MULTI FUNCTION OVER CURRENT AND
EARTH FAULT RELAY[50/51x3,50/51N] $C\epsilon$

DOG−M51D

Feature

The multi−OCR is a microprocessor based digital type protective relay that has 3 phases overcurrent and ground overcurrent element which are provided with inverse, very inverse, extremely inverse, and definite time, curkes. OCR and GOCR can set the functions independently. The relay may be supplied in drawout type case or fixed type case according to customer's requirement. Its protceting coordination is configured with (1) one of time inverse curvesand instananuouse setting, or (2) definite time setting. The relay works more precisely and correctly than electmechanical type or static type, because of appling advanced digital converting technology.

Application

The relay is suitable for solid or resistance grounded distribution feeder of utility company or cosumer's substation. Since the relay has multi−funtions and wide range settings. it is no necessary for engineer to calculate in detail at the beginning of design.

Front plate
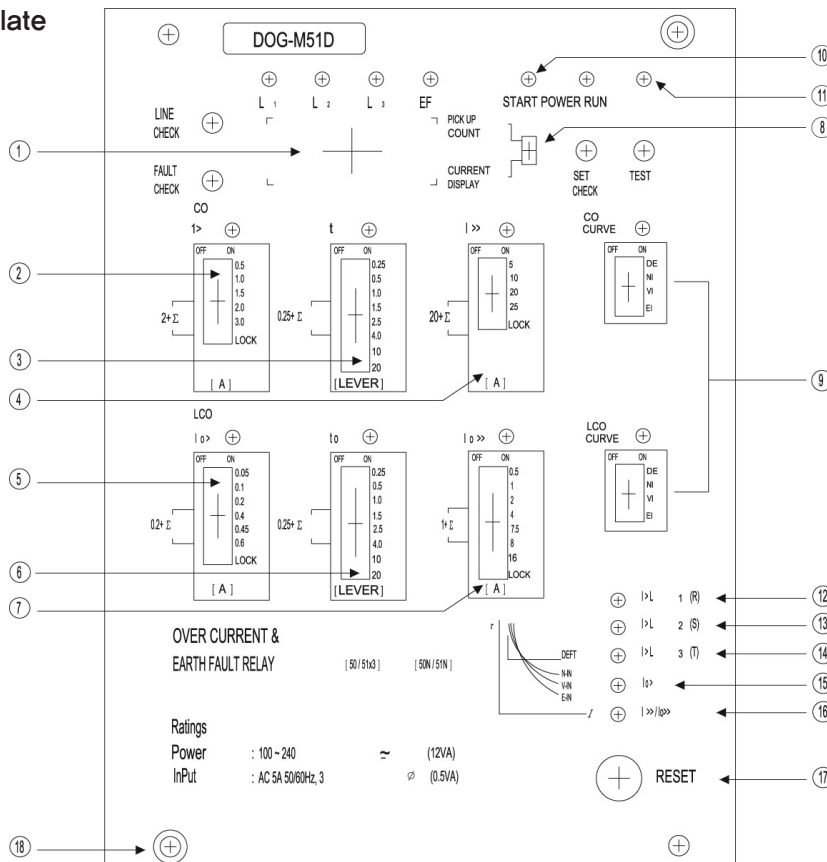
(1) Curr. Start Time Display
(2) Curr. Limit Element
(3) Time Limit Element
(4) Instantaneous Element
(5) EF Current Element
(6) EF Time Element
(7) EF Instant. Element
(8) Monitor Selection Switch
(9) Time Curve Selection Switch
(10) Curr Pickup (RED)
(11) CPU Run LED (GRE)
(12) "R" Phase Indicator (YEL)
(13) "S" Phase Indicator (YEL)
(14) "T" Phase Indicator (YEL)
(15) EF Indicatior (YEL)
(16) Instantaneous Indicator (YEL)
(17) Reset (PUSH)
(18) Draw-put Handle

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DOG−M51(Non Draw out)　　　　　　　　　　　　　　　　　　　　IEC255 JEC 2500,2510
DOG−M51D(Draw out)

