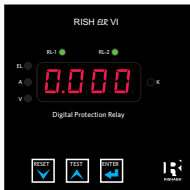


# Operating Manual

## Earth Leakage Relay



# EARTH LEAKAGE RELAY

## Programmable Multi-function Relay Installation & Operating Instructions

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## 1. INTRODUCTION

Earth Leakage Relay: -

The purpose of Earth-Leakage protection is to measure the Earth leakage current of an electrical installation, or part of an installation, and interrupt the power supply if the Earth-Leakage current becomes dangerous to property.

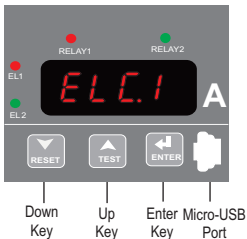
RISH Earth Leakage Relay with associated sensors (Core Balance Current Transformers), measure the leakage current in an electrical installation to detect levels that may be damaging. When used for protection, they cause an associated circuit breaker or switch to interrupt the supply of power to the protected system.

RISH Earth Leakage Relay may also be used to monitor earth-leakage in electrical insulation due to aging of cables or extensions in the installation. Continuous measurement of leakage currents makes it possible to plan maintenance on faulty circuits before an increase in the leakage currents leads to a complete shutdown of the installation.

Alarming / Monitoring Applications :-

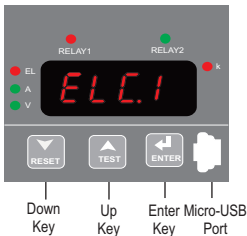
A need to set up the relay for an alarm only (but not protection) may be encountered in situations where an automatic shutdown would introduce additional hazards and therefore an operator must make the shutdown decision (e.g., continuous industrial processes, life-support equipment, or a fire pump circuit).

Critical processes of industrial machines can also benefit by application of RISH Earth Leakage Relay in alarm mode. In these cases, providing indication of higher than normal earth-leakage current can allow planned maintenance, rather than a costly disruption of production.



The Earth Leakage Relay can be programmed on site for four different parameters namely ELC.1 (Earth Leakage Current 1), ALR.1 (Alarm1), ELC.2 (Earth Leakage Current 2), ALR.2 (Alarm 2)

The front panel has three push button keys namely Reset/Down, Test/Up, Enter.



The ELR VI can be programmed on site for seven different parameters namely ELC.1 (Earth Leakage Current 1), ALR.1 (Alarm1), PH.OC (phase over current), PH.UC (phase under current), PH.OU (phase over voltage), PH.uU (phase under voltage), r.por (Reverse power).

The front panel has three push button keys namely Reset/Down, Test/Up, Enter.

ELR can be configured through PRKAB using standard Modbus protocol.

## 1.1 Display and Operating Elements

Meter Front	Element	Colour	Significance
	EI1 EL2	Bi-colour (Green / Red)	Earth Leakage Current 1 LED indication Earth Leakage Current 2 LED indication  <b>LED States -</b> Green - Healthy State Green (Flashing) - Reset Delay (applicable to ELR VI) Red - Fault present Red (Flashing) - Trip Delay
	RELAY 1 RELAY 2 RELAY	Bi-colour (Green / Red)	RELAY 1 LED (1CO+1CO only) RELAY 2 LED (1CO+1CO only)  <b>LED States -</b> Green - Healthy State Red - Fault / Alarm present
	RESET / ▼	-	RESET / DOWN Key (< 3 sec): Decrement values, move downwards in menu RESET / Down Key (> 3 sec): Reset relay in manual reset mode
	TEST / ▲	-	TEST/UP Key (<3 sec): Increment values, move upwa- rds in menu TEST / UP Key (> 3 sec): Switch relay contacts, resets to initial position when released
	ENTER / ◀	-	ENTER Key (< 3 sec): Confirm values, menu level changes ENTER Key (> 3 sec): Enter Setup mode

## 1.2 Models

### 1.2.1 Earth Leakage Relay

Features	ELR+	ELR
ELC.1(Earth Leakage Current 1)	✓	✓
ALr.1(Alarm 1)	✓	✓
ELC.2(Earth Leakage Current 2)	✓	X
ALr.2(Alarm 2)	✓	X

### 1.2.2 ELR VI model

Features	ELR VI	ELR VI (NE)
ELC.1(Earth Leakage Current 1)	✓	✓
ALr.1(Alarm 1)	✓	✓
OU (Over Voltage)	✓	✓
uU (Under Voltage)	✓	✓
OC (Over Current)	✓	✓
uC (Under Current)	✓	✓
r.Por (Reverse Power)	✓	X

✓ Available

X Not available

## 2. MEASUREMENT PARAMETERS

In normal operation, the user is presented with one of the measurement reading screens out of several screens. These screens may be scrolled through one at a time in incremental order by pressing the "⌚" key and in decremental order by pressing "Ⓢ" key.

TABLE 1 (A):

Measured Parameters of Earth Leakage Current:

Measured Parameters	Units
Earth Leakage Current 1	Ampere
Earth Leakage Current 2	Ampere
High / Low Earth Leakage Current 1	Ampere
High / Low Earth Leakage Current 2	Ampere

TABLE 1 (B):

Measured Parameters of ELR VI Model:

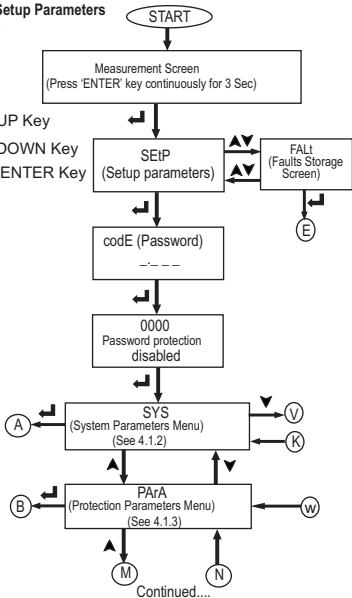
Measured Parameters	Units
Earth Leakage Current 1	Ampere
Voltage	Volt
Current	Ampere
Power	Watt

