

Inverse-Time Overcurrent & E/F Relays

Type ICM 21, ICM 21B



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Inverse-Time Overcurrent & E/F Relays

Features

- Reliable, robust Ferraris measuring system without gearing or coupling
- Range of time setting 10-100% (see current/time characteristic)
- Range of current setting 1 : 4, adjustable in 7 steps by means of non-interrupting setting switch
- High resetting current, at least 90% of relay setting
- Max. overrun time of 0.02 s
- Temperature -compensated measuring system
- Instantaneous maximum-current trip with own contact and own visual signal
- Instantaneous trip is continuously adjustable in either $I \times 2.5 - 10$ or $I \times 4 - 20$ range and to infinity
- Separate double-pole tripping contactor with indicator, for high contact rating
- Low internal consumption
- Plug-in active part, the C.T. connections being automatically short-circuited when the relay is withdrawn
- Tropicalized design

Application

The relay type ICM is an over current relay with an inverse-time characteristic. Its tripping time is shorter and the fault current is greater. As secondary relay parts, it is fed by current transformers. It is used to protect parts of electrical installations and simple line systems against over current, earth fault and short circuits. For the protection of solidly earthed systems against earth faults, relays are available with current setting up to 0.1 A. The relay can be employed in all situations where delayed interruption of short circuits is required, provision also being made for instantaneous tripping at a set maximum current.

Design & principle

The relay comprises a temperature-compensated Ferraris measuring system which requires no coupling, gearing or hinged armature. The 1 mm thick Ferraris disc of aluminum is drawn by a recall spring, a recall tape and a worm against a stop on

the time adjustment disc, and is thus held in its position of rest. The worm compensate for any change in the force of the recall spring within an angle of rotation of the Ferraris disc of 320° . Thus the recall torque remains constant. The driving torque and the angular speed of the Ferraris disc are constant. As a result the current/time characteristics of the relay are exactly proportional. The relays are manufactured with two current/time characteristic for 50 Hz (Fig. 6, 7). The characteristic determines the type designation of the particular relay. The current coil of the driving solenoid has 14 tapings, corresponding to the seven stages of the non-interrupting setting switch for the relay current.

The adjustment of the time setting disc determines the angle of rotation of the Ferraris disc prior to contact making.

The braking magnet consisting of a pair of cross-magnetized magnets determines the speed of rotation of the Ferraris disc at a given current.

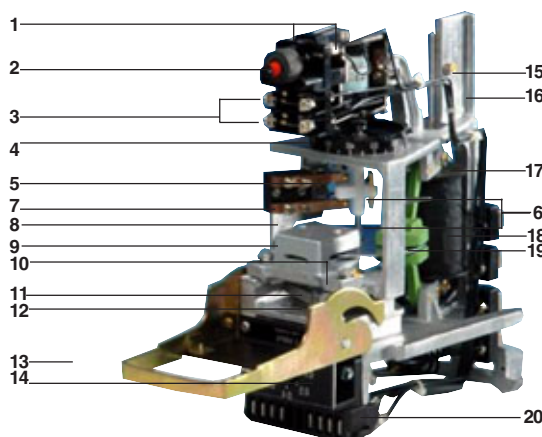


Fig. 1 - Active part of the relay ICM 21

- 1 Coil terminals of the indicating contactor
- 2 Indicator button of delayed trip
- 3 Contacts of the indicating contactors CV2
- 4 Time setting disc
- 5 Moving contact pin of the relay time contact
- 6 Relay time contact
- 7 Indicator button of instantaneous trip
- 8 Drum for setting the instantaneous trip
- 9 Damping magnet
- 10 Damping magnet mounting screw
- 11 Temperature compensating lever
- 12 Pointer of arm 11
- 13 Locking arm
- 14 Switch for setting relay pick-up current
- 15 Slide for adjusting current
- 16 Scale for marking factory adjustment of slide
- 17 Driving magnet
- 18 Coil of the driving magnet
- 19 Ferraris disc
- 20 Test contacts

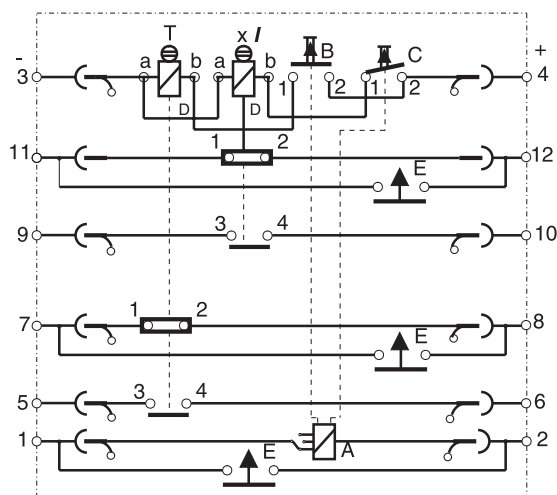


Fig. 2 - Wiring diagram of relay types ICM21KP, ICM21BKP with test terminals (MR 410059)