Specifications

■ Rating

Rated current	AC 5A
Frequency	50/60Hz±5%
Auxiliary Voltage	AC/DC 110V(86∼260V)
Ambient temperature	−10℃ to 60℃(with no icing)

■ Current setting
−OC−

Overcurrent range	2∼10A/steps of 0.5A
Instantaneous	20∼80A/steps of 5A

−EF−

Overcurrent range	0.2∼2A/steps of 0.05A
Instantaneous	1∼40A/steps of 0.5A

■ Time setting & curve IEC 255−3
−OC−

Overcurrent time lever	0.25∼40(Steps of 0.25 lever)
Instantaneous	Less than 40ms

· Normal inverse time　　$NI = \dfrac{0.14}{I^{0.02}-1} \cdot \dfrac{tp}{10}$

· Very inverse time　　$VI = \dfrac{13.5}{I-1} \cdot \dfrac{tp}{10}$

· Extremely inverse time　　$EI = \dfrac{80}{I^{2}-1} \cdot \dfrac{tp}{10}$

· Definite time　　$D = 2 \cdot \dfrac{tp}{10}$　　※ I: Fault current(%)
　　　　　　　　　　　　　　　　　　　※ tp: time lever

Resetting Value	〉95%
Reset time	〈100ms

■ Burden

Overcurrent	0.5VA
Earth Fault	0.5VA
Aux Voltage	12VA(AC),6W(DC)

■ Contact

Output Relay		Trip 2a
Trip & Alam contact capacity		
	Make	AC 240V 10A(L/R=0ms)
		DC 1000W 0.5Sec(L/R=0ms)
	Break	AC 240V 3A(L/R=0ms)
		DC 30W 0.5Sec(L/R=0ms)

■ Indicator

Operating start	LED(Red)
CPU RUN	LED(Gre)
Operating	LED(Red)Manual Reset

■ Operating time

Over Current	Lever #10
Normal inverse time	300% 6.3 sec
	700% 3.5 sec
Very inverse time	300% 6.75 sec
	700% 2.25 sec
Extremely inverse time	300% 10 sec
	700% 1.67 sec
Earth Fault	Lever #5
Normal inverse time	300% 3.15sec
	700% 1.76sec
Very inverse time	300% 3.37sec
	700% 1.12sec
Extremely inverse time	300% 5.0sec
	700% 0.83sec
Instantaneous time	Lessthan 0.04sec
Degree Protection	IP52
Thermal Withstand Capability	for 1s 80xIn Continuously 3xIn

■ Vibration resistance

Malfunction	10Hz 5mm double amplitude 30s each in X and Y directions 16.7Hz 2.5mm double amplitude 600s each in X,Y, and Z directions

■ Shock resistance

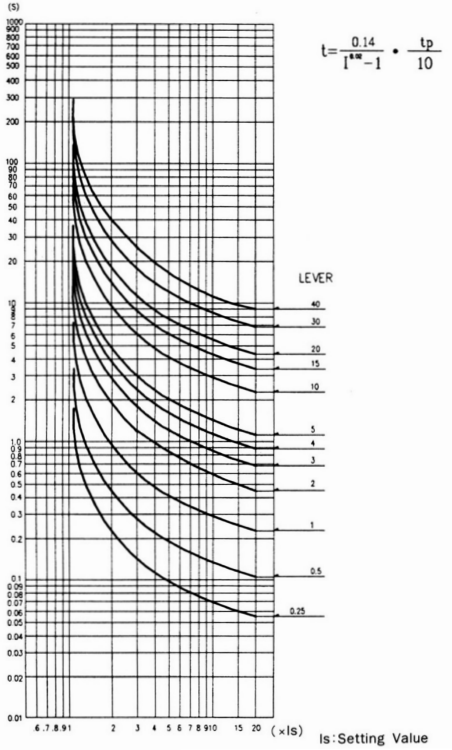|	
Destruction;	300m/s(approx. 30G) 3 time each in 3 directions