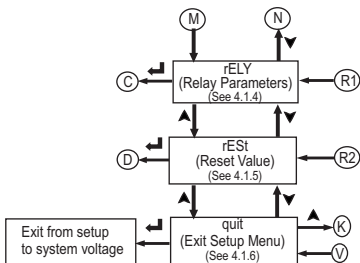


### 3. Flow Diagram: -

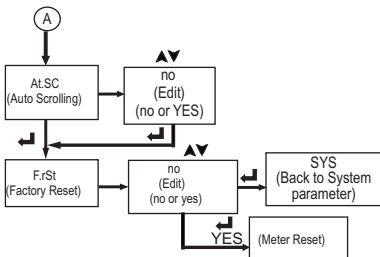
#### 3.1 Earth Leakage Relay: -

##### 3.1.1 Setup Parameters screen

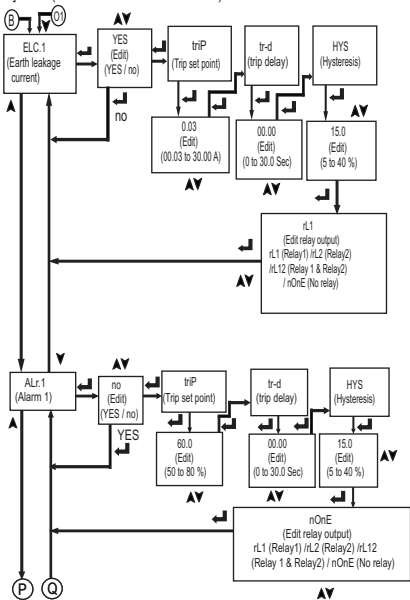


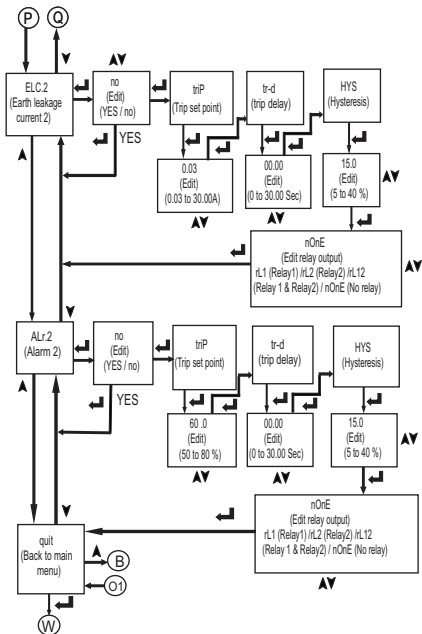


#### A) SYS (System Parameters Menu)

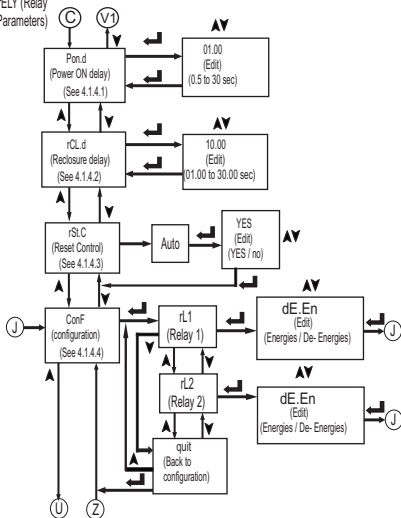


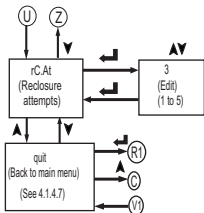
## B) PArA (Protection Parameters Menu)



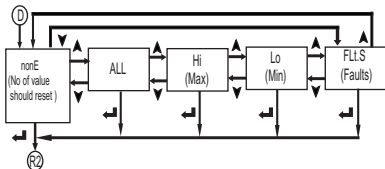


C] rELY (Relay Parameters)

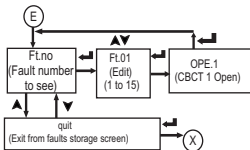




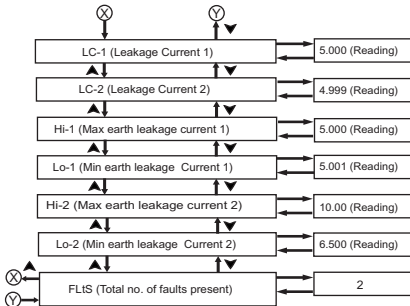
D) rEst (Reset Values)



### E] FALT (Faults Storage Screen)



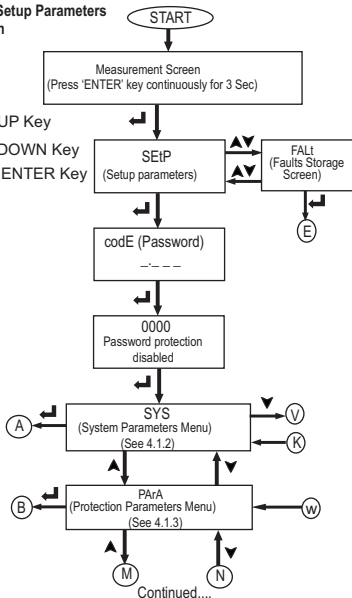
### 3.1.2 Measuring Parameters screens



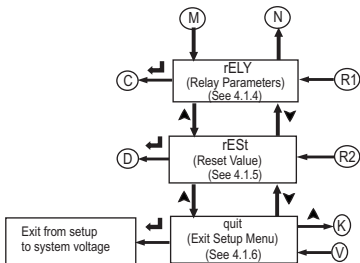
**Note:** - Display will toggle between Measuring parameter name and it's value.

## 3.2 ELR VI ( Earth Leakage Relay VI ) :-

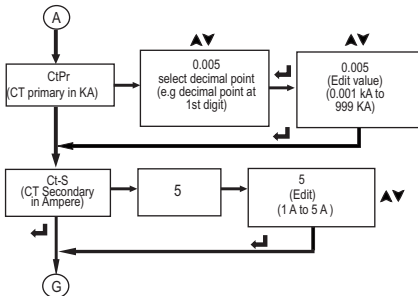
### 3.2.1 Setup Parameters screen

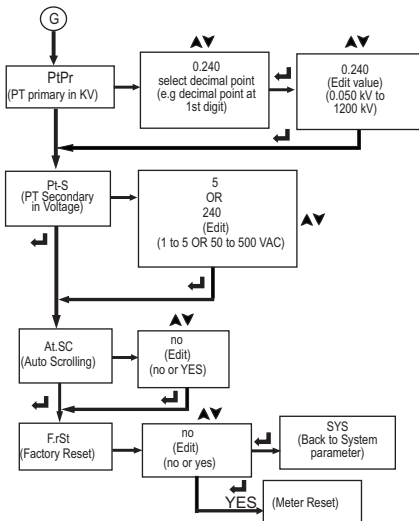






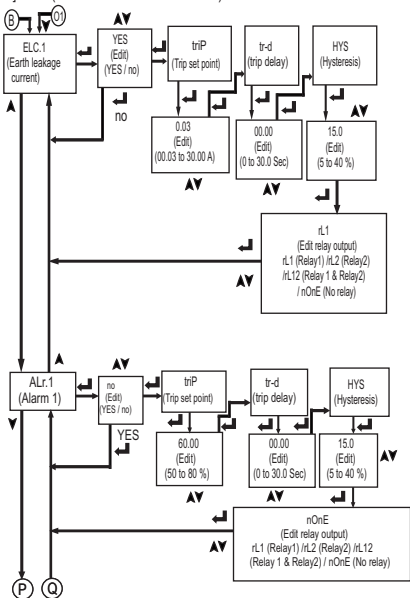
#### A) SYS (System Parameters Menu)

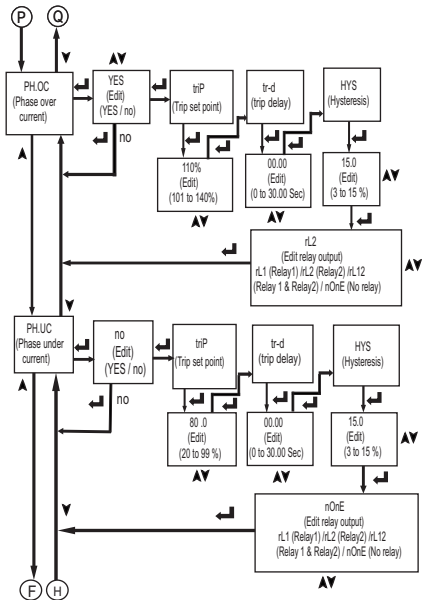




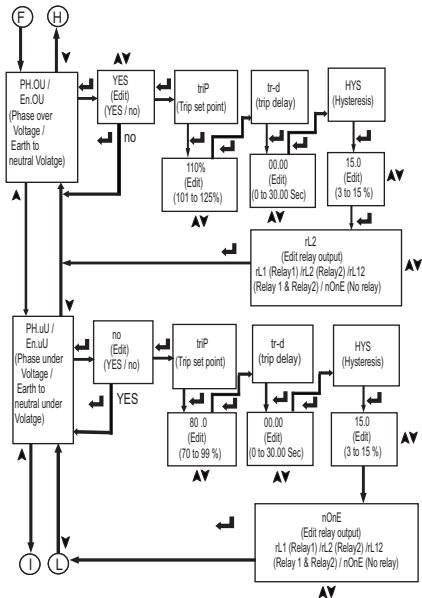
**Note: -** PT Primary is not applicable to ELR VI (NE).

