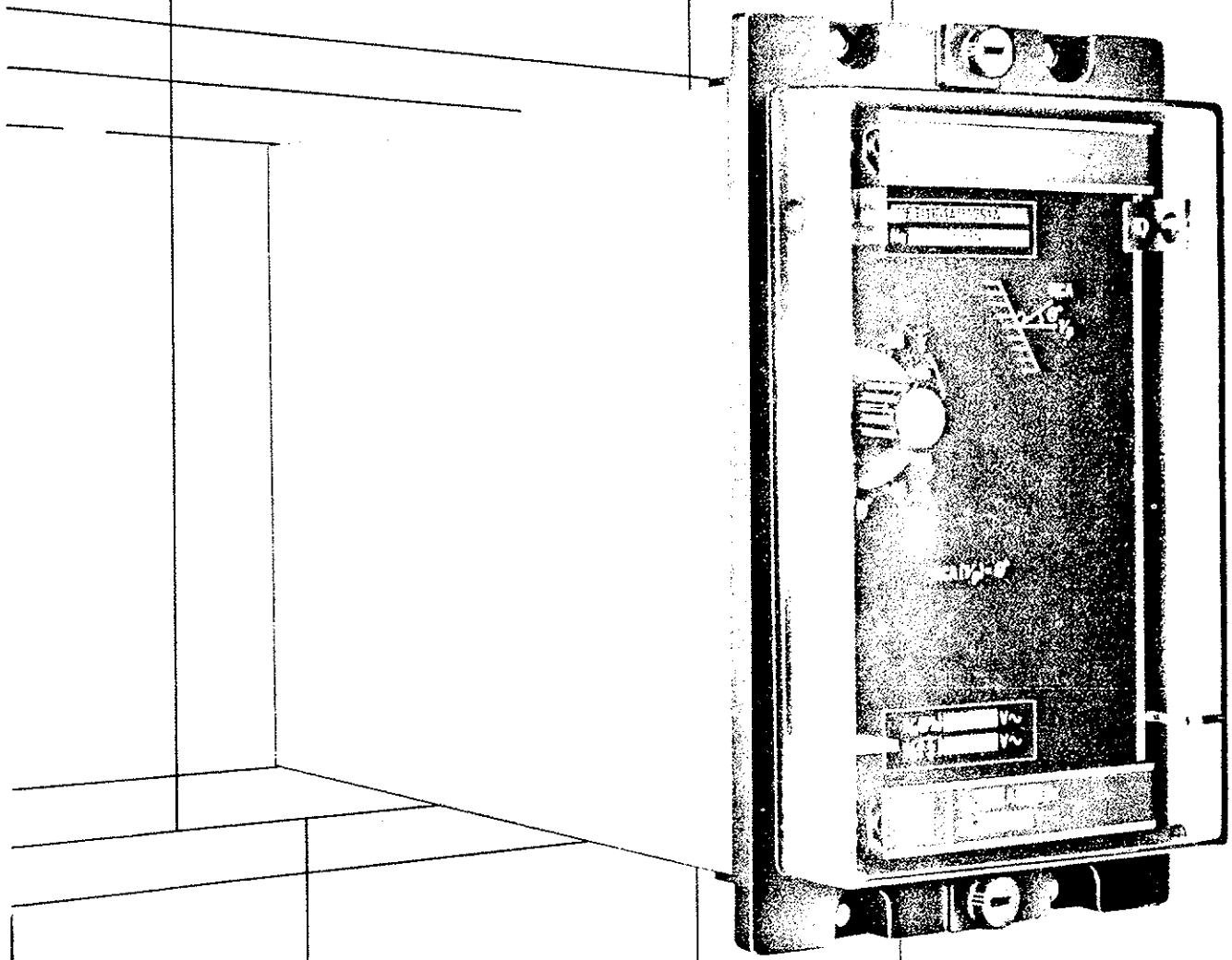
Measurements

Type METI

Directional Relay



MMC

Type METI

FEATURES

- Relay characteristic angle (RCA) selected by switch
- Low burden
- Each model covers both phase and earth fault applications

