phase balance current relay

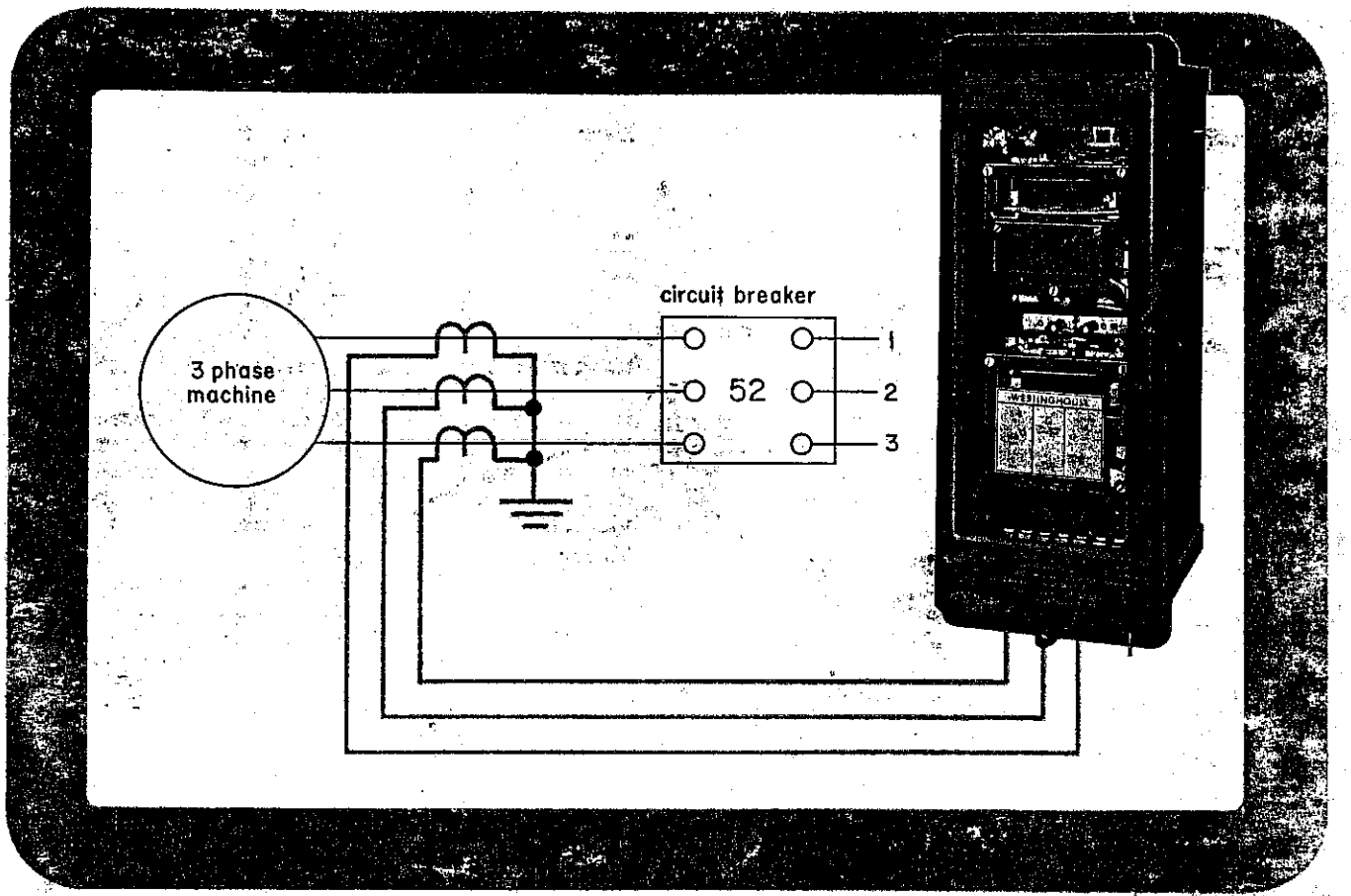
type CM

for phase current unbalance protection of polyphase apparatus

descriptive bulletin

41-160

page 1



application

for protection of polyphase apparatus against damage from single phase or unbalanced-current operation

The CM relay operates when a definite percentage of current unbalance exists between any two phases. Variable current pick-up values are provided by taps on the electromagnet coil winding. At 150 to 350% of tap value current, the relay operates at approximately 15% unbalance between phase currents. See figure 4.

