GE
Grid Solutions

MVAJ 05/10/20

Tripping and Control Relays

Protective relays are precise measuring devices, the contacts of which should not be expected to switch large electrical loads.

In some cases, the protective relay can trip a circuit- breaker directly, or according to the coil rating and the number of circuits to be energised.

The MVAJ relay interfaces with the protection to provide: higher contact capacity, additional contacts for tripping multiple circuit-breakers, control functions, signalling and interlocking.

The MVAJ range comprises very reliable hinged armature relays designed to directly operate circuit-breaker trip coils. Built to very high specifications, the MVAJ range provides a highly flexible and reliable link between the protective relays and the circuit-breakers.

Models Available

- **Trip relays**
  Trip relays possess a standard hand-reset flag and operate within 10 ms.
  Table 1 shows the trip relay versions available
- **Control relays**
  Control relay variants of each trip relay are available. These relays operate within approximately 15 ms
- All relays configured for high burden applications are suitable for DC operation only

Key Features

- Negligible contact bounce
- 10 contacts in Midos size 2 case and 20 contacts in Midos size 4 case
- Supplied as high burden
- Low burden easily selectable by removing an external link
- Hand, electrical and self reset variations
- Reset inhibition feature
- Delayed cut-off available in high burden applications
- AC or DC operation for low burden configuration
- 2.5 second time delay

Key Benefits

- Directly operates circuit breaker trip coils
- High reliability
- High-speed operation
- Immunity to wiring capacitance discharge

Imagination at work

Applications

Self-reset relays reset when the initiating signal is removed, making them suitable for use as trip relays in auto-reclose schemes and also for general flagging purposes. Hand-reset relays require manual resetting, making them effective lockout relays which are commonly used to trip circuit-breakers associated with transformers. Electrical-reset relays require a voltage to be applied to the unit to reset the contacts. These relays may be used in auto-reclose schemes, or where remote resetting of the relay is required.

Trip Relay

With the exception of the MVAJ 102 time delayed self-reset relays, all trip relays are suitable for either low burden or high burden applications.

High Burden Application

These relays, supplied as high burden, are suitable for use in high security circuit-breaker tripping circuits. The high burden provides greater immunity to capacitance discharge currents, which can result at the inception of an earth fault on battery wiring. This makes the relays particularly suitable for use in distributed tripping or control relay contact logic schemes, where the initiating contact may be remote from the relay.

MVAJ 05

When configured for high burden applications, the burden is either cut off at operation or is economised to a low figure instantaneously.

MVAJ 10, MVAJ 20

When configured for high burden applications, the burden is either cut off or is economised to a low figure after a 40-60 ms time delay. Due to the greater minimum operating current, the high burden application also permits the use of supervision relays such as type MVAX 11, where the wiring is at risk. The 40- 60 ms time delay ensures reliable operation of series elements such as type MCAA repeat relays.

Type MVAJ 102 relay is specifically designed for applications requiring a tripping relay which is self-resetting after a nominal delay of 2.5 seconds. This relay may be used, for example, for inter-tripping between higher voltage and low voltage circuit-breakers of a large 3-phase power transformer.

This may become necessary when the high 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 low voltage circuit-breaker.

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

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

Low Burden Application

These relays are suitable for general applications where the initiating contact is located close to the relay. When configured for low burden applications, by removing the external link from terminals 22 and 24, the burden is either cut off during operation or is economised to a low figure instantaneously.

Trip Relay Model Variants

Reset Mechanism	5 Contacts	10 Contacts	20 Contacts
Self-reset	051	101	-
Self-reset (2.5 s delayed reset)	-	102	-
Hand-reset	053	103	203
Electrical-reset	054	104	204
Hand & Electrical reset	055	105	205

Control relay

Control relay variants of the standard trip relay are suitable for applications where the operating time of the unit is not critical, but where the condition of the armature should be clear from the position of the following flag.