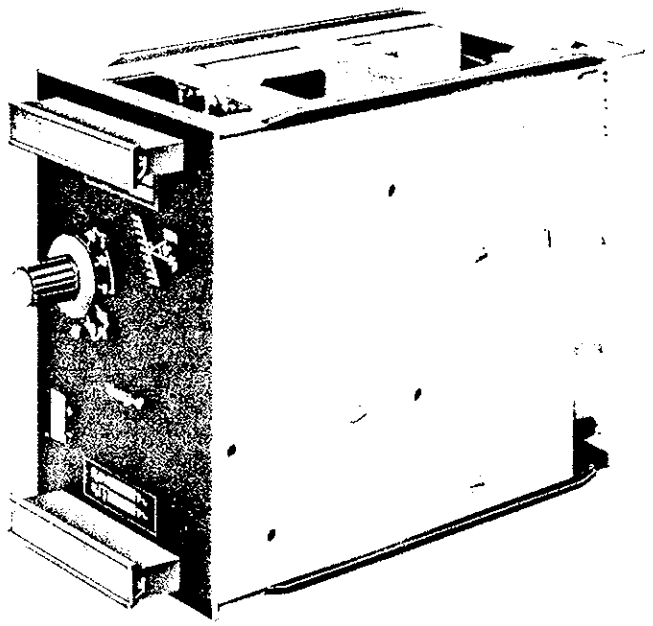


Figure 1. Type METI 11 relay withdrawn from case.

MODELS AVAILABLE

METI11 Voltage polarised single pole relay
METI12 Dual polarised single pole relay
METI31 Voltage polarised three pole relay

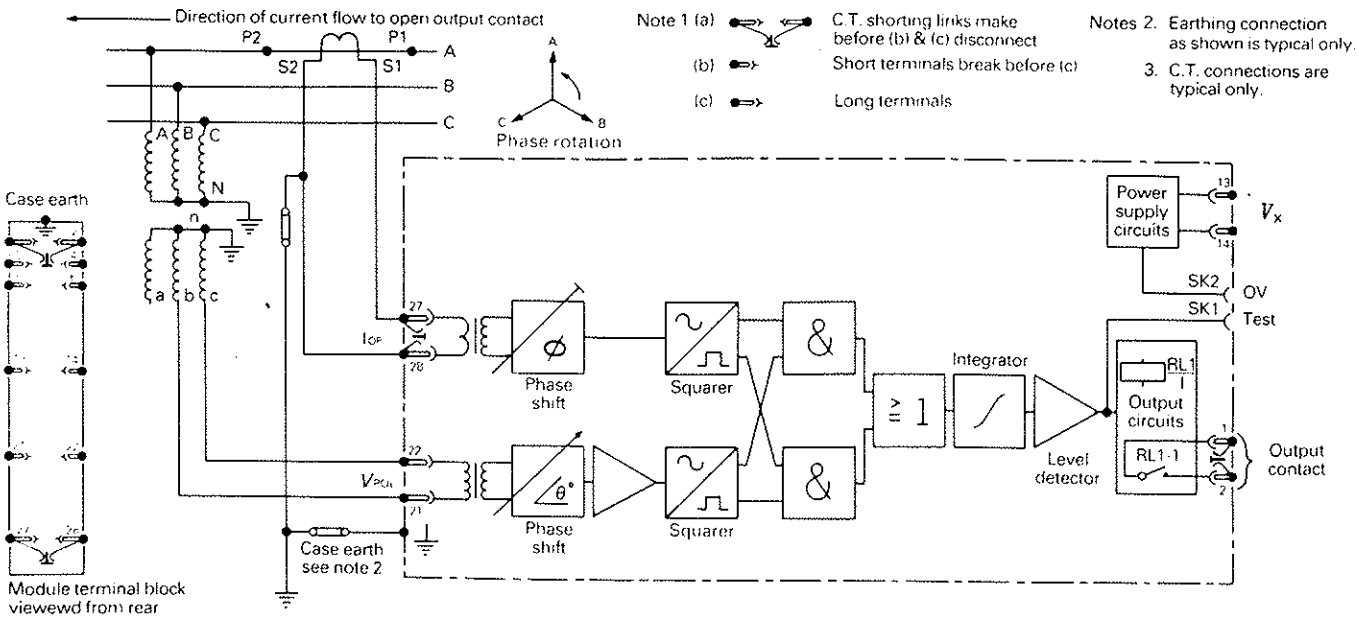
APPLICATION

The relay type METI is designed specifically for directional control of the overcurrent and earth fault relay type MCGG. Each relay is provided with adjustable characteristic angle settings, thus making the relay suitable for both phase and earth fault applications.

The combination, of relays types METI and MCGG, is used to ensure discrimination when overcurrent protection is applied to parallel feeders, ring mains, parallel transformers and transformer feeders.

