Type MCGG 22, 42, 52, 53, 62, 63 & 82 Overcurrent Relay for Phase and Earth Faults

Features

- Choice of 4 inverse time curves and 3 definite time ranges by switched selection.
- Wide setting range of 0.05 x I_n to 2.4 x I_n in steps of 0.05 x I_n.
- Time multiplier range 0.05 to 1 on all seven characteristics.
- Separate led indicators provided on each measuring board to show time delayed and instantaneous operations.
- Led start indicators provided to facilitate testing.
- Separate output contacts provided for time delayed phase fault, instantaneous phase fault, time delayed earth fault and instantaneous earth fault operations.
- Low ac burden.
- Suitable for use with separate direction relay.
- Accurately follows time curves to BS142 and IEC255.
- High resetting ratio.
- Fast resetting time.
- Positive, calibrated settings by means of switches.
- Internal dc auxiliary power supply operating over a wide input range.
- Separate test mode with trip test feature.
- Indication of power to the measuring board.
- Non-volatile memory for time delayed and instantaneous led indicators.

Figure 1: Relay type MCGG 62 withdrawn from case.

Models available

MCGG 22

Single phase overcurrent with instantaneous element.

MCGG 42

Two phase overcurrent with instantaneous elements.

MCGG 52

Two phase overcurrent plus earth fault with instantaneous elements.

MCGG 53

Two phase overcurrent (with polyphase measurement) plus earth fault with instantaneous elements.

MCGG 62

Three phase overcurrent with instantaneous elements.

MCGG 63

Three phase overcurrent (with polyphase measurement), with instantaneous element.

MCGG 82

Three phase overcurrent plus earth fault with instantaneous elements.

Associated publications:

Midos System R6001
Directional Relay R6003

Model	3 Phase overcurrent		2 Phase overcurrent		Single Phase or earthfault		Measuring boards	Case size
	†	inst	†	inst	†	inst		
MCGG 22					●	●	1	4
MCGG 42			●	●			2	6
MCGG 52			●	●	●	●	3	8
MCGG 53			●	●	●	●	2	8
MCGG 62	●	●					3	6
MCGG 63	●	●					1	6
MCGG 82	●	●			●	●	4	8

Application

The relay can be used in applications where time graded overcurrent and earth fault protection is required.

The relay can be used to provide selective protection for overhead and underground distribution feeders. Other applications include back-up protection for transformers, generators and HV feeder circuits and the protection of neutral earthing resistors.

With all the current/time characteristics available on one relay, a standard relay can be ordered before detailed co-ordination studies are carried out – a distinct advantage for complex systems. Also, changes in system configuration can be readily accommodated.

An instantaneous element with low transient overreach is incorporated within each phase or earth fault measuring board. This can be easily disabled in applications where it is not required.

For applications where the instantaneous earth fault element is required to have a sensitive setting whilst remaining stable on heavy through faults the use of a stabilising resistor is recommended. The current transformers for this application must satisfy the criteria detailed under 'Current transformer requirements' in Technical Data.

The total impedance of the relay and the series stabilising resistor is usually low enough to prevent the current transformers developing voltages over 2kV during maximum internal faults, but in some applications a non-linear resistor is required to limit this voltage.

Non-standard resistance values and non-linear voltage limiting devices are available.

Description

This range of MCGG relays is designed so that versions are available with separate measuring boards for each phase or earth fault input; alternatively, phase inputs may be combined on to one board for polyphase measurement (see table). These boards, together with the other circuits of the relay, are contained in a single plug-in module which is supplied in a size 4, 6 or 8 Midos case. The case incorporates one or two terminal blocks for external connections. Removal of the module automatically short circuits the current transformer connections by means of safety contacts within the case terminal block. For added security, when the module is removed, the ct circuits are short circuited before the connections to the output contacts and the dc supply are broken. The relay uses solid state techniques, each measuring board utilising a micro-computer as a basic circuit element. The current measurement, whether performed on a single phase or polyphase input, is performed via an analogue-to-digital converter. Application diagrams are provided in Figures 2 to 8 (inclusive) showing typical wiring configurations.

Each measuring board has a built-in 'power off' memory feature for the time delayed and instantaneous led indicators.

Power to each measuring board may be tested whilst the relay is in service. without affecting the current measurement. A test mode is also available to carry out a trip test on the output relays. During this test, current measurement is inhibited.

When required, directional control can be exercised over the relay by connecting an output contact from direction relay type METI to the terminals provided.

Separate output contacts, capable of circuit breaker tripping, are provided for time delayed phase faults, instantaneous phase faults, time delayed earth fault and instantaneous earth fault operations.

Switch position (0)	Switch position (1)	Operating characteristic		
	● ● ●	Trip test		
● ● ●		Standard inverse	$t = \frac{0.14}{(I^{0.02} - 1)}$	sec SI
● ●	●	Very inverse	$t = \frac{13.5}{(I - 1)}$	sec VI
● ●	●	Extremely inverse	$t = \frac{80}{(I^2 - 1)}$	sec EI
●	● ●	Long time earth fault	$t = \frac{120}{(I - 1)}$	sec LT
● ●	●	Definite time 2 seconds		D2
●	● ●	Definite time 4 seconds		D4
●	● ●	Definite time 8 seconds		D8

Table1: Operating time characteristics with corresponding switch positions.

Relay settings

Separate setting switches for each measuring board are provided on the relay frontplate. These are used to select the required time/current characteristic, current and time multiplier settings.

Selection of time characteristics

The current/time characteristic selection is carried out by means of three switches (identified by symbol on the nameplate).

Table 1 gives the basic operating characteristic and the settings of the switches.

Time multiplier setting

The time given by each of the operating characteristics must be multiplied by the time multiplier to give the actual operating time of the relay. This control is marked xt = Σ where Σ is the sum of all the switch positions.

The range of multiplication is from 0.05x to 1.0x in steps of 0.025.

This acts as a conventional time multiplier on the current dependent characteristics and gives the following time ranges for the definite time characteristics.

Operating characteristics	Time range
s	s
2	0.1 to 2.0 in 0.05s steps
4	0.2 to 4.0 in 0.1s steps
8	0.4 to 8.0 in 0.2s steps

Current setting

Time delayed element

The current setting control is marked $I_s = \Sigma \times I_n$ where I_s is the current setting in amps, Σ is the sum of all the switch positions and I_n is the relay rated current in amps.

Each measuring board provides a setting range of 0.05 x I_n to 2.4 x I_n in steps of 0.05 x I_n.

Instantaneous element

The setting control of the instantaneous element is marked $I_{inst} = \Sigma \times I_s$ where Σ is the sum of the switch positions and I_s is the time delayed element setting.

When all switches are set to the left (at zero), or when the lowest switch is set to infinity regardless of the positions of the other five switches, the instantaneous feature is rendered inoperable. The range of adjustment of finite settings is from 1x to 31x in unity steps.

Trip test

Current measurement is inhibited by setting the curve selection switches to 111. This causes all three led to flash once per second. If the reset push button is then pressed for approximately six seconds, both output relays associated with that measuring board will operate.

