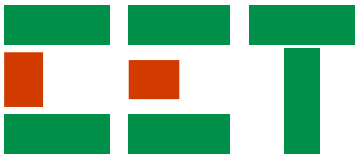
iRelay 50-P
Overcurrent Relay
User Manual



CET Electric Technology Inc

Danger and Warning

This device can be installed by the professional personnel only. For any failure caused due to the non-compliance with the instructions in this Manual, we will not bear any responsibility.

Important Notes

Thank you for using the product of CET Electric Technology Inc. In order to use iRelay 50-P safely, correctly and efficiently, please pay attention to the following important notes:

1) The User Manual is only applicable to the iRelay 50-P protection relay.

2) Please read the User Manual carefully, and carry out setting, testing and operation according to the User Manual. If some documents are provided together with iRelay 50-P, they shall prevail.

3) Never insert or pull out each plug-in unit of iRelay 50-P, or touch the chip and components on printed circuit board when iRelay 50-P is charged, in order to prevent damage of iRelay 50-P.

4) Please test and check iRelay 50-P with qualified testing instrument and equipment.

5) In case iRelay 50-P has any abnormality, please contact our after-sales technical service (0086-400-9916-218) in time.

6) The default password set for iRelay 50-P is: 0001.

We have checked relevant contents of this manual. As it is impossible to avoid all errors, we cannot guarantee the complete consistency of the manual with actual device. The data in the manual will be reviewed periodically and necessary amendments will be made in the documents of new version. You are welcomed to bring forward suggestions on amendments. The change of later versions won't be notified.

Table of Contents

1. Introduction

1.1. Overview

iRelay 50-P is a multifunctional protection relay developed meticulously by CET and applicable to medium-voltage ring main unit, distribution substation, switching station, etc. iRelay 50-P adopts high-end configuration in hardware design, and low-power consumption processor, and high-performance synchronous sampling A/D. iRelay 50-P does not require auxiliary voltage supply and can import its power supply from the current transformers, it applies to the situations of no auxiliary power but needs numerical relays very conveniently. It can substituted for tradition protection mode of fuse + load switch, it improve the protection of load remarkably.

1.2. Features

- Adopting high-performance 32-bits embedded processor with low-power consumption, 16-bits high-performance synchronous sampling A/D, big-capacity high-speed non-volatile memory chip with infinite number of reading and writing times, big liquid crystal display, graphical interface;
- Abundant and reliable protection relays, delay of device power on to instantaneous overcurrent relay operation is less than 100ms;
- Extremely low consumption of power from the current transformers, merely 50mA is needed for steady running;
- Because of its compact construction, iRelay 50-P can be installed in kinds of incomprehensive cabinet conveniently;
- Supporting MODBUS-RTU protocol;
- Perfect remote control and central signal output functions: It's available to control the switch through communication port and device panel;
- Big capacity, and 256 entries of event logs supporting classified query (resolution 1ms);
- iRelay 50-P software and hardware have perfect self-check function;
- It supports online software upgrading;
- On chip hardware watchdog keeps a watch on the system of iRelay 50-P functioning and resets it in case of its failure.
- Fully-closed case is adopted to completely separate strong and weak current. Corresponding anti-interference measure is adopted for software to realize top grade of various criteria of electromagnetic compatibility;
- Meeting the most adverse application environment: Meeting the requirement of wide operating temperature (-25℃~+70℃).

1.3. Functions List

Table 1-1 Functions List

iRelay 50-P	Detailed Description
Inputs and outputs	4-channel current inputs: IA, IB, IC, IN 3-channel current inputs for power supply: I1,I2,I3 2-channel digital inputs: IN1,IN2(24V DC or 48V DC internal excitation) 2-channel digital outputs: OUT1(dry contact, include normally opened and closed contact),OUT2(Impulse output,24V,48V optional)
Protection configuration	68F2,50/68,50P-1,50P-2,50P-3,50P-4,51P-1,51P-2,50IN-1,51IN-1,51IN-2,50I0-1,51I0-1,51I0-2,46-1,46-2,51Neg-1,51Neg-2,IN1,IN2
Measuring Function	phase currents, external zero sequence, current sequence component
SOE Logs	256 events, including DI/DO logs, Relay logs, Diagnosis logs, and Maintenance logs
Communication	RS-485 communication port: 1 channel
Communication Protocol	MODBUS-RTU protocol

1.4. Order notice

1.4.1. Auxiliary power supply voltage requirements

The auxiliary power supply of iRelay 50-P device is DC24V or DC48V, and the rated power of the auxiliary power supply must match the rated capacity of the circuit breaker trip coil. For example, if the rated capacity of the circuit breaker trip coil is 36W, the rated power of the auxiliary power supply is ≥36W。

Do not use 220V power supply and ensure that the DC power supply voltage is consistent with the rated voltage of the device, otherwise it will cause damage to the power supply of the device and fail to work!

1.4.2. CT ordering technical requirements

1）The secondary winding output of the current transformer used with iRelay 50-P requires dual winding output, such as protection winding and measurement winding. The measurement winding is used for the power input of the self-powered protection device and is called the power supply winding; the protection winding is used for self-powered. The protection device protects the current sampling input.

2）The self-powered protection device has special requirements for the power supply winding. The load capacity of the power supply winding is not less than 5VA to ensure that the device can start and work

normally when the primary loop load current needs to be greater than 15A and not less than 10% of the rated current.

The test method to check whether the power supply winding meets the requirements is as follows:

The secondary power supply winding side of the current transformer is connected with a power resistance of 1K and 5W, and different percentages of the rated primary current are input on the primary power supply winding side of the current transformer, and the two ends of the power resistance of the secondary power supply winding are tested with the AC voltage file of a multimeter. The effective value of the voltage. Determine whether the effective value meets the requirements of Table 1-1.

（When testing the power supply winding, pay attention to short-circuit both ends of the protective winding with wires）

Table 1-1 CT test methods and effective value requirements

testing method	Current Transformer Primary current (A)	The effective value of CT secondary power supply winding terminal voltage (V)	
		suitable.	perfect
Connect the CT secondary power supply winding to a power resistor with a resistance value of 1K and 5W, and use a multimeter to test the voltage at both ends of the resistor.	10% of CT rated primary current and 15A 注	≥11V	15V－25V
	50% CT rated primary CT value	≥20V	25V－30V
	More than 200%CT rated primary value	≤40V，（CT saturation voltage no longer increases）	≤35V

注：

1）When the rated primary current of CT is less than 150A, the primary load current is required to be greater than 15A; when the rated primary current of CT is ≥150A, it is required to be no less than 10% of the rated current；

2）When the current level is less than or equal to 300A, in order to achieve the best power output of the power supply winding, the number of turns of the power supply winding is recommended to be 150~250 turns.

1.4.3. Technical requirements for ordering circuit breaker trip coils

1）Before purchasing the circuit breaker, it is necessary to clarify that the rated voltage of the circuit breaker tripping coil is the same as the rated voltage of the auxiliary power supply of the device, otherwise the tripping coil will be damaged.

2）Before purchasing the circuit breaker, it is necessary to clarify that the rated capacity of the

tripping coil of the circuit breaker is less than 36W (the internal resistance of this low-power coil should not be too small, 24V coil resistance>16 ohms, 48V coil resistance>64 ohms). Otherwise it will cause damage to the trip coil

2. Technical Specifications

2.1. Environment Parameters

1) Operating temperature: -25℃～+70℃
2) Storage temperature: -40℃～+85℃
3) Atmospheric pressure: 70 kPa～110 kPa
4) Relative humidity: 5%～95% (Non-condensing)
5) Above sea level: <3000m

2.2. Rated Parameters

1) Power supply: self-powered (current transformers for power supply,See 1.4.2 for detailed parameters) Or 24V/48V DC auxiliary voltage supply,The allowable deviation is±20%
2) Rated phase current: 5A, 1A
3) Rated neutral current: 1A
4) Rated frequency: 50Hz/60Hz
5) Power consumption
   - AC current loop: 5A configuration, no more than 1VA/phase;
     1A configuration, no more than 0.5VA/phase.
   - Operating power supply circuit: current transformers for power supply ,no more than1VA;
     auxiliary voltage supply, no more than 2W.

2.3. Accuracy

1) Accurate working scope
   - Protective current: 0.05In~20In
   - Zero sequence current: 0.02A~20A
   - Frequency: 45.00Hz~65.00Hz
2) Accuracy of protection settings
   - Current setting: ≤±2.5% or ±0.01In
3) Time setting accuracy
   - Natural action time: ≤40ms (impose 1.2X action setting excitation for over-protection, and 0.7X action setting excitation for under-protection)
   - Definite time-lag action time: ≤±40ms or 1% (impose 1.2X action setting excitation for over-protection, and 0.7X action setting excitation for under-protection)
   - Inverse time limit action time: ≤±5% (1 – I/(I_{set}*80)) or ±40ms, I is the exciting current imposed, while I_{set} is the set current value.
   - Delay of device power on to instantaneous overcurrent relay operation is less than

100ms(impose 2X action setting excitation, current transformers for power are no less than 0.2A).

4) Measurement accuracy

- Accuracy 0.5%, Maximum resolution 0.001A.

2.4. Digital Input Resolution

The resolution of digital input is 1ms.

2.5. Overload Capacity

AC current loop: 2X rated current, working continuously; 10X rated current, 10s allowed; and 40X rated current, 1s allowed

2.6. Digital Outputs

1) OUT1 Output：
   - Turn-on capacity：5A,continuous;30A,0.2s
   - Dry contact output
   - Operate time：<10 ms
   - Release time：<5 ms
2) OUT2 Output：
   - Output capacity >3Ws(current transformers for power supply are more than 0.2In)
   - Active pulse output，Default time: 150ms
   - 24V DC/48V DC optional

2.7. Digital Inputs

There are 2 digital inputs with 24V DC or 48V DC internal excitation.

Note: digital input only allows access to dry contact.

2.8. Communications

1 RS-485 Serial ports

interface type :Two wire RS-485

Working: Half duplex

communicate rate: 2400、4800、9600、19200、38400bit/s

communication protocol: Modbus-RTU

2.9. Electrical Insulation Requirements

1) Dielectric strength

   Complies with IEC 60255-5; 2kV@1minute.

2) Insulation resistance

   Complies with IEC 60255-5; >100MΩ/500V AC.

3) Impulse voltage

Complies with IEC 60255-5; 5kV, 1.2/50μs.

2.10. Mechanical Tests

1) Sinusoidal Vibration

- Response: Complies with IEC 60255-21-1, Level 1;
- Endurance: Complies with IEC 60255-21-1, Level 1.

2) Shock Test

- Response: Complies with IEC 60255-21-2, Level 1;
- Endurance: Complies with IEC 60255-21-2, Level 1.

3) Bump Test: Complies with IEC 60255-21-2, Level 1.

2.11. Electromagnetic Compatibility

(1) Emission test:

Complies with IEC 60255-26 (Chapter 5).

(2) Immunity test:

Complies with IEC 60255-26 (Chapter 6). The electromagnetic environment is class A (severe electrical environment). Acceptance guide is guideline A.

- Electrostatic Discharge Immunity: Complies with IEC 61000-4-2, Level IV;
- Radiated electromagnetic field: Complies with IEC 61000-4-3, level III (10V/m);
- Electrical fast transient/burst immunity: Complies with IEC 61000-4-4, Level IV;
- Surge (shock) immunity: Complies with IEC 61000-4-5, Level IV;
- Radio frequency conduction disturbances: Complies with IEC 61000-4-6, Level III;
- Slow damped oscillation wave immunity: Complies with IEC 61000-4-18, Level III
- Power frequency immunity: Complies with IEC 60255-26, Level A;
- Power frequency magnetic field interference: Complies with IEC 61000-4-8, Level IV;
- Impulsive magnetic field immunity: Complies with IEC 61000-4-9), level 5;
- Damped oscillation magnetic field immunity: Complies with IEC 61000-4-10, level 5;
- Voltage transient and voltage short interruption: Complies with IEC 61000-4-11, class 3, IEC 61000-4-29;
- DC power input port ripple: Complies with IEC 61000-4-17, level 4;
- Voltage slow rise/slow fall: Complies with IEC 60255-26

2.12. Torque

terminal：0.6N.m

2.13. Marked degree of protection

Panel: IP40

2.14. Pollution degree

level 3

2.15. Security

In line with GB/T14598.27 standards.

3. Functions

3.1. Protection Functions

3.1.1. Magnetizing inrush detection (68F2)

This stage is mainly used to block other stages. The ratio between the second harmonic component and the fundamental frequency component is measured on all the phase currents. When the ratio in any phase exceeds the setting value, the stage gives a trip signal.