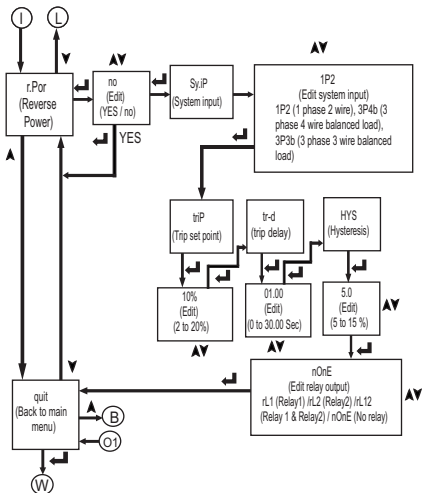
## B) PArA (Protection Parameters Menu)





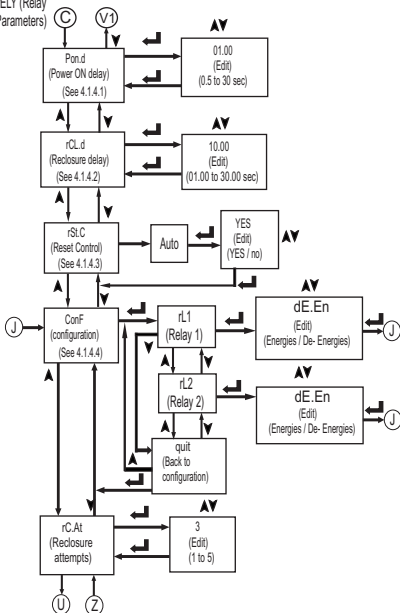
Continued....

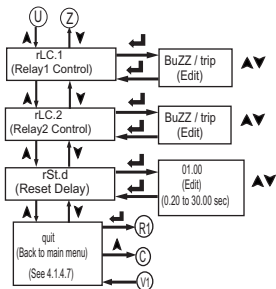




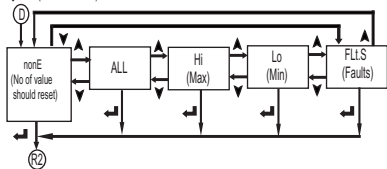
Note :- Reverse power is not applicable to ELR VI (NE) model.

C] rELY (Relay Parameters)

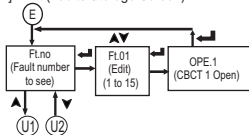




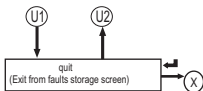
D) rESt (Reset Values)



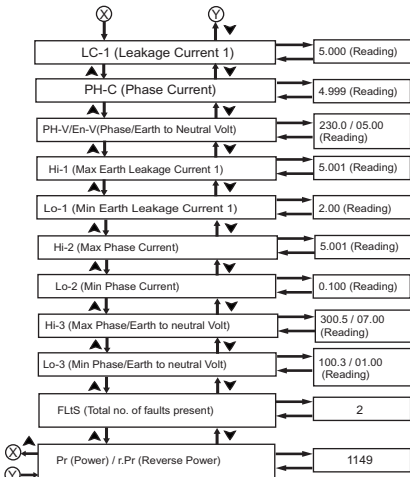
E) FALt (Faults Storage Screen)







### 3.2.2 Measuring Parameters screens



**Note:** - Display will toggle between Measuring parameter name and it's value.

## 4. PROGRAMMING

### 4.1 Menu Selection

The following sections comprise step by step procedures for configuring the RISH Relay according to individual user requirement.

#### 4.1.1 Password Protection



Fig No: - 1

To access the Set-Up menu press and hold "ENTER" key for 3 Seconds, the screen is shown in fig 1. On pressing "ENTER" key, meter will ask for password shown in fig 2.



Fig No: - 2

Then meter will enter into edit mode as shown in fig 3 (\*Denotes decimal Point is flashing).

Press "ENTER" key, by default password is set to "0000" as shown in fig 4.



Fig No: - 3

New Password Setting

Pressing "Ⓢ" key decrements digit value from 9 to 0. Value will wrap from 0 to 9.



Fig No: - 4

Pressing "Ⓣ" key increments digit value from 0 to 9, then value will wrap from 9 to 0.

Example: - For Setting New password "1234" follow the procedure. Press "Ⓣ" key or "Ⓢ" key once, to enter into password edit mode, screen is shown in fig 3 (\*Denotes decimal Point is flashing).



Fig No: - 5

Press "Ⓣ" key to increment first digit to '1' as shown in fig 5. Press "ENTER" key to confirm number 1, decimal point will shift to next digit. Press "Ⓣ" key to increment second digit to '2' as shown in fig 6. Press "ENTER" key to confirm digit 2.



Fig No: - 6

Press "Ⓣ" key to increment third digit to "3" as shown in fig 7.



Fig No: - 7

Press "ENTER" key to confirm digit "3".

Press "Ⓣ" key to increment fourth digit to "4" as shown in fig 8.



Fig No: - 8

Press "ENTER" key to confirm digit "4".

The image shows a rectangular box containing the text "SET" in a large, bold, black, sans-serif font.

Fig No: - 9

On pressing "ENTER" key new password will be set as shown in fig 9. On again pressing "ENTER" key meter will confirm new password & will go to SET UP menu.

For changing password at screen shown in fig 9, Press "7" key or "8" key and start from **"New Password Setting"**.

#### SETUP Menu

Press "7" key or "8" key to move through set up menu.

The image shows a rectangular box containing the text "SYS" in a large, bold, black, sans-serif font.

Fig No: - 10

"SYS" (System) menu allows user to select system parameters like "Auto", "Factory Reset". (for ELR, ELR+) (Refer Section 4.1.2.5 to 4.1.2.6)

OR

It allows user to select system parameters like "CT / PT Primary", "CT / PT Secondary", "Auto", "Factory Reset". (for ELR VI) (Refer Section 4.1.2.1 to 4.1.2.6)

The image shows a rectangular box containing the text "PArA" in a large, bold, black, sans-serif font.

Fig No: - 11

"PArA" (Parameter) menu allows user to select different fault parameters like "ELC.1" (Earth leakage current 1), "ALR.1" (Alarm 1), "ELC.2" (Earth leakage current 2), "ALR.2" (Alarm 2) (for ELR+ model) (Refer section 4.1.3)

OR

"ELC.1" (Earth leakage current 1), "ALR.1" (Alarm 1) (for ELR model) (Refer section 4.1.3)

OR

"ELC.1" (Earth leakage current 1), "ALR.1" (Alarm 1), "PH.OC" (Phase Over Current), "PH.uC" (Phase under Current), "PH.OU" (Phase Over Voltage), "PH.uU" (Phase Under Voltage), "r.Por" (reverse power) (for ELR VI model) (Refer section 4.1.3).

The image shows a rectangular box containing the text "rELY" in a large, bold, black, sans-serif font.

Fig No: - 12

"rELY" (Relay) menu allows user to select different Relay related parameters like "Pon.d" (Power ON delay),

"COnF" (Relay Configuration), "rC.At" (Reclosure attempts). (Refer section 4.1.4)

OR

It allows user to select different Relay related parameters like "Pon.d" (Power ON delay), "rCL.d" (Reclosure delay), "rSt.C" (Reset Control), "COnF" (Relay Configuration), "rC.At" (Reclosure attempts), "rLC.1" (Relay1 Control), "rLC.2" (Relay2 Control) (for ELR VI) (Refer section 4.1.4).



Fig No: - 13

"rEst" (Reset) menu allows user to reset different parameters like "ALL" (Min, max value of Earth Leakage Current, faults), "Hi" (High Earth Leakage Current, Alarm), "Lo" (Low Earth Leakage Current, Alarm). "FLt.S" (Faults). (Refer section 4.1.5)



Fig No: - 14

"quit" (Quit) menu allows user to quit from SETUP menu. (Refer section 4.1.6)



## 4.1.2 System Parameter Selection Menu

Fig No: - 15

"SYS" (System) menu allows user to set system related parameters.

On pressing "ENTER" key meter will enter into system parameters & ask for Auto scroll mode as shown in fig 29 (refer section 4.1.2.5) (for ELR, ELR+ model).