Power supply healthy test

If, whilst the relay is in service, the reset button is pressed, all the leds are iluminated, indicating that there is power to the measuring boards. The leds are reset on releasing the push button. During this test, normal current measurement is not inhibited.

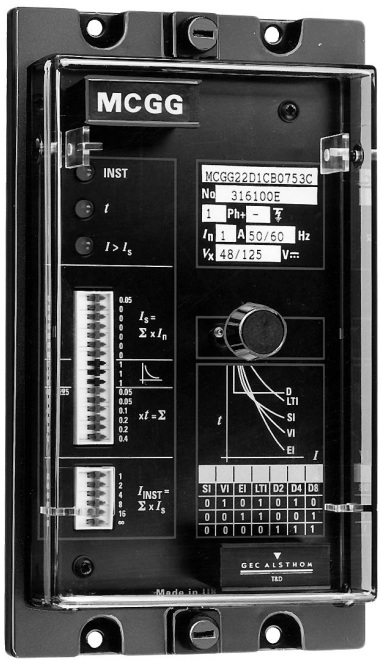

Figure 2: Type MCGG 22 nameplate

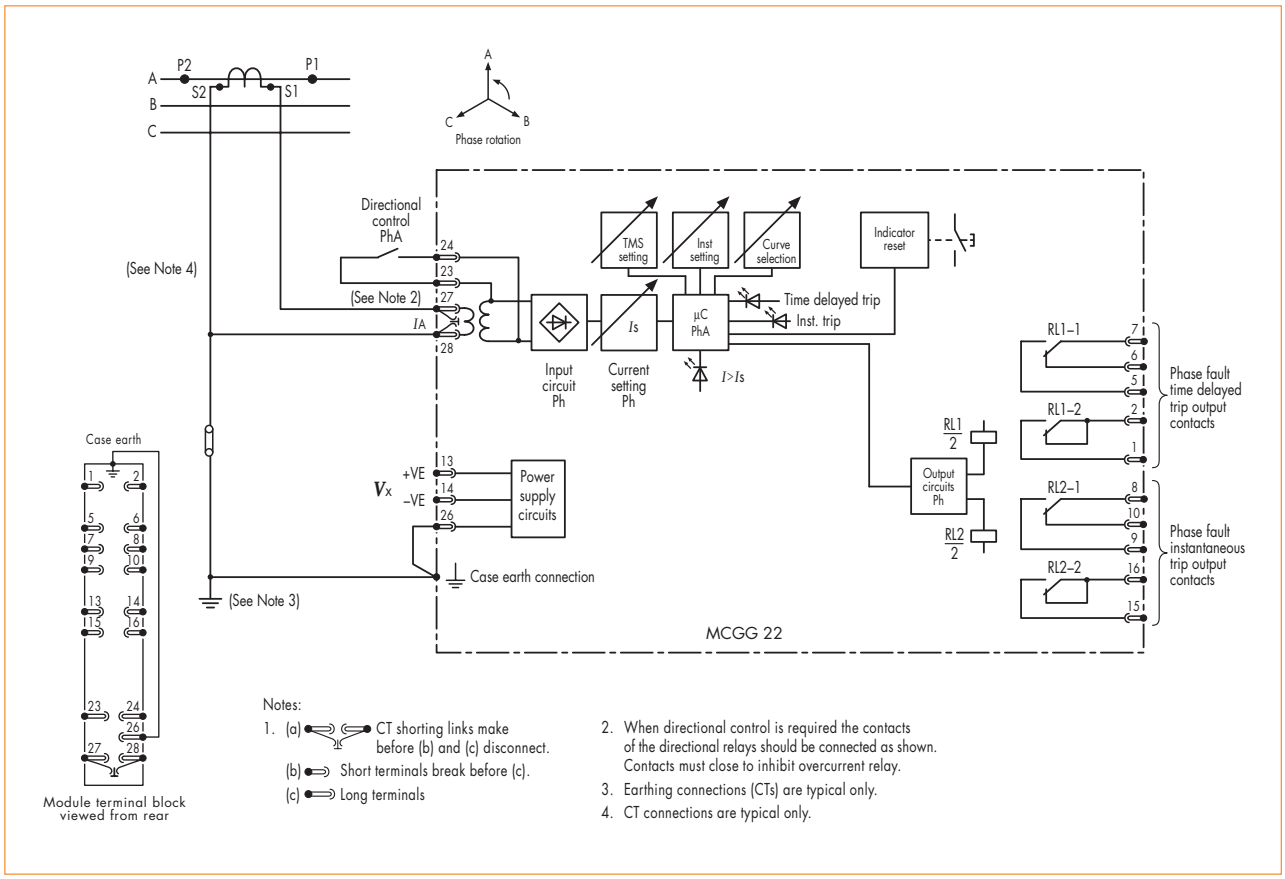

Figure 3: Application diagram (10 MCGG 22 02): static modular overcurent relay type MCGG 22. Single phase with instantaneous element.