The voltage polarised version, when applied as a phase fault relay is generally used in the quadrature connection with a relay characteristic angle setting of 30° or 45° (current lead) which will result in system characteristic angles of 60° or 45° respectively, where the line current lags the phase-neutral voltage. When used for earth fault applications, the polarising voltage is supplied by a 3-phase voltage transformer tertiary winding and a relay characteristic angle of 45° or 60° (current lag) is used for solidly earthed systems and 0° for resistive earthed systems.

The dual polarised relay is used for earth fault applications where there is a power transformer available with an earthed neutral and the polarising current is supplied by a current transformer in the neutral connection. The dual polarised relay can work satisfactorily with either or both voltage polarising and current polarising inputs connected to the relay.



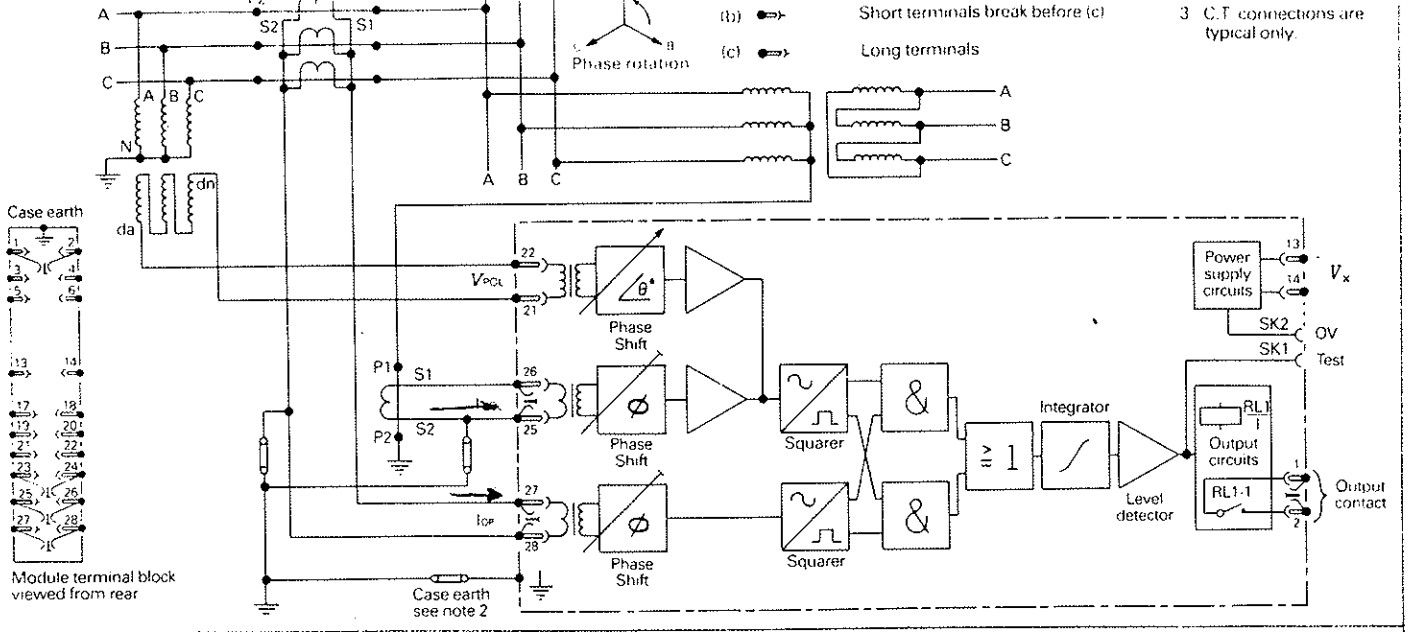


Figure 3. Application diagram: Directional relay Type METI12. Single phase dual polarised earth fault.

DESCRIPTION

The type METI relay comprises a plug-in module with a case and cover of standard dimensions. To ensure that current transformer connections cannot be open circuited when the module is being withdrawn from case, short-circuiting contacts are mounted on the case terminal block, these are actuated by a barrier on the module terminal block. As added security, the d.c. supply is broken and the output terminals short-circuited when the module is withdrawn from the case. When used with the type MCGG relay, the output contacts of the METI relay close for faults in the restrain direction and inhibits the operation of the overcurrent relay.

The relay uses solid state techniques, a block average comparator being used to detect the direction of current flow.