The relay is used to protect machines under load, when as sensitive protection is not provided by a voltage operated relay since polyphase machines tend to maintain normal phase voltage even with one phase open, unless the machine is heavily loaded.

The CM is used primarily for motor protection on three phase systems. However, it can be used at any location to detect current unbalance. It can also be used on the a-c side of rotary converters or generators to detect open phases or phase unbalance.

May, 1957
supersedes descriptive bulletin 41-293 dated February, 1949
mailed to: E/320/DB; D65-9A; C28-5B

operation — torque relation and contact arrangement

The CM relay consists of two mechanically independent induction discs. Usually 1 and 2 phase currents (figure 1) energize the upper electromagnets while 2 and 3 phase currents energize the lower electromagnets. When phase currents are balanced, the electromagnets create equal and opposing torques on each of the discs.

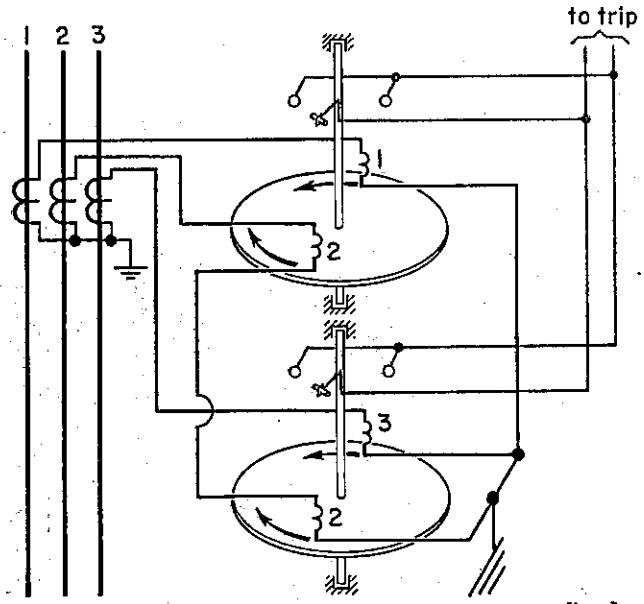


fig. 1

Each electromagnet has three taps. The same tap-value setting should be used on all four electromagnets. In general, the lower ampere taps are used for maximum sensitivity.

The relay contacts are electrically common and connected in parallel. Closing of any one contact on either the upper or lower disc completes the trip circuit.

universal trip circuit: Gravity type indicator, tripping range 0.2 to 30 amperes, is factory connected in parallel with contactor switch for trip currents over 2.25 amperes d-c. For trip currents less than 2.25 amperes, the lead to contactor switch coil should be disconnected and "dead-ended" at the screw provided on the switch Micarta base.

The main contacts of the relay will close 30 amperes at 250 volts d-c, and the contactor switch contacts will carry this current for sufficient time to trip a circuit breaker.