68F2 is released only in the 5 seconds after the change of phase current from none to more than 0.02In.All of overcurrent protections will be blocked when 68F2 operates.

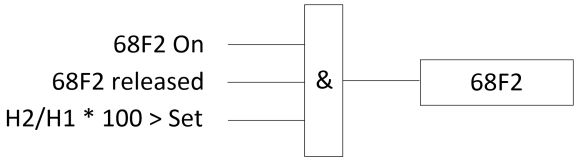


Fig. 3-1 Logic diagram of 68F2 protection

When the following conditions are met at the same time, 68F2 protection operates:

- 68F2 is on;
- 68F2 is released;
- H2/H1 > Set.

3.1.2. Over-Current Block Protection (50/68)

Over-current block protection is used in the application where switching capacity of the circuit breaker is inadequate, or the circuit is FC(fuse with contactor) circuit. When the fault current is more than the fixed value of over-current block protection, relevant output is blocked. Over-current block protection can set operate output for alarm.

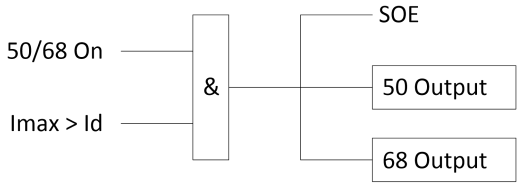


Fig. 3-2 Logic diagram of over-current block protection

When the following conditions are met at the same time, over-current block protection operates:

- Over-current block protection is on;
- Imax > Id; Imax is the maximum value of three-phase currents; Id is the fixed current value of over-current block.

After over-current block operates, priority of its block output (68 Output) is superior to that of other all protections, including 50 output of over-current block.

Over-current block protection does not prohibit running of other protections.

After over-current block protection operates, make the “Trip” indicator lamp light up, Drop-off to pick-up

ratio of over-current block protection is 0.95.

When over-current block protection is on, if relevant output is triggered by protection, the output will not operate immediately. After 30 milliseconds, if over-current block protection operates, the block output (68 outputs) will not operate; otherwise, the block output (68 outputs) may operate. In general, over-current block protection will always return (or never operate), so the block output (68 outputs) will operate finally.

If over-current block protection is off, outputs operate according to the normal logic of output.

3.1.3. Instantaneous Over-current Protection (50P-1)

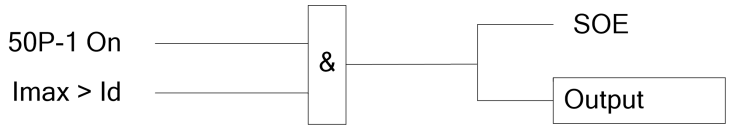


Fig. 3-3 Logic diagram of instantaneous over-current protection

When the following conditions are met at the same time, instantaneous over-current protection operates:

- Instantaneous over-current protection is on;
- Imax > Id. Imax is the maximum value of three-phase currents; Id is the fixed current value of 50P-1.

After instantaneous over-current protection operates, “Trip” indicator lamp lights up. Drop-off to pick-up ratio is 0.95.

3.1.4. Over-current Protection with Definite Time (50P-2)

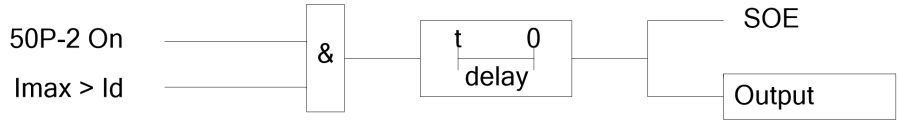


Fig. 3-4 Logic diagram of over-current protection with definite time

When the following conditions are met at the same time, after delay setting, over-current protection with definite time operates:

- Over-current protection with definite time is on;
- Imax > Id. Imax is the maximum value of three-phase currents; Id is the fixed current value of 50P-2.

After over-current protection with definite time operates, “Trip” indicator lamp lights up. Drop-off to pick-up ratio is 0.95.

3.1.5. Definite Time Over-current Protection (50P-3)

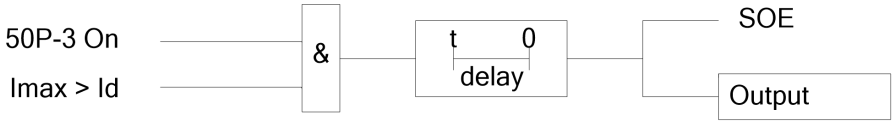


Fig. 3-5 Logic diagram of definite time over-current protection

When the following conditions are met at the same time, after delay setting, definite time over-current protection operates:

- Definite time over-current protection is on;

- Imax > Id. Imax is the maximum value of three-phase currents; Id is the fixed current value of 50P-3.

After definite time over-current protection operates, “Trip” indicator lamp lights up. Drop-off to pick-up ratio is 0.95.

3.1.6. Overload Protection (50P-4)

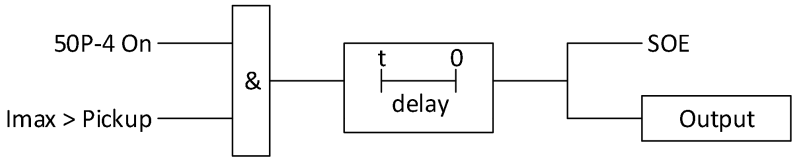


Fig. 3-6 Logic diagram of overload protection

When the following conditions are met at the same time, after delay setting, overload protection operates:

- Overload protection is on;
- The maximum value of phase currents is more than the fixed value (Pickup) of overload protection.

After verload protection operates, “Trip” or “Alarm” indicator lamp is optional through “Signal”. Drop-off to pick-up ratio is 0.90

3.1.7. Inverse Time Over-current Protection (51P-1,51P-2)

Inverse time over-current protection adopts 2 sections (51P-1, 51P-2) and 1 time limit. Take Inverse time over-current 1 section protection as an exampl:

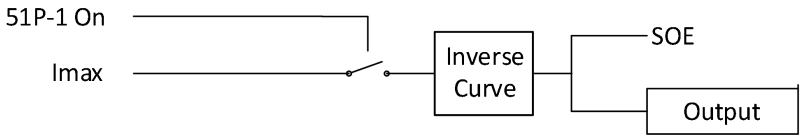


Fig. 3-7 Logic diagram of inverse time over-current protection

Inverse time over-current protection supports 5 kinds of inverse curves of IEC standard.

Table 3-1 Formulas of IEC standard inverse curves

Curve Name	Formula
C1 *Normal Inverse*	$tp=TD*\left[\frac{0.14}{M^{0.02}-1}\right]$
C2 *VeryInverse*	$tp=TD*\left[\frac{13.5}{M-1}\right]$
C3 *Extremely Inverse*	$tp=TD*\left[\frac{80.0}{M^{2}-1}\right]$
C4 *Long Inverse*	$tp=TD*\left[\frac{120.0}{M-1}\right]$

C5 *Short Inverse*	$tp=TD*\left[\frac{0.05}{M^{0.04}-1}\right]$

In the formulas above, M=Imax/Ip, Ip is the fixed value of pickup, Imax is the maximum value of three-phase currents, TD is the multiple of time dial, tp is the operation time. If M is more than 20, M will be 20.

The inverse protection will drop out and the accumulated time will be reset if the maximum value of three-phase currents is less than 0.95 times of fixed current.

After inverse time over-current protection operates, “Trip” or “Alarm” indicator lamp is optional through “Signal”.

3.1.8. Neutral Over-current Protection (50IN-1)

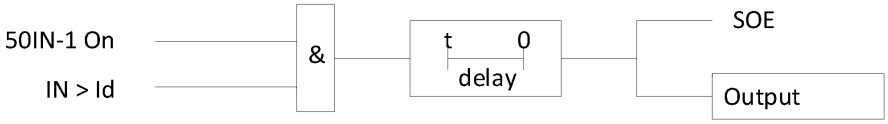


Fig.3-8 Logic diagram of neutral over-current protection

When the following conditions are met at the same time, after delay setting, neutral over-current protection operates:

- Neutral over-current protection is on;
- IN> Id.IN is the value of neutral current; Id is the fixed value of neutral over-current protection.

After neutral over-current protection operates, “Trip” or “Alarm” indicator lamp is optional through “Signal”. Drop-off to pick-up ratio is 0.95.

3.1.9. Inverse Time Neutral Over-current Protection (51IN-1,51IN-2)

Inverse time neutral over-current protection adopts 2 sections (51IN-1, 51IN-2) and 1 time limit. Take Inverse time neutral over-current 1 section protection as an exampl:

Inverse time neutral over-current protection supports 5 kinds of inverse curves of IEC standard, which are all the same with Inverse time over-current protection (see table 3-1 for details).

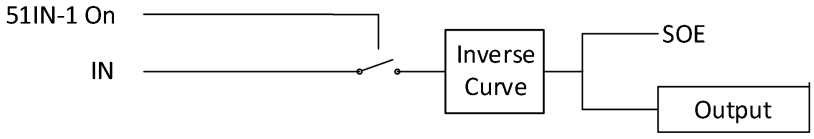


Fig. 3-9 Logic diagram of inverse time neutral over-current protection

After inverse time neutral over-current protection operates, “Trip” or “Alarm” indicator lamp is optional through “Signal”.

3.1.10. Zero-sequence Over-current Protection (50I0-1)

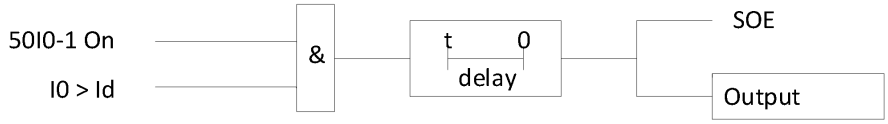


Fig.3-10 Logic diagram of zero-sequence over-current protection

When the following conditions are met at the same time, after delay setting, zero-sequence over-current protection operates:

- zero-sequence over-current protection is on;
- I0> Id.I0 is the value of zero-sequence current($\dot{I}0 = \frac{\dot{I}A + \dot{I}B + \dot{I}C}{3}$); Id is the fixed value of zero-sequence over-current protection.

After zero-sequence over-current protection operates, “Trip” or “Alarm” indicator lamp is optional through “Signal”. Drop-off to pick-up ratio is 0.95.

3.1.11. Inverse Time Zero-sequence Over-current Protection (51I0-1,51I0-2)

Inverse time zero-sequence over-current protection adopts 2 sections (51I0-1, 51I0-2) and 1 time limit. Take Inverse time zero-sequence over-current 1 section protection as an exampl:

Inverse time zero-sequence over-current protection supports 5 kinds of inverse curves of IEC standard, which are all the same with Inverse time over-current protection (see table 3-1 for details).

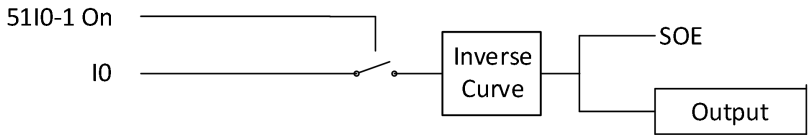


Fig. 3-11 Logic diagram of inverse time zero-sequence over-current protection

After inverse time zero-sequence over-current protection operates, “Trip” or “Alarm” indicator lamp is optional through “Signal”.

3.1.12. Negative-sequence Over-current Protection(46-1,46-2)

Negative-sequence over-current protection adopts 2 sections (46-1, 46-2) and 1 time limit. Take negative-sequence over-current 1 section protection as an exampl:

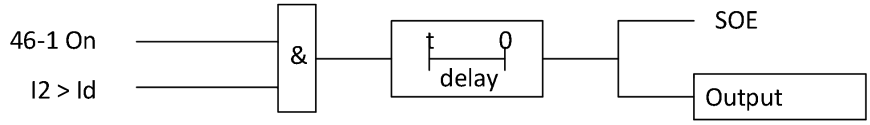


Fig.3-12 Logic diagram of negative-sequence over-current protection

When the following conditions are met at the same time, after delay setting, negative-sequence over-current protection operates:

- negative-sequence over-current protection is on;
- I2> Id.I2 is the value of negative-sequence current; Id is the fixed value of negative-sequence over-current protection.

After negative-sequence over-current protection operates, “Trip” or “Alarm” indicator lamp is optional through “Signal”. Drop-off to pick-up ratio is 0.95.

3.1.13. Inverse Time negative-sequence Over-current Protection (51Neg-1,51Neg-2)

Inverse time negative-sequence over-current protection adopts 2 sections (51Neg-1, 51Neg-2) and 1 time limit. Take Inverse time negative-sequence over-current 1 section protection as an exampl:

Inverse time negative-sequence over-current protection supports 5 kinds of inverse curves of IEC standard, which are all the same with Inverse time over-current protection (see table 3-1 for details).