Figures 2, 3 and 4 show block diagrams of the METI11, 12 and 31 respectively.

The polarising voltage input is isolated by an interposing voltage transformer, the output of which is connected to a phase shifting circuit. The phase shift is determined by a switch on the module front plate. The signal obtained from this circuit is squared by an operational amplifier circuit and fed to one input of a block average comparator.

The current input to the relay is isolated by an interposing current transformer. The output of this is phase shifted by a fixed amount to make the overall range of adjustment on the voltage input easier to obtain.

The signal from this phase shifting circuit is squared by a second operational amplifier circuit and fed to the other input of the block average comparator.

The output of the comparator is fed to an integrating circuit, followed by a level detector and amplifier.

The output relay contact remains closed when the phase relationship between the input current and voltage is in the 'restrain' condition. In the 'operate' condition the output relay contact opens.

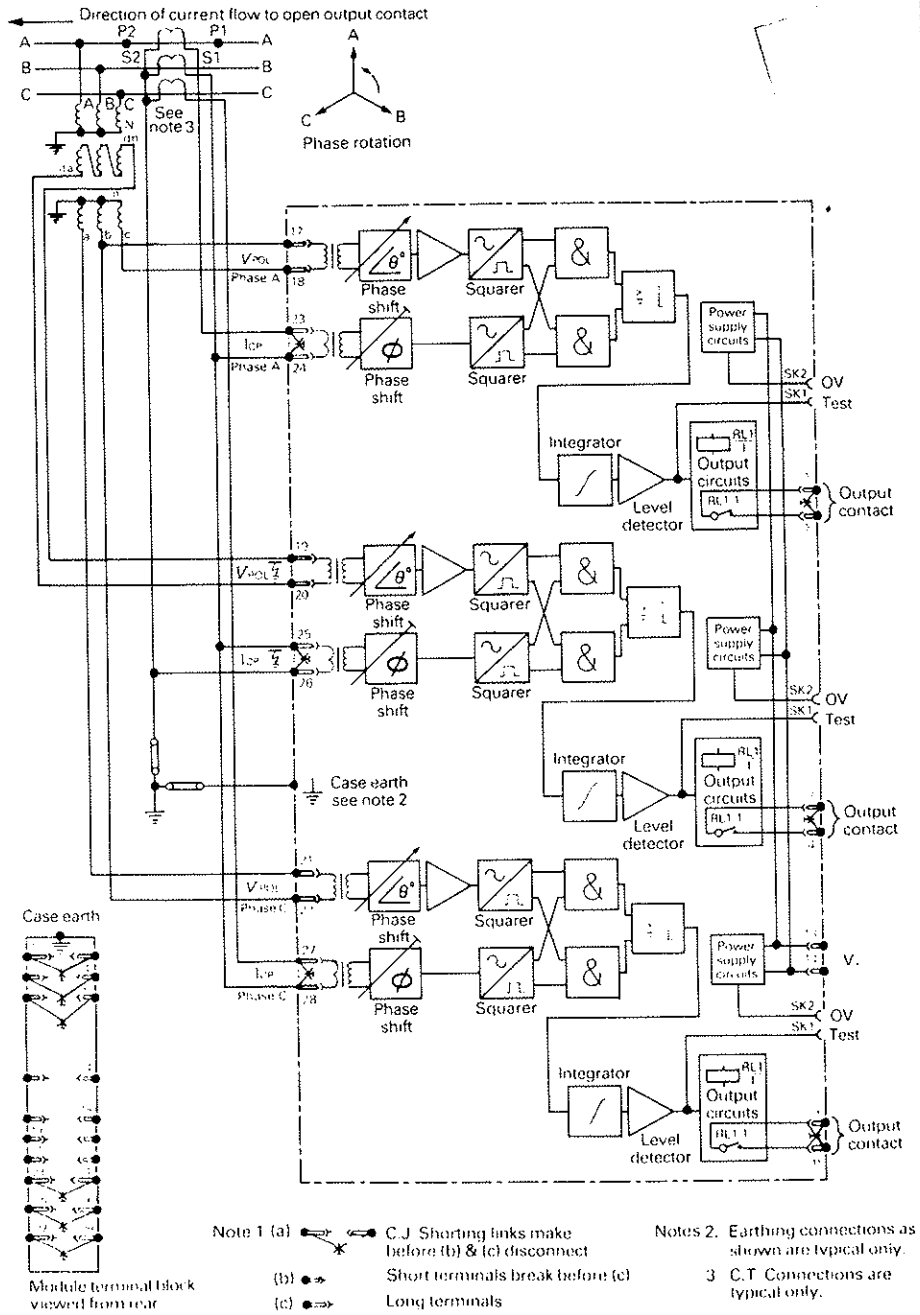


Figure 4. Application diagram: Directional relay Type METI31. Two phase and earth fault.