OR

It will ask for "CT primary" (refer section 4.1.2.1) (for ELR VI model).



Fig No: -16

### 4.1.2.1 Current Transformer (CT) Primary

This Screen "CtPr" (Current Transformer Primary) allows

user to set Current transformer's primary value in KA.

Kilo is indicated by annunciation of K LED. CT primary can be set from 1A to 999 KA.

After CtPr meter will show previously stored CT Primary value.

Setting New Current transformer's Primary Value:

Pressing "⑦" or "⑧" key, meter will enter into edit mode.

Pressing "⑦" or "⑧" key first time, meter will edit position of decimal point.

Pressing "ENTER" key will start decimal point blinking.

Pressing "⑦" key increments digit value & Pressing "⑧" key decrements digit value.

Pressing "ENTER" key will advance to next digit.

After setting Ct-Pr value meter will go to Current transformer's secondary setting refer section 4.1.2.2

#### 4.1.2.2 Current Transformer (CT) Secondary



This Screen "Ct-S" (Current transformer Secondary) allows user to set Current transformer's Secondary value in A.

Fig No: -17 The CT secondary can be set from 1A to 5A. After "Ct-S" as shown in fig 34, meter will show previously stored CT Secondary value.

Setting New Current transformer's Secondary Value.

Pressing "⑦" or "⑧" key, meter will enter into edit mode. Pressing "⑦" key increments digit value & Pressing "⑧" key decrements digit value.

Pressing "ENTER" key will set new CT secondary. On again pressing "ENTER" key meter will confirm new CT secondary.

After setting Ct-S value meter will go to the PT primary setting refer section 4.1.2.3 (for ELR VI) OR PT Secondary refer 4.1.2.4 (for ELR VI (NE))

#### 4.1.2.3 Potential Transformer (PT) Primary



This Screen allows user to set Potential Transformer's primary value in KV. K is indicated by annunciation of 'K' LED.

Fig No: -18 The PT primary can be set from 0.050 K VAC to 1200 KVAC. "PtPr" (Potential transformer primary) is shown in fig 18 &

meter will show previously stored PtPr value "0.415" (415 VAC) as shown in fig 18 and "K" LED will be lit which indicate in KV.

A digital display showing the number 0.415. The digits are black on a white background.

Fig No: -19

### Setting New Potential transformer's Primary Value.

Pressing "7" or "8" key, meter will enter into edit mode  
Pressing "7" key increments digit value & Pressing "8" key decrements digit value.

A digital display showing the number 0.415. A small star is positioned under the decimal point.

Fig No: -20

Example: - For setting new PtPr value to 0.230KV, follow the steps:

pressing "7" key or "8" key first time, meter will edit position of decimal point.

A digital display showing the number 0.415. A small star is positioned under the decimal point.

Fig No: -21

As shown in fig 19 decimal point is adjusted.

Pressing "ENTER" key will start blinking decimal point & editing of value as shown in fig 20.

Press "ENTER" key to advance to next digit as shown in fig No 21. (\*Denotes decimal Point is flashing).

A digital display showing the number 0.215. A small star is positioned under the decimal point.

Fig No: -22

Press "8" key to decrement digit to "2" as shown in fig 22.

Press "ENTER" key to advance to next digit as shown in fig 23.

A digital display showing the number 0.215. A small star is positioned under the decimal point.

Fig No: -23

Now press "7" key to increment digit to "3", as shown in fig 24. Press "ENTER" key to advance to next digit as shown in fig 25.

Press "8" key to decrement digit to "0" as shown in fig 26. On pressing "ENTER" key new PT primary will be



Fig No: -24

set as shown in fig 27. On again pressing "ENTER" key, meter will confirm new PT primary & will go to Potential Transformer's Secondary setting refer section 4.1.2.4



Fig No: -25

#### 4.1.2.4 Potential Transformer (PT) Secondary

This screen allows user to set potential transformer's secondary value in V. The PT secondary can be set from 50 V to 500 V (for **ELR VI**) OR from 1 V to 5 V (for **ELR VI(NE)**).



Fig No: -26

"Pt-S" (Potential transformer's secondary) is shown in fig 28. After "Pt-S" meter will show previously stored PT secondary value. (\*Denotes decimal Point is flashing).



Fig No: -27

Setting New Potential transformer's Secondary Value:  
Pressing "7" or "8" key, meter will enter into edit mode. Pressing "7" key increments digit value & Pressing "8" key decrements digit value.

Pressing "ENTER" key will advance to next digit. After setting Pt-S value meter will go to Auto scroll mode. (Refer Section 4.1.2.5)



Fig No: -28

#### 4.1.2.5 Auto Scroll



Fig No: -29

This Screen "At.SC" allows user to enable screen scrolling. After "At.SC" meter will show previously stored auto scrolling mode. (YES/NO)

Setting Auto scrolling mode:

Pressing "7" or "8" key, meter will enter into edit mode. Press "7" or "8" key to get "YES".

On pressing "ENTER" key Auto scrolling mode will be set. On again pressing "ENTER" key meter will confirm newly changed auto scrolling mode & go to Factory reset (refer section 4.1.2.6)

Note: - If faults are present auto scrolling mode will not work.

#### 4.1.2.6 Factory Reset



Fig No: -30

This Screen " F.rst " (Factory Reset) allows user to reset meter to factory default setting.

#### **Factory Resetting :-**

To Reset meter to factory default setting follow the procedure: -

Pressing "⑦" or "⑧" key, meter will enter into edit mode.

Example: -

Press "⑦" key to get "YES". On pressing "ENTER" key Meter will be reset to default setting (Refer section 6 for **Default settings**).



### 4.1.3 Parameter Selection Menu

#### 4.1.3.1 Parameters selection

"PARA" (Parameters selection) allows user to select 4 different parameters For (ELR + model) OR 2 different parameters For (ELR model) OR 7 different parameters For (ELR VI model) OR 6 different parameters for (ELR VI (NE) model).

Press "ENTER" key to enter into parameters selection screen.

Press "⌂" key or "Ⓢ" key to move through parameter selection menu.

By pressing "ENTER" key User can select the desired parameters (refer section 4.1.3.2).

"ELC.1"(Earth leakage current 1),"ALR.1"(Alarm 1),"ELC.2"(Earth leakage current 2),"ALR.2"(Alarm 2) for ELR+ model OR "ELC.1"(Earth leakage current 1),"ALR.1"(Alarm 1) for ELR model.

OR

"ELC.1"(Earth leakage current 1),"ALR.1"(Alarm 1),"PH.OC" (Phase Over Current), "PH.uC"(Phase under Current), "PH.OU" (Phase Over Voltage), "PH.uU" (Phase Under Voltage),(for ELR VI , ELR VI (NE)), "r.POR" (Reverse Power) (only for ELR VI model).

#### 4.1.3.2 YES/NO



Fig No: -31

This screen is used to activate OR Deactivate a parameter.

Disabled parameters are shown in fig 31.

Parameters Enable mode :-

To enabled parameters follow the steps: -

Pressing "⌂" or "Ⓢ" key, meter will enter into edit mode.

Example: -

Press "⌂" key to get "YES" on screen as shown in fig 32. On pressing "ENTER" key Selected parameters will be enabled as shown in fig 33.



Fig No: - 32



Fig No: -33

On again pressing "ENTER" key enabled parameters will be confirm & will go to "trip" (Trip point refer section 4.1.3.3) OR "Sy.Ip" (System input) in case of Reverse Power (refer section 4.1.3.8).

### 4.1.3.3 Trip Point

Pressing "⌵" or "Ⓢ" key, meter will enter into edit mode. Pressing "⌵" key increments digit value & Pressing "Ⓢ" key decrements digit value.