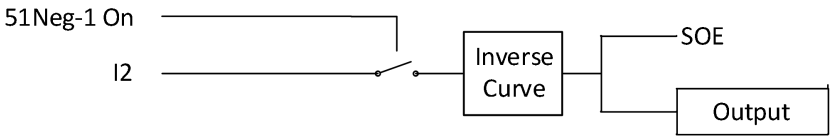


Fig. 3-13 Logic diagram of inverse time negative-sequence over-current protection

After inverse time negative-sequence over-current protection operates, “Trip” or “Alarm” indicator lamp is optional through “Signal”.

3.1.14. DI Protection

IN1, IN2 can be configured as DI protection. When digital input is closed, the corresponding DI protection will start.

The “Type” of DI protection is optional.

The logic of IN1 DI protection is showed as follow, the logic of IN2 is the same as IN1.

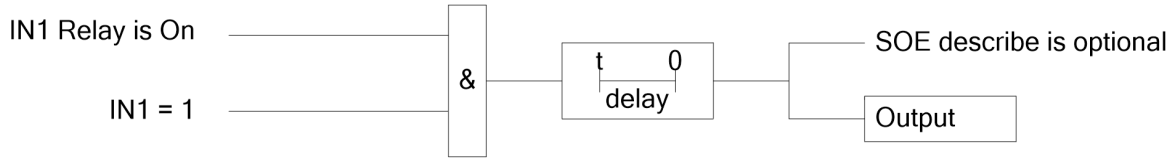


Fig. 3-14 Logic diagram of DI protection

When DI protection operates, “Trip” or “Alarm” indicator lamp is optional through “Signal”. If “Signal” is collocated to “Event”, no indicator lamp will be lighted.

Note:The output of DI protection cannot be used for tripping, which can only use for signal or alarm.

3.2. Measurements

iRelay 50-P can provide primary and secondary currents measurements.

Primary currents include Ia, Ib, Ic and secondary currents include IA, IB, IC, IN, current sequence and Acc Inverse Time of 51P-1,51P-2, 51IN-1,51IN-2,51I0-1,51I0-2 and 51Neg-1,51Neg-2.

3.3. Power Supply Mode

There are three mode of power supply in iRelay 50-P, current transforms, auxiliary power and internal battery.

Current Transforms：iRelay 50-P can be powered by secondary coil of current transforms. Please connect the power supply pins to the CTs for measurements and not connect to the CTs for protection.

Auxiliary power：iRelay 50-P can be powered by DC 24Vor 48Vauxiliary power.

Internal battery：iRelay 50-P can be powered by internal battery. This mode is just for emergency use. In this mode, LED and LCD will not light and only for data check and Config, protection and relays will exit.

3.4. Remote Signal Function

There are 2 digital inputs in iRelay 50-P, both can be flexibly configured.

3.5. Control Functions

There are 2 outputs OUT1, OUT2 in iRelay 50-P, both can be flexibly configured. OUT1 is dry contact, include normally opened and closed contact, OUT2 is impulse output, which is 24V, 48V optional.

Both of OUT1, OUT2 can be remotely controlled, which can be output without be selected before operation, when the parameter of SBO in the system parameters is configured as “OFF”.

3.6. Communication Function

iRelay 50-P is collocated with a RS485 communication port, which can be connected with various power monitoring networks, realize remote measuring, remote signaling, remote control, SOE log, etc. iRelay 50-P supports MODBUS RTU protocol.

3.7. Log Function

iRelay 50-P is able to store 256 SOE logs in total, including relay logs, DI/DO logs, diagnosis logs, and maintenance logs; all the logs refer to the latest data and are refreshed automatically; the SOE log is not lost in case of power cut off. The first log is the latest log while the second log takes the second position; in case of no effective log, “No Log” is displayed.

- DI/DO logs

iRelay 50-P is responsible for collecting the status of digital inputs and digital outputs. In case of signal displacement in any switch volume (that is to say, the contact changes from combined to separated or from separated to combined), a remote signal is produced and occurrence time and switch volume change status are recorded.

- Relay logs

The relay logs include the category of protective action (over-current etc.), characteristic value of protective action and time of protective action (year, month, day, hour, minute, second and millisecond).

- Diag. logs

Upon electrification of iRelay 50-P, the self-inspection and monitoring are implemented to iRelay 50-P operation status in fixed time; in case of serious malfunction inspected in the components, iRelay 50-P is locked up for protection and alarm signal is output.

Self-inspection and monitoring contents include:

- CPU and hardware system
- AD and sampling system
- Data storage

- Fixed value and its storage system
- Work power supply system inside iRelay 50-P

● Maint. logs

iRelay 50-P will automatically log the event upon relay protection and debugging personnel's revision of parameters set by iRelay 50-P. The log includes the operation contents and time; it can't be revised and is not lost in case of power cutoff; it is adopted as the basis of accident analysis together with the form of protection fixed value, log of protective event and log of malfunction recording.

The maint.log of iRelay 50-P includes the following contents:

- Power charging and cutoff of iRelay 50-P
- Removal of event log
- Local and communication reset signal
- Revision of unit time
- Revision of user password
- Revision of parameters
- Calibration of analog quantity

The concrete record and displayed contents of event log report are as follows:

Table 3-2 Contents of event log

Item	Contents	Remark
DI/DO logs	Event No	
	Displacement contact and method: The contact changes from combined to separated or from separated to combined	
	Displacement time of remote signaling: From year to millisecond	
Relay logs	Event No	Corresponding setup of output action
	Action category: Protective action corresponding to XXX	
	Malfunction measuring value recorded at the time of protective action	
	Action time: Output or delay time from year to millisecond	
Diag. logs	Event No	Output alarm signal and lock up protective action
	Malfunction self-inspection contents	
	Malfunction self-inspection time: From year to millisecond	
Maint. logs	Event No	

	Operation contents of unit	
	Operation time of unit: From year to millisecond	

4. Installation and Wiring Diagram

4.1. Installation

iRelay 50-P should be installed in a dry environment with no dust and kept away from heat, radiation and electrical noise sources.

4.1.1. Installation Chart

The installation method and size are as shown in the Fig. 4-1.

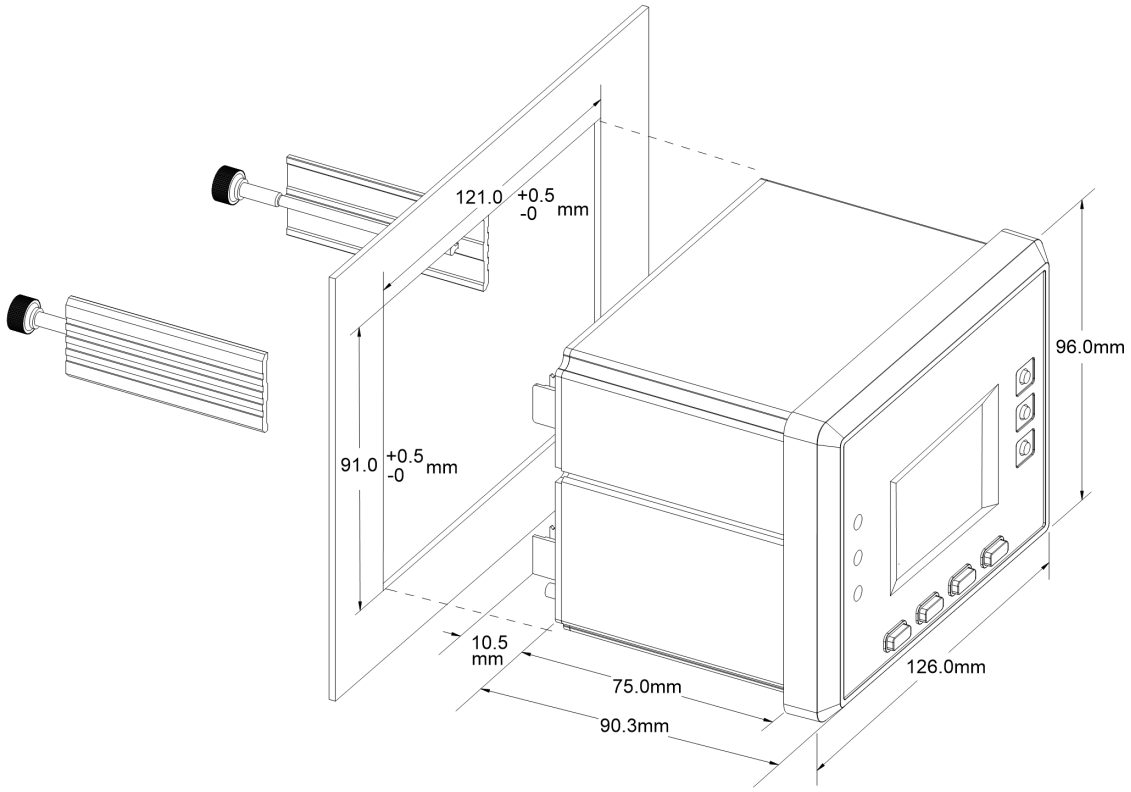


Fig. 4-1 Panel Cutout

4.1.2. Backplane Terminal Layout

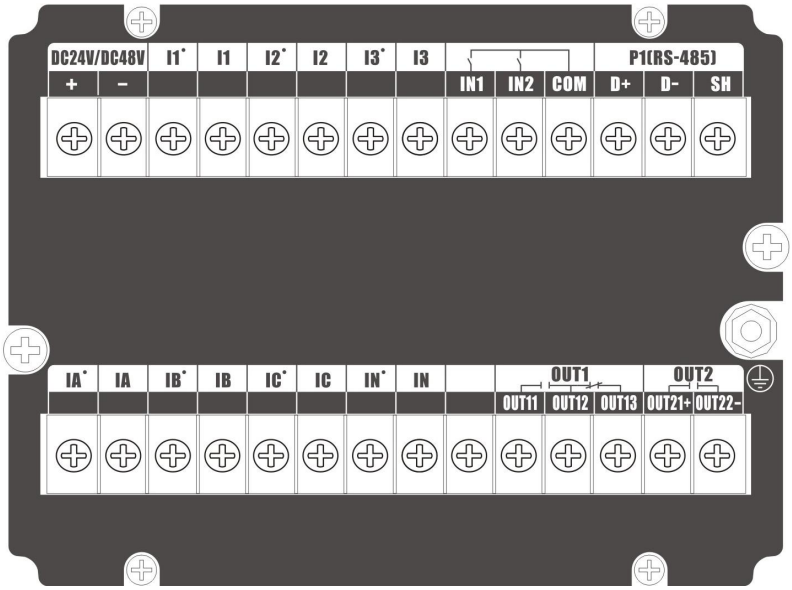


Fig.4-2 Backplane terminal drawing of iRelay 50-P

Table 4-1 Terminal Diagram Description

Terminal Identification	Description
DC24V/DC48V+	Auxiliary power supply, 24V DC or 48V DC.
DC24V/DC48V-	
I1*	Connected to the secondary measuring winding of CTs for power supply. I1*and I1, I2*and I2, I3*and I3 connect one phase each, no polarity requirement. Because the finally power provide is the summation power of all three phase, more phases are connected can make less current requirement in each phase. When only one phase is connected, iRelay 50-P can work too, but needs more current in that phase compare with more phase are connected.
I1	
I2*	
I2	
I3*	
I3	
IN1	Inputs of IN1 and IN2, internal excitation
IN2	
COM	DI public end, be connected to negative pole when DI is supplied by DC power.
P1 (D+,D-,SH)	RS-485 interface, signals A, B and shield grounding.
IA*	3-phase relay current input, becoming synonym end with "*" added.
IA	
IB*	
IB	
IC*	
IC	
IN*	Neutral current input, becoming synonym end with "*" added.
IN	
OUT11	Normally dry contact, OUT11 is normally-closed contact while OUT13 is normally-closed contact.
OUT12	
OUT13	
OUT21+	Active impulse output, depends on device selection, the output can be 24V DC or 48V DC, which can be connected to the circuit breaker trip coil to drive the breaker trip.
OUT21-	

