

# INSTALLATION INSTRUCTION MANUAL EARTH FAULT/LEAKAGE RELAY



EFR/ ELR operates on current sensing principle & is used in electrical circuits & system where Earth Fault / Earth Leakage protection is required. These relay's are accurate, easy to set , compact & easy to installed. These relay's offers 1CO / 2CO Relay contact.

### MOUNTING

Rare mounted or Panel mounted or flush mounted.

### FUNCTION

The unit are provided with settable EF / EL current trip setting, Trip time delay & with provision of relay energizing on fault condition logic (NFS). Select external CT / CBCT to be installed in the system after considering EF/ EL current levels expected in systems circuit. External CT / CBCT should have secondary current rating as mentioned in specification. connect CT / CBCT secondary as per current rating & respective terminals shown in diagram. When the power is applied to the unit relay remains in de - energized condition. The relay energized immediately , when input current exceeds EF/ EL set level for selected trip time delay. The unit operates in manual reset mode hence for resetting it is necessary to press RESET push button provided on front side of unit. relay's offering remote reset facility also be resetted by using external no type remote reset push button.

### CAUTION

- Ensure that your relay is-
  - Not installed near any heat sources like Burner, Sunlight ,electric arc etc.
  - Not subjected to abnormal vibration.
  - Not subjected to direct rains, stormy wind & dust.
  - Installed as near to the starter as possible.

### FOR CONTACTOR -

The output relay NO contact are to be connected in series with no - volt coil of the contactor

### FOR CIRCUIT BREAKER -

In case of circuit breaker application, relay NO contacts are to be connected in series with shunt trip coil or NC contacts are to be connected in series with UV trip coil.