Pressing "ENTER" key will confirm new trip point. After setting new trip point meter will go to Trip delay setting (refer section 4.1.3.4)

TABLE 2 (B): ELR+

Parameters	Upper Limit	Lower limit
ELC.1(Earth Leakage Current 1)	30A	30mA
ALr.1(Alarm 1)	80%	50%
ELC.2(Earth Leakage Current 2)	30A	30mA
ALr.2(Alarm 2)	80%	50%

Note: ELR model has only ELC1 and Alarm1 parameters.

TABLE 2 (B): ELR VI

Parameters	Upper Limit	Lower limit
ELC.1 (Earth Leakage Current 1)	30A	30mA
ALr.1 (Alarm 1)	80%	50%
PH.OC (Phase Over Current)	140%	101%
PH.UC (Phase under Current)	99%	20%
PH.OU (Phase Over Voltage)	125%	101%
PH.uU (Phase under Voltage)	99%	70%
r.Por (Reverse Power)	20%	2%

Note: Reverse Power is not applicable to ELR VI (NE) model.

#### 4.1.3.4 Trip Delay

Pressing “⑦” or “⑧” key, meter will enter into edit mode. Pressing “⑦” key increments digit value & Pressing “⑧” key decrements digit value.

Pressing “ENTER” key will confirm new trip Delay.

After setting new trip Delay meter will goto Hysteresis (refer section 4.1.3.5)

Note: - 1. Alarm tripping delay will be Earth Leakage Current Trip delay.

2. If ELC (Earth Leakage Current) parameter is disabled then user can set Alarm delay upto 30 Sec.

TABLE 2 (B): ELR+

Parameters	Upper Limit	Lower limit
ELC.1(Earth Leakage Current 1)	30 sec	0 sec
ALr.1(Alarm 1)	30 sec	0 sec
ELC.2(Earth Leakage Current 2)	30 sec	0 sec
ALr.2(Alarm 2)	30 sec	0 sec

Note: ELR model has only ELC1 and Alarm1.

TABLE 2 (C): ELR VI

Parameters	Upper Limit	Lower limit
ELC.1(Earth Leakage Current 1)	30 sec	0 sec
ALr.1(Alarm 1)	30 sec	0 sec
PH.OC (Phase Over Current)	30 sec	0 sec
PH.UC (Phase under Current)	30 sec	0 sec
PH.OU (Phase Over Voltage)	30 sec	0 sec
PH.uU (Phase under Voltage)	30 sec	0 sec
r.Por (Reverse Power)	30 sec	0 sec

**Inverse-time tripping curve** (applicable to Earth Leakage Current) :-

The inverse-time tripping curve built into the RISH Earth Leakage Relay optimize protection of property and enhance continuity of service.

Protection is optimized because the higher the Earth Leakage current it detects, the faster the relay will operate.

Inverse Curve Formula:

$$\text{Relay Operating Time} = \text{Set Trip Delay} \times \frac{\text{Trip Set value}}{\text{Measured value}}$$

#### 4.1.3.5 Hysteresis

Pressing "⑦" or "⑧" key, meter will enter into edit mode. Pressing "⑦" key increments digit value & Pressing "⑧" key decrements digit value.

Pressing "ENTER" key will confirm new hysteresis.

After setting new Hysteresis meter will goto Relay assignment (refer section 4.1.3.6)

TABLE 2 (B): ELR+

Parameters	Upper Limit	Lower limit
ELC.1(Earth Leakage Current 1)	40% <sup>#</sup>	5%
ALr.1(Alarm 1)	40% <sup>#</sup>	5%
ELC.2(Earth Leakage Current 2)	40% <sup>#</sup>	5%
ALr.2(Alarm 2)	40% <sup>#</sup>	5%

Note:-

# Relay will reset at point 15mA or 40% of  $I_{n\Delta}$  whichever is greater.

1. ELR model has only ELC1 and Alarm1.

**2. For safety reasons, if relay has already tripped then it will not reset unless Earth Leakage Current is healthy i.e below hysteresis value. This is to prevent unnecessary relay chattering.**

Parameters	Upper Limit	Lower limit
ELC.1(Earth Leakage Current 1)	40% <sup>#</sup>	5%
ALr.1(Alarm 1)	40% <sup>#</sup>	5%
PH.OC (Phase Over Current)	15%	3%
PH.UC (Phase under Current)	15%	3%
PH.OU (Phase Over Voltage)	15%	3%
PH.uU (Phase under Voltage)	15%	3%
r.Por (Reverse Power)	15%	5%

## Hysteresis Calculation Method:

Example: -

A) For "OV" (Over Voltage)

PT Secondary = 100 V

Trip point = 105% of PT Secondary = 105 V

Hysteresis = 3% of PT Secondary = 3 V

Relay Reset point = Trip point - Hysteresis

= 105 - 3

= 102 V

B) For Leakage Current

Leakage Current setting = 10 A

Tripping point = 80% to 100% of set Leakage Current = 8 - 10 A

Hysteresis = 10% of set Leakage Current = 1 A

Relay Reset point = Tripping point - Hysteresis

= 8 - 1

= 7 A



Fig No: -34

### 4.1.3.6 Relay Assignment

This screen allows user to assign any fault to relay options like "none" (No), "rL1" (Relay 1), "rL2" (Relay2), "rL12" (Relay with two change Over Contacts).



Fig No: - 35

Pressing "⌚" or "Ⓢ" key, meter will enter into edit mode.

Example: -

To assign Relay 1 to any fault parameter follow the steps.



Fig No: - 36

When on screen (fig) 34 press "⌚" key to get "rL1" (Relay 1) as shown in fig 35. On pressing "ENTER" key Relay 1 will be assigned as shown in fig 36.

Note: - 1. Relay assigned to ELC will not be available in remaining parameters.

2. Relay assigned to Alarm will not be available in remaining parameters.

3. Relay assigned to "PH.OU" or "En.OU", "PH.uU" or "En.uU", "PH.OC", "PH.uC", "r.Por" will be available for each other but will not

available in ELC, Alarm.

For Example : - Relay 1 is assigned to ELC.1 then user can set only Relay 2, none to remaining parameters.

If Relay 2 is assigned to "PH.OV" or "En. OV" then user can set it to all except ELC1, Alarm1.



Fig No: - 37

#### 4.1.3.7 Quit

On pressing "ENTER" key meter will quit (Exit) from parameter selection menu.

#### 4.1.3.8 System input



This screen allows user to select three different options like 1P2 (1 phase 2 wire), 3P4b (3 phase 4 wire balanced load), 3P3b (3 phase 3 wire balanced load).

Press "7" key or "8" key to move through options in system input.

By pressing "ENTER" key selected options will be confirm & meter will go to trip point setting (refer section 4.1.3.3).

Note : - When system input is 1 phase 2 wire, 3 phase 4 wire PT Pri / Sec act as Line to neutral & if 3 phase 3 wire it acts as Line to Line.

On measurement screens if positive power is measured meter will show name "Pr" (+ve power) & its value and if negative power is measured meter will show name "r.Pr" (revesre power) & its value.



Fig No: -38

#### 4.1.4 Relay Setup Menu

This menu "rELY" (Relay) allows user to configure different relay related parameters.

When on "rELY" menu as shown in fig 38.

Press "ENTER" key to enter into relay related parameters selection screen.

Press "7" key or "8" key to move through relay related parameters

By pressing "ENTER" key User can select the desired parameters.

parameters like "Pon.d" (Power ON delay), "rCL.d" (Reclosure delay), "rSt.C" (Reset Control), "COnF" (Relay Configuration), "rC.At" (Reclosure attempts), "rLC.1" (Relay1 Control), "rLC.2" (Relay2 Control) (For ELR VI model). (refer section 4.1.4).



#### 4.1.4.1 Power ON Delay

This screen allows user to set Power ON delay from 0.5 Sec to 30 Sec.

Fig No: - 39

Pressing "7" or "8" key, meter will enter into edit mode. Pressing "7" key increments digit value & Pressing "8" key decrements digit value.