4.2. Wiring Diagram

4.2.1. Typical wiring diagram

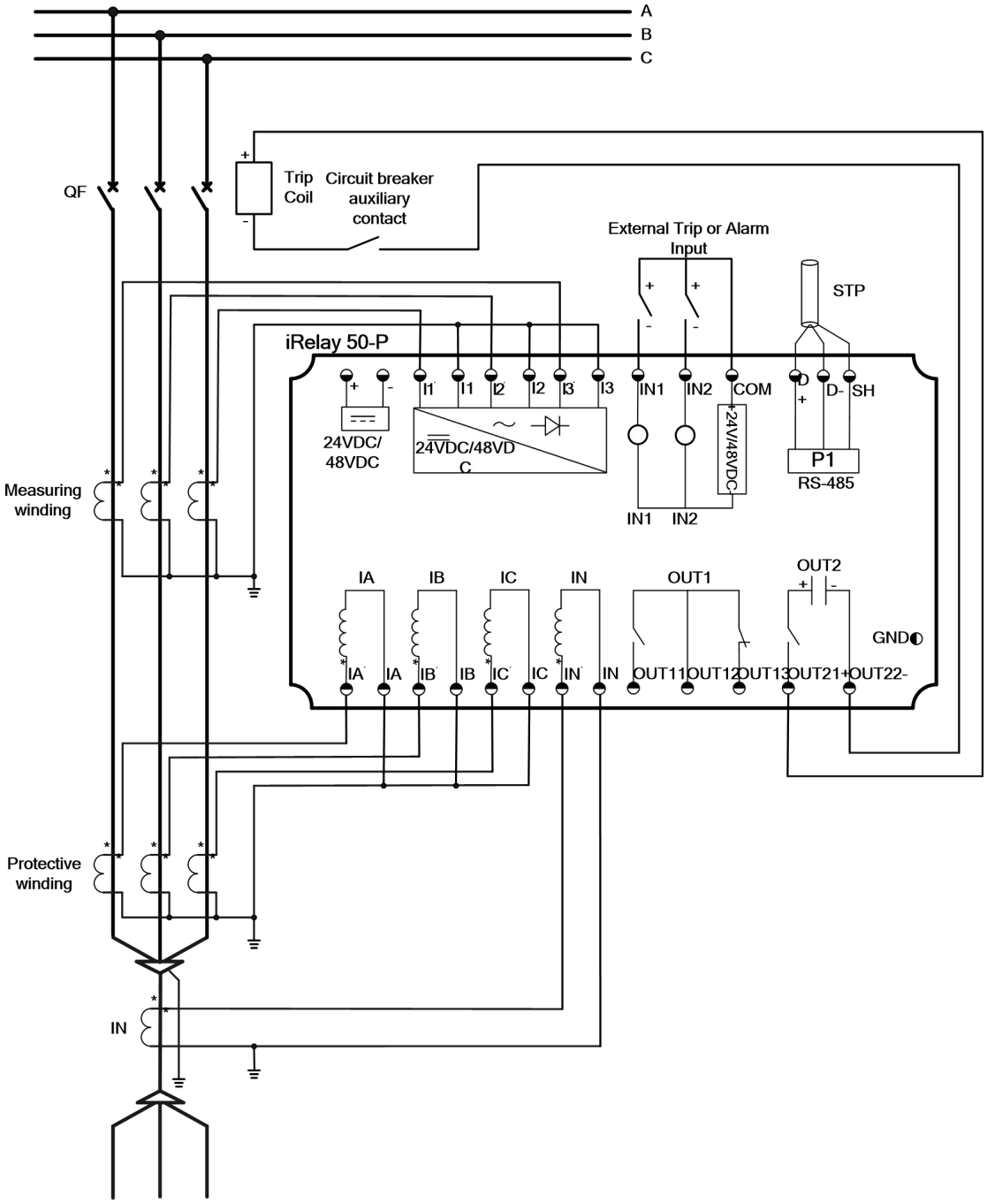


Fig. 4-3 Schematic wiring diagram of 3TA circuit (wye connection) with power supply from CTs

Schematic wiring diagram description as shown in Table 4-2。

Table 4-2 3TA Schematic wiring diagram description

Terminal Identification	Description
DC24V/DC48V	Auxiliary power supply, 24V DC or 48V DC.
I1、I2、I3	Connected to the power winding of CTs for power supply.
IN1,IN2	Inputs of IN1 and IN2, internal excitation

P1	RS-485 interface
IA,IB,IC	3-phase relay current input,Connected to the protection winding of CTs for protection function.
IN	Connected to the zero sequence of CTs for collecting zero-sequence current
OUT1	Normally dry contact for the signal output or the breaker trip.
OUT2	Active impulse output, depends on device selection, the output can be 24V DC or 48V DC, which can be connected to the circuit breaker trip coil to drive the breaker trip,it must be connected to the normally-closed contact.

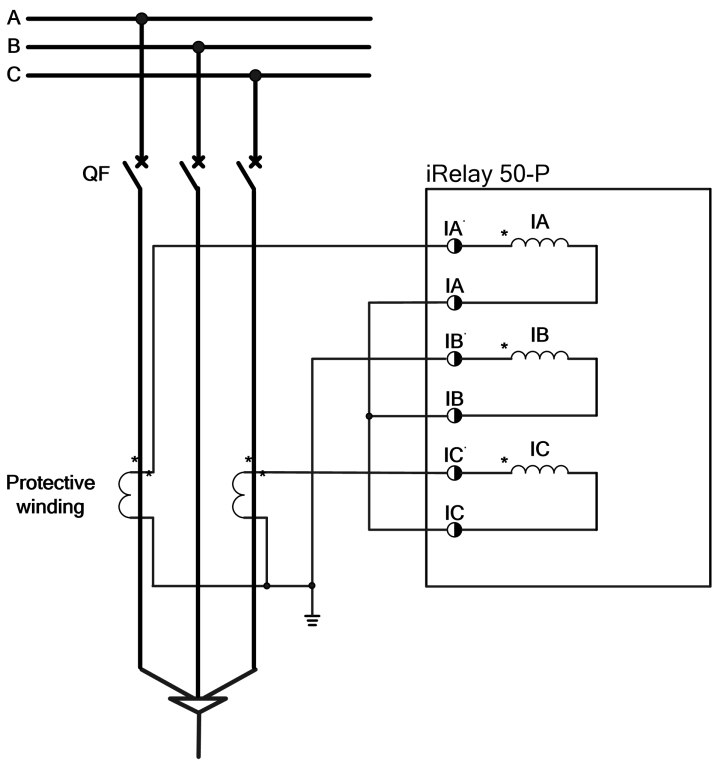


Fig. 4-4 Schematic wiring diagram of 2TA circuit (delta connection)

Schematic wiring diagram description as shown in Table 4-3。

Table 4-3 2TA Schematic wiring diagram description

Terminal Identification	Description

I1、I2、I3	Connected to the power winding of CTs for power supply.
IA,IB,IC	3-phase relay current input,Connected to the protection winding of CTs for protection function.

4.2.2. Typical wiring diagram

- The auxiliary power supply of the device is 24V/48V DC, please do not connect to the 220V power supply, and make sure that the DC power supply voltage is consistent with the rated voltage of the device, otherwise the device power supply will be damaged and it will not work。
- The CT connected to the self-powered circuit and the CT connected to the protection circuit should come from different windings, otherwise the accuracy of the protection action will be affected.
- If there is only single-phase or two-phase power supply current, only the power supply phase needs to be connected, and the non-power supply phase can be suspended; series connection between different phases is prohibited.
- The relay types of OUT2 and OUT1 are different. It is necessary to distinguish between OUT1 (conventional passive dry contact) and OUT2 (active pulse). It is forbidden to connect the power supply that drives the conventional passive dry contact to the active pulse node. .
- The rated voltage of the trip coil connected to OUT2 is the same as the rated voltage of the device, otherwise the trip coil will be damaged.
- The protective trip circuits of OUT1 and OUT2 must be connected in series with the normally open auxiliary contacts of the circuit breaker.

5. Operating Instructions

5.1. Front Panel

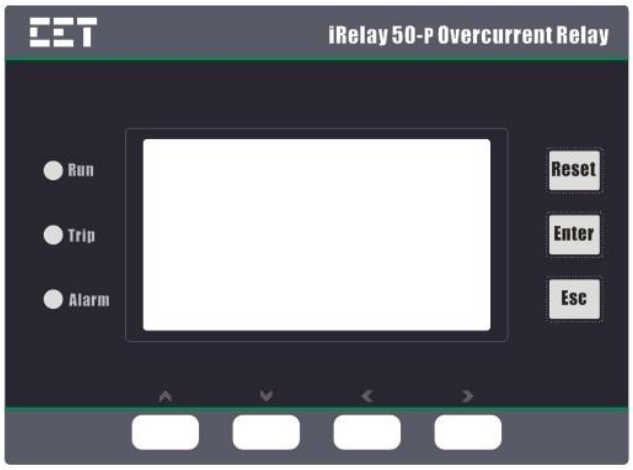


Fig. 5-1 Front panel view

5.2. Keys Operation

Total seven keys are set up below the liquid crystal screen on the front panel of iRelay 50-P, and they are, ▲, ▼, ◀, ▶, Reset, Enter, Esc, with detailed functions as shown below:

▲: Shift up of cursor, being setting +1 in editing mode;

▼: Shift down of cursor, being setting -1 in editing mode;

◀: Shift left of cursor or page up, "◀" appears at the upper corner of the page of which page-up is available when entering the last layer of menu;

▶: Shift right of cursor or page down, "▶" appears at the upper corner of the page of which page-up is available when entering the last layer of menu;

Reset: Reset the protection light, alarm light, and configuration Output.

Enter: Confirm the current selection or parameter revision;

Esc: Exit from current operation or parameter revision.

Reset + Esc: When iRelay 50-P is power off, if these two keys be pressed at the same time, iRelay 50-P will power on by internal battery,see section 3.3.

5.3. Signal Indicator Lights

iRelay 50-P has 3 signal indicator lights in total:

Run: Flashing indicates normal work of iRelay 50-P;

Trip: Red light ON indicates protective action on tripping, and can be turned off by pressing “Reset” key if all protective action on tripping return;

Alarm: Yellow light ON indicates self-check fault of device or protection action on signals, and can be turned off by pressing “Reset” key if all protective action on signals return;

5.4. Default Display Menu

After iRelay 50-P is powered on, iRelay 50-P will enter the default interface display, as shown in Fig. 5-2. The symbol “ ” displayed in bottom of page indicates the status of communication, when iRelay 50-P receive or send messages, the symbol flash. If iRelay 50-P is not operated in 10mins, the system will return to the page automatically, and meanwhile, the backlight will be turned off.

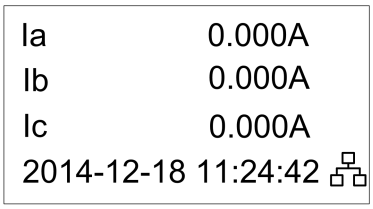


Fig. 5-2 Default Display

5.5. Logs

SOE report display screen is as shown in Fig. 5-3. The screen is bounced out in case of that protection operates or fault is discovered with iRelay 50-P from self-check. In case the protection operates, the “Trip” light or “Alarm” light will be turned on according to the protection configuration; if fault or error is discovered from self-check, “Alarm” light will be turned on. The page popped up will display the fault nature, characteristic value and action time.

Each page may display one SOE report. After “Esc” key is pressed, this page will disappear, and the default page will be displayed. If multiple SOE reports are displayed, “◄”, “►” may be used for page up and page down.