construction

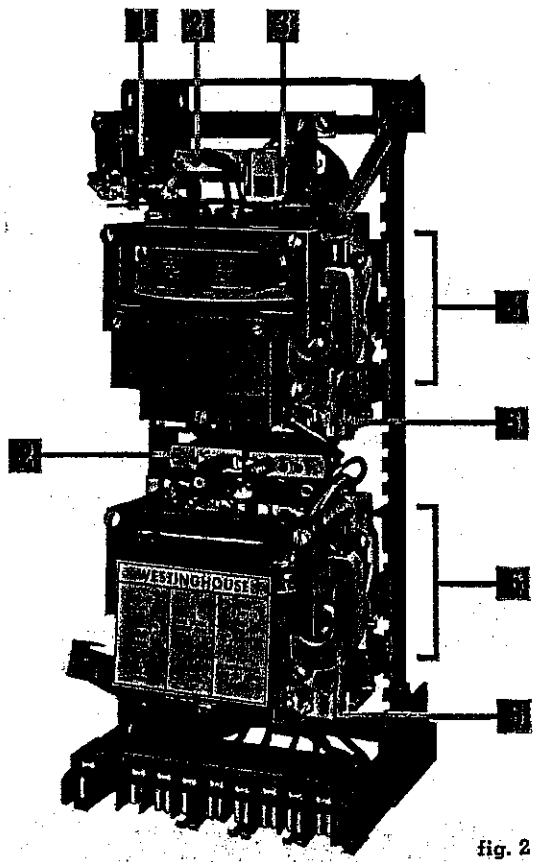


fig. 2

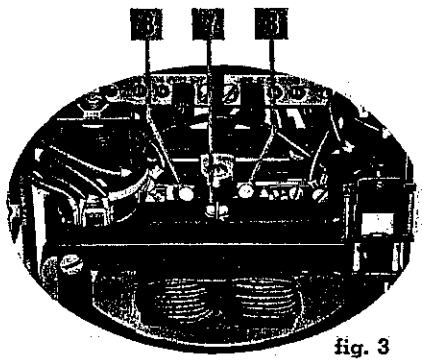


fig. 3

4 contactor switch: Contacts shunt main contacts of relay and carry heavy tripping currents. Seals in trip circuit until de-energized by external "a" switch.

5 taps: Three taps on each electromagnet. The tap value is the minimum pick-up current of each electromagnet with the opposing electromagnet de-energized.

1 operation indicator

2 upper induction unit

3 damping magnets

6 lower induction unit

7 moving contacts

8 stationary contacts

characteristics

typical operating curve

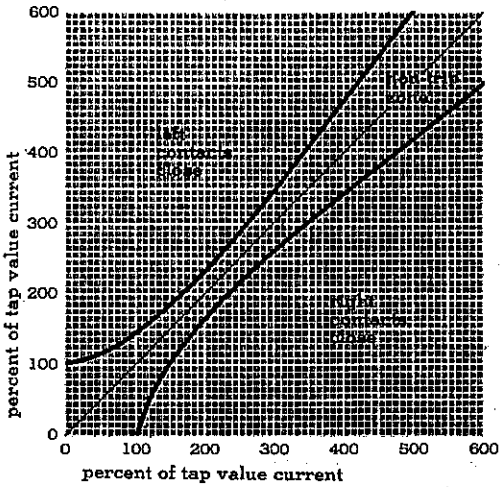


fig. 4

typical time curves

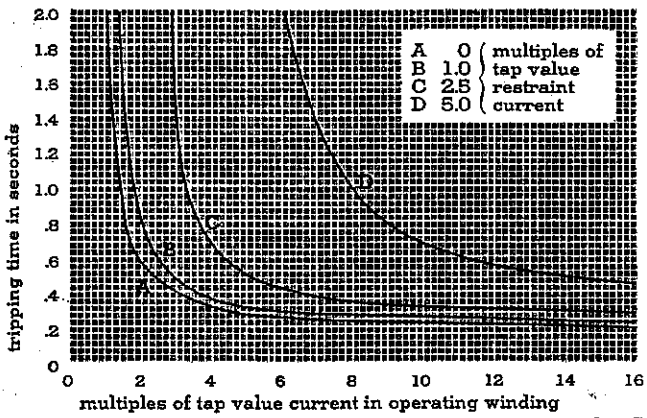


fig. 5

If additional time delay is required, apply timing relays described in descriptive bulletin 41-570.