The dual polarised relay operates using the same principle, but in this relay the current polarising input is given the same phase shift as the operating quantity so that the characteristic angle for current polarisation is 0°.

TEST POINTS

As an aid to commissioning, voltage test points are provided on the relay frontplate. A multi-meter may be used to check this voltage, which should read positive with the output contacts closed and negative with output contacts open.

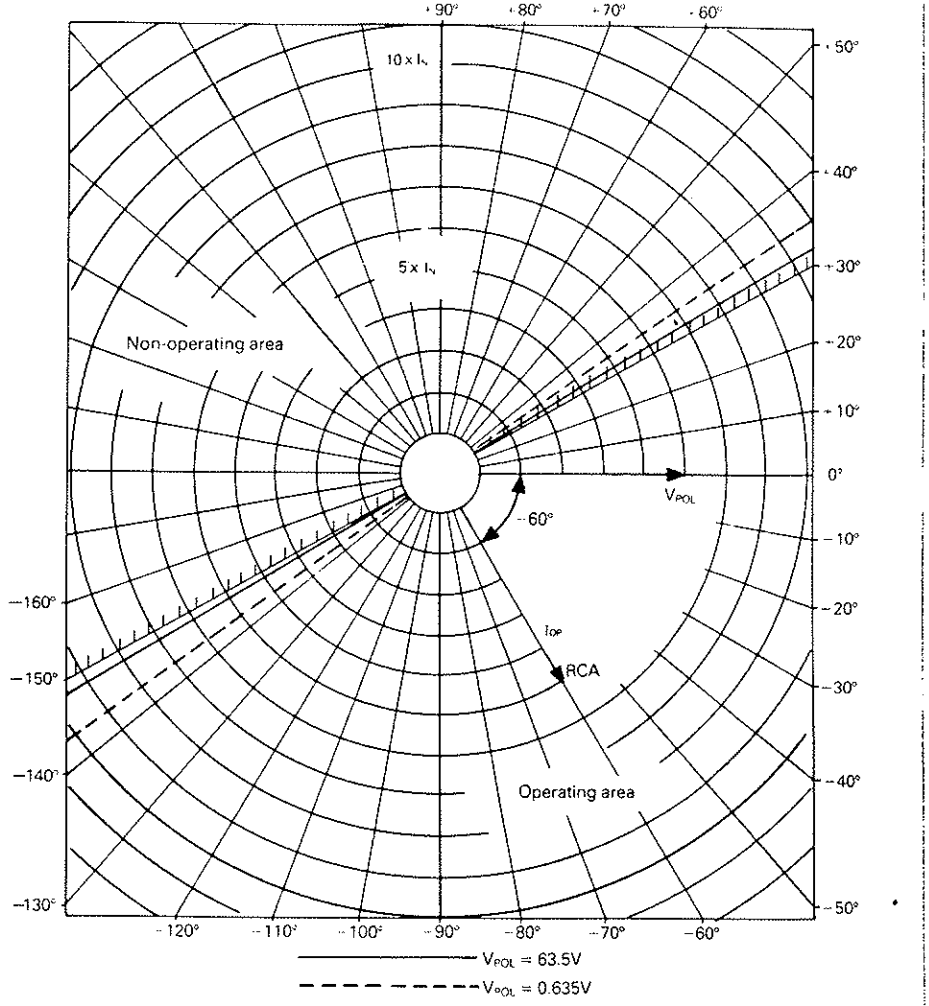
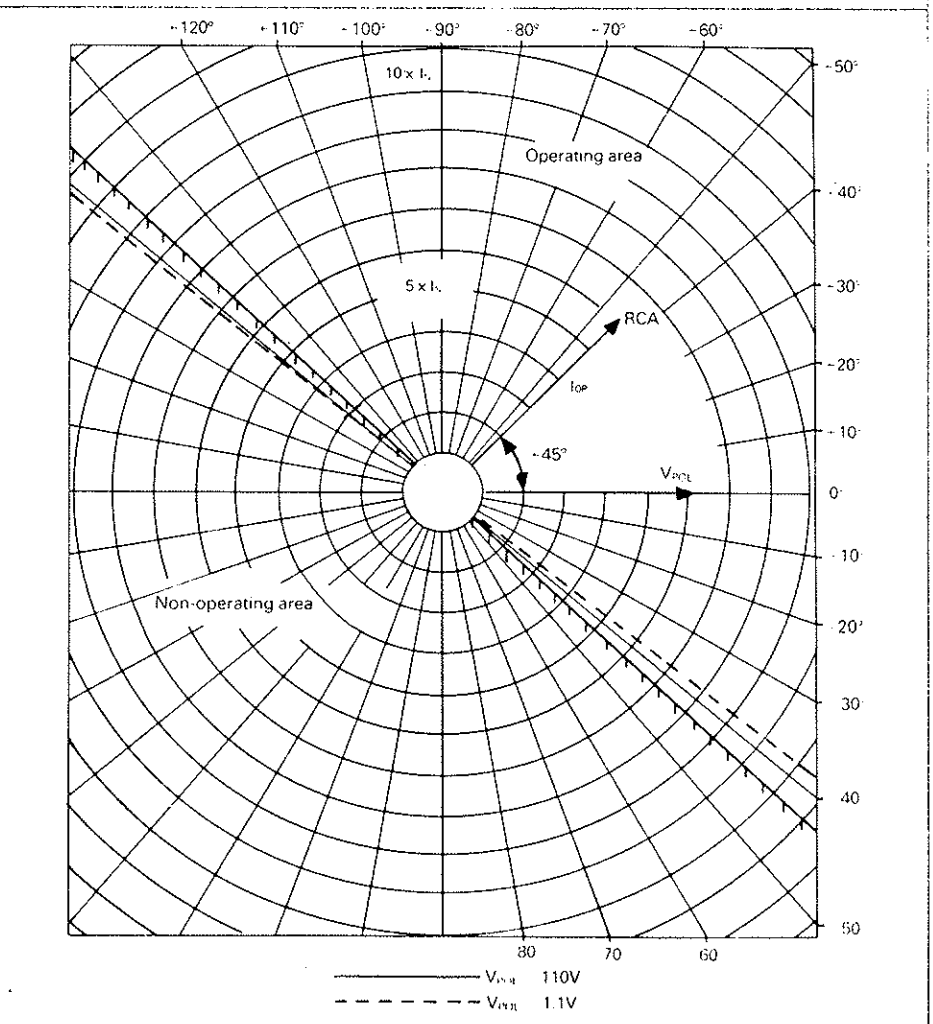