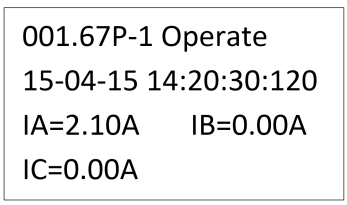


Fig. 5-3 SOE report

5.6. Menu

Various functions of iRelay 50-P device may be accessed through menu and the menu structure of iRelay 50-P is as shown below:

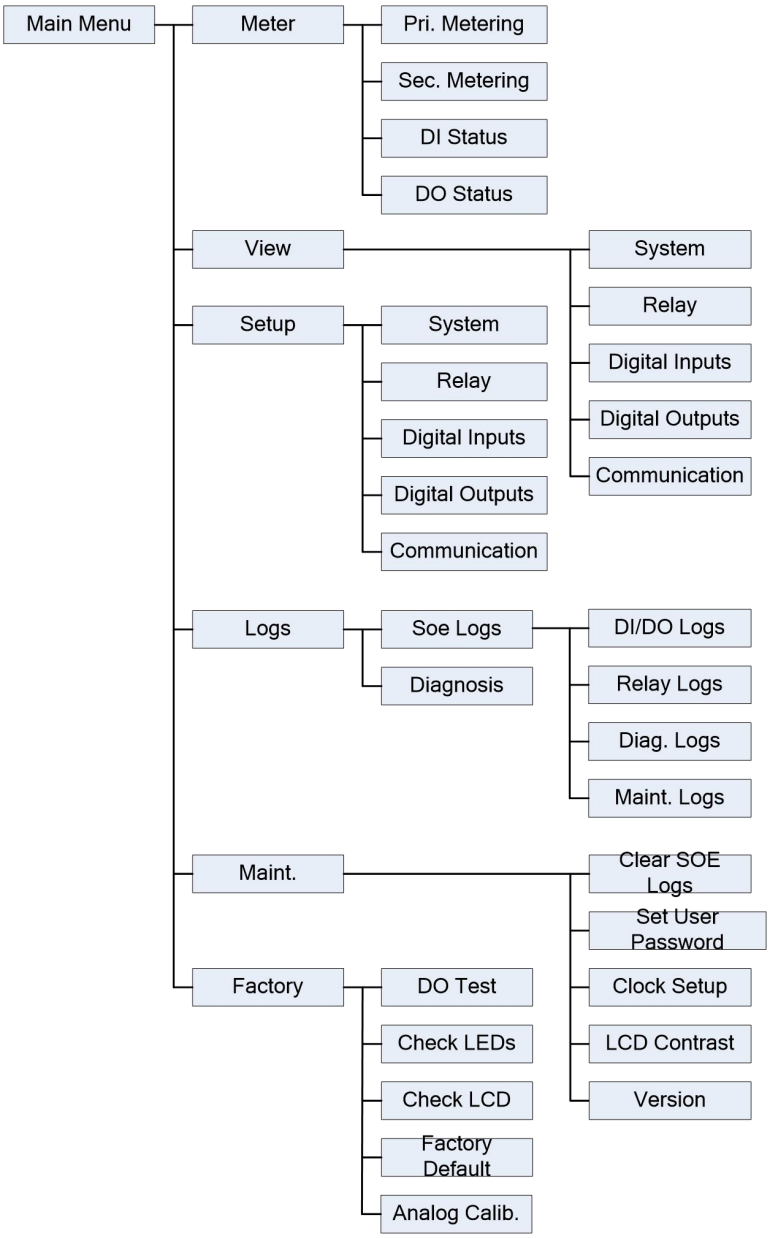


Fig. 5-4 Menu structure

In case of default display page, press “Enter” key to access the main menu page, as shown in Fig. 5-5. Here, press “▲”, “▼” key for selection, and the menu selected is highlighted. Here, press “Enter” key to access the next-level menu.

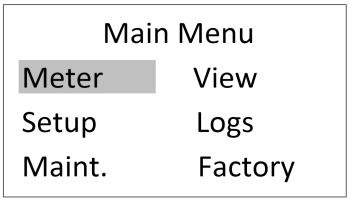


Fig. 5-5 Main menu page

5.6.1. Meter

Select “Meter” with cursor and press “Enter” key to access the next-level menu. “Meter” menu is as

shown in Fig. 5-6; the sub menu is shown as following:

Pri. Metering: Display all of the primary current measuring values. See Fig. 5-7.

Sec. Metering: Display all of the secondary current measuring values. See Fig. 5-8.

DI Status: Display the real-time status of inputs, as shown in Fig. 5-9.

DO Status: Display the real-time status of outputs, as shown in Fig. 5-10.

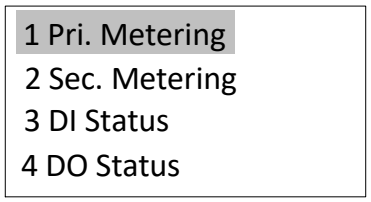


Fig. 5-6 Menu of Meter

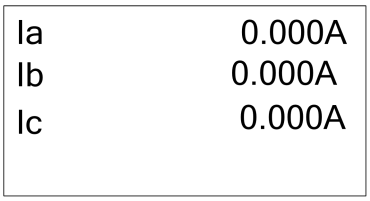


Fig. 5-7 Menu of Primary Metering

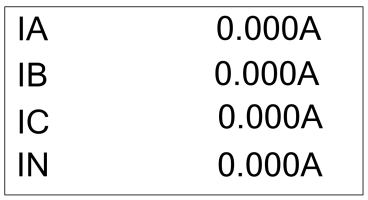


Fig. 5-8 Menu of Secondary Metering

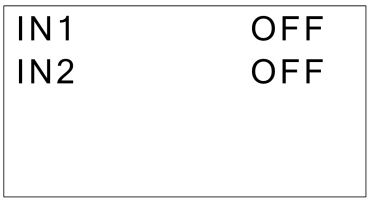


Fig. 5-9 Menu of inputs status

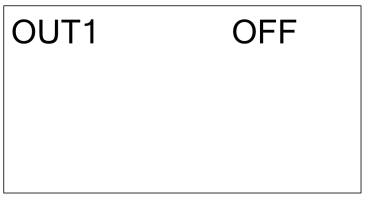


Fig. 5-10 Menu of outputs status

5.6.2. View

On view page, it's only available to view parameters, but not to setup parameters. Select "View" and press "Enter" key to access the next-level menu, as shown in Fig. 5-11. These settings are the data having been set up and are in operation, can't be revised.

System:

It's available to view the rated value of primary voltage and second voltage, transformation ratio of current transformer, and zero-sequence current transformer, and the main circuit diagram, etc, as shown in Fig.5-12.

Relay:

1. After accessing the page of relay settings, we may view the list of protections, as shown in Fig.5-13.

2. After selecting the protection to be viewed, we may access the view page of detailed protection parameters, as shown in Fig.5-14.

Digital Inputs:

1. After accessing Digital Inputs page, we may select the DI configuration to be viewed, as shown in Fig.5-15.

2. After selecting the DI configuration to be viewed, we may view the detailed parameters of DI configuration, as shown in Fig.5-16.

Digital Outputs: It's available to view the output broadening time of digital outputs, as shown in Fig.5-17.

Communication: After accessing the page of communication, we may view the detailed parameters, as shown in Fig.5-19.

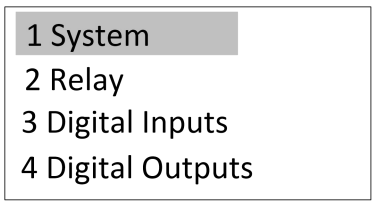


Fig. 5-11 Menu of View

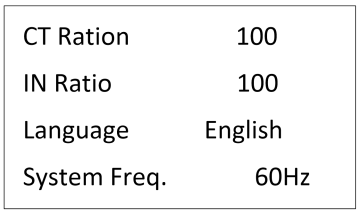


Fig. 5-12 Menu of System

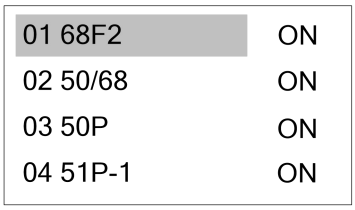


Fig. 5-13 Menu of Relay

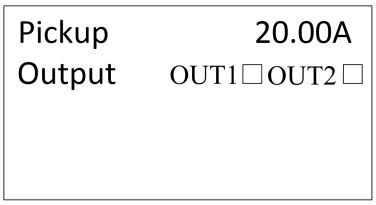


Fig. 5-14 Menu of Relay

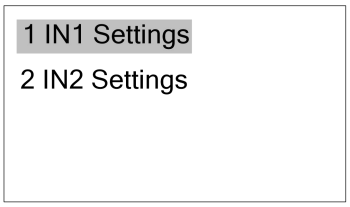


Fig. 5-15 Menu of Digital Inputs

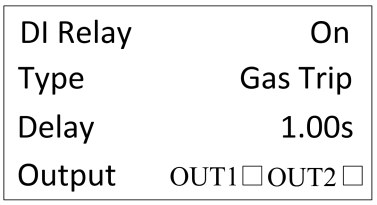


Fig. 5-16 Menu of IN Settings

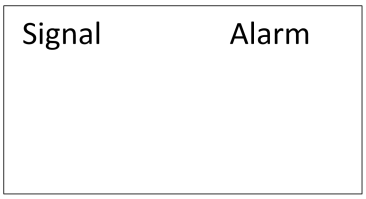


Fig. 5-17 Menu of Digital Outputs

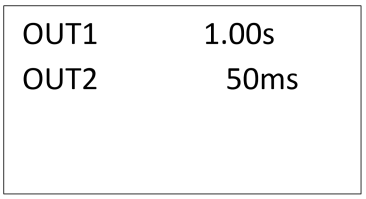


Fig. 5-18 Menu of Digital Outputs

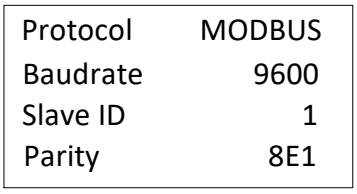


Fig. 5-19 Menu of Communication

5.6.3. Setup

Input user password for setting up or revising settings. The detailed operating steps are as shown below:

1. Select the parameter item to be set up and press “Enter” key to bounce out the menu of “user password”, as shown in Fig. 5-20;

2. Input password and press “Enter” key, and if the password is wrong, the prompt of wrong password will be bounced out, as shown in Fig. 5-21; if the password is correct, parameter setup screen will be bounced out, as shown in Fig. 5-22.

3. Select the parameter to be revised and press “Enter” key on the Setup page, and press “◄”, “►”, “▲”, “▼” keys to revise parameters, as shown in Fig. 5-23;

4, When “Esc” key is pressed to exit from every parameter setup page, iRelay 50-P will bounce out “Save Changes” page, as shown in Fig. 5-24; press “◄”, “►” to select “Yes” or “No”, and press “Enter” key to save or not according to the option selected. If “Esc” is pressed on the screen, the data won’t be saved, and the operation will exit from the previous screen directly.

Default password before delivery: “0001”.

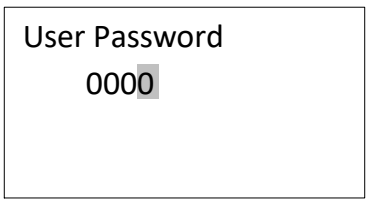


Fig. 5-20 Password input

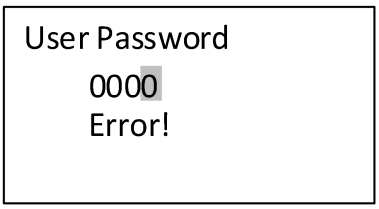


Fig. 5-21 Input password error page

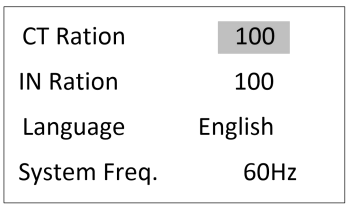


Fig. 5-22 System setup page

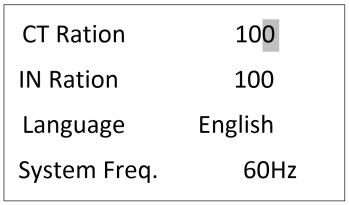


Fig. 5-23 System setup page

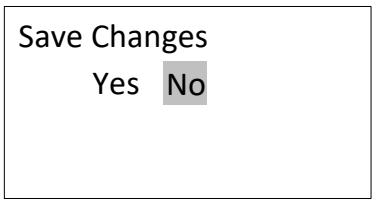


Fig. 5-24 Save page

5.6.4. Logs

The Logs page is as shown in Fig.5-35. Press "▲", "▼" key to make choice, and the menu selected is highlighted. Press "Enter" key to access next-level menu, as shown in Fig. 5-36.

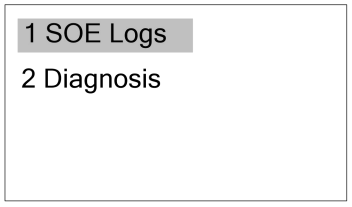


Fig. 5-35 Logs page

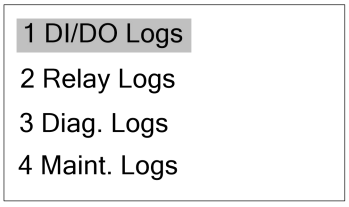


Fig.5-36 SOE Logs page

1) SOE Logs

As shown in Fig. 5-37～5-40, each page may display 1～2 events at one stroke. Press "◀", "▶" key to page down or page up for viewing records. There are 256 entries of SOE Logs at the most.

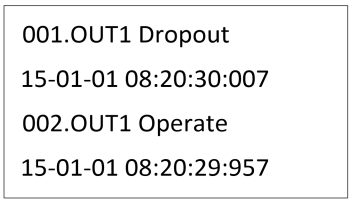


Fig. 5-37 DI/DO logs page

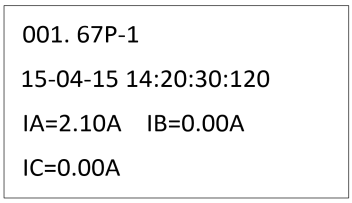


Fig. 5-38 Relay logs page

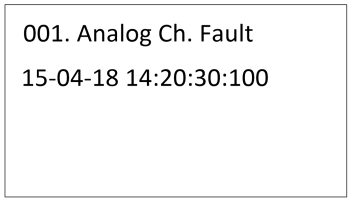


Fig. 5-39 Diag. logs page

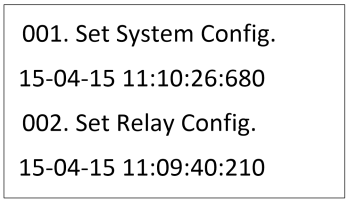


Fig. 5-40 Maint. logs page

2) Diagnosis

Diagnosis page is as shown in Fig. 5-41, and it shows Diagnosis information.

