HDW3

intelligent control unit
iTR326H

User Manual

☐ please carefully read the User Manual before the installation and use of the products, and then keep it properly as backup.

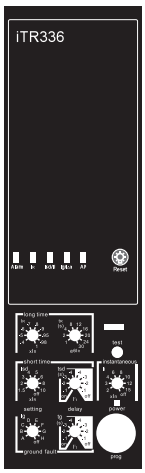
Himel

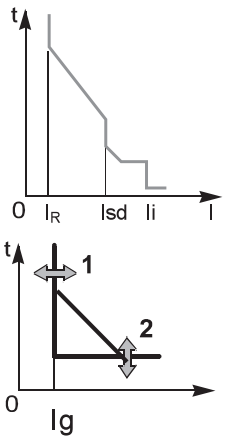
CONTENT

1 Introduction

1.1 Overview

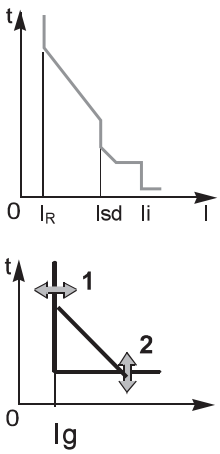
iTR326
L+S+I+G





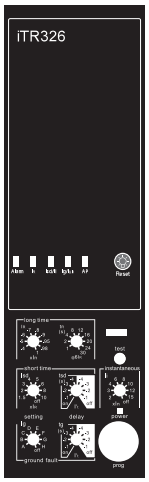
Basic type: 3 section protection

iTR326H
L+S+I+G



Advanced type: complete protection / measurement / maintenance / communication

1.2 Function Introduction

	iTR326	iTR326H
		
Protection	Long time-L	Long time-L
	Short time-S	Short time-S
	Instantaneous-I	Instantaneous-I
	MCR	MCR
	Ground fault-G	Ground fault-G
		Under-voltage
		Over-voltage/alarm
		Inverse power protection
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		Under-frequency
		Over-frequency
		3-phase imbalance
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		Current harmonic
Measure		Current
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		Frequency
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Additional function	Test function	Pre-Alarm
		Self-diagnose
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Com.		Modbus

1 Introduction

1.3 Panel Instruction

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2 LED indicator light
3 Data Sheet
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6 Terminal connector
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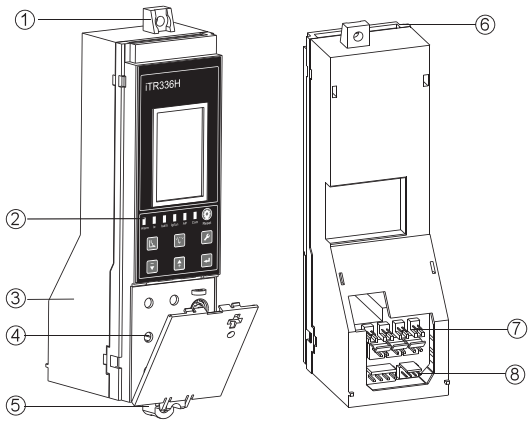

Direction

9 Alarm LED
10 Long-time LED
11 Short/instantaneous LED
12 Leakage LED
13 Advanced protect LED
14 Communication
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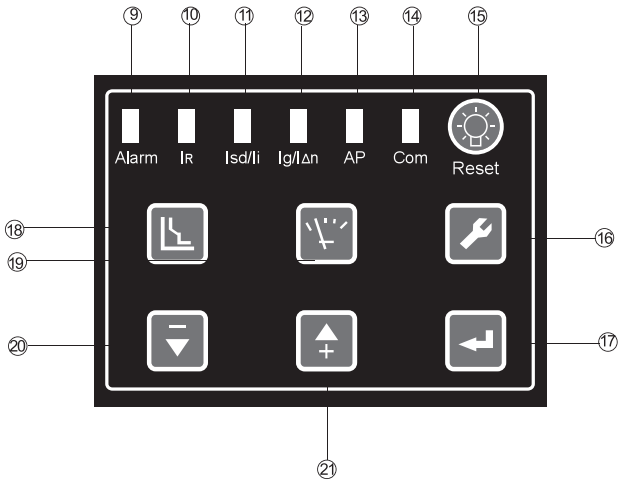

Navigator

16 System setting
17 Confirm
18 Protection interface/return
19 Measurement interface/return
20 Move down
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Control Panel

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23 Long time-time setting t_R
24 Short time-current setting Isd
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26 Ground fault-current setting Ig
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28 Padlock
29 Test,instantaneous
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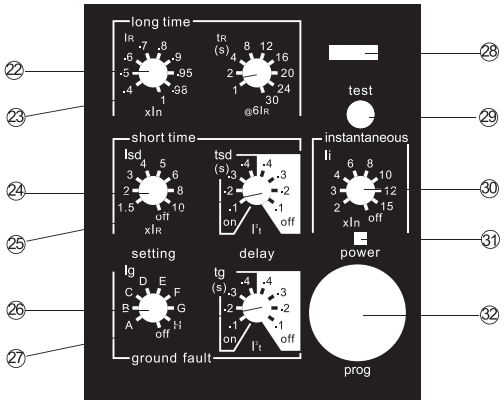
31 Power
32 Test port



2 Technical Characteristics

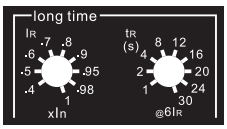
2.1 Protection Characteristics

2.1.1 Overload Protection

Overload Long Time Protection is usually used for the overload of the electric cable.