Figure 5. Typical characteristic of earth fault voltage polarised unit. Relay characteristic angle = −60°



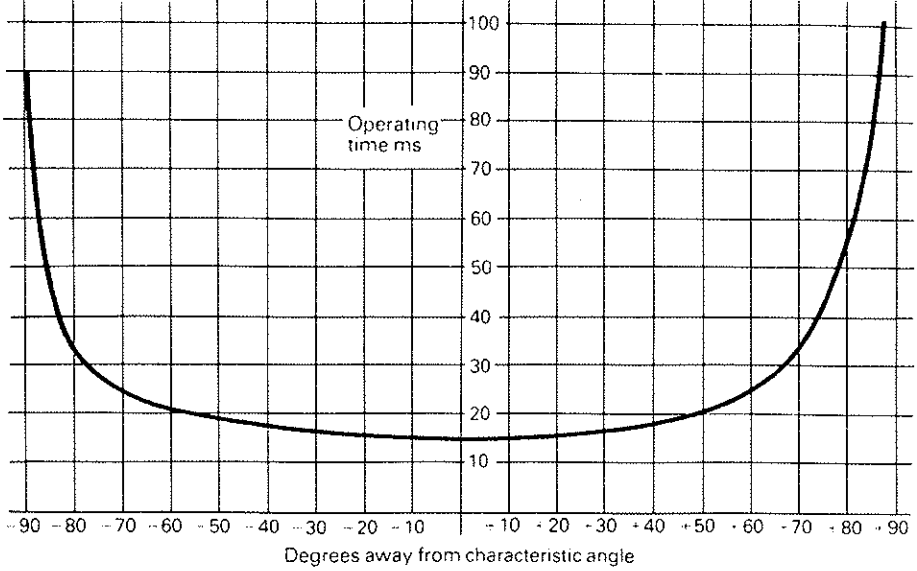


Figure 7. Typical operating time characteristic with rated volts and rated current.