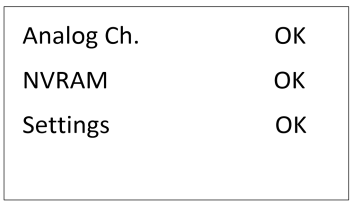


Fig. 5-41 Diagnosis page

5.6.5. Maintenance

The following work may be completed after accessing this page: Clear SOE Logs; set up original value of energy; revise user password; revise system time; set up LCD contrast; display device information, as shown in

Fig. 5-42.

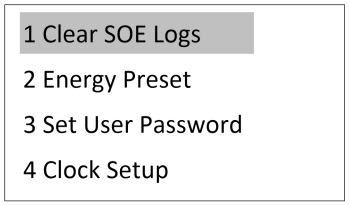


Fig. 5-42 maintenance page

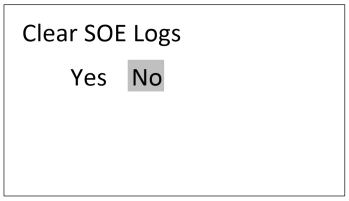


Fig. 5-43 Clear SOE Logs page

5.6.6. Factory

The page is used for factory calibration.

iRelay 50-P has been subject to strict debugging and calibration before being delivered, and shall not be changed at random by non-professional maintenance personnel! Factory password is required for accessing this menu.

5.6.7. Settings List

Table 5-1 Settings List

Parameter Name		Unit	Setting Scope	Default Value
System	CT Ratio		1～9999	100
	IN Ratio		1～9999	100
	Language		Chinese/ English	Chinese
	System Freq.	Hz	50/60	50
	SBO		Off/On	On
	Start Events		Off/On	Off
	Dropout Events		Off/On	Off
	Pulse Mode		Single/Multiple	Single
68F2	68F2		Off/On	Off
	Pickup	%	10～50	20
50/68	50/68		Off/On	Off
	Pickup	A	0.25～100.00(5A rated) 0.05～20.00(1A rated)	20.00
	68 Out		OUT1,OUT2	0
50P-1	50P-1		Off/On	Off
	Pickup	A	0.25～100.00(5A rated) 0.05～20.00(1A rated)	20.00
	Output		OUT1,OUT2	0
50P-2	50P-2		Off/On	Off
	Pickup	A	0.25～100.00(5A rated) 0.05～20.00(1A rated)	20.00

	Delay	s	0.00～99.99	1.00
	Output		OUT1,OUT2	0
50P-3	50P-3		Off/On	Off
	Pickup	A	0.25～100.00(5A rated) 0.05～20.00(1A rated)	20.00
	Delay	s	0.00～99.99	1.00
	Output		OUT1,OUT2	0
50P-4	50P-4		Off/On	Off
	Pickup	A	0.25～100.00(5A rated) 0.05～20.00(1A rated)	20.00
	Delay	s	0.00～600.00	1.00
	Output		OUT1,OUT2	0
	Signal		Alarm/ Trip	Alarm
51P-1	51P-1		Off/On	Off
	Curve		C1/C2/C3/C4/C5	C3
	Pickup	A	0.25～15.00(5A rated) 0.05～3.00(1A rated)	3.00
	Time Dial		0.05～1.00	1.00
	Output		OUT1,OUT2	0
	Signal		Alarm/ Trip	Alarm
51P-2	51P-2		Off/On	Off
	Curve		C1/C2/C3/C4/C5	C3
	Pickup	A	0.25～15.00(5A rated) 0.05～3.00(1A rated)	3.00
	Time Dial		0.05～1.00	1.00
	Output		OUT1,OUT2	0
	Signal		Alarm/ Trip	Alarm
50IN-1	50IN-1		Off/On	Off
	Pickup	A	0.02～20.00	6.00
	Delay	s	0.00～99.99	1.00
	Output		OUT1,OUT2	0
	Signal		Alarm/ Trip	Alarm
51IN-1	51IN-1		Off/On	Off
	Curve		C1/C2/C3/C4/C5	C3
	Pickup	A	0.02～3.00（1A rated）	1.50

	Time Dial		0.05～1.00	1.00
	Output		OUT1,OUT2	0
	Signal		Alarm/ Trip	Alarm
51IN-2	51IN-2		Off/On	Off
	Curve		C1/C2/C3/C4/C5	C3
	Pickup	A	0.02～3.00（1A rated）	1.50
	Time Dial		0.05～1.00	1.00
	Output		OUT1,OUT2	0
	Signal		Alarm/ Trip	Alarm
50I0-1	50I0-1		Off/On	Off
	Pickup	A	0.25～100.00(5A rated) 0.05～20.00(1A rated)	20.00
	Delay	s	0.00～99.99	1.00
	Output		OUT1,OUT2	0
	Signal		Alarm/ Trip	Alarm
51I0-1	51I0-1		Off/On	Off
	Curve		C1/C2/C3/C4/C5	C3
	Pickup	A	0.25～15.00(5A rated) 0.05～3.00(1A rated)	1.50
	Time Dial		0.05～1.00	1.00
	Output		OUT1,OUT2	0
	Signal		Alarm/ Trip	Alarm
51I0-2	51I0-2		Off/On	Off
	Curve		C1/C2/C3/C4/C5	C3
	Pickup	A	0.25～15.00(5A rated) 0.05～3.00(1A rated)	1.50
	Time Dial		0.05～1.00	1.00
	Output		OUT1,OUT2	0
	Signal		Alarm/ Trip	Alarm
46-1	46-1		Off/On	Off
	Pickup	A	0.25～100.00(5A rated) 0.05～20.00(1A rated)	20.00
	Delay	s	0.00～99.99	1.00
	Output		OUT1,OUT2	0
	Signal		Alarm/ Trip	Alarm
46-2	46-2		Off/On	Off

	Pickup	A	0.25～100.00(5A rated) 0.05～20.00(1A rated)	20.00
	Delay	s	0.00～99.99	1.00
	Output		OUT1,OUT2	0
	Signal		Alarm/ Trip	Alarm
51Neg-1	51Neg-1		Off/On	Off
	Curve		C1/C2/C3/C4/C5	C3
	Pickup	A	0.25～15.00(5A rated) 0.05～3.00(1A rated)	3.00
	Time Dial		0.05～1.00	1.00
	Output		OUT1,OUT2	0
	Signal		Alarm/ Trip	Alarm
51Neg-2	51Neg-2		Off/On	Off
	Curve		C1/C2/C3/C4/C5	C3
	Pickup	A	0.25～15.00(5A rated) 0.05～3.00(1A rated)	3.00
	Time Dial		0.05～1.00	1.00
	Output		OUT1,OUT2	0
	Signal		Alarm/ Trip	Alarm
IN1（IN2）Relay	DI Relay		Off/On	Off
	Type		Refer to the manual.	Gas trip
	Delay	s	0.00～99.99	1.00
	Output		OUT1,OUT2	0
	Signal		Alarm/ Trip	Alarm
Digital Output	OUT1	s	0.01～99.99/ Latch	1.00
	OUT2	ms	30～120	100
Communication	Protocol		MODBUS	MODBUS
	Baud rate		2400/4800/9600/19200/38400	9600
	Slave ID		1～247	1
	Parity		8N1/ 8O1/8E1	8E1
System configuration	CT Nom.	A	1A/5A	5A
	IN. CT Nom.	A	1A	1A
LCD Contrast	LCD Contrast		0～20	10

System parameter Notes:

1) The default configuration of events logs are off.

When “Start Events” and “Dropout Events” are “On”: Start Events, Start Dropout Events, Operation Events and Operation Dropout Events will be recorded.

When “Start Events” is “On” and “Dropout Events” is “Off”: Start Events and Operation Events will be recorded.

When “Start Events” is “Off” and “Dropout Events” is “On”: Operation Events and Operation Dropout Events will be recorded.

When “Start Events” and “Dropout Events” are “Off”: Only Operation Events will be recorded.

2) Impulse Mode indicates that when OUT2 is selected “Single”, it will stop impulse output after relay returns, and when OUT2 is selected “Multiple”, it will not stop impulse output until iRelay 50-P is reset or power off. Generally, “Single” mode is preferred.

Protection setting Notes:

1) The event type of digital inputs is optional: Gas trip, gas alarm, Temperature1, Temperature2, DCS1, Non-electric, Spring, and DCS3.

2) 5A rated and 1A rated in current setting of phase protection current indicate the rated value of phase current.

3) When digital output is set to”0.00s”, it will be displayed as “Latch”.

6. Debugging

6.1. Test notes

1）Self-powered current loop (I1, I2, I3)

A) The I1, I2, and I3 current loops can only be used as the self-powered power supply of the device, and are strictly prohibited to be used for protection and measurement of other functional current inputs. Usually connected to the special winding of the current transformer (see section 1.4.2 for the technical requirements when ordering, and see Figure 6-1 and 6-2 for the wiring diagram);

B) It is strictly forbidden to connect the windings of the self-powered current input loop (I1, I2, I3) and the protection current input loop (IA, IB, IC) of the device in series.

C) It is recommended to connect the two-phase or three-phase self-powered current according to the requirements of the typical wiring diagram (Figure 6-1, Figure 6-2)

D) During debugging, the self-powered current loop of the device can be connected to single-phase, two-phase or three-phase self-powered current. If it is connected to single-phase or two-phase self-powered current, the other non-powered phases can be suspended (see Figure 6-1)

E) Since the three terminals I1, I2, and I3 have been short-circuited inside the device, it is strictly forbidden to connect the three-phase or two-phase I1', I2', and I3' to the current, otherwise the device will be burnt out! Refer to Figure 6-1 for correct wiring and Figure 6-2 for incorrect wiring.

F) If you use the self-powered circuit and auxiliary power supply to provide working power for the device at the same time, please confirm that the input voltage of the auxiliary power supply is DC 24V or 48V.

G) It is strictly forbidden to apply a DC or AC power supply higher than the rated voltage of 48V (the limit value is 57.6V) to the device to prevent the device from being burned!

H) It is strongly recommended to tighten the self-powered current access terminals (I1, I2, I3) and confirm that it is correct before applying the self-powered current. It is strictly forbidden to temporarily lap the terminals of the self-powered current loop and artificially apply the working current intermittently to prevent other abnormal situations such as arcing and burn out the self-powered working power supply of the device.

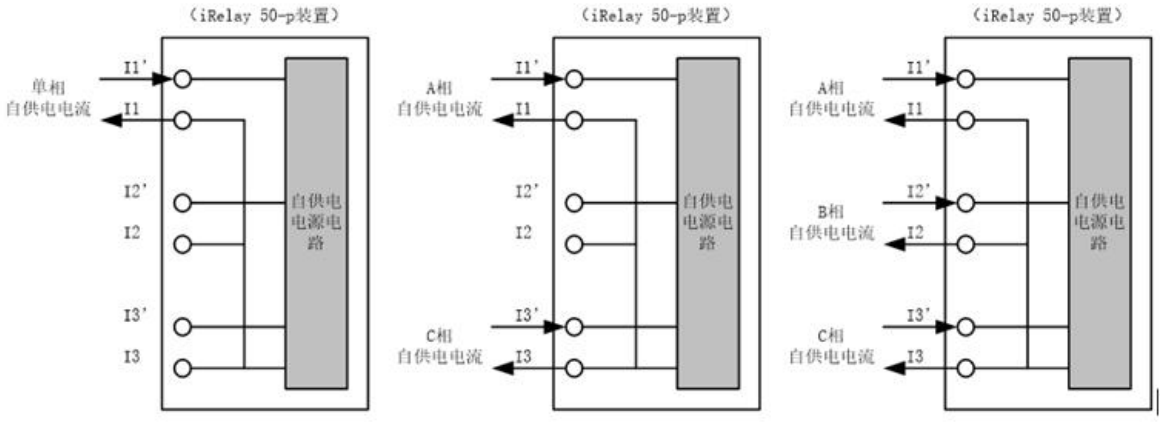


Figure 6-1 Correct wiring method of self-powered power supply

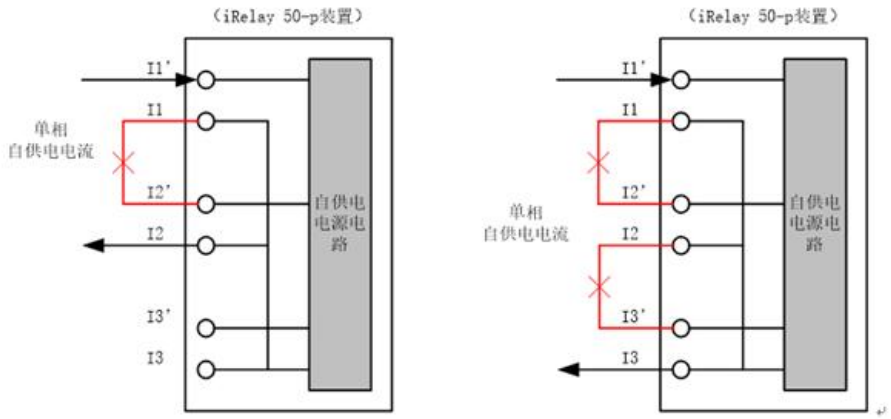


Figure 6-2 Incorrect wiring method of self-powered power supply

2）Trip circuit (OUT2)

A) The relay types of OUT2 and OUT1 are different. It is necessary to distinguish between OUT1 (conventional passive dry contact) and OUT2 (active pulse). It is forbidden to connect the power supply that drives the conventional passive dry contact to the active pulse node.

