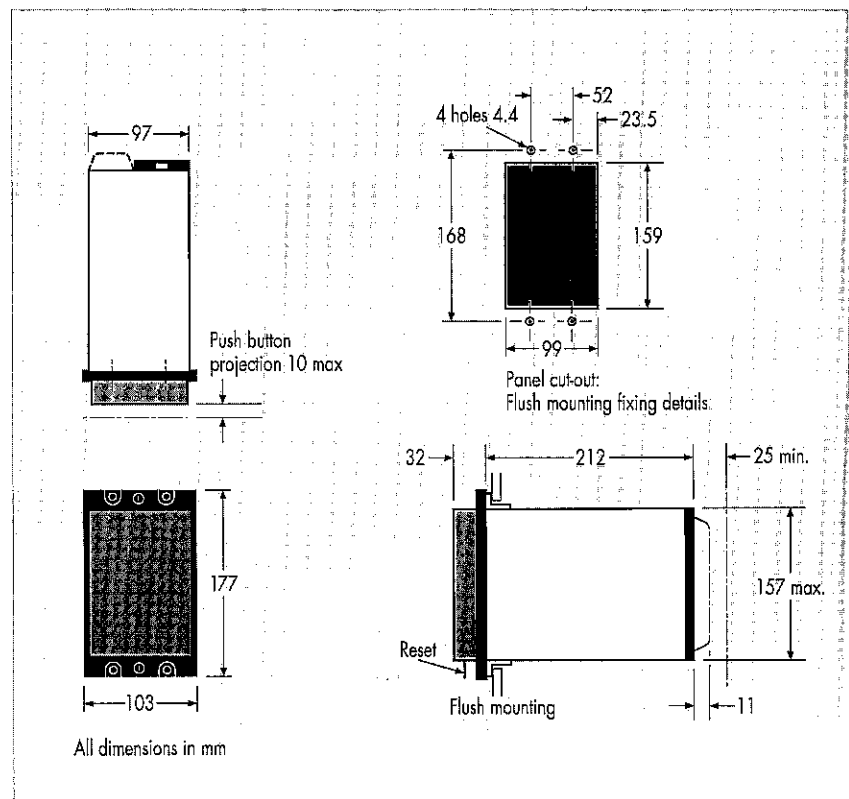


Figure 7: Case outline size 4

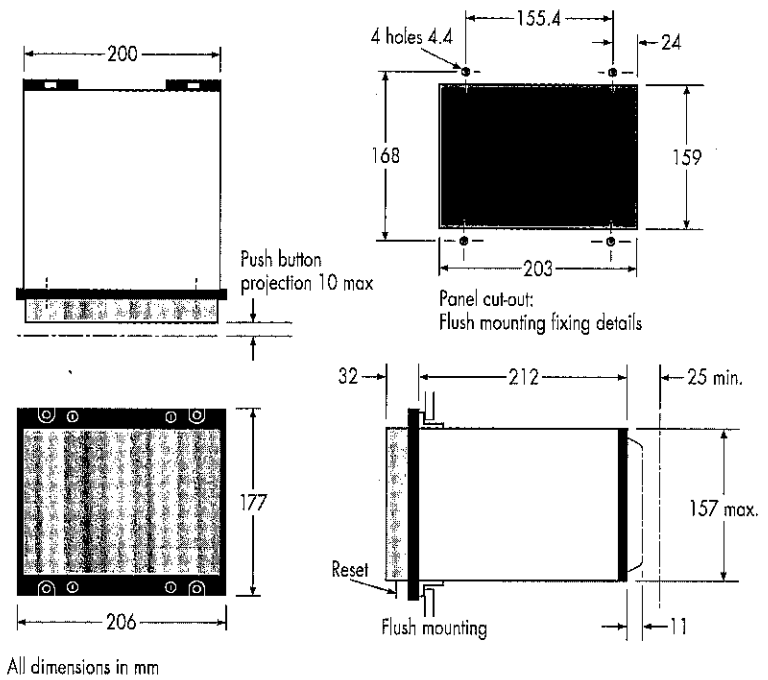


Figure 8: Case outline size 8

Cases

MVAJ relays are housed in size 2, 4 or 8 cases as indicated in Table 1. Dimensions for these cases are shown in Figures 6, 7 and 8 respectively.

Information Required with Order

Relay type
Voltage rating
Number and combination of contacts for tripping duties
Hand reset operation indicator required
Instantaneous or time delayed cut-off contact

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