Configuration

All trip relays are supplied as high burden. With the exception of MVAJ 102, they may be converted to low burden by removing the link between case terminals 22 and 24. A second link connected between case terminals 21 and 23 enables a reset inhibitor feature to be introduced into the circuit of 10 and 20 contact electrical-reset relays, ensuring that the reset circuit is disabled when the operating circuit is energised. On relay types 104, 105, 204 and 205, this link may be removed if the feature is not required. This link must remain fitted to MVAJ 101 relay to enable the economising circuit. Tables 2 and 3 describe the user selectable features which are available by external link connection.

Hand-reset Relays (Type MVAJ 053, 103, 203)

These relays incorporate an internal break contact in series with the operating coil of the attracted armature unit. This contact breaks the coil circuit and reduces the burden to zero for all relays in the low burden configuration and for the MVAJ 053 relay in high burden configuration.

For type MVAJ 103 and 203 relays configured for high burden operation, as supplied, the burden is reduced to approximately 100 W for 40-60 ms before being cut off to zero.

When the break contact cuts off, the high burden is held until the time delay circuit switches it out. This time delay allows any flagging or auxiliary element in series with the tripping relay to operate before full cut off. The relay is reset by means of a push-button located on the front cover. For type MVAJ 20 relays, each element is reset separately.

Electrical, Hand/Electrical-reset Relays (Type MVAJ 054/055/104/105/ 204/205)

These relays operate similarly to the hand-reset relays. The internal break contact in series with the operating coil breaks the coil circuit and reduces the burden to zero for all relays in the low burden configuration and for the MVAJ 054 and 055 relays in high burden configuration.

For type MVAJ 104, 105 and 205 relays configured for high burden operation, as supplied, the burden is reduced to approximately 100 W for 40-60 ms before being cut off to either zero or an economised level.

For a hand/electrical-reset relay, once the main attracted armature unit is latched in the operate state, an internal contact closes, thus enabling the reset circuit. The relay may then be reset by energising the reset coil by means of closing the reset contact. If required, the rest inhibitor may be activated by linking case terminals 21 and 23. This circuit ensures that while PR is closed, contact RL2-1 is open, stopping the reset circuit from being simultaneously energised and thus protecting the circuit. If the reset contact is closed while the protective contact PR is also closed, the relay will oscillate between operate and reset states.

Relay Type	Feature	Link in	Link out
MVAJ 051, 053, 054, 055	Burden Cut-off	High Instantaneous	Low Instantaneous
MVAJ 101, 103, 104, 105, 203, 204, 205	Burden Cut-off	High 40-60 ms time delayed	Low Instantaneous
MVAJ 102	Link not necessary (configured as high burden models)		
Note: When the relay cut-off occurs, the current drawn by the relay is either reduced to an economised level or it is removed entirely (i.e. zero watt cut-off state for MVAJ 05 or a low level for MVAJ 10 and MVAJ 20).			

Relay Type	Feature	Link in	Link out
MVAJ 051, 053, 054, 055, 102		Link not available	
MVAJ 101	Link fitted (relay cut-off to economised state)		
MVAJ 103, 203	Link not available (relay cut-off to zero watts)		
MVAJ 104, 105, 204, 205	Cut-off state reset inhibitor	economised active	zero watts disabled

Self-reset Relays (Type MVAJ 051, 101)

Self-reset relays operate in the same manner as the hand and electrical models but have a residual gap in the magnetic path to ensure that they reset.

For a self-reset relay, when the attracted armature unit is energised by the protection contact PR, a resistance is switched in series which reduces the burden sufficiently to hold the unit in the operated condition. On the opening of contact PR, this economised burden is removed and the relay resets. For all relays in the low burden configuration and for the MVAJ 051 relay in high burden configuration, the burden is economised instantaneously.

For type MVAJ 101 relay configured for high burden operation, the burden is reduced to approximately 100 W for 40-60 ms before being cut off to an economised level. The external link between case terminals 21 and 23 must remain fitted on these relays.

2.5 Second Time Delayed Self-reset Relays (Type MVAJ 102)

The MVAJ 102 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 2.5 s time delay. These relays use the same basic principles of operation as described for the standard self-reset relay. The burden is reduced to an economised level 40-60 ms after operation.