B) OUT2 active pulse is divided into two voltage types: 24V and 48V. When using the relay protection device to test the OUT2 outlet, it is necessary to confirm whether the relay protection device is compatible with potential contacts.

C) Choose the appropriate voltage and tripping capacity type according to the actual current supply range.

D) The trip circuit must be connected in series with the normally open auxiliary contact of the circuit breaker.

E) When there is no auxiliary power supply and CT self-powered current (the device is powered off), the device's own rechargeable battery can be charged. The rechargeable battery can be fully charged in about 60s, and the auxiliary power supply or CT self-powered charging time is 30min (24VDC selection) or 10min (48VDC selection). After an active pulse trip, the device needs to be recharged. Generally, it can operate reliably when it is charged to 0.6Up (Up: the pulse amplitude after reaching the steady state).

6.2. Check before power on

A) Check whether the model and parameters of the device are consistent with the order. If the self-powered circuit (I1, I2, I3) is used for power supply, it needs to be connected to the transformer measurement winding. The power supply circuit is forbidden to be connected in series with the protection winding to avoid affecting the protection accuracy; When using DC auxiliary power supply, be sure to check whether the rated voltage of the power supply matches (the auxiliary power supply voltage is 24V or 48V DC, and it is prohibited to use city power or 220V DC power supply, otherwise the device will be damaged);

B) Confirm that the device is reliably grounded.

C) Check whether the appearance of the device is in good condition, whether the terminals, buttons, and LCD display are in good condition.

D) Check whether the actual wiring of the device is consistent with the design drawings of the tested protective screen group screen, the main wiring of the primary equipment protected by the tested protective screen and the description of the relevant secondary equipment drawings.

6.3. Power-on check

A) After power-on, if the software of the device starts to run normally, the indicator light of the device "running" flashes at this time, you can simply judge whether each CPU board and program are normal;

B) Whether the LCD is displayed normally;

C) Check the parameter settings of the device. If the factory default settings of the device do not meet the on-site requirements, refer to the device instructions for corresponding settings.

6.4. Analog check

Input the rated current value (1A or 5A, please check the current selection of the device nameplate) to the protection current circuit (IA, IB, IC, IN), and check whether the primary and secondary measurement values displayed by the device are within the error range.

6.5. Debugging before being put into Operation

1) Protection function debugging

Set the fixed value of the protection current, start the protection, configure the OUT1 outlet, and use the relay protection meter to increase the amount to test whether the protection is reliable and return. Measurement

When testing the protection function, the test methods of using OUT1 and OUT2 are different. The OUT1 output is a dry contact output, which can be directly connected to the relay tester's input circuit; OUT2 is an active pulse output. Connect OUT2 to the relay input module of the relay tester, and it must be connected at both ends of the OUT2 outlet. Connect a resistor (note that the resistance power should be greater than U^2 /R, such as 48V configuration prototype, the resistance value is 1K ohm, then the power should be greater than 2.4W)

2) Trip function debugging

Set the fixed value of the protection current, start the protection, configure the OUT2 outlet, test whether the circuit breaker trips correctly after the protection action; conduct a trip test

Please confirm the following two points before inspection;

A) The trip circuit must be connected in series with the normally open auxiliary contact of the circuit breaker. If it is not connected in series, it is forbidden to carry out the tripping test, so as to avoid the contact of the device from sticking and burning out the circuit breaker trip coil

B) Identify the type of OUT2 (whether the voltage type is 24V or 48V) and the resistance value of the field trip coil (the internal resistance of the low-power coil should not be too small, it is recommended that the resistance of the 24V coil is greater than 16 ohms, and the resistance of the 48V coil greater than 64 ohms). If the resistance value parameter of the trip coil is not within the recommended range, please stop the trip test first, otherwise the OUT2 contact of the device may be damaged or the trip coil may be burned. After the relevant parameters are fed back to the device R&D department of CET company, the CET device R&D department Confirm whether iRelay 50-P can meet the circuit breaker tripping requirements

3) DI debugging

DI debugging is conducted under the “Measurements->DI Status” menu. Short circuit IN1 and COM, the display status of IN1 will change from “OFF” to “ON”, open the short circuit, the display status of IN1 will change from “ON” to “OFF”.

4) DO debugging

DO debugging may be conducted in “DO Test” of “Factory”. Select the output to be debugged, and press “Enter” key to test whether the output operate correctly.

5) Relay action test

Conduct debugging according to concrete project setting.

6) Communication function debugging

It is conducted under “Setup->Communication” menu to confirm the continuous number of each protection device inside the substation, and that there is no repeated address number. Connect iRelay 50-P with communication management machine, and connect it to the monitoring system. Conduct related operations at the monitoring system, like reading the metering value and protection setting, revising and downloading settings, remote resetting, protection time check, DI/DO call, reading protection action event information, etc., and check whether the protection device can normally respond to and correctly execute commands; meanwhile, observe whether the communication between the protection device and upper-position computer is normal by monitoring the communication management machine and background messages.

6.6. Device Fault Analysis

1) The “Run” light does not work normally.

- Check whether the power supply for iRelay 50-P is connected correctly, when iRelay 50-P is powered by auxiliary power and when iRelay 50-P is powered by CTs, makes sure the current provide by the CTs are enough;
- If the “Run” light is ok, but the LCD is abnormal or the key is not working, please check whether the front panel gets loose;
- If iRelay 50-P bounces out abnormal event alarm, please check whether each panel is well inserted.

2) The meter value of iRelay 50-P is incorrect.

- Check whether the wire connection of current channels is normal;
- Check whether CTs are sound, and whether the CT ratio is set up correctly;
- Check whether GND is correctly grounded.

3) The DI input is incorrect.

- Check whether the input contact is accessed correctly;

4) RS-485 communication is abnormal.

- Check whether communication parameters are correct, including ID, baud rate, parity check bit, and stop bit;
- iRelay 50-P Protocol MODBUS only supports RTU mode;
- Check whether the baud rate set of RS-232/RS-485 converter is correct;
- Check whether the whole communication network circuit is correct;
- If the communication interface chip or optical coupler is abnormal, please contact with manufactory;
- Check whether communication interface wire is sound, and whether background software works normally;
- Close iRelay 50-P and PC host computer, and restart them for re-trial.

Note: If you have any problem you can't solve, please contact our after-sales service department in time.

7. After-sales Service Commitment

7.1. Device Upgrading

Users may use upgraded software of iRelay 50-P for free. The Company will notify users of the information on software upgrading by all means.

7.2. Quality Assurance Scope

The following problems of iRelay 50-P doesn't belong to the scope of quality assurance:

a) Damage caused by incorrect installation, use and storage;

b) Abnormal operation and application conditions not meeting the regulations of the product;

c) Devices repaired by any institution or individual not authorized by the Company;

d) Device after the period of quality assurance for free.

7.3. After-sales Contact Method

0086-400-9916-218

Appendix A- Inverse Time Over-current Curve

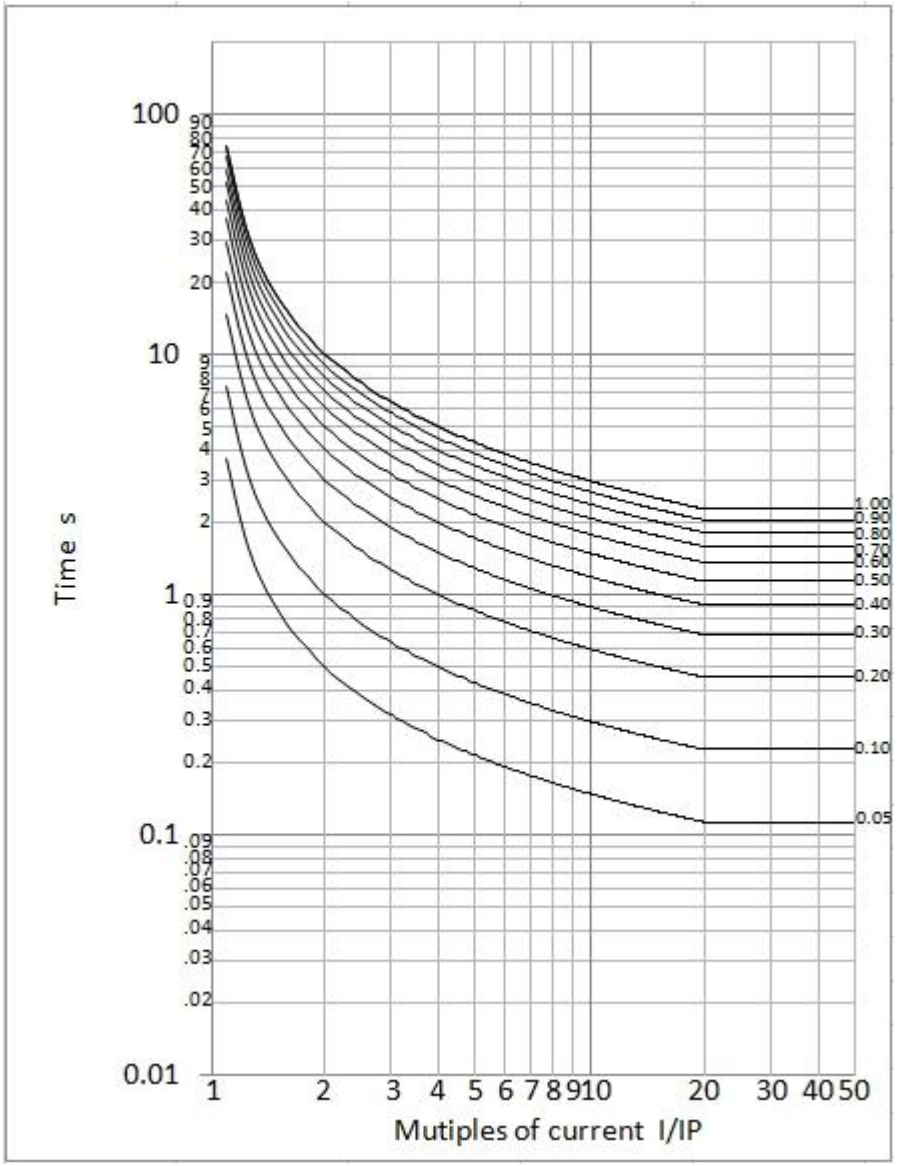


Fig. A-1 Normal Inverse Curve (C1)