TECHNICAL DATA

Ratings

	A.C. Operating current (I_n)	1A or 5A
	A.C. Polarising voltage (V_n)	63.5/110V (See Note 1)
	A.C. Polarising current (METI12 only)	1A or 5A
	Note 1. The standard relay can be operated from phase to phase or residual (broken delta) connections.	
	Frequency	50Hz or 60Hz
D.C. Auxiliary voltage (V_x)	(V_x)	Operating range (V)
	30/34	24-37.5
METI11 and 12	48/54	37.5-60
	110/125	87.5-137.5
METI31	30/34	24-37.5
	48/54/110/125	37.5-137.5
	Over the above ranges for types METI11, 12 and 31. The variation in operating boundary is $<\pm 2°$.	

Burdens:

A.C.	Voltage circuit <0.5VA at rated voltage Current circuit(s) <0.5VA at rated current	
D.C. Auxiliary voltage (V_x)	(V_x)	Burden (W)
METI11 and 12	30/34	<1.8 at 30V
	48/54	<2.9 at 48V
	110/125	<7.3 at110V
METI31	30/34	<5.0 at 30V
	48/54	<7.6 at 48V
	110/125	<18.7 at 110V

Settings: Each pole of each relay is fitted with the following characteristic angle settings:

−60°)
−45°) Current lagging voltage
0°
+30°)
+45°) Current leading voltage

Operating boundaries:	Refer to Figures 5 and 6
Nominal boundary of operation	±90° from the RCA
Accuracy of the operating boundary	less than ±3° from the nominal boundary
Difference between the positions of the operating and non-operating boundaries (Pick-up/Drop-off ratio)	less than 3°

Operating and reset times

At the relay characteristic angle	Operating time: <20ms Reset time: <20ms For other angles see Figure 7

Effective range	Operating current	0.1 x rated current to 30 x rated current
	Polarising voltage	0.63V to 240V
Effective angle	±70°	
	The operating time of the relay within the effective angle is less than 50ms.	
Sensitivity	The relay output contact will open when both the operating and polarising quantities at 1% of the rated values and the angle between these quantities is equal to the relay characteristic angle.	
Directional stability	With any voltage applied from 0 to 240V a.c. and any current applied between 0 and 30 x rated value in the restrain direction the relay will close its output contact.	
Effect of transients	The typical effect of transient offsets in the input waveform is to increase the operating time of the relay to less than 25ms, at the relay characteristic angle.	
Thermal withstand		
Voltage circuits	Withstands 240V a.c. continuously	
Current circuits	Withstands 2.2 x rated current continuously 100 x rated current for one second.	
Contacts	One contact per pole is provided. It is open for current flow in the operate direction and closed for power flow in the restrain direction. The contact will make, carry continuously, and break 25W d.c. resistive, subject to maxima of 1A and 1000V d.c.	
Environmental withstand	Environmental classification for storage only: 25/070/56 IEC 68 BS 2011	
Temperature	Operating –25°C to +55°C Storage and transport –25°C to +70°C	
Humidity	Long term damp heat: 56 day severity in accordance with: IEC 68 - 2 - 3 BS 2011 Part 2.1Ca	
Salt mist:	BS 2011 Part 2.1Kb	
Enclosure protection	IP50 (dust protected) in accordance with: IEC 529 BS 5490	
Vibration	The relay complies with: BS 142 Section 2.1 Category S2 0.5g between 10 and 300Hz	
Mechanical durability	The relay will perform more than 10,000 operations	
Voltage withstand		
Insulation	The relay complies with: IEC 255 - 5 BS 142 section 1.3	
	2kV rms for 1 minute between all case terminals connected together and the case.	
	2kV rms for 1 minute between independent circuits of the scheme, including contact circuits.	
	1kV rms for 1 minute across the contacts of the normally open outgoing contact pairs.	

CASES

Types METI11 and 12 are housed in size 4 cases as shown in Figure 8.

Type METI31 is housed in a size 8 case as shown in Figure 9.