### TRIP TIME DELAY SELECTION

Refer specification

TECHNICAL SPECIFICATIONS	D2 EFR1	S2 CMR3	F3 EFR 1	S2 ELR 1	S2 ELR 2	S2CMR4	F3 ELR 2
1. Auxilliary Supply :	12 / 24 / 30 VDC ±10% 110 - 240 VAC/DC± 20 % 380/415/440 VAC ± 20 %	100 - 120, 220 - 240, 415 VAC± 20% 24VDC ± 20%	24 30VDC±10% 110/220/230/240VAC/DC ± 20% 380/415/440VAC ± 20%, 50Hz	100 - 120, 220 - 240, 415 VAC ± 20% 24 VDC ± 20%	100 - 120, 220 - 240, 415 VAC ± 20% 24 VDC ± 20%	100 - 120, 220 - 240, 415 VAC ± 20% 24 VDC ± 20%	24 / 30VDC ± 10% 110 - 240VAC/DC ± 20%
2. Rated Current Input :	5A /1A ( Selection Via. Terminals ) Terminal 1 & 2 : Current Input 5A Terminal 1 & 3 : Current Input 1A	5A /1A ( Selection Via. Terminals )	5A /1A ( Selection Via. Terminals )	0.03 To 30 A PRIMARY CURRENT INPUT THRO' MINILEC - ELR CBCT	30 To 300 mA PRIMARY CURRENT INPUT THRO' MINILEC - ELR CBCT	30 To 300mA PRIMARY CURRENT INPUT THRO' MINILEC - ELR CBCT	30 to 300mA viaCBCT
3. Frequency :	50 / 60 Hz, ± 3%	48 to 63 Hz.	50 / 60 Hz, ± 3%	50 Hz / 60 Hz.	50 Hz / 60 Hz.	50 Hz / 60 Hz.	50 / 60Hz, ± 3%
4. Power Consumption :	3 VA max.		3 VA max.		3 VA max.	3 VA max.	3 VA max.
5. Output Relay Contact :	1CO / (2 CO)	(2 CO)	1CO / (2 CO)	2CO.	2CO.	2CO / (1CO)	2CO / (1CO)
6. Output Contact Rating :	5A, 240 VAC ( Resistive )	5A, 240 VAC ( Resistive )	5A, 240 VAC ( Resistive )	5 Amp, 240VAC [RESISTIVE]	5 Amp, 240VAC [RESISTIVE]	5 Amp, 240VAC [RESISTIVE]	5 Amp, 240VAC [RESISTIVE]
7. Life Expectancy :	0.5 x 10 <sup>6</sup> operations at 100% rating	0.5 x 10 <sup>6</sup> operations at 100% rating	0.5 x 10 <sup>6</sup> operations at 100% rating				0.5x10 <sup>6</sup> operations at 100% rating
8. EF Trip Setting :	10% to 100% of rated Current Input (variable)	10% to 100% of rated Current Input (variable)	10% to 100% of rated Current Input (variable)				For current : -10% w.r.t. Set Value For trip delay : ±10% w.r.t. Trip time delay (SET VALUE)+100mS
9. Set Accuracy :	± 5% w.r.t. Current input of 100% ( Full scale)	± 5% w.r.t. Current input of 100% ( Full scale)	± 5% w.r.t. Current input of 100% ( Full scale)				
10. Trip Time delay :	0.1 Sec. To 1 Sec. ± 0.1 sec. OR 1 Sec. To 10 Sec. Optional for D2 EFR1	0.1 Sec. To 1 Sec. OR 1 Sec. To 10 Sec. (Optional)	0.1 Sec. To 1 Sec. OR 1 Sec. To 10 Sec. (Optional)	0.1, 0.2, 0.3, 0.4, 0.5, 0.6, 0.7, 0.8, 0.9, 1S	0.1, 0.2, 0.3, 0.4, 0.5, 0.6, 0.7, 0.8, 0.9, 1S	0.1, 0.2, 0.3, 0.4, 0.5, 0.6, 0.7, 0.8, 0.9, 1S	0.1, 0.2, 0.3, 0.4, 0.5, 1, 2, 5, 7, 10 sec
11. Reset :	Manual / Remote (For D2 EFR Only) Reset	Manual / Remote Reset	Manual / Remote Reset	MANUAL RESET	Manual Reset	Manual Reset	Manual /Remote Reset
12. Indication :	ON (Green) - ON EF ( Red ) - TRIP	ON (Green) - ON EF ( Red ) - TRIP	ON (Green) - ON EF ( Red ) - TRIP	POWER ON (GREEN) - ON ( STEADY ) EARTH LEAKAGE (RED) - EL ( STEADY )	POWER ON (GREEN) - ON ( STEADY ) EARTH LEAKAGE (RED) - EL ( STEADY )	POWER ON (GREEN) - ON ( STEADY ) EARTH LEAKAGE (RED) - EL ( STEADY )	ON (green) - Power ON EL ( red ) - Earth leakage Trip