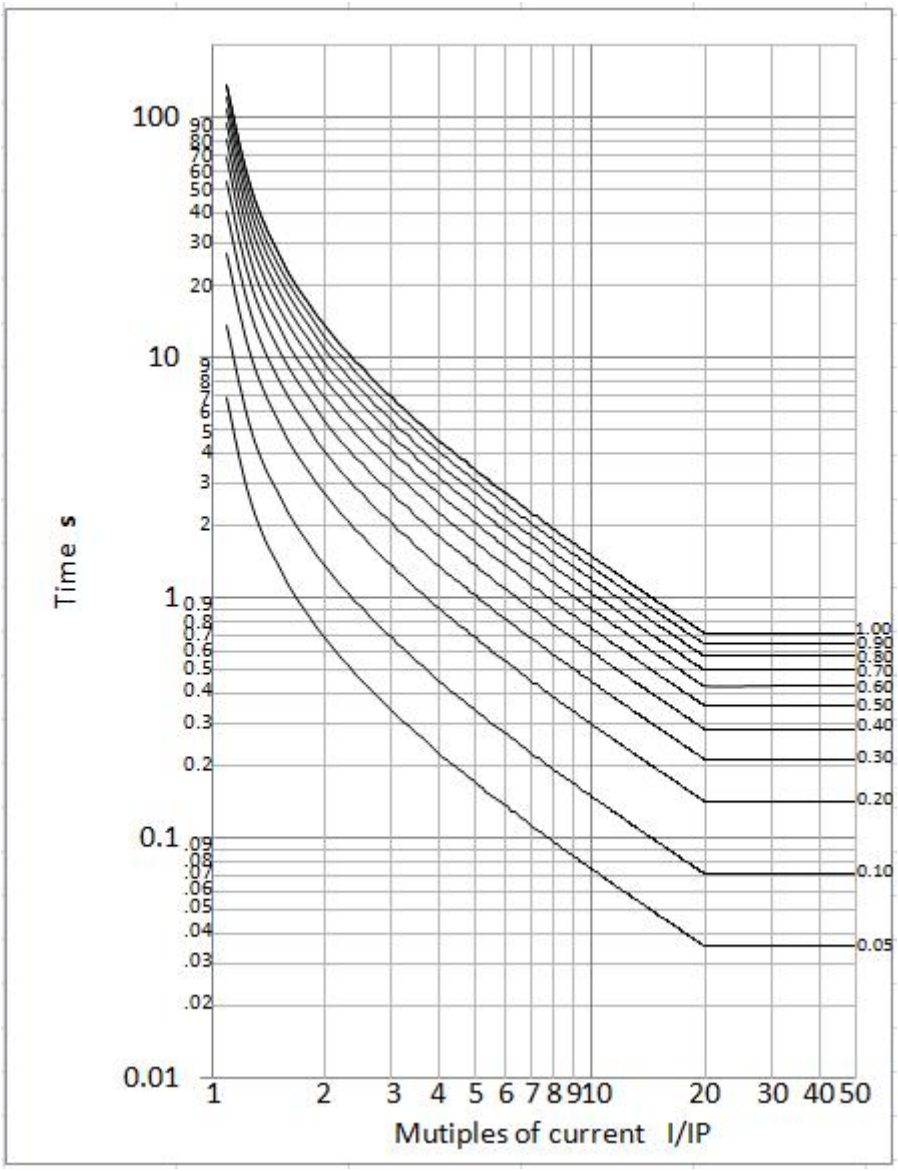


Fig. A-2 Very Inverse Curve (C2)

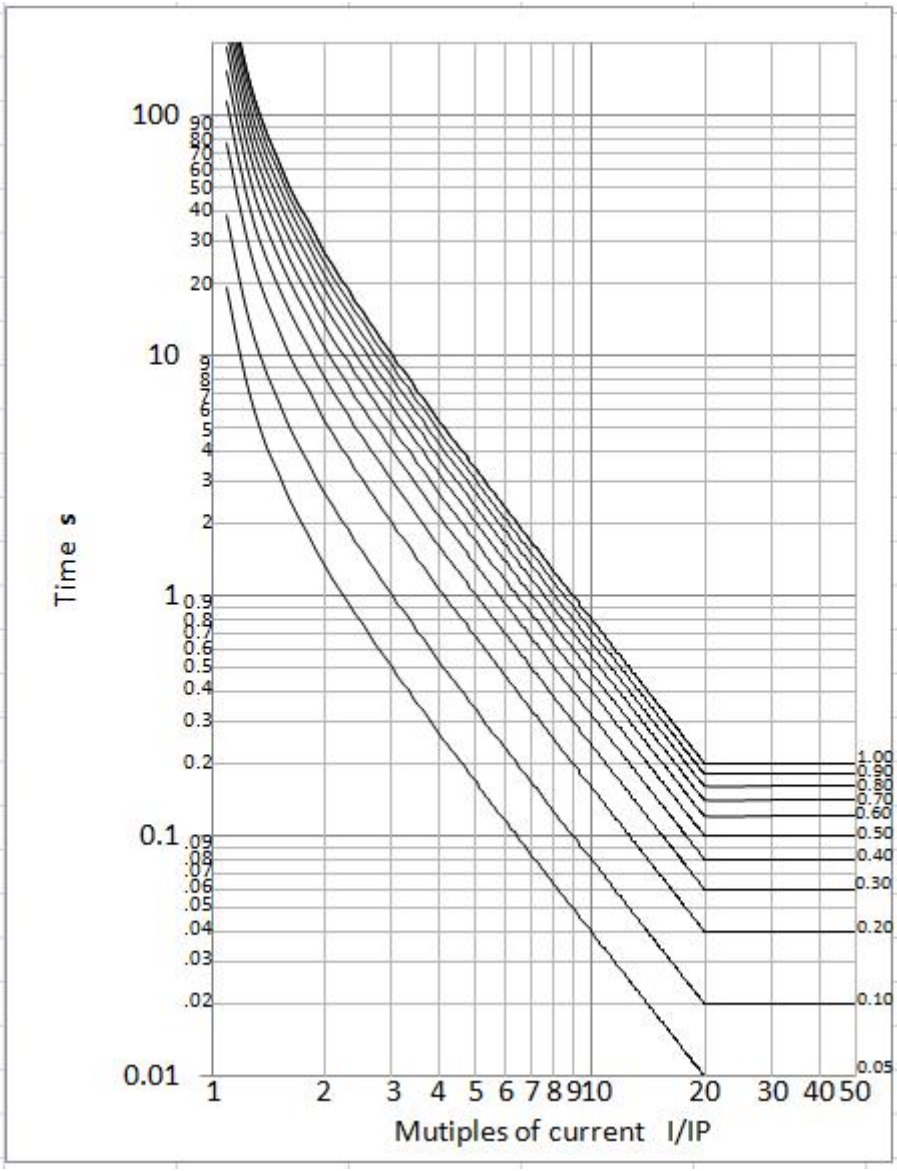


Fig. A-3 Extremely Inverse Curve (C3)

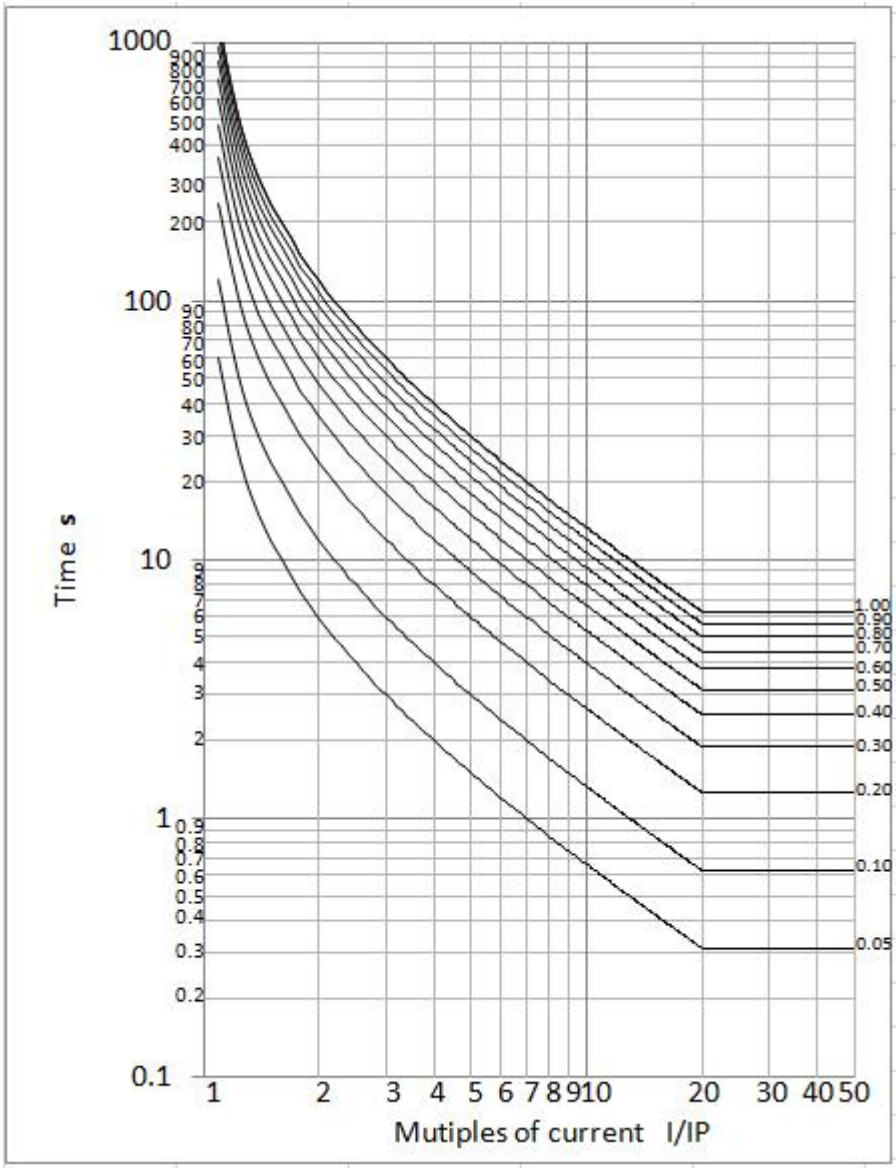


Fig. A-4 Long Inverse Curve (C4)

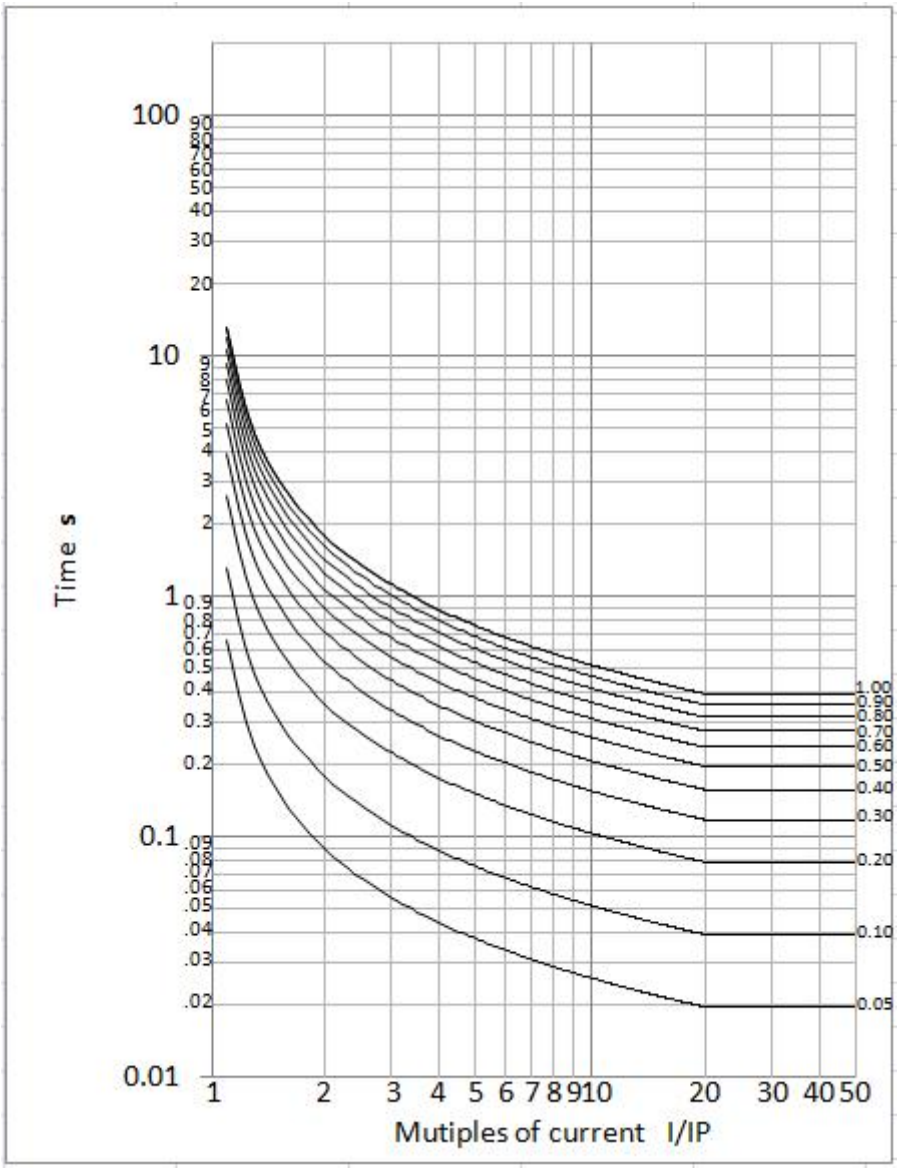


Fig. A-5 Short Inverse Curve (C5)