Pressing "ENTER" key will confirm new Power ON delay. Power ON Delay will be applicable only once when the meter is powered ON, and both relays rL1 & rL2 remain in tripped state during delay. After setting new Power On delay meter will go back to Power on delay screen (refer section 4.1.4.1)

TABLE 7:

	Upper Limit	Lower limit
Power ON Delay	30 Sec	0.5 Sec

#### 4.1.4.2 Reclosure Delay



This Delay is used between two Reclosure Attempts and available only in Auto Reset Control Mode.

This screen allows user to set Reclosure delay from 1 Sec to 30 Sec.

Fig No: - 40

Pressing "7" or "8" key, meter will enter into edit mode. Pressing "7" key increments digit value & Pressing "8" key decrements digit value.

Pressing "ENTER" key will confirm new Reclosure delay.

TABLE 8:

	Upper Limit	Lower limit
Reclosure Delay	30 Sec	1 Sec

#### 4.1.4.3 Reset Control



Screen (Fig 28 "rSt.C" (Reset Control) allows user to set Auto Reclosure mode or Manual mode.

Fig No: - 41



Fig No: - 42

In Auto mode Meter will automatically reset (reconnect) relay for the number of reclosure attempts after it enters into Manual Reset Mode.

In manual mode user can manually reset relay by Reset button for approx 3 to 5 sec.



Fig No: - 43

On pressing "ENTER" key meter will show previously stored Auto / manual mode. As shown in fig 43 Auto mode is enabled.

Example: -

Assign Relay Reset control in manual mode.

Pressing "⌚" or "Ⓢ" key, meter will enter into edit mode.

To disable Relay reset control in auto mode follow the steps.

Press "⌚" key to get "no" as shown in fig 44.

On pressing "ENTER" key Relay Reset control will be in manual mode.



Fig No: -44

After setting new Relay Reset control meter will go back to Relay reset control screen (refer section 4.1.4.3)

### **Working of Reclosure Delay, Reset Delay and Reclosure Attempts:**

Example:

Auto Reset Control = On, Trip Delay = 10 Sec, Reclosure Delay = 10 Sec and Reclosure Attempts = 2.

Assuming Fault condition has occurred, Relay is tripped after Trip Delay then Relay is reset (reconnect) after Reclosure Delay.

Now if Fault is still present then again Relay will trip after Trip Delay, then this will continue for the number of Reclosure Attempts. If it finds healthy condition at first attempt only then relay remains in Reset Mode only.



Fig No: - 45

#### **4.1.4.4 Relay Configuration**

This menu allows user to configure relay in energized or de-energized mode.

On Pressing "ENTER" key meter will show previously configured relay.

Example: Assign relay in energized mode.

Pressing "⌚" or "Ⓢ" key, meter will enter into edit mode. Press "⌚"



key to get "En" (energized mode) as shown in fig 45. On pressing "ENTER" key Relay will be configured in energized mode.

Note: - similarly user can configure relay in "dE.En" de-energized mode.

#### 4.1.4.5 Reclosure Attempts



Fig No: - 46

This screen allows user to set Reclosure attempts from 1 to 5.

Pressing "⌚" or "Ⓜ" key, meter will enter into edit mode.

Pressing "⌚" key increments digit value & Pressing "Ⓜ" key decrements digit value.

Pressing "ENTER" key will confirm new Reclosure attempts.

After setting new Reclosure attempts meter will go back to Reclosure attempts screen (refer section 4.1.4.5)

#### 4.1.4.6 Relay 1 Control



Fig No: - 47

This screen allows user to assign relay1 to trip mode or to buzzer mode.

On pressing Reset key / Ⓜ, if meter is in trip mode the relay will reset only when no fault is present, whereas in

buzzer mode the particular relay will reset immediately even if fault is present.

Note: - Relay 1 control is not applicable to Earth Leakage Current, Alarm.

On Pressing "ENTER" key meter will show previously configured relay control mode.

Example: -

After "rLC.1", for Assigning relay1 to trip mode follow the steps.

Pressing "⌚" or "Ⓜ" key, meter will enter into edit mode.



Fig No: - 48

Press "⌚" key to get "trip" (trip mode) as shown in fig 48.

On pressing "ENTER" key, relay 1 will be assigned to trip mode as shown in fig 49.

After setting new Relay control mode, meter will go back to Relay Control screen (refer section 4.1.4.6)



Fig No: - 49

#### 4.1.4.7 Relay 2 Control

Fig No: - 50

This screen allows user to assign relay2 to trip mode or to buzzer mode.

On pressing Reset key / Ⓢ, if meter is in trip mode the relay will reset only when no fault is present, whereas in

buzzer mode the particular relay will reset immediately even if fault is present.

Note : - Relay 2 control is not applicable to Earth Leakage Current, Alarm.

On Pressing "ENTER" key meter will show previously configured relay control mode.

Example: -

After "rL1", for Assigning relay2 to trip mode follow the steps.

Pressing "Ⓣ" or "Ⓢ" key, meter will enter into edit mode.

Fig No: - 51

Press "Ⓣ" key to get "trip" (trip mode) as shown in fig 51.

On pressing "ENTER" key, relay 1 will be assigned to trip mode as shown in fig 52.

After setting new Relay control mode, meter will go back to Relay Control screen (refer section 4.1.4.5)

Fig No: - 52

#### 4.1.4.8 Reset Delay

This screen allows user to set reset delay from 0.2 Sec to 30 Sec.

Pressing "Ⓣ" or "Ⓢ" key, meter will enter into edit mode.

Pressing "Ⓣ" key increments digit value & Pressing "Ⓢ" key decrements digit value.

Pressing "ENTER" key will confirm new Reset delay.

After setting new Reset delay meter will go back to Reset delay screen (refer section 4.1.4.8)

Fig No: - 53

#### 4.1.4.9 Quit

On pressing "ENTER" key meter will quit (Exit) from Relay SETUP menu .

Fig No: - 54

#### 4.1.5 Reset menu

Screen (Fig) 54 " rEST " (Reset) function allows user to reset High, Low Earth Leakage Current 1 & 2, stored faults.

Press "ENTER" key screen will show "nonE" (No) as shown in fig 55.

Fig No: - 55

Fig No: - 56

Press "⌚" key or "Ⓢ" key to move through options in Reset Menu.

Fig No: - 57

Options in Reset menu are: -

**none:** - No

**ALL** - All values.

**Hi** - High values.

**Lo** - Low values.

**FLtS** - Stored Faults.

Fig No: - 58

By pressing " ENTER " key User can Reset values from the selected options.

Fig No: - 59

Fig No: - 60

#### 4.1.6 Quit Screen

On pressing "ENTER" key meter will quit (Exit) from main menu.

The image shows a digital display with the text "FALt" in a large, bold, monospace font. The letters are black on a white background.

## 4.2 Faults

### 4.2.1 Fault Number

Fig No: - 61

Screen (Fig) 61 " FALt " (Fault) shows stored faults & corresponding response value.

When on "FALt" menu as shown in fig 61,

pressing "⌂" key OR "Ⓢ" will go to "quit" (quit) menu refer section 4.2.2 as shown in fig 60.

When on "quit" menu as shown in fig 60, pressing "⌂" key OR "Ⓢ" will go to "FALt" (Fault) menu refer section 4.2.1 as shown in fig 61.

The image shows a digital display with the text "Ft.no" in a large, bold, monospace font. The letters are black on a white background.

Fig No: - 62

When on fault menu, pressing "ENTER" key meter will show "Ft.no" (Fault numbers) as shown in fig 62. This function will show Last 15 faults.

**Example:** - To know the name of first fault & it's details follow the steps: - Pressing "⌂" or "Ⓢ" key, meter will enter into edit mode.

The image shows a digital display with the text "Ft.0.1" in a large, bold, monospace font. The letters are black on a white background.

Fig No: - 63

Pressing "⌂" key increments digit value & Pressing "Ⓢ" key decrements digit value.