13. Current Sensor :	Neutral CT/ CBCT/ Summation CT with secondary current Rating of 1A Or 5A ( Protection class)	Neutral CT/ CBCT/ Summation CT with secondary current Rating of 1A Or 5A ( Protection class)	Neutral CT/ CBCT/ Summation CT with secondary current Rating of 1A Or 5A ( Protection class)	MINILEC MAKE - ELR CBCT (ID SUPPORTED 35,70,120,150MM)	MINILEC MAKE - ELR CBCT	MINILEC MAKE - ELR CBCT	CBCT
14. Operating conditions :	Temperature : -5°C to 60°C Humidity : Upto 95% R.H.	Temperature : -5°C to 60°C Humidity : Upto 95% R.H.	Temperature : -5°C to 60°C Humidity : Upto 95% R.H.	TEMPERATURE = -5 °C TO +60 °C HUMIDITY = UPTO 95% Rh.	TEMPERATURE = -5 °C TO +60 °C HUMIDITY = UPTO 95% Rh.	TEMPERATURE = -5 °C TO +60 °C HUMIDITY = UPTO 95% Rh.	Temperature - -5 c to 60 c humidity - upto 95% R/H.
15. Enclosure :-	D2 / S2 series - ABS	F3 ENCLOSURE (ABS)	F3 ENCLOSURE (ABS)	S2 SERIES - ABS / PC - ABS	S2 SERIES - ABS / PC - ABS	S2 SERIES - ABS / PC - ABS	F3 ENCLOSURE (ABS)
16. Dimensions (mm) : OVERALL (L X W X D)	Overall : 76 x 56.5 x 117.5 Mounting : 68 x 46	90 x 35 x 60	overall cut out -96 X 96 X 80mm -92 X 92	90 x 35 x 60	90 x 35 x 60	90 x 35 x 60	overall cut out 96 X 96 X 80mm - 92 X 92 mm
17. Weight (approx) :	550 gms.	140 gms.	500 gms.	140 gms.	140 gms.	140 gms.	235gms (24 / 30 VDC MODEL), 265gms (110 - 240 VAC/DC MODEL)
18. SYSTEM SUPPLY VOLTAGE	100 / 110 / 120 VAC ± 20% 220 / 230 / 240 VAC ± 20% 380 / 415 / 440 VAC ± 20%	100 / 110 / 120 VAC ± 20% 220 / 230 / 240 VAC ± 20% 380 / 415 / 440 VAC ± 20%	100 / 110 / 120 VAC ± 20% 220 / 230 / 240 VAC ± 20% 380 / 415 / 440 VAC ± 20%	100 / 110 / 120 VAC ± 20% 220 / 230 / 240 VAC ± 20% 380 / 415 / 440 VAC ± 20%	100 / 110 / 120 VAC ± 20% 220 / 230 / 240 VAC ± 20% 380 / 415 / 440 VAC ± 20%	100 / 110 / 120 VAC ± 20% 220 / 230 / 240 VAC ± 20% 380 / 415 / 440 VAC ± 20%	100 / 110 / 120 VAC ± 20% 220 / 230 / 240 VAC ± 20% 380 / 415 / 440 VAC ± 20%
19. EL CURRENT TRIP SETTING	N.A.	N.A.	N.A.	0.03, 0.1, 0.3, 0.5, 1, 3, 5, 10, 20, 30A	30, 60, 90, 120, 150, 180, 210, 240, 270, 300mA	30, 60, 90, 120, 150, 200, 225, 250, 275, 300 mA	30, 60, 90, 120, 150, 200, 225, 250, 275, 300 mA
20. RESET GAP	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.
21. MOUNTING	DIN RAIL MOUNTING	Flush Fitting Panel Mounting	Flush Fitting Panel Mounting	DIN RAIL MOUNTING	DIN RAIL MOUNTING	DIN RAIL MOUNTING	Flush Fitting Panel Mounting
22. TEST MODE	TEST FACILITY BY TEST PUSH BUTTON	TEST FACILITY BY TEST PUSH BUTTON	TEST FACILITY BY TEST PUSH BUTTON	TEST FACILITY BY TEST PUSH BUTTON	TEST FACILITY BY TEST PUSH BUTTON	TEST FACILITY BY TEST PUSH BUTTON	TEST FACILITY BY TEST PUSH BUTTON
23. POWER DELAY	1-10 sec ± 1 sec (Adj). Only for S2 CMR3	N.A.	N.A.	N.A.	0.5 S ± 0.1 S	0.5 S ± 0.1 S	500mSec ± 100mSec