■ Insulation to IEC 255
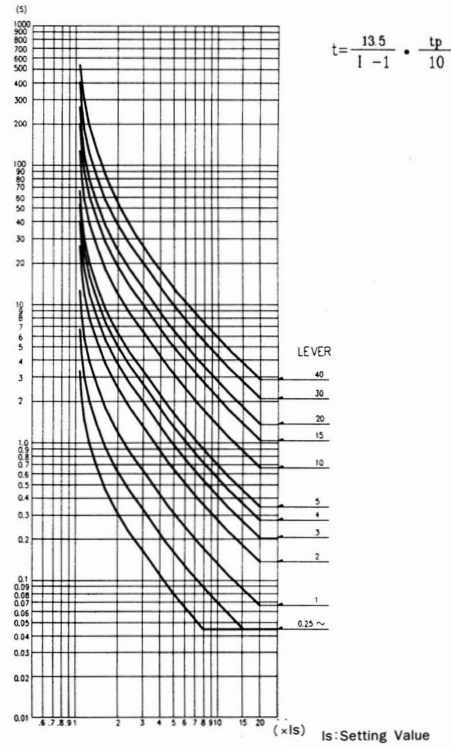
Dielectric withstand	2kV for 1 minute between all terminals and case earthed.
Insulation resistance at	500V 〉100MΩ
Impluse Voltage Withstand	5kV−1.2/50 μs
Surge transient simulator	2.5kV 1MHz/200Ω
Weight	2.2kg

Operating time curves

Normal Inverse
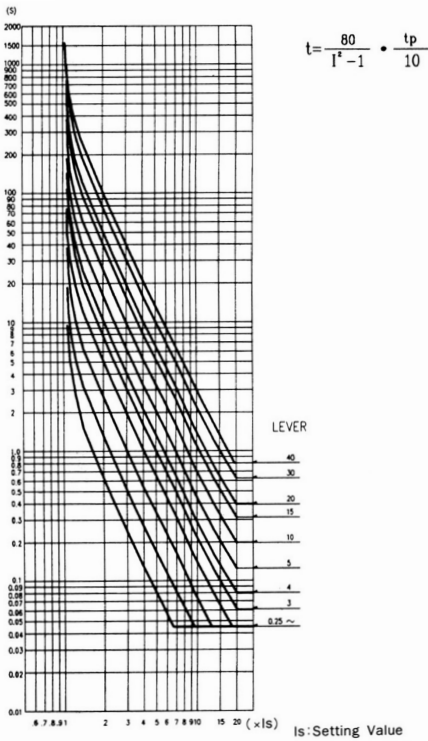
$$t = \frac{0.14}{I^{0.02} - 1} \cdot \frac{tp}{10}$$

Very Inverse

$$t = \frac{13.5}{I - 1} \cdot \frac{tp}{10}$$

Extremely Inverse

$$t = \frac{80}{I^2 - 1} \cdot \frac{tp}{10}$$

Definite Time

$$t = 2 \cdot \frac{tp}{10}$$
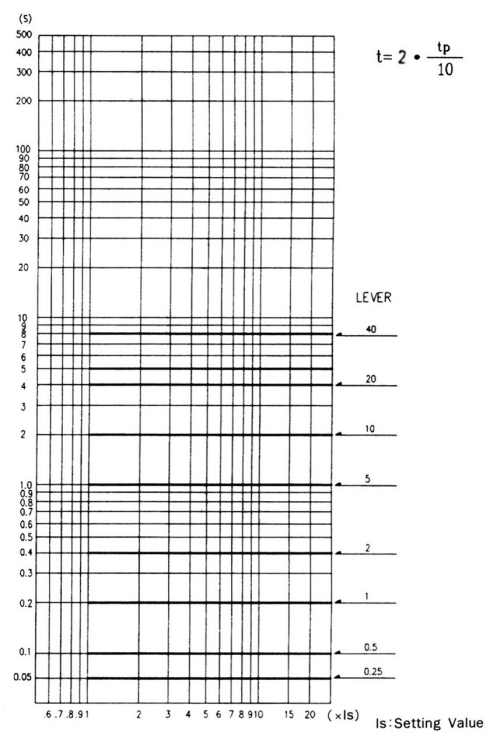
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Current Setting Mode

Time limit Current setting

In consideration of current transformer ratio, setting shall be conducted some where around contact demand 150%

$$I_{TAP} \fallingdotseq \frac{I_1 \times 5}{I_{CT}} \times (1.1 \sim 1.5)$$

I_{TAP} = Relay setting tap
I_1 = Current value of contact demand
I_{CT} = Rated current of primary in transformer

Time limit setting

Required to set current it cooperate with electric corporation concerned.