For a time delayed self-reset relay, the connection to terminal 25 is used to hold the relay in the energised state until a timer on the circuit board times out. The timer begins the timing sequence when the PR contact opens.

Highly flexible and reliable hinged armature relays

Flagging

Standard Flag

All MVAJ trip relays are fitted with a standard hand-reset flag which drops upon operation of the relay. When the relay is reset the flag stays in the operated state indicating that a fault has occurred. The flag(s) may be reset by means of a lever on the cover.

Following Flag

Following flags are generally fitted to relays required for control functions. Upon the operation or reset of the relay, the flag follows the armature to indicate the current condition of the relay. Where the following flag is fitted, the operation of the relay is increased to approximately 15 ms which is generally unsuitable for trip relay applications.

Technical Data

Ratings

Auxiliary voltage (Vx)

Rated Voltage (Vx)	Operating Range (V)
24/27*	14.4 – 32.4
30-34*	18.0 – 40.8
48/54*	28.8 – 64.8
110/125	66 – 150
220/250	132 - 300

Burdens	Burden at higher rated voltage (W)			Minimum operating current (mA)	
	To operate*	Operated	To reset	Up to 125 V*	220/ 250 V*
MVAJ 05	80/150	5	<40	>25/50	>10/20
MVAJ 10	50/150	4	<40	>25/50	>10/20
MVAJ 20	50/150	4	<80	>25/50	>10/20

** low/high burden configuration*

Operate Time	Operate Time (Standard Flag)	Operate Time (Following Flag)
MVAJ 05	<8 ms	15 ms
MVAJ 10	<8 ms	15 ms
MVAJ 20	<10 ms	15 ms

The relay operate time will not increase by more than 1 ms due to contact bounce

Reset Time

- Self-reset relays
  MVAJ 051 (low burden and high burden 24/27 V, 30/34 V, 48/54 V), MVAJ 101: 20 ms.
- MVAJ 051 (high burden 110/125 V, 220/250 V) <20 ms
  if a diode is fitted instead of the high burden direct link between terminals 22 and 24.
  2.5 s delayed self-reset approx.
- Electrical-reset <15 ms

Contact Ratings

- Make and carry for 3 seconds
  ac 7500 VA with maxima of 30 A and 300 V
  dc 7500 W with maximaof 30 A and 300 V
- Make and carry continuously
  ac 1250 VA with maximof 5 A and 300 V
  dc 1250 VA with maxima of 5 A and 300 V
- Break
  ac 1250 VA with maxima of 5 A and 300 V
  dc 80 W resistive 40 W inductive (L/R=0.04 s)
  with maxima of 5 A and 300 V

Durability

- Loaded contact 10,000 operations minimum
- Unloaded contact 100,000 operations minimum

Capacitance Discharge Withstand

High Burden Configuration

For relays with rated voltages up to and including 125 V, the relays will with-stand, without operating, a discharge into their operate circuits of a 10 uF capacitor charged to 120% of the higher rated voltage for the relay. For relays with rated voltages of 220/250 V, the relays will withstand, without operating, a discharge into their operate circuits of a 10 uF capacitor charged to 100% of the higher rated voltage for the relay, i.e. 275 V.

Low Burden Configuration

When operating in low burden configuration, the relays will withstand, without operating, a discharge into their operate circuit of a 1uF capacitor charged to 120% of the higher rated voltage for the relay.

Specifications

ESI 48-4 EB1: 1983 – Low burden
ESI 48-4 EB2: 1983 – High burden

Make	Break	MVAJ 051 MVAJ 053 MAVJ 054 MVAJ 055	MVAJ 101 MVAJ 102	MVAJ 103 MVAJ 104 MVAJ 105	MVAJ 203 MVAJ 204 MVAJ 205	CC*
5	0	•				00
4	1	•				01
3	2	•				02
2	3	•				03
10	0		•	•		00
8	2		•	•		02
6	4		•	•		04
4	6		•	•		06
2	8			•		08
20	0				•	00
18	2				•	02
16	4				•	04
14	6				•	06
12	8				•	08
10	10				•	10
8	12				•	12
6	14				•	14
4	16				•	16

** Contact combination required when ordering*

Case

MVAJ 05 and MVAJ 10 relays are housed in size 2 Midos cases as shown in Figure 1.
MVAJ 20 relays are housed in size 4 Midos cases as shown in Figure 2.