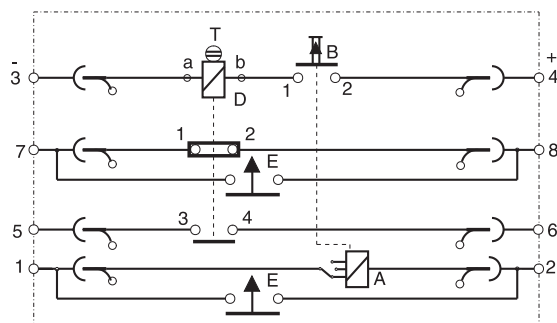


Fig. 3 - Wiring diagram of relay types ICM21NP, ICM21BNP with test terminals (MR 410035)

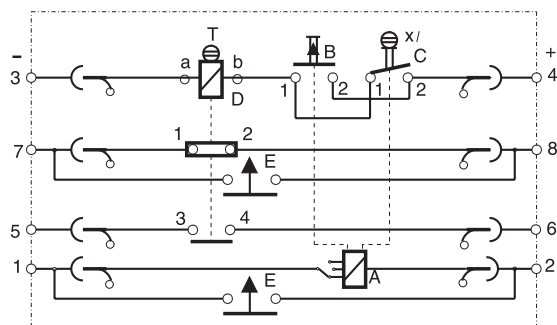


Fig. 4 - Wiring diagram of relay types ICM21P, ICM21BP with test terminals (AK 421256)

Legend :

- A : Current coil
- B : Time-lag contact
- C : Instantaneous contact
- D : Indicating tripping contactor
- E : Shorting switch
- X/ : Signal button of instantaneous trip
- T : Signal button of indicating contactor

The armature of the instantaneous maximum-current release is drawn by the leakage flux of the driving magnet, acting against the force of a spring. The maximum current setting may be adjusted at the adjusting cylinder. When set to infinity (∞), the release is blocked. The release has its own contact (normally open) and a signal button which can be reset from outside.

The indicating release contactor (CV2) has two separate contacts with double interruption and a signal button which pops out when the relay trips and can be reset manually.

The contactor coil is a voltage coil. When the relay picks up, the contactor coil is connected to the auxiliary voltage by relay contacts. The breaker tripping current is handled by the indicating contactor.

It is possible to incorporate two separate indicating contactors, one for the inverse-time tripping, the other for the instantaneous maximum-current tripping. The active part of the relay is plugged into the dust-tight casing. The locking arm, normally vertical, can then be pulled down, in which position the active part of the relay is already disconnected from the leads and the C.T. connections automatically short-circuited. The relay can now be entirely withdrawn from its casing, for testing or repair.

Designation of types

Type of relay		Current/time characteristic 50 Hz
ICM 21	Inverse time relay, British Standard 142/ IS : 3231	Fig. 6
ICM 21B	Very inverse time relay	Fig. 7

The relay casing is supplied for flush mounting in a switchboard. (see Fig. 8).

Test terminals, type suffix 'p'

At the front of the relays are the easily accessible test terminals 20 (Fig.1). When terminals 11 and 12 are provided for relays with two indicating contactors, test terminals can only be provided for relay terminals 1 - 10. Circuit 11 - 12 (signal for instantaneous trip) is therefore not equipped with test terminals.

For the special model with test terminals, a separate test plug (Fig.5) can be supplied. For testing, it is inserted beneath the pair of lugs in the casing, and then the drawout arm is lowered. First of all, the shorting switches close, then the connections to the terminals of the casing are interrupted and finally the test terminals are connected to the terminals of the test plug.

The test plug is supplied with 3 m cable but without any terminals on the supply side.

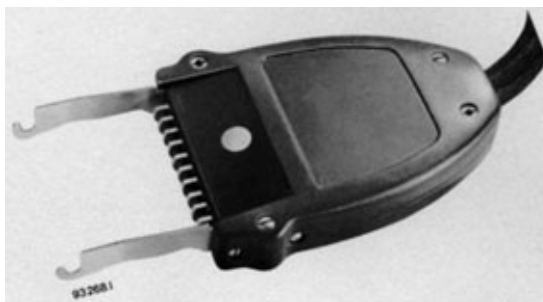


Fig. 5- Test plug for inverse-time overcurrent relay type ICM 21.