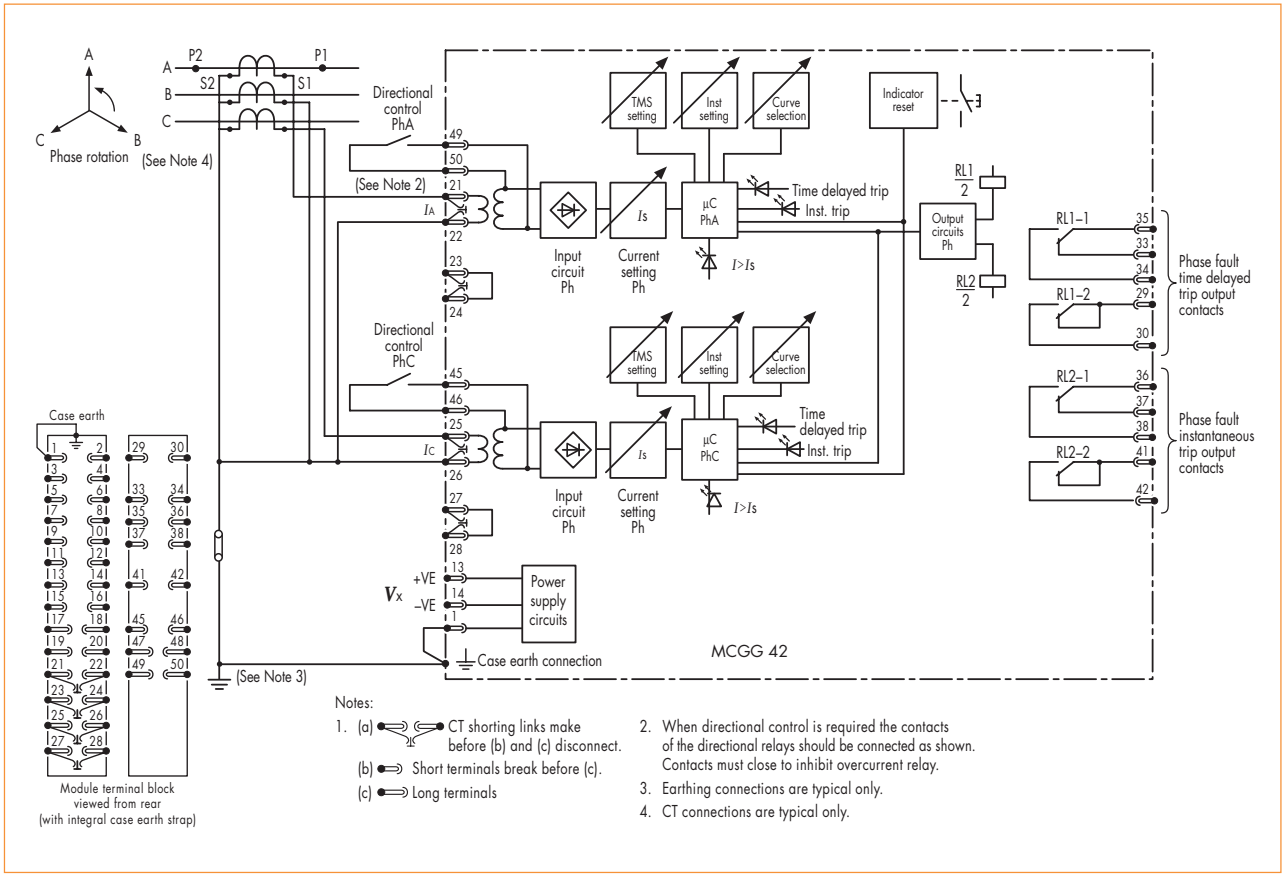

Figure 4: Application diagram (10 MCGG 42 03): static modular overcurent relay type MCGG 42. Two phase with instantaneous element.

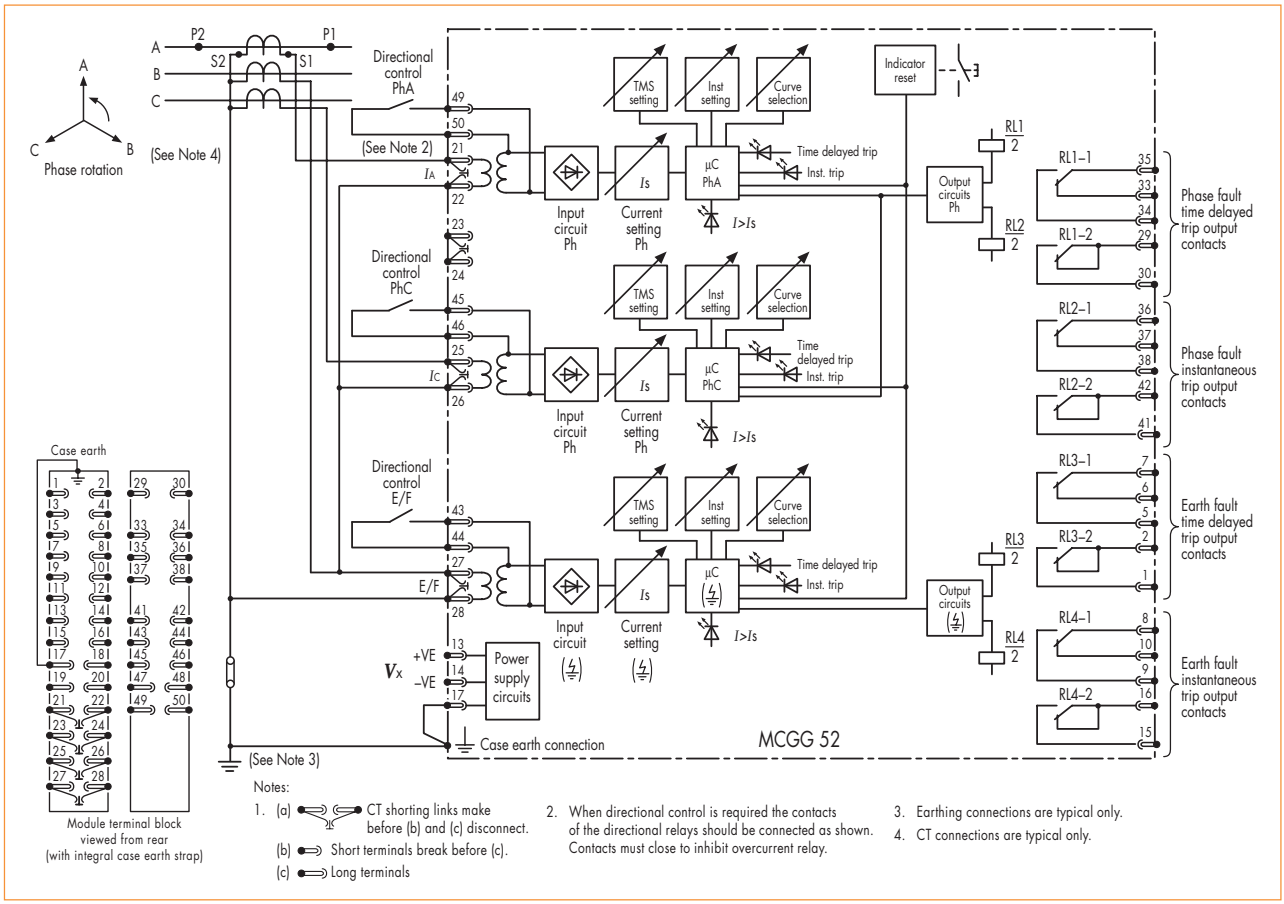

Figure 5: Application diagram (10 MCGG 52 03): static modular overcurent relay type MCGG 52. Two phase plus earth fault with instantaneous elements.