To access this Set Up press "Enter" key, meter will show "Ft.01" (Fault1) as shown in fig 63. (\* denotes decimal point is flashing).

On pressing "ENTER" key meter will show fault name.

Pressing "⌂" or "Ⓢ" key, meter will show all fault parameters values.

Note : - 1. If Logged fault is Reverse power then meter will show r.Por, PH-C, PH-V (in case of ELR VI model) or En-V (in case of ELR VI NE model) values else it will show ELC1, PH-C, PH-V or En-V values.

2. Faults are stored in First In First Out (FIFO) order which means the latest fault is always stored on first location and previous faults get shifted downwards.

The image shows a digital display with the text "Quit" in a large, bold, monospace font. The letters are black on a white background.

Fig No: - 64

### 4.2.2 Quit

On pressing "ENTER" key meter will quit (Exit) from fault menu & go to measurement parameters menu.

### 4.3 Other Indications



Fig No: - 65

When input exceeds 33 Amp in Earth Leakage Relay, 127 % PT Secondary, 145% of CT Secondary meter will show "-OL-" (Over Load), If power exceeds 9999 K meter will show "-OL-" (Over Load) as shown in fig 65.

Caution: - Input should not exceed upper limits of Earth Leakage Current specified above.

## 5. OTHER FEATURES

### 5.1 Test Relay operations

"TEST" (Test) feature allows user to test relay operation when healthy inputs are applied i.e no fault is present.

To Test relay operations follow the steps: -

On pressing "TEST / Ⓣ" key for 3 seconds, all relay contacts will switch positions & Relay1, Relay2 LEDs will turn ON, and on releasing will return to initial state.

### 5.2 Manual Reset

When "Reset / Ⓜ" key is pressed continuously for 3 Sec the manual reset will be acknowledged and when the fault condition is no longer present, the relay will automatically reset.

Note: - To access this feature, Relay reset control should be set as "no".

### 5.3 CBCT Open Detection

Rish Earth Leakage Relay offers CBCT open detection feature to both Earth Leakage Current 1 & 2.



Fig No: - 66

If CBCT 1 of ELC.1 is not connected to input terminals (refer connection diagram) meter will flash "OPE.1" (CBCT 1 open) message as shown in fig 66 & operates associated Relay. Similarly when CBCT2 of ELC.2 is not connected meter will flash "OPE.2" (CBCT 2 open) .

Note : -CBCT open detection feature will be enabled if ELC parameter is enabled.

## 6. DEFAULT SETTINGS / On FACTORY RESET

TABLE 6 (A):

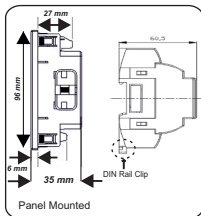
Parameters	Default values
Earth leakage Current Trip point	30 mA
Alarm Trip point	60%
Hysteresis	15% / 5%*
Power ON Delay	1 Sec
Trip Delay	0 Sec / 1 Sec*
Reclosure Delay	10 Sec
Reclosure attempts	3
Relay Reset Options	Autoreclosure
Relay Configuration mode	De - Energize
Trip Setting For Over Voltage	110%
Trip Setting For Under Voltage	80%
Trip Setting For Over Current	110%
Trip Setting For Under Current	80%
CT Primary	5 A
CT Secondary	5 A
PT Primary	0.240 kV
PT Secondary	240 V / 5 V
Auto Scrolling	Disabled
Reset Delay	1 Sec
Relay Control mode	Trip
Earth Leakage Current 1	Enabled
Alarm 1	Disabled
Earth Leakage Current 2	Disabled
Alarm 2	Disabled
Phase / Earth to neutral Over Voltage	Enabled
Phase / Earth to neutral Under Voltage	Disabled
Phase Over Current	Enabled
Phase Under Current	Disabled
Reverse Power	Disabled

\*Applicable for Reverse Power.

Note : - 1. Above mentioned default settings are applicable as per their model.

2. PT Primary is not applicable to ELR VI (NE) model.

## 7. INSTALLATION



### Caution

1. In the interest of safety and functionality this product must be installed by a qualified engineer, abiding by any local regulations.
2. Voltages dangerous to human life are present at some of the terminal connections of this unit. Ensure that all supplies are de-energized before attempting

Protection Relay can be mounted on a top-hat rail or directly on to wall by mounting plate.

The front of the enclosure conforms to IP 20.

The terminals of the product should be protected from liquids.

The Meter should be mounted in a reasonably stable ambient temperature and where the operating temperature is within the range  $-10$  to  $55^{\circ}\text{C}$ . Vibration should be kept to a minimum and the product should not be mounted where it will be subjected to excessive direct sunlight.

### 7.1 EMC Installation Requirements: -

This product has been designed to meet the certification of the EU directives when installed to a good code of practice for EMC in industrial environments, e.g.

1. Screened output and low signal input leads or have provision for fitting RF suppression components, such as ferrite absorbers, line filters etc., in the event that RF fields cause problems.

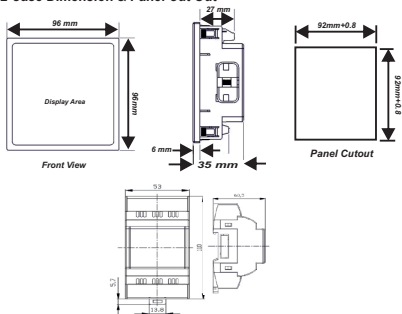
Note: It is good practice to install sensitive electronic instruments that are performing critical functions, in EMC enclosures that protect against electrical interference which could cause a disturbance in function.

2. Avoid routing leads alongside cables and products that are, or could be, a source of grounded interference.
3. To protect the product against permanent damage, surge transients must be limited to  $2\text{kV}$  pk. It is good EMC practice to suppress

automatically recover in the event of a high level of transients. In extreme circumstances it may be necessary to temporarily disconnect the auxiliary supply for a period of greater than 5 seconds to restore correct operation. The Current inputs of these products are designed for connection in to systems via Core Balance Current Transformers only, where one side is grounded.

4. ESD precautions must be taken at all times when handling this product.

## 7.2 Case Dimension & Panel Cut Out



## 7.3 Wiring

Input connections are made directly to screw-type terminals with indirect wire pressure. Numbering is clearly marked on the connector. Choice of cable should meet local regulations. Terminal for Current inputs will accept upto  $4\text{mm}^2$  (12AWG) solid or  $2.5\text{mm}^2$  stranded cable.

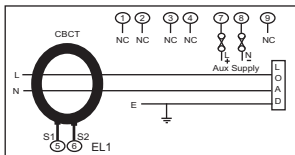
## 7.4 Auxiliary Supply

Meter should ideally be powered from a dedicated supply.

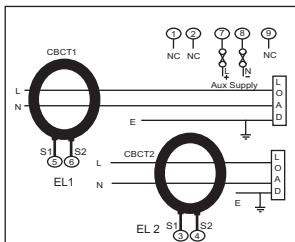


## 8. CONNECTION DIAGRAMS

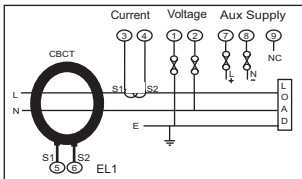
### A) DIN RAIL MOUNTABLE ELR:



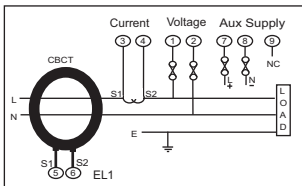
RISH ELR



RISH ELR+

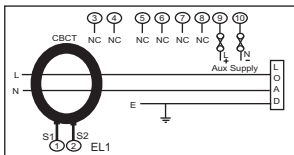


RISH ELR - VI (For Earth to Neutral Voltage Measurement)