Instantaneous current setting

Required to set power in consideration of primary and secondary protective coordination so that wrong operating fault can not occur due to exciting rush current of transformer. Generally measuring capacity, setting shall be done at 1,000~ 1,600%(current value)

$$I_{TAP} \fallingdotseq \frac{I_1 \times 5}{I_{CT}} \times (10 \sim 16)$$

I_{TAP} = Setting tap
$I_1 \cdot$ = Current value based on KVA
I_{CT} = Primary rated current of CT(Secondary Current 5A)

Test

1. When testing of time limit element. one touch of OC test switch can perform both tests ,of time limit element and instantaneous element
2. All the test of grounding element with only pushing EF test switch, you can easily check the function of time limit and instantaneous element.
3. For OC and EF test and confirmation of operating indicator LED, you shall keep constant power voltage connected.
4. "Lock" on setting tap scale is the position where relay does not operate, after the test you shall get it back to ordinary position.

Indication

Fault Part		Operating Indicator					
Discription	Phase	Over Current				Earth Fault	
		R	S	T	INST	OC	INST
Over Current	R−S	●	●				
	S−T		●	●			
	T−R	●		●			
	R.S.T	●	●	●			
Instanoneous overcurrent	R−S	●	●		●		
	S−T		●	●	●		
	T−R	●		●	●		
	R.S.T	●	●	●	●		
Earth Fault	N					●	
	N						●

Trip indicator

when the aux relay is operated, it is able to confirm operating status of following parts and LED LAMP.

Line check

Push the line check switch, you can see the load current of each phase (R. S. T)

Fault check

When there are some fault, the circult breaker will be shutdown after a few second. At that time, the status of fault(2ry current of CT) will be displayed and the current value of fault will be memoried due to operating S-RAM.

After aux power turn off, the status of fault is memoried due to operating S-RAM

In order to reset memory function, please push line check S/W and fault check S/W at the same time, and value of memory will be detected.

Pick-up count

On operating pick up count it is able to see the time of trip operating(%) due to display the trip time counter

Set check

It is able to confirm each setting tap value due to display the setting value an display window.

OC tset & EF test

It is able to confirm the status of relay operating by the relay the function(CO.)

The time setting of time lever and the operating time curve will be checked at the same time on testing

If the run lamp is not operated, please push the reset button.

Run

On run position, it is indicated the status of power source and the operating status of CPU. (when run lamp turn on, it is good condition, and when run lamp turn off, it is error condition)
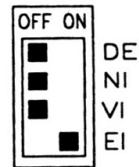
Operating Characteristics

All switchs of front plate for relay are installed dip switdh

Tripping time curve(CO)

DE (Definite time)
NI (Normal inverse)
VI (Very inverse)
EI (Extremely inverse)

Please select each curve as changing over the dip switch

Over current setting

The definitive current tap is limited for 2A to 10A and the tap is divided 0.5 step.

Dip switch has ON-OFF position and it is able to set the setting range in case of "on" position

Please refer to front plate how to set.

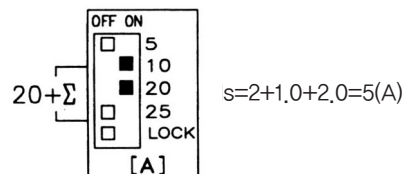But if you set setting current, you should plus the value of on position

$Is=2+1.0+2.0=5(A)$
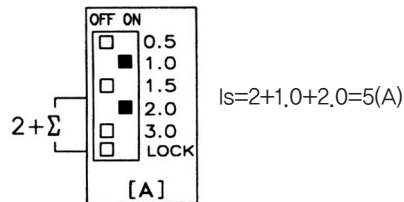
Time lever setting

Time lever is limited from 0.25 to 4.0 sec and the tap is divided 0.25 step

$Ts=0.25+0.25+0.5+1.0+1.5+2.5+4.0=10$ lever
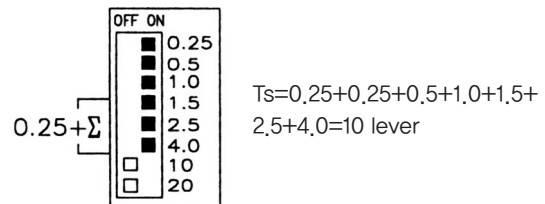
Instantaneous current setting

The tap of instantaneous current is limited from 20A to 80A and the tap is divided 5A step.