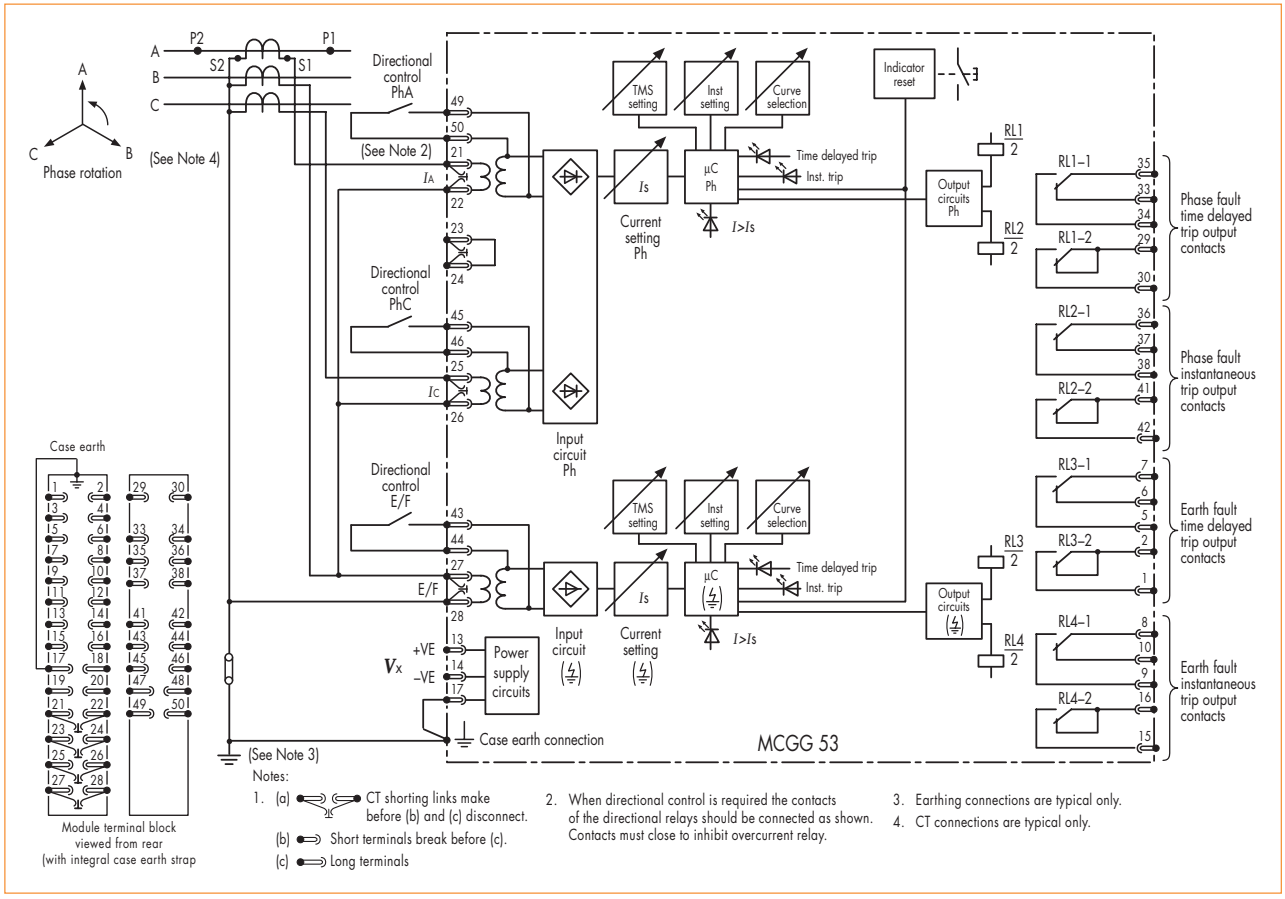

Figure 6: Application diagram (10 MCGG 53 02): static modular overcurent relay type MCGG 53. Two phase (with polyphase measurement), plus earth fault with instantaneous elements.

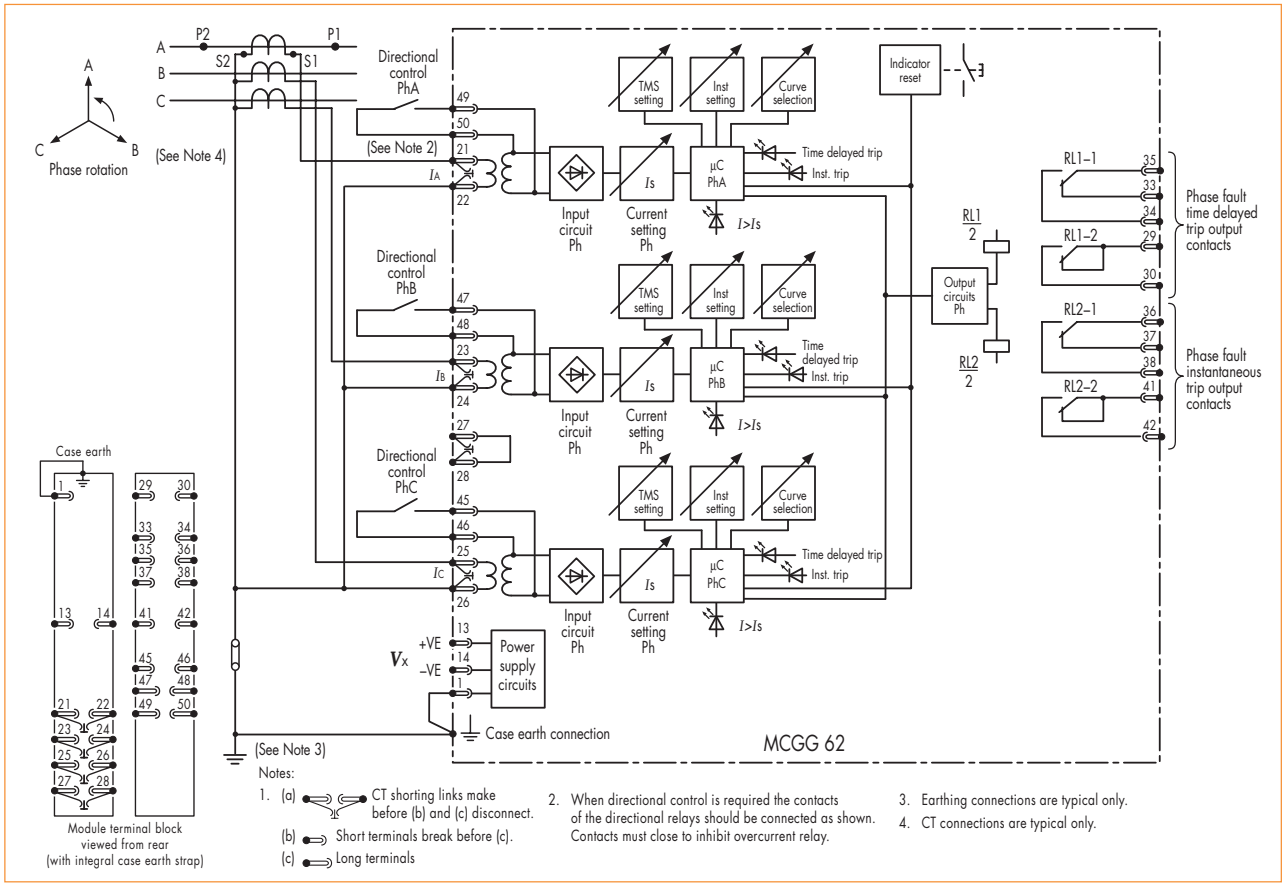

Figure 7: Application diagram (10 MCGG 62 03): static modular overcurent relay type MCGG 62. Three phase with instantaneous element.