WARRANTY - AGAINST ALL MANUFACTURING DEFECTS FOR 18 MONTHS FROM DATE OF SUPPLY OR 12 MONTHS FROM INSTALLATION WHICHEVER IS EARLIER

D2 EFR / F3 EFR / S2 ELR1 / S2 ELR2 / F3 ELR2

SETTING OF EARTHFAULT RELAY

Typical Earthfault Relay Setting for electrical low voltage system of 415 V AC, 3 phase, 50 Hz, maximum demand of 150 kW at lagging power factor of 0.85 are shown below.

Power =  $\sqrt{3} \times V \times I \times \cos \phi$

Load Current =  $\frac{150 \times 1000}{1.732 \times 415 \times 0.85}$

Load Current = 245.50 Amps.

Current Transformer Selected = 300/5A, 15 VA, Class 5P10

Minilec make D2 EFR 1 is Provided with Earthfault current setting between 10% - 90%

Hence Earthfault at 10% setting =  $10\% \times 300A = 30Amps$

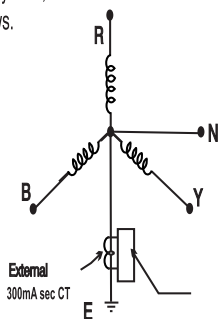
Similarly Earthfault at 30% setting =  $30\% \times 300A = 90Amps$

These are typical earthfault current calculations and settings shown as an example. Individual user can make the earthfault settings as per their requirement.

D2 EFR / F3 EFR / S2 ELR1 / S2 ELR2 / F3 ELR2

DIAGRAM

For Generator and Transformer application, with 3Ph-4W system, connection of CT can be made as follows.



OPERATIONAL DIAGRAM FOR EFR / ELR

Power (ON)  
EF% SETTING

Manual Reset

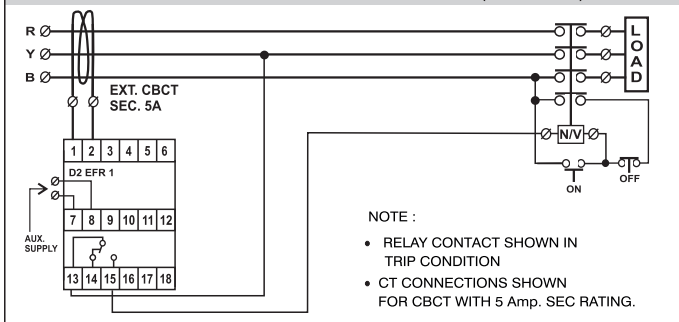
Relay

EF / EL LED

T1 : Trip Delay  
T2 : Unit is reset by pressing MANUAL /REMOTE reset push button switch.

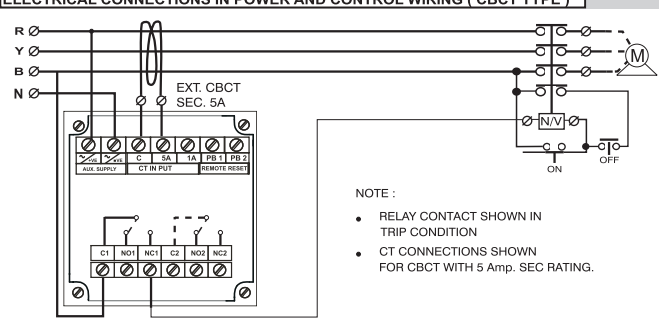
D2 EFR1

ELECTRICAL CONNECTIONS IN POWER AND CONTROL WIRING ( CBCT TYPE )



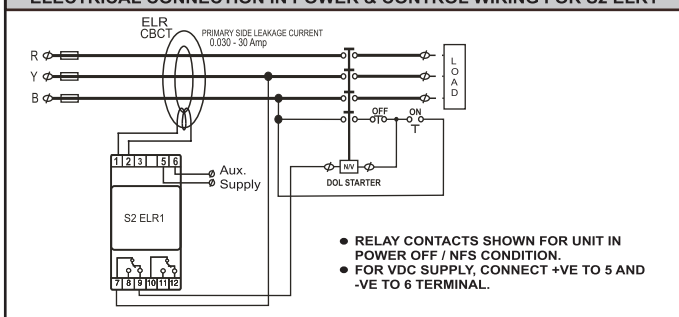
F3 EFR1 / F3 EFR2

ELECTRICAL CONNECTIONS IN POWER AND CONTROL WIRING ( CBCT TYPE )



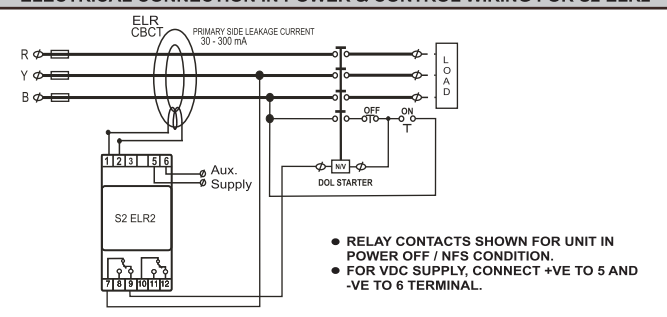
S2 ELR1

ELECTRICAL CONNECTION IN POWER & CONTROL WIRING FOR S2 ELR1



S2 ELR2

ELECTRICAL CONNECTION IN POWER & CONTROL WIRING FOR S2 ELR2



CONNECTION DIAGRAM

INDICATIONS :