trip circuit coil data

coil only	rating: amps d-c	resistance: ohms d-c	amps d-c	
			continuous	1 sec
operation indicator	0.2	2.8	0.6	18.0
contactor switch	2.0	0.25	3.8	44.0

contactor switch and operation indicator in parallel: 0.23 ohms d-c

electromagnet coil data

taps: amp	amp continuous	burden 60 cycles‡	watts	volt amp	p.f. angle
1	3	at 2.5 amp	6.4	30.75	78°
2	5		2.37	8.6	74°
3	5		1.37	4.0	70°
2	6	at 5 amp	6.4	30.75	78°
4	10		2.37	8.6	74°
6	10		1.37	4.0	70°

‡ Burden values are for each electromagnet, current lagging. Therefore, there will be twice this burden across terminals 6-7; for the two windings in series.

circuit diagrams

internal wiring • front view

single trip, phase balance current relay, type CM

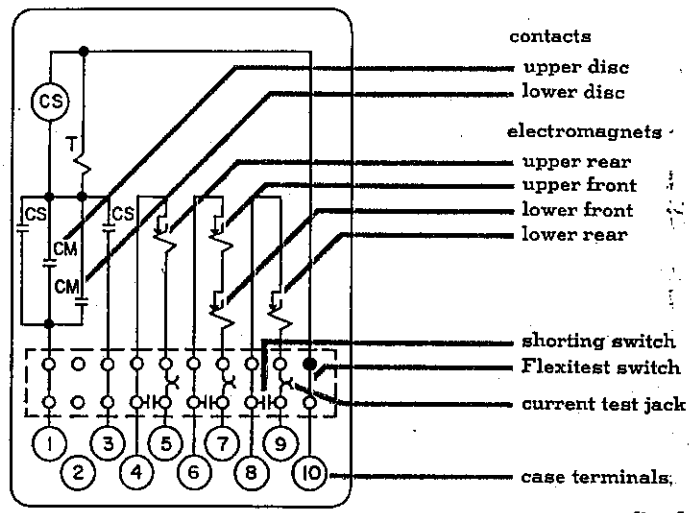


fig. 6

typical applications

grounded or return neutral systems

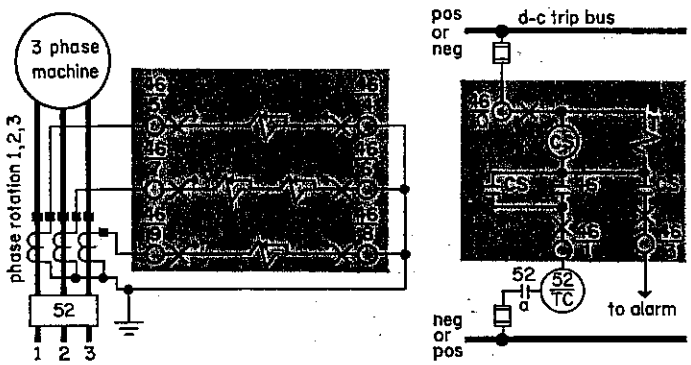


fig. 7

ungrounded neutral systems

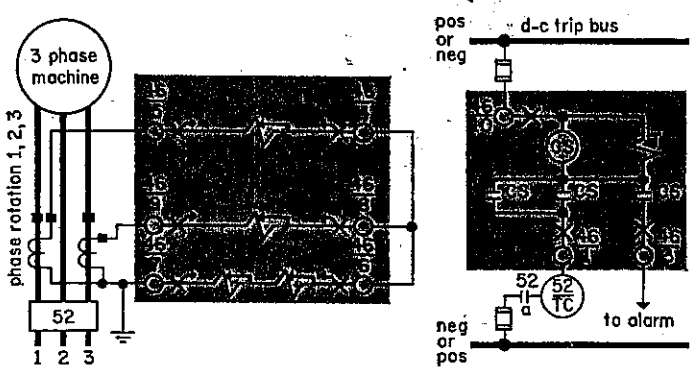


fig. 8

device number chart
- 46—phase balance current relay, type CM
- 52—power circuit breaker
- CS—contactor switch
- T—operation indicator
- a—breaker auxiliary contact
- TC—breaker trip coil
- —fuse—

phase balance current relay
type CM

ordering information — order by style number

All styles are three phase, 60 cycles. 50 cycle relays available on request.