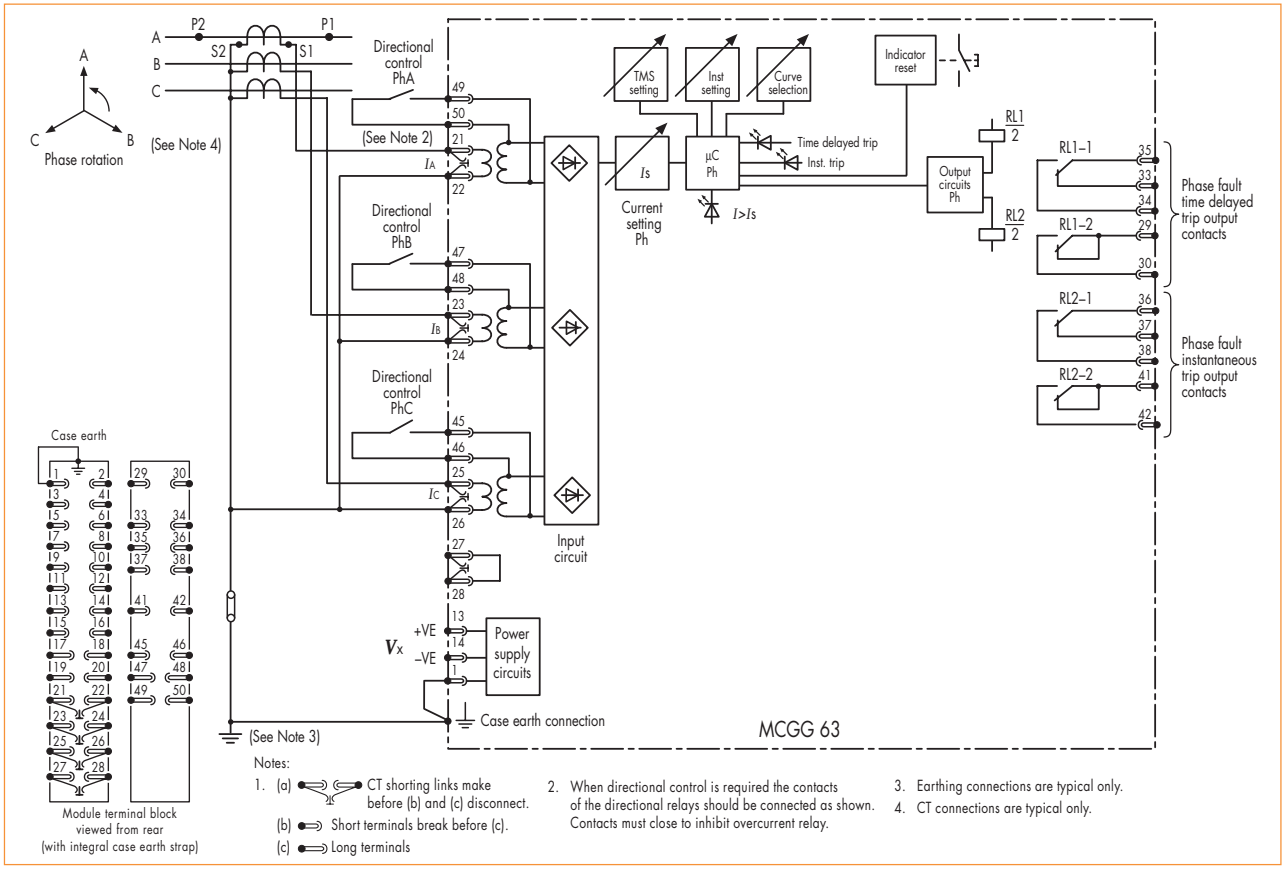

Figure 8: Application diagram (10 MCGG 63 02): static modular overcurent relay type MCGG 63. Three phase (with polyphase measurement) with instantaneous element.

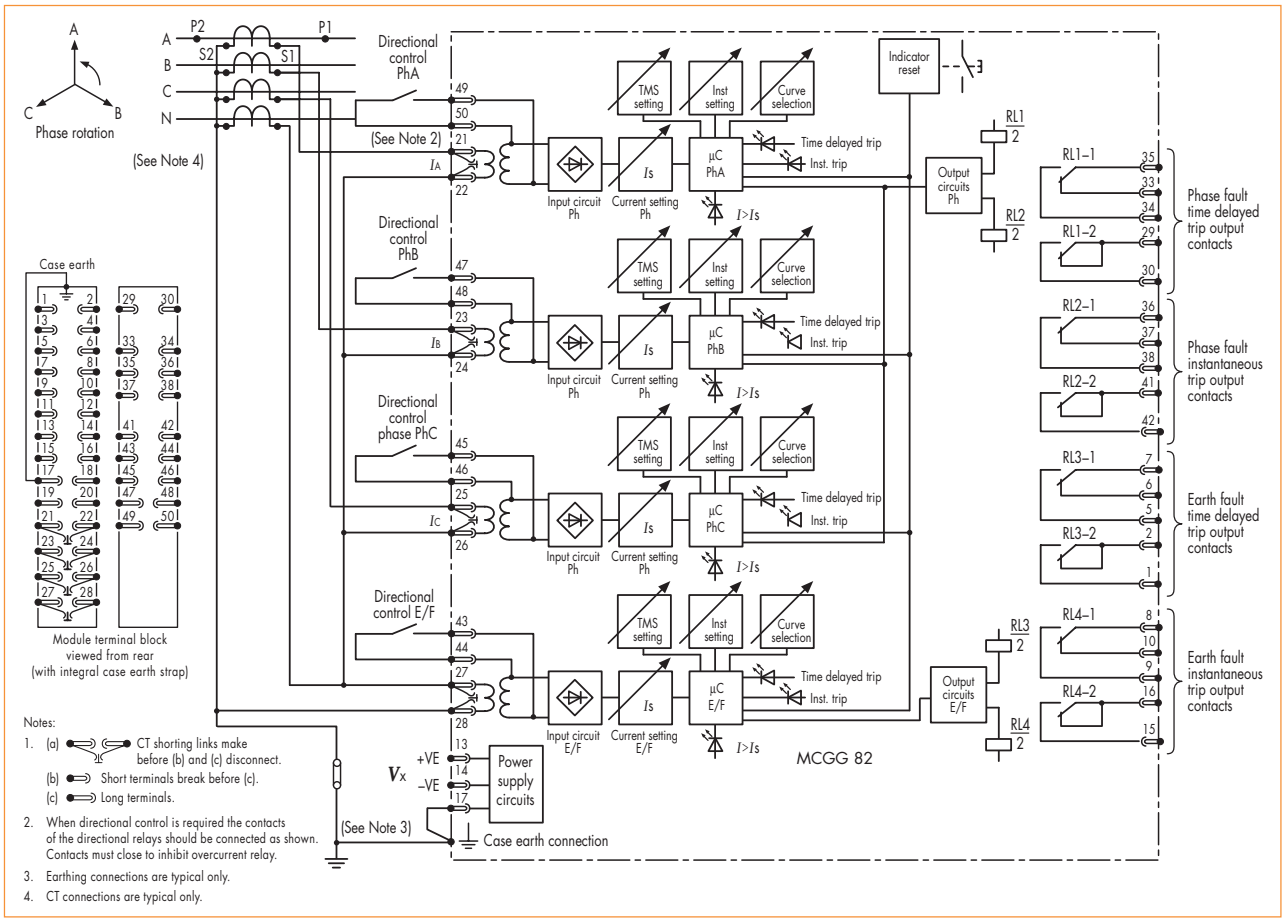

Figure 9: Application diagram (10 MCGG 82 03): static modular overcurent relay type MCGG 82. Three phase plus earth fault with instantaneous elements (4 wire system).

Technical Data

Ratings

AC Current (I_n)	1A or 5A
Frequency	50/60Hz
DC Supply (V_x)	24/54V, 48/125V or 110/250V

Burdens

AC Burden

Less than 0.25 VA for 1A relays and less than 0.5VA for 5A relays, at unity power factor and at rated current on any setting.