ON : POWER ON

EF : EARTH FAULT TRIP

TERMINAL DETAILS

1-2 : CURRENT I/P FROM EXTERNAL CT 5 AMP SECONDARY.

1-3 : CURRENT I/P FROM EXTERNAL CT 1 AMP SECONDARY.

7-8 : AUX. SUPPLY FOR VDC CONNECT + VE TO 7

- VE TO 8

10-11 : EXTERNAL REMOTE RESET PUSH BUTTON ( NO TYPE )

13-14-15 : OUTPUT RELAY CONTACT ( C1- NO1 - NC1 )

16-17-18 : OUTPUT RELAY CONTACT ( C2 - NO2 - NC2 )

NOTE : UNIT WILL NOT OPERATE IN FAIL SAFE MODE.  
RELAY CONTACTS SHOWN FOR UNIT IN TRIP CONDITION.  
DOTTED PART SHOULD BE USED FOR 2 CO CONTACT ONLY.

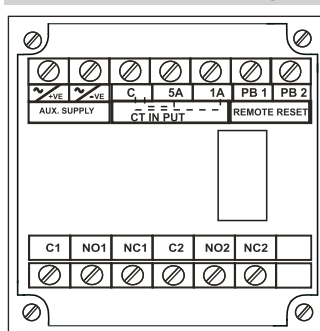
D2 EFR1

COMPLIANCE TO STANDARDS

	TEST	IEC STD.
1.	EFT Test of Auxiliary Supply	61000-4-4
2.	Surge Test of Auxiliary Supply	61000-4-5
3.	Voltage Interruption, Variation & Dip Test	61000-4-11
4.	ESD Test (Contact Discharge)	61000-4-2
	ESD Teast (Air Discharge)	61000-4-2
5.	H.V. Test (Dielectric Test)	60255-5
6.	Insulation Resistance Test	60255-5
7.	Dry Heat Test	60068-2-2
8.	Damp Heat test (Steady State)	60068-2-30
9.	Damp Heat test (cyclic test)	60068-2-78

CONNECTION DIAGRAM

F3 EFR1 / F3 EFR2



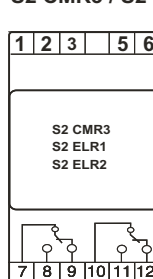
TERMINAL DETAILS

- ~/+VE, ~/-VE : AUX SUPPLY
- C1 - NO1 - NC1 : OUTPUT RELAY CONTACT. (1<sup>st</sup>)
- C2 - NO2 - NC2 : OUTPUT RELAY CONTACT. (2<sup>nd</sup>)
- C - 5A : CT INPUT 5A SECONDARY
- C - 1A : CT INPUT 1A SECONDARY
- PB 1, PB 2 : REMOTE RESET

INDICATION

- ON ( GREEN ) : POWER ON.
- EF ( RED ) : EARTH FAULT TRIP.

S2 CMR3 / S2 ELR1 / S2 ELR2



INDICATIONS :

ON : POWER ON

EF : EARTH FAULT TRIP

TERMINAL DETAILS

7-8-9: OUTPUT RELAY CONTACT ( C1- NO1 - NC1 )  
10-11-12: OUTPUT RELAY CONTACT ( C2 - NO2 - NC2 )

- TERMINAL 1 & 3 = 1Amp SECONDARY CT / CBCT  
1 & 2 = 5 Amp SECONDARY CT / CBCT
- FOR VDC SUPPLY, CONNECT +ve TO 5 & -ve TO 6 TERMINALS.
- RELAY CONTACTS SHOWN FOR UNIT IN POWER OFF / NFS CONDITION.