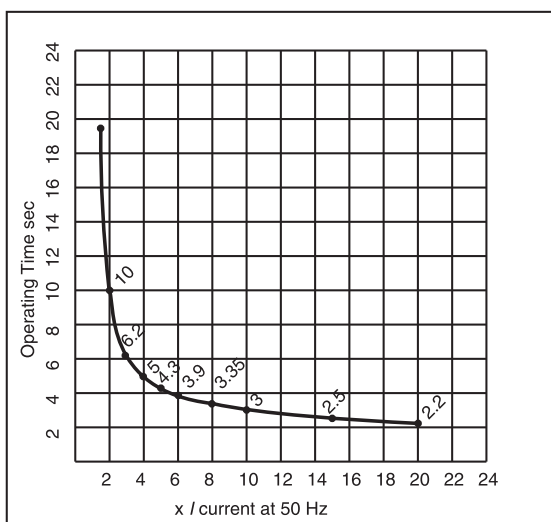


Fig 6 - Inverse time characteristics (BS 142/ IS 3231) of relay type ICM21..

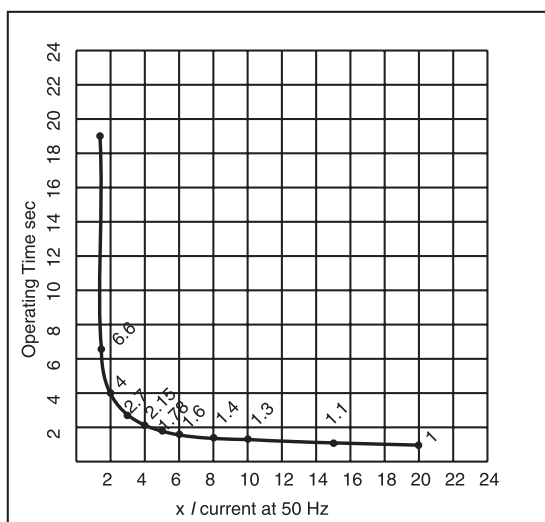


Fig 7 - Very Inverse time characteristics of relay type ICM21B..

Technical data

Current range	Relay base current setting I							
2.5/10 A	2.5	3.0	4.0	5.0	6.0	8.0	10	A
1.0/4.0 A	1.0	1.25	1.5	2.0	2.5	3.0	4.0	A
0.5/2.0 A	0.5	0.6	0.8	1.0	1.2	1.5	2.0	A
0.2/0.8 A	0.2	0.25	0.3	0.4	0.5	0.6	0.8	A
0.1/0.4A	0.1	0.125	0.15	0.2	0.25	0.3	0.4	A
Burden at pick-up current: at 50Hz	3.5	3.6	3.7	3.9	4.2	4.4	4.8	VA
Rated frequency	50 Hz							
Permissible sustained current	2 x set current							
Short-circuit strength :								
Thermal (for 1 s)	100 x minimum set current							
Dynamic	500 x minimum set current							

Timing element	
Starting current	1.1 x / ± 4 %
Closing current	Not greater than 1.3 x /
Time-lag	as per characteristic, Fig. 6,7
Max. Error	upto 2 x / ± 10 % 2 to 4 x / ± 7 % 4 to 20 x / ± 5 %
Reset time when time-lag set to 100%	approx. 9.5 s
Max. overrun time	0.02 s
Reset current	>0.9 x /

Instantaneous maximum-current trip	
Setting range	2.5 – 10 x I / and α 4 – 20 x I / and α
Max. error up to 10 x I setting	± 10%
Operating time at twice set current or over	0.07 s. Max.
Drop-out current	approx. 1.2–2.5 x base current I of relay

Indicating contactor				
Indicating contactor with voltage coil				
Rated auxiliary voltage		24, 30, 48, 110, 220, 250 V DC		
Nominal consumption		approx. 3 W on DC		
Nature of free contacts		2 normally open (or 1 N/C and 1 N/O)		
Operating time		approx. 0.03 s		
Contact ratings : Sustained current Making current		max. 10 A max. 30 A		
Maximal break current	Voltage	50 Hz AC. resistive and inductive, p.f. = 0.3	D.C. resistive	D.C. inductive L/R = 15 ms
1 contact	220 V 110 V 24-60 V	20 A	1.1 A 6 A 16 A	0.8 A 3 A 7.5 A
2 contacts in series	220 V 110 V	– –	6 A 15 A	3.5 A 10 A

These are max. values for a small number of operations. To attain a contact life of about 10,000 operations, they should be reduced to about 60%.

General items	
Test voltage	2kV/50Hz, 1 min.
Weight with one indicating contactor	3.8 kg
Weight with two indicating contactors	4.0 kg
Weight of test plug with 3 m cable	1.5 kg
Circuit diagrams	see page 4
Dimensions	see page 7

Table 1 - Contact arrangements, type designations, wiring diagrams of relay type ICM.