The impedance of the relays over the whole of the setting range (5% to 240% rated current) is less than 0.25Ω for 1A relays and less than 0.02Ω for 5A relays and is independent of current.

DC Burden

Relay rating	Relay type			
	MCGG 22, 63	MCGG 42, 53	MCGG 52, 62	MCGG 82
24/54	1.5W	2.5W	3.0W	4.0W
48/125	2.0W	3.0W	3.5W	4.5W
110/250	2.5W	3.5W	4.0W	5.0W

The figures above are maxima under quiescent conditions. With output elements operated they are increased by up to 2.5W per element.

Current transformer requirements

Relay and ct secondary rating (A)	Nominal output (VA)	Accuracy class	Accuracy limit current (X rated current)	Limiting lead resistance – one way (ohms)
1	2.5	10P	20	1
5	7.5	10P	20	0.15

Note: For 5A applications with longer leads, the ct rating can be increased in steps of 2.5VA where each step of 2.5VA is equivalent to additional 0.06Ω lead resistance.

Instantaneous earth fault element

For installations where the earth fault element is required to have a sensitive setting whilst remaining stable on heavy through faults, the use of a stabilising resistor is recommended, the value of which will vary according to the specific application. If assistance is required in selecting the appropriate value, please consult the Applications Department of GEC ALSTHOM T&D Protection & Control.

Setting ranges

Time delayed settings (I_s), phase/earth fault measuring range: 5% to 240% of I_n in 5% steps.

Instantaneous setting (I_{inst})

1 x –31 x I_s in 1 x 1$_s$ steps

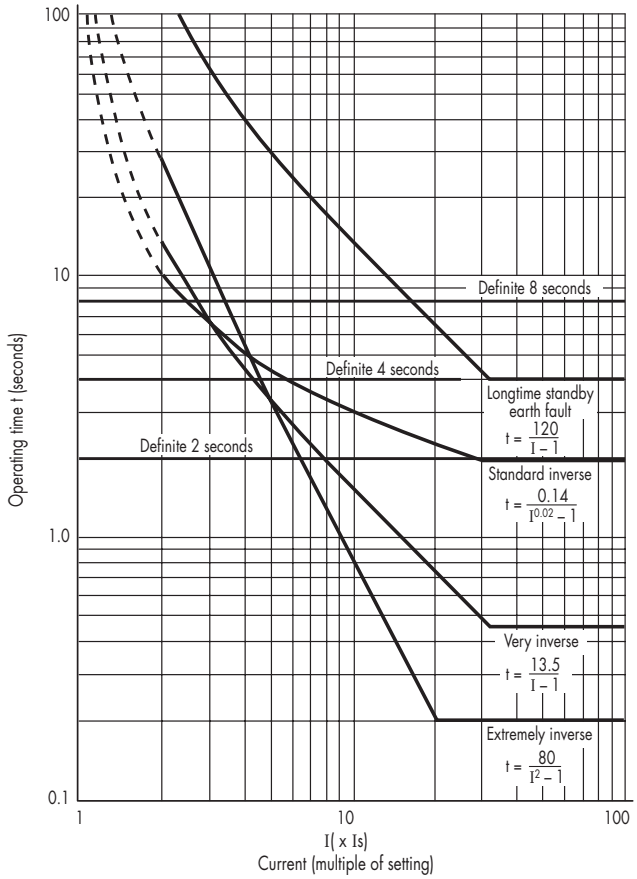

Figure 10: Time delayed overcurrent element – operation time characteristics.

Operating time

Time delayed element	Shown in Figure 10
Operating characteristics selectable to give:	Standard inverse IDMT Very inverse IDMT Extremely inverse IDMT Long time earth fault IDMT Definite time 2s, 4s, 8s
Time multiplier setting	0.05 to 1.0 in 0.025 steps (applicable to all time characteristics)
Instantaneous elements	Shown in Figure 11
	For settings of 5 x I_s and above: <35ms at 2x instantaneous setting

Accuracy – reference conditions

Current setting (I_s)	Reference range 0.05I_n to 2.4I_n for MCGG 22, 42, 52, 62, 82 and E/F element of MCGG53.	
	0.2I_n to 2.4I_n for phase fault elements of MCGG 53 and 63.	
Input current	Time characteristic	Reference range
	Standard inverse Very inverse Long time inverse	2 x I_s to 31 x I_s
	Extremely inverse	2 x I_s to 20 x I_s
	Definite time	1.3 x I_s to 31 x I_s
Ambient temperature	20°C	

Frequency	50Hz to 60Hz	
Time multiplier setting	1x	
DC auxiliary voltage	Reference ranges	24V to 54V 48V to 125V 110V to 250V

Accuracy – influencing quantities

Time multiplier	On settings 0.05 to 1.0 ±2% or ±30ms whichever is the greater
Ambient temperature Operative range	–25°C to +55°C
Variations over this range Setting current	±5%
Time characteristic	Time variation
Standard inverse Very inverse Long time inverse	±5%
Extremely inverse	±7.5%
Definite time	±3%
Frequency Setting current	±1% over the range 47-62Hz
Operating time	±2% or ±30ms whichever is the greater, over the range 47–52Hz or 57–62Hz.

DC auxiliary voltage	V_x dc(V)	Operative range (V)
	24/54	19 – 60
	48/125	37.5 – 150
	110/250	87.5 – 300