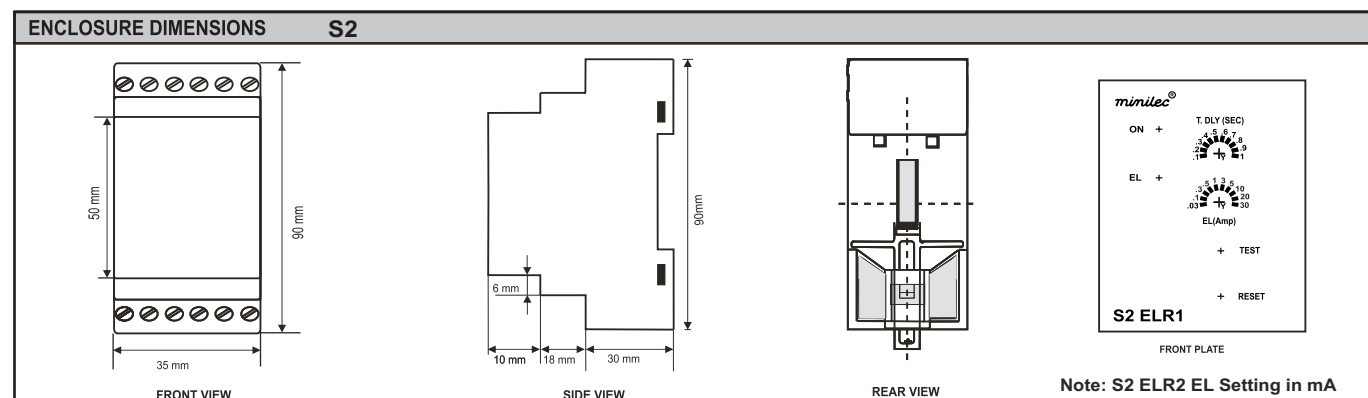
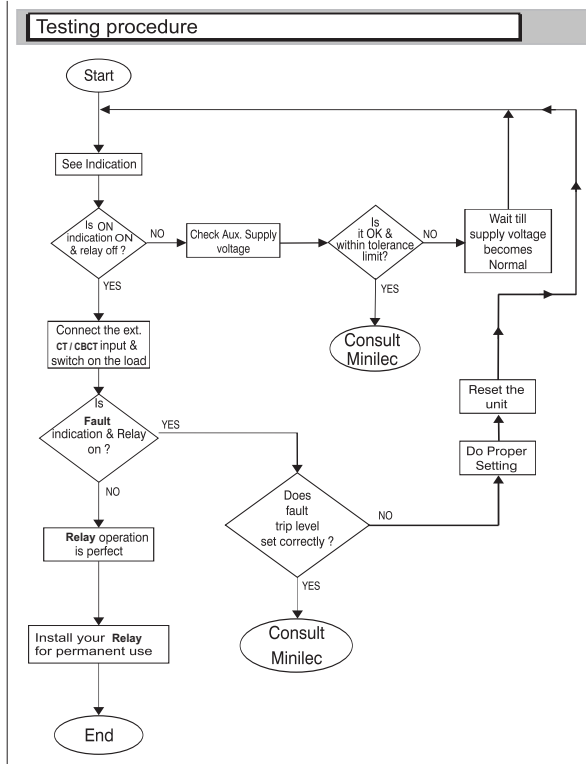
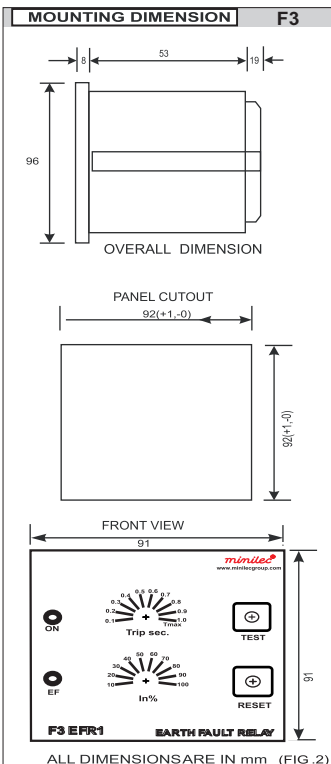
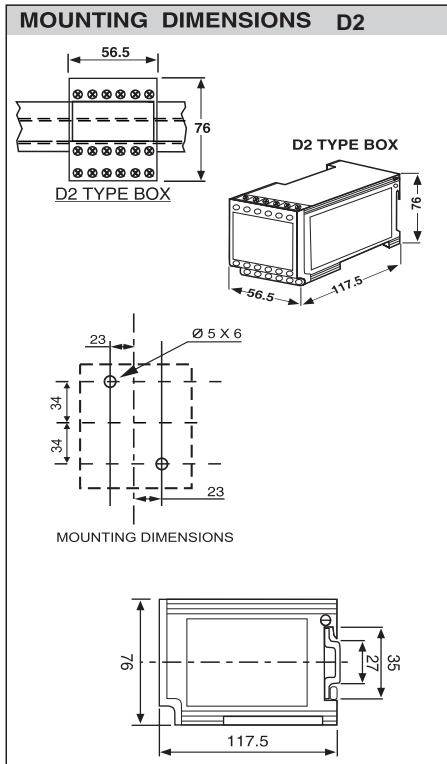