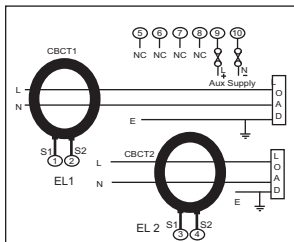


RISH ELR-VI

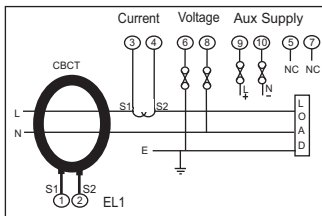
## B) PANEL MOUNTABLE ELR:



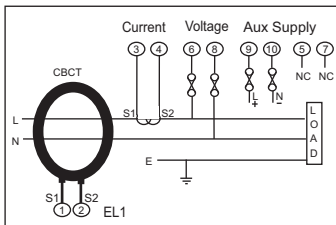
RISH ELR



RISH ELR+



**RISH ELR - VI (For Earth to Neutral Voltage Measurement)**



**RISH ELR-VI**

## 9. TECHNICAL SPECIFICATIONS

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### Input

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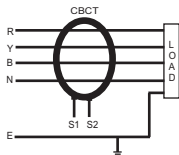
Leakage current ( $I_{\Delta n}$ )	30mA to 30 A (through CBCT)
Tripping Range	80% to 100% of ( $I_{\Delta n}$ )
Alarm Tripping Range	80% to 100% of Alarm trip point
ELR - VI model	
Nominal Input Voltage (AC RMS)	5 V AC (for Earth to Neutral Voltage measurement), 500 (V AC).
Max Continuous Input Voltage (OL Indication)	127% of PT Secondary
System PT Secondary range	1V to 5 VAC, 50V to 500 V programmable on site (as per resp. model).
System PT Primary range	50 to 1200 kV programmable on site. ( <b>Note:</b> - Not applicable for 1 to 5V AC input).
Nominal Input Current (AC RMS)	5 A
Max Continuous Input Current (OL Indication)	145% of CT Secondary
System CT Secondary Values	1 A to 5 A programmable on site
System CT Primary Values	1A to 999 kA programmable on site
Operating Frequency Ranges	45 to 66 Hz
Input Voltage Ranges	50% to 125% of Pt Secondary
Input Current Ranges	20% to 140% of Ct Secondary

### Auxiliary Supply

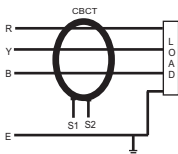
---

Higher Aux	60 V – 300V AC-DC
Lower Aux	20 V – 60 VDC / 20 V – 40 VAC
Aux supply frequency	45 to 66 Hz range

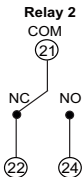
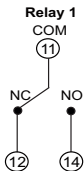
3 Phase 4 wire connection



3 Phase 3 wire connection



## RELAY CONNECTIONS :



**Note-** Relay Contacts are shown in power off condition

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## VA Burden

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Input Voltage Burden	< 0.6VA approx.
Input current burden	< 0.25 VA approx. per phase
Auxiliary supply burden	< 4 VA approx for AC aux. < 4 W approx for DC aux.

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## Reference condition for Accuracy :

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Reference Condition	23°C +/- 2°C
Input waveform	Sinusoidal (distortion factor 0.005)
Input Frequency	50 or 60 Hz $\pm 2\%$
Auxiliary supply voltage	230 VAC / DC $\pm 1\%$
Auxiliary supply frequency	50 or 60 Hz $\pm 1\%$

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## Accuracy :

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Leakage Current	$\pm 5\%$ of Full Scale
Voltage	$\pm 1\%$ of nominal value
Input Current	$\pm 1\%$ of nominal value
Power	$\pm 2\%$ of nominal value
Trip, Pre Alarm, Autoreclosure time delays (for Leakage Current)	$\pm 5\%$ of Set Delay or $\pm 50\text{msec}$ (whichever is greater).
Power ON delay	$\pm 140\text{ msec}$ or $\pm 5\%$ of Set Delay,
Reset, Trip (for Voltage & Current) time delays	Whichever is Greater (WIG)
Instantaneous tripping (Applicable for Leakage tripping)	$< 25\text{msec}$ for leakage current greater than 5 times of set value

**Note: - ELR can be configured through PRKAB using standard Modbus protocol.**

## 10. Core Balance Current Transformer (CBCT):-



RISH TWE - 73/30(50)



RISH TWE - 95/50(40)



RISH TWE - 135/85(30)



RISH TWE - 165/130(30)



RISH TWE - 260/200(22)



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**Mechanical Attributes :**

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Weight <300g Approx.

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**Applicable Standards:**

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Testing as per	IEC 60947- 2, Annex - M
EMC	IEC 61326-1:2012, Table 2
Immunity	IEC 61000-4-3. 10V/m min – Level 3 industrial Low level
Safety	IEC 61010-1-2010, Permanently connected use
IP for water & dust	IEC60529
Pollution degree:	2
Installation category:	300V CAT III / 600V CAT II
High Voltage Test	2.2 kV AC, 50Hz for 1 minute between all Electrical circuits.

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**Environmental :**

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Operating temperature	-10 to +55°C
Storage temperature	-25 to +70°C
Relative humidity	0... 95% non condensing
Shock	15g in 3 planes
Vibration	10... 55 Hz, 0.15mm amplitude
Enclosure	IP20 (front face only)

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**Relay Contacts :**

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Types of output	1CO, 2CO, 1CO+1CO
Contact Ratings (Res. Load)	5A/250VAC/30VDC
Mechanical Endurance	1x10 <sup>7</sup> OPS
Electrical Endurance	NO- 3x10 <sup>4</sup> OPS for 1CO / 1CO+1CO relay NC- 1x10 <sup>4</sup> OPS 1x10 <sup>5</sup> OPS for 2CO relay

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Maximum Cable Length for connection between Meter and CBCT  
: <1 Mtr

Note: - Use Twisted pair shielded cable.  
(Not to be run parallel to power cables).

## Models : -

- > RISH TWE - 73/30(50)
- > RISH TWE - 95/50(40)
- > RISH TWE - 135/85(30)
- > RISH TWE - 165/130(30)

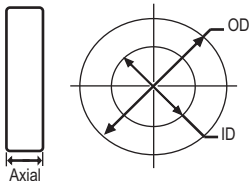
## Features: -

- > Slim Design
- > Encapsulated CBCT
- > Compact in size
- > Light in Weight

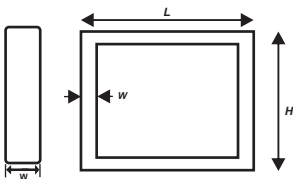
## CBCT Specifications: -

CBCT Type	: Closed Toroid
Turns Ratio	: 600 / 1A
Rated Current	: 30A
System Voltage	: 720 V maximum
System Frequency	: 50 Hz or 60 Hz
Insulation Voltage	: 3kV for 1 minute
Distance Between CBCT and ELR	: < 1 meters
Operating Temperature	: -10°C to +55°C

Dimensions :-



CBCT	Dimensions (in mm)			Current Ranges
	OD	ID	Axial	
RISH TWE - 73/30(50)	73	30	50	30mA to 30A
RISH TWE - 95/50(40)	95	50	40	30mA to 30A
RISH TWE - 135/85(30)	135	85	30	30mA to 30A
RISH TWE - 165/130(30)	165	130	30	500mA to 30A



CBCT	L	H	W	Current Ranges
RISH TWE - 260/200(22)	260	200	22	30mA to 30A

## NOTE

The information contained in these installation instructions is for use only by installers trained to make electrical power installations and is intended to describe the correct method of installation for this product.

However, 'manufacturer' has no control over the field conditions which influence product installation. It is user's responsibility to determine the suitability of installation method in the user's field condition, 'manufacturer' only obligations are responsibility to determine suitability of the installation method in the user's field conditions. 'Manufacturer' only obligations are those in manufacturer standard conditions.

'Manufacturer' only obligations are those in 'Manufacturer' standard condition of sale for this product and in no case will 'Manufacturer' be liable for any other incidental, indirect or consequential damages arising from the use or misuse of the products.