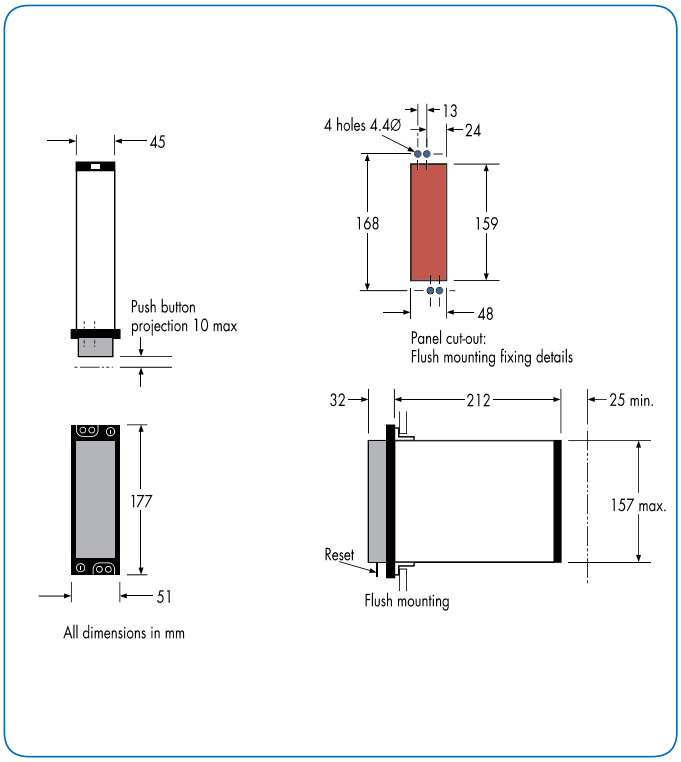


Figure 1 Case outline size 2

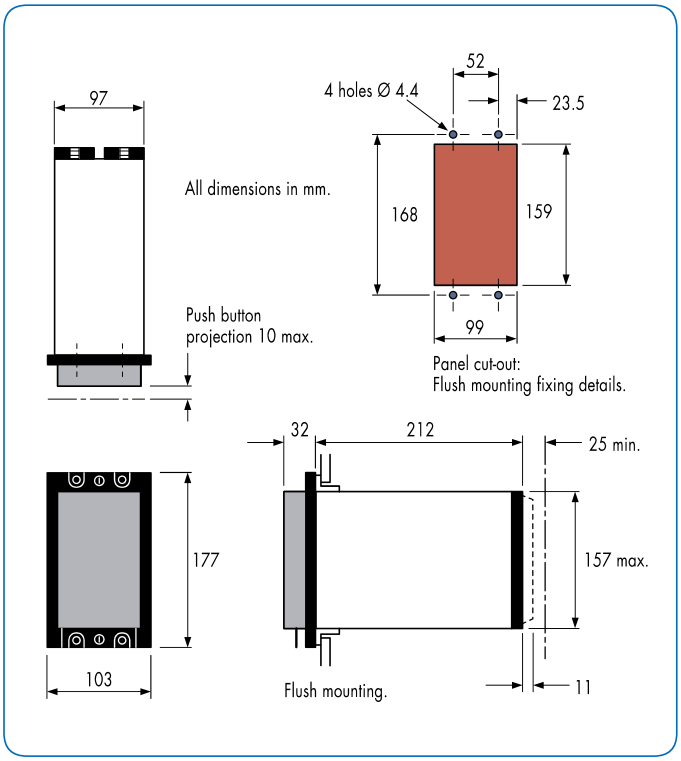
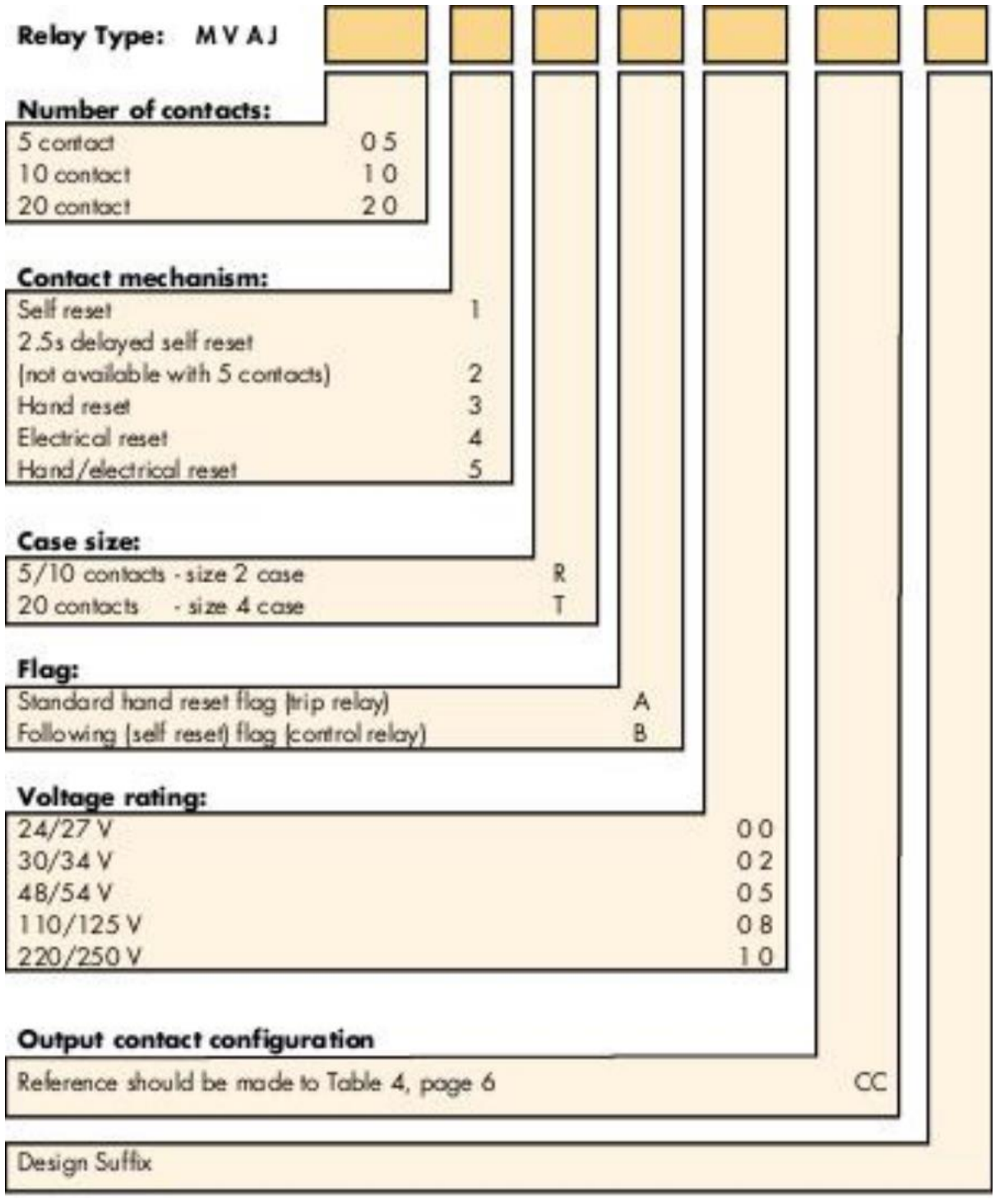


Figure 2 Case outline size 4

Proven protection -
as safe, simple and versatile as
your application requires

Information Required with your Order



Device Track Record
Tripping and Control Relays

MVAJ: Range launched 1984. Over 16,000 relays delivered
MVAJ 05/10/20: Range launched in 1999. Over 10,000 relays delivered
Simple, reliable, secure and versatile

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