INFORMATION REQUIRED WITH ORDER

Model required: METI11, 12, or 31
Voltage rating: V_x d.c.
Current rating: I_n (1A or 5A) a.c.
Rated frequency
Case mounting: flush
semi-projecting
rear flange

High voltage impulse withstand	The relay complies with: IEC 255-5 BS 142 section 1.3 5kV peak, 1.2/50 μs, 0.5 joule
High frequency disturbance test	The relay complies with: IEC 255 - 4 Class III BS 142 section 1.4 2.5kV peak between independent circuits and between circuits and case earth. 1.0kV peak across input circuits. 1MHz burst decaying to 50% of peak value after 3 to 6 cycles. Repetition rate 400 per second.
National/International specifications	The relay complies with relevant clauses in the following specifications: BS 142 IEC 255

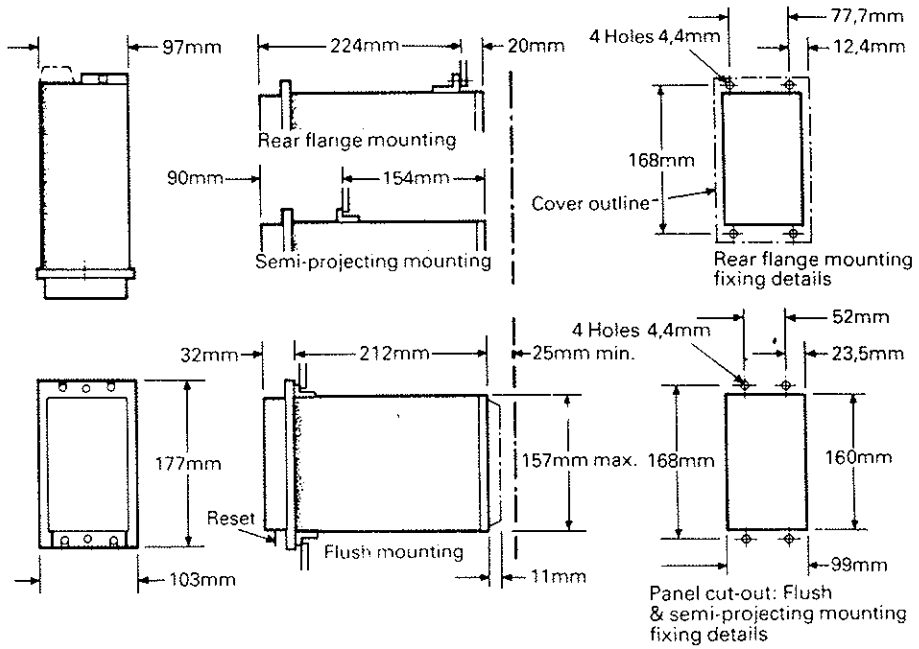


Figure 8. Case outline size 4.

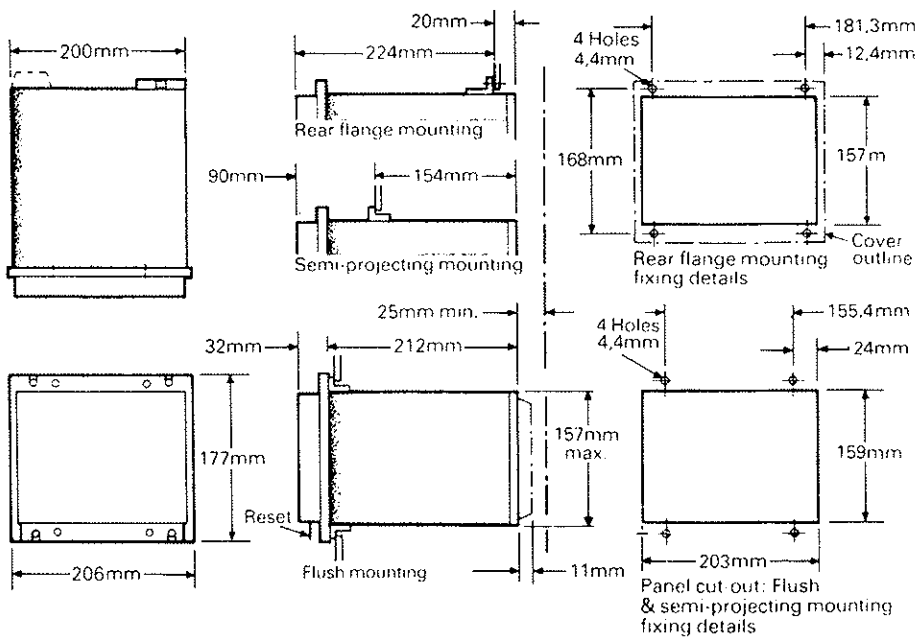


Figure 9. Case outline size 8.