Table 1 - PROGRAMMING MODE SETTING

PRESS TEST/ RESET PUSH BUTTON FOR	S2 CMR3 LED STATUS		Mode
	ON LED	EF LED	
	●	○	Run Mode
≧ 8 SEC	☆	☆	Program Mode
≧ 4 SEC	●	●	Test Facility.
WAIT 3 SEC	○	○	Exit Test Mode.
≧ 4 SEC	—	—	Auto / manual Reset selection
≧ 4 SEC	●	○	● Auto Reset / ○ Manual Reset
≧ 4 SEC	☆	○	Fail Safe/ Non Fail Safe selection
≧ 4 SEC	● / ○	○	● Fail Safe / ○ Non Fail Safe
IF P. B. IS NOT PRESSED FOR > 10 SEC	☆	☆	AUTO EXIT program mode after flashing for 3 sec.

● LED ON      ○ LED OFF      ☆ LED FLASHING

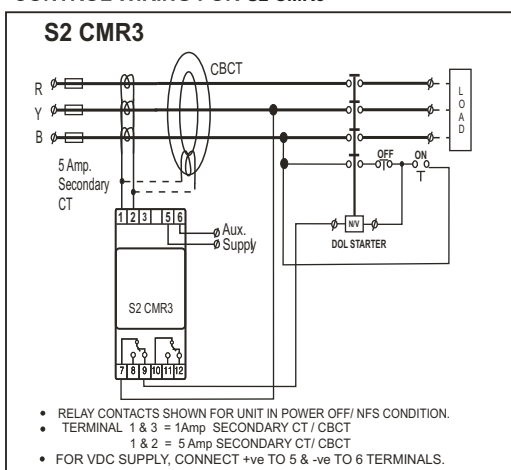
NOTE:- 1. BY PRESSING P. B. CONTINUOUSLY ENTER IN DESIRED MODE, SKIPPING IN BETWEEN MODES.  
2. S2 CMR2,3,4,5 BY DEFAULT IN NON FAIL SAFE MODE.

Instructions for Screw Gun torque adjustment -

- Torque should be 1 Nm max.
- Max 2.5 sq. mm size wire can be used.

### S2 CMR3

### ELECTRICAL CONNECTION IN POWER & CONTROL WIRING FOR S2 CMR3



WEEE (Waste Electrical & Electronic Equipment) Regulations: After end of equipment life, recycle or disposal needs to be done as per guidelines or handover it to Ewaste processing authorized agencies. For more details contact us.

**WARRANTY - AGAINST ALL MANUFACTURING DEFECTS FOR 18 MONTHS FROM DATE OF SUPPLY OR 12 MONTHS FROM INSTALLATION WHICHEVER IS EARLIER**

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