$s=2+1.0+2.0=5(A)$

If the dip switch is set on lock position, the instantaneous function is not operated.

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Trip indicator
when the aux relay is operated, it is able to confirm operating status of following parts and LED LAMP.

Line check
Push the line check switch, you can see the load current of each phase (T,EF)

Fault check
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Pick-up count
On operating pick up count, it is able to see the time of trip operating(%) due to display the trip time counter

Set check
It is able to confirm each setting tap value due to display the setting value an display window.

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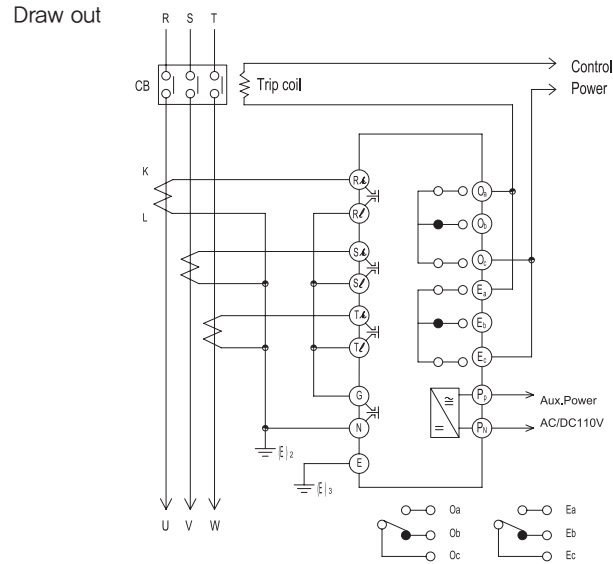
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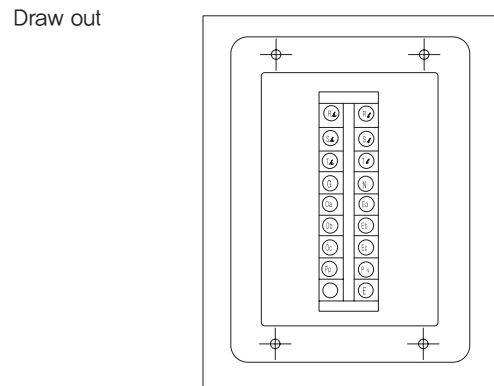
Block Diagram
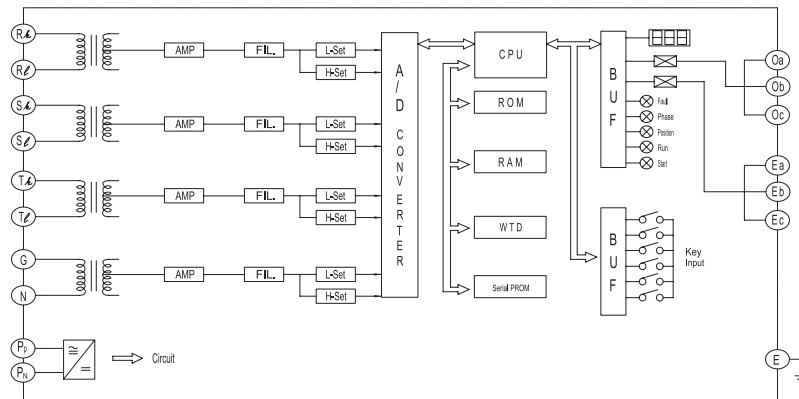
Wiring

Draw out

Terminal arrangment

Draw out

Dimension

Digital type draw out

Cutting Size: 165 X 122mm