Contact arrangement	2NO	1NO+1NC	4NO	2NO+2NC	Instantaneous current trip range	Current range amp.	Aux. supply DC
Relay type	Wiring diagram						
ICM21 ICM21P ICM21B ICM21BP	AK-421256	AK-421256	N.A.	N.A.	2.5-10 x I 4 - 20 x I	0.1 to 0.4 0.2 to 0.8 0.5 to 2 1 to 4 2.5 to 10	24 ,30, 48, 110, 220, 250 V
ICM21N ICM21NP ICM21BN ICM21BNP	MR-410035	MR-410035	N.A.	N.A.	N.A.		
ICM21K ICM21KP ICM21BK ICM21BKP	N.A.	N.A.	MR-410059	MR-410059	2.5-10 x I 4 - 20 x I		

Type designation

ICM21	Inverse time relay (3 Sec at 10 x I) and with instantaneous current trip unit
ICM21B	Very inverse time relay (1.3 Sec at 10 x I) and with instantaneous current trip unit
Suffix ' N '	Without instantaneous current trip unit
Suffix ' K '	With two elements of indicating contactor
Suffix ' P '	With test terminal

Dimensions

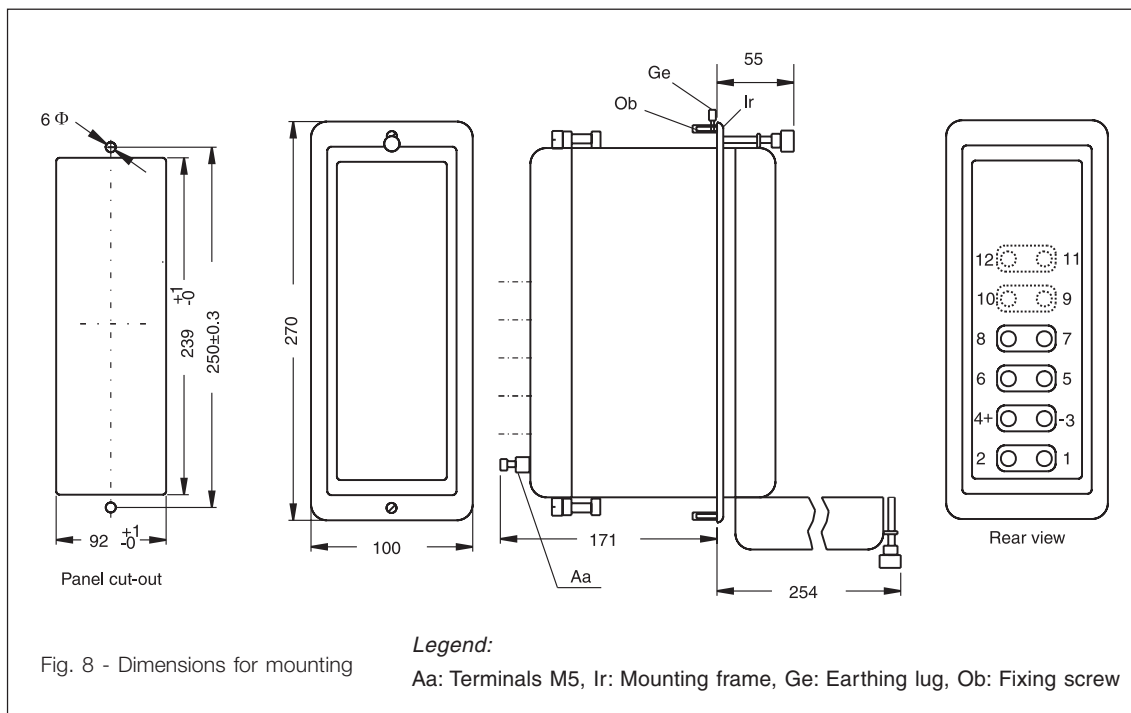


Fig. 8 - Dimensions for mounting

Ordering details

Item No. Qty.
Refer table 1 for selection and mark (✓) appropriate boxes.

Relay Type:	ICM21N	☐	ICM21 BN	☐
	ICM21NP	☐	ICM21 BNP	☐
	ICM21	☐	ICM21 B	☐
	ICM21P	☐	ICM21 BP	☐
	ICM21K	☐	ICM21 BK	☐
	ICM21KP	☐	ICM21 BKP	☐
Current Range :	0.1 - 0.4 A	☐		
	0.2 - 0.8 A	☐		
	0.5 - 2.0 A	☐		
	1.0 - 4.0 A	☐		
	2.5 - 10 A	☐		
Aux Supply:	24V DC	☐	110VDC	☐
	30V DC	☐	220V DC	☐
	48VDC	☐	250VDC	☐
Instantaneous:	4 - 20 x I set	☐		
Current trip range	2.5 - 10 x I set	☐		
Contact:	1NO + 1NC	☐	2NO + 2NC	☐
Arrangement	2NO	☐	4NO	☐



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