single pole, single throw circuit closing contacts

tap range: amps	operation indicator	contactor switch "CS"	Flexitest universal case♦		wired as per:
			relay style no.	case size	
1-3	universal d-c	2.0 amp d-c	1876 186	FT-31	fig. 6
2-6	0.2/30 amps		1876 185		

♦ For mounting on panels thicker than 3/16 inch, enter two items on order for:
(1) Standard style relay;
(2) Hardware necessary to mount on____inch panel.

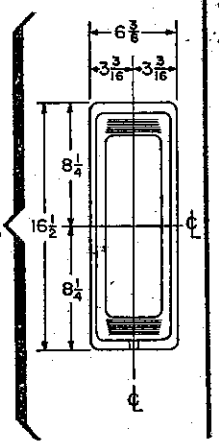
shipping weights and dimensions

weight, lb		domestic shipping carton dimensions, inches
net	shipping	
26	33	19 x 12½ x 21

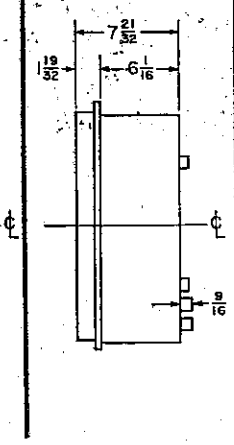
dimensions — for reference only

case type: FT-31

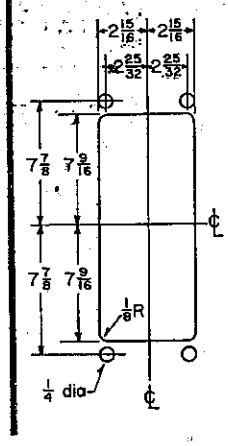
case dimensions (inches) — front view



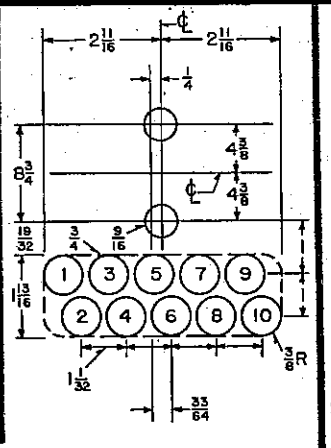
case dimensions (inches) — side view



panel cutout dimensions (inches) front view — semi-flush

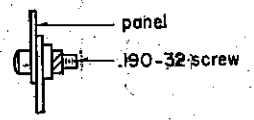


panel cutout dimensions (inches) front view — projection

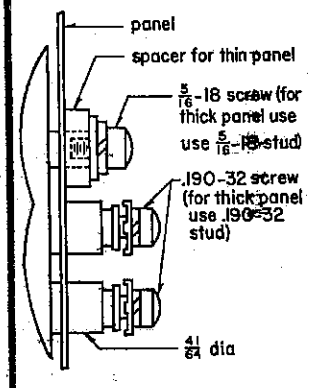


terminal and mounting hardware

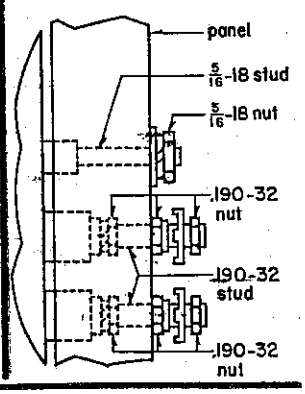
semi-flush mounting
3/16" panels



projection mounting
3/16" panels



3/16" to 2-1/2" panels



further information:

prices	price list 41-020
instructions	instruction leaflet 41-181.1
renewal parts	renewal parts data 41-293
Flexitest case	descriptive bulletin 41-075
timing relays	descriptive bulletin 41-570
inquiries	nearest Westinghouse sales office

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