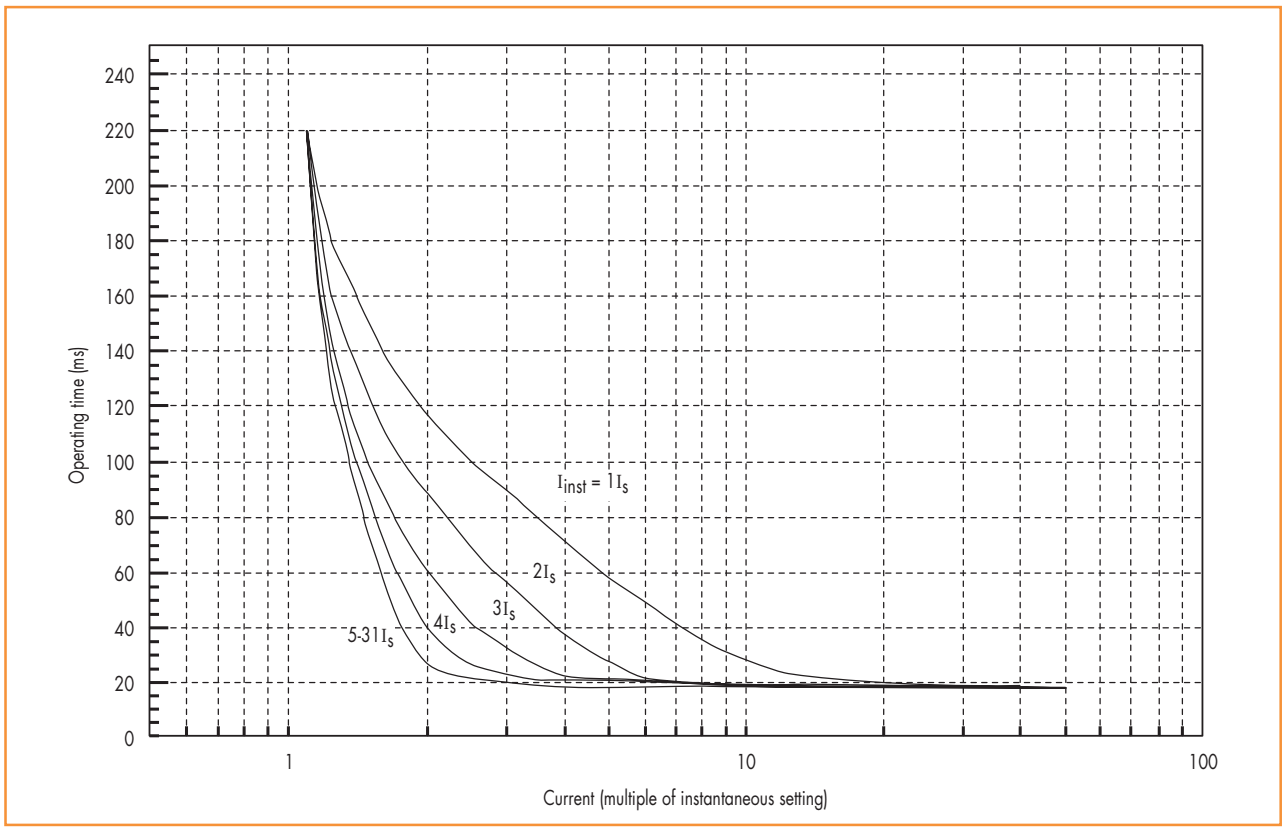

Figure 11: MCGG instantaneous operating times (various settings).

Variations over these ranges	
Setting current	±1%
Operating time	±2% or ±30ms whichever is greater
Accuracy – general	
Current setting	
Time delayed element	1.0 x I_s to 1.1 x I_s
Instantaneous elements	I_{inst} = 1 x I_s 1.0 x I_{inst} to 1.1 x I_{inst}
All other settings	I_{inst} ±5%
Operating time	
Time characteristic	Accuracy
Standard inverse Very inverse Long time inverse	±5%
Extremely inverse	±7.5% ±30ms whichever is greater
Definite time	±3%
Repeatability (within basic accuracy claim)	
Pick-up current	better than ±1%
Operating time	better than ±2% or ±30ms whichever is greater.
Overshoot time	Less than 30ms (when the input current is reduced from any value within the operative range to zero).
Resetting current	Time delayed and instantaneous elements: not less than 95% of time delayed current setting.
Resetting and disengaging times	Less than 70ms (when the input current is reduced from any value within the operative range to zero).
Transient overreach	System time constant up to 30ms: 5%
(instantaneous elements)	System time constant up to 100ms: 12%
Thermal withstand	
Continuous withstand	2 x I_s or 2.6 x I_n whichever is lower, with a minimum of 1 x I_n
Short time withstand	For 1s: 100 x I_n with 400A maximum For 3s: 57 x I_n with 230A maximum
Operation indicators	Each measuring board is fitted with two red led indicators, one showing time delayed operation and the other showing instantaneus operation. The reset button provided on the frontplate resets all the operation indicators. The green timer start indicator illuminates when the input current exceeds the setting current I_s to facilitate testing of the module. This indicator is self resetting. Led covers are available to eliminate any undesired led indication.

Contacts

		Changeover	Make
MCGG 52, 53, 82	Phase fault time delayed element	1	1
	Phase fault instantaneous element	1	1
	Earth fault time delayed element	1	1
	Earth fault instantaneous element	1	1
MCGG 22, 42, 62, 63	Time delayed element	1	1
	Instantaneous element	1	1

Contact ratings

Make and carry for 0.2s	7500VA subject to maxima of 30A and 300V ac or dc
Carry continuously	5A ac or dc
Break	ac – 1250VA dc – 50W resistive 25W, L/R = 0.04s } subject to maxima of 5A and 300V
Durability	
Loaded contact	10,000 operations minimum
Unloaded contact	100,000 operations minimum

Directional control

Directional control can be exercised over each pole individually by connecting the output contact of a relay type METI across appropriate case terminals.

Relay type	Direction control terminals
MCGG 22	23,24
MCGG 42	45, 46, 49, 50
MCGG 52, 53	43 to 46, 49, 50
MCGG 62, 63	45 to 50
MCGG 82	43 to 50

Note: The directional control circuits are isolated from all other circuits but are electrically connected to the relay case. These circuits must not, therefore, be insulation or impulse tested to the case.

High voltage withstand

Dielectric withstand IEC 255-5: 1977	2.0kV rms for 1 minute between all case terminals connected together and the case earth terminal, with the exception of the directional control terminals. 2.0kV rms for 1 minute between terminals of independent 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, 1.2/50μs, 0.5J between all terminals and case earth and between adjacent terminals, with the exception of the directional control terminals, (see note).

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. Note: The directional control terminals comply with class II and will withstand 1kV peak between all independent circuits, and 500V peak across the directional control terminals.
DC supply interruption IEC 255-11: 1979	The unit will withstand a 10ms interruption in the auxiliary supply, under normal operating conditions, without de-energising.
AC ripple on dc supply IEC 255-11: 1979	The unit will witstand 12% ac ripple on the dc supply.
Fast transient disturbance IEC 255-22-4: 1992 Class IV	4.0kV, 2.5kHz applied directly to auxiliary supply.
IEC 801-4: 1988 Level 4	4.0kV, 5.0kHz applied directly to all inputs.
Electrostatic discharge IEC 255-22-2: 1989 Class II	4.0kV discharge in air with cover in place
IEC 801-2: 1991 Level 2	4.0kV point contact discharge with cover removed.
Surge immunity IEC 1000-4-5: 1995 Level 4	4.0kV peak, 1.2/50µs between all groups and case earth. 2.0kV peak, 1.2/50µs between terminals of each group.
EMC compliance 89/336/EEC EN50081-2: 1994 EN50082-2: 1995	Compliance with the European Commission Directive on EMC is claimed via the Technical Construction File route. Generic Standards were used to establish conformity.
CE Product safety 73/23/EEC	Compliance with the European Commission Low Voltage Directive.
EN 61010-1: 1993/A2: 1995 EN 60950: 1992/A3: 1995	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	Cold
IEC 68-2-2: 1974	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 — Response Class 1
Endurance Class 1

Cases

MCGG 22 Size 4
MCGG 42 Size 6
MCGG 62 Size 6
MCGG 63 Size 6
MCGG 52 Size 8
MCGG 53 Size 8
MCGG 82 Size 8

The dimensions of the cases are shown in Figures 12, 13 and 14.

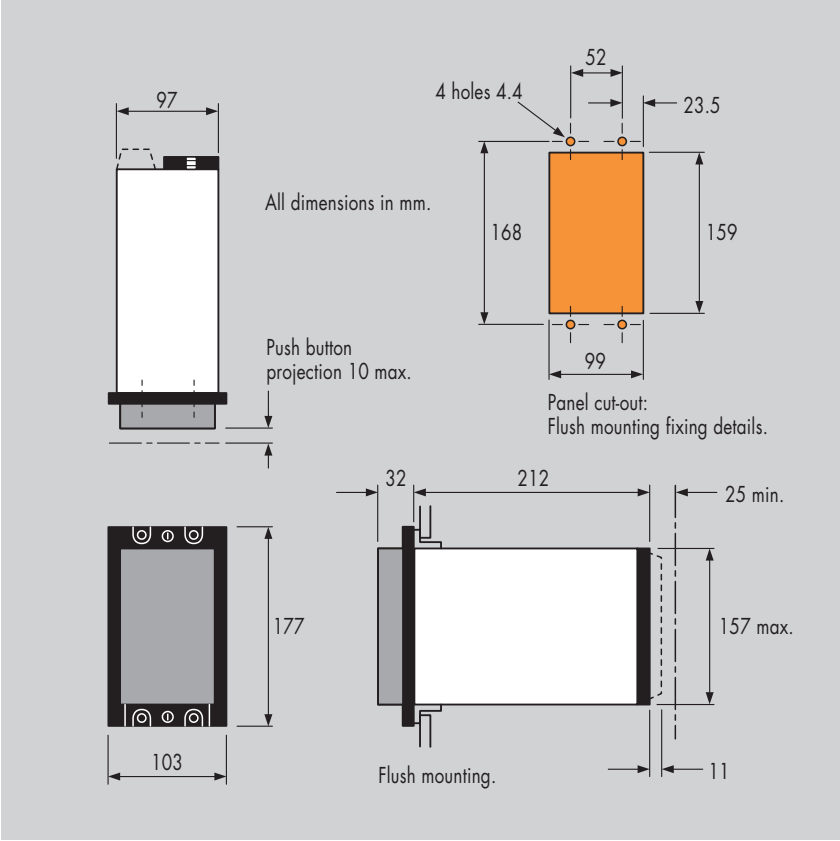

Figure 12: Case outline size 4.

Information Required with Order

Relay type (see models available).

Rated current and frequency.

DC auxiliary voltage range.

Requirement for led cover part GJ0280 001.

(These self adhesive led covers can be supplied to cover the instantaneous led when used in auto-reclose applications as the leds remain on during normal use).

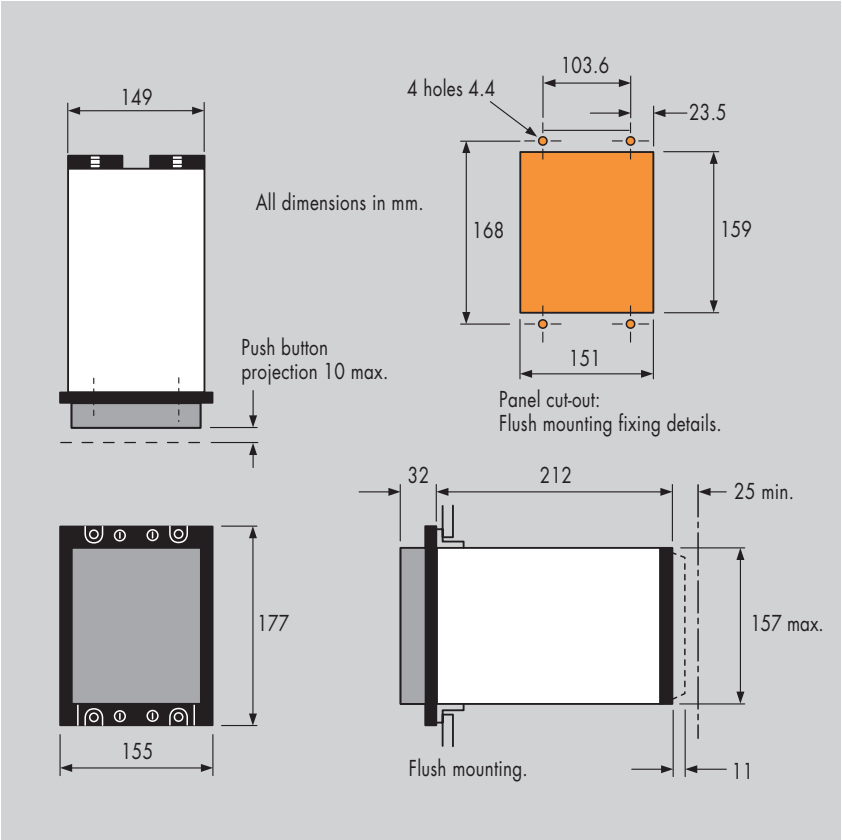

Figure 13: Case outline size 6.

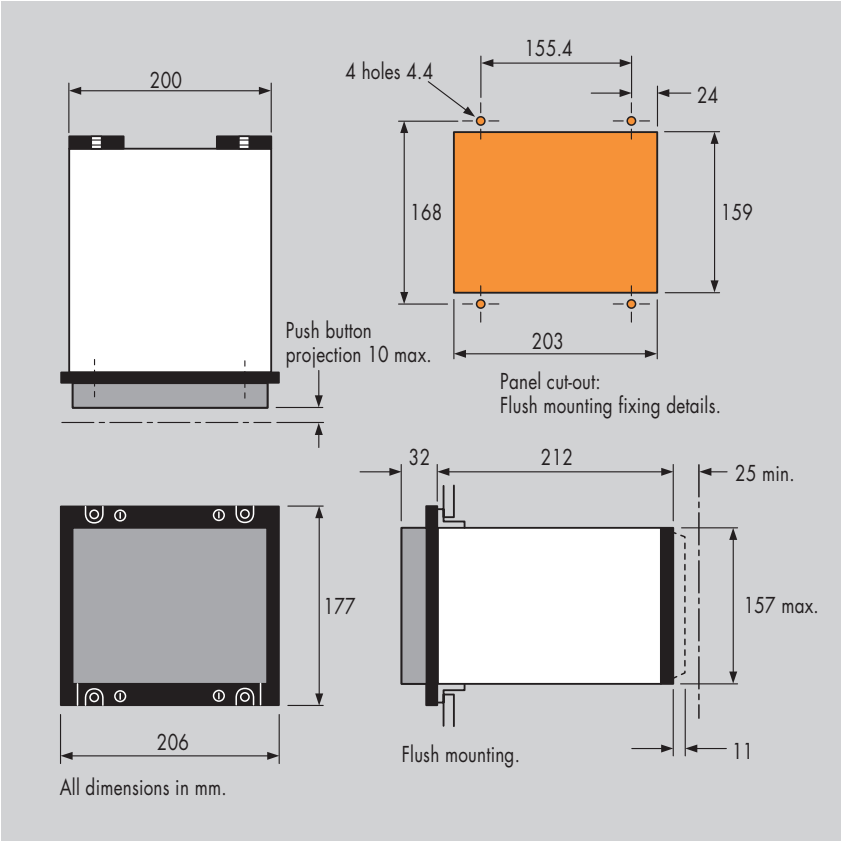

Figure 14: Case outline size 8.