The function is based on RMS value.

2.1.1.1 Protection Characteristics



Item	Setting Range	Note
Tripping Current Setting	① Rough setting: By knob: (0.4, 0.5, 0.6, 0.7, 0.8, 0.9, 0.95, 0.98, 1.0) In ② Accurate setting: By Intelligent control unit panel	iTR336: adjusted by switch
Tripping Characteristic	1.05 I_R: >2h Non-tripping; 1.2 I_R: <1h Tripping; ≥ 1.2 I_R: Delayed tripping;	
Protection Curves	iTR336、iTR336E I^2t: $t=(6/N)^2*t_R$ N----Fault current divide the times of setting current I/I_R t----Fault trip delay time t_R ----:Long delay time value iTR336H, iTR336H-L SI: Standard Inverse Protection VI: Instantaneous Inverse Protection EI(G):Extreme Inverse(for power distribution protection) EI(M):Extreme Inverse(for motor protection) HV: High Voltage Fuse Compatible I² t :General Purpose Inverse Protection	Default: I^2t
Tripping delay time t_R（s）	I^2t: setting current / Tripping time s 1.5 I_R: 16s 32s 64s 128s 192s 256s 320s 384s 480s 2 I_R: 9s 18s 36s 72s 108s 144s 180s 216s 270s 6 I_R: 1s 2s 4s 8s 12s 16s 20s 24s 30s Delay error ± 10% Different protection characteristics refer to following curve.	Default: I^2t 6 I_R trip at 30s
Protection mode	Trip & alarm	
Protection excution mode	Tripping mode: the opening release act and the breaker open. Alarm mode: Alarm indicator lamp action. Fault trip alarm can set to DO output for user. Fault memory: the last 10 fault records.	

2 Technical Characteristics

2.1 Overview

Setting parameter and tripping characters

The characteristics of each tripping curves is as follow:

(1) Standard Inverse SI

$$t = \frac{0.0365}{N^{0.02} - 1} \times Tr$$

(2) Instantaneous Inverse VI

$$t = \frac{5}{N - 1} \times Tr$$

(3) Extreme Inverse(for power distribut EI(G)

$$t = \frac{35}{N^2 - 1} \times Tr$$

(4) Extreme Inverse(for motor protectio

$$t = \frac{35.5}{1.15} \times \log_e\left(\frac{N^2}{N^2 - 1.15}\right) \times Tr$$

(5) High Voltage Fuse Compatible HV

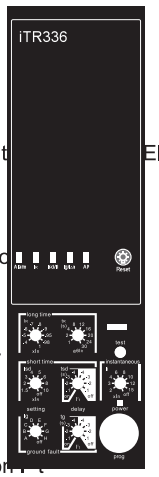
$$t = \frac{1295}{N^4 - 1} \times Tr$$

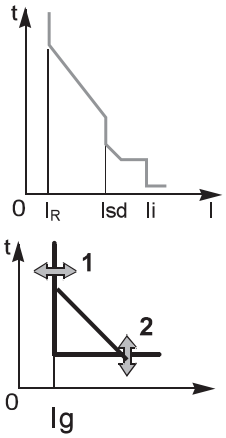
(6) General Purpose Inverse Protection

$$t = (6/N)^2 \times Tr$$

iTR326

L+S+I+G

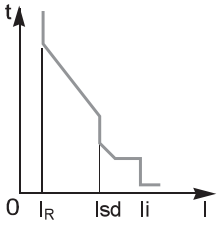


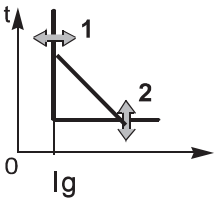


Basic type: 3 section protection

iTR326H

L+S+I+G





Advanced type: complete protection / measurement / maintenance / communication

N=I/I_R, I is actual fault current, I_R is the setting value of overload

Curve	Setting current	Tripping time s								
Setting current I^2t curve	6 I_R	1s	2s	4s	8s	12s	16s	20s	24s	30s
	1.5 I_R	16s	32s	64s	128s	192s	256s	320s	384s	480s
	2 I_R	9s	18s	36s	72s	108s	144s	180s	216s	270s
	6 I_R	1	2	4	8	12	16	20	24	30
Standard Inverse SI	1.5 I_R	4.48	8.97	17.93	35.86	53.79	71.72	89.66	107.59	134.48
	2 I_R	2.61	5.23	10.46	20.92	31.38	41.84	52.29	62.75	78.44
	6 I_R	1	2	4	8	12	16.01	20.01	24.01	30.01
Instantaneous Inverse VI	1.5 I_R	10	20	40	80	120	160	200	240	300
	2 I_R	5	10	20	40	60	80	100	120	150
	6 I_R	1	2	4	8	12	16	20	24	30
Extreme Inverse (for distribution protection)EI(G)	1.5 I_R	28	56	112	224	336	448	560	672	840
	2 I_R	11.67	23.33	46.67	93.33	140	186.67	233.33	280	350
	6 I_R	1	2	4	8	12	16	20	24	30
Extreme Inverse (for motor protection)EI(M)	1.5 I_R	22.09	44.18	88.36	176.73	265.09	353.45	441.82	530.18	662.73
	2 I_R	10.46	20.93	41.86	83.71	125.57	167.42	209.28	251.14	313.92
	6 I_R	1.00	2.00	4.01	8.02	12.03	16.04	20.04	24.05	30.07
High Voltage Fuse Compatible HV	1.5 I_R	318.77	637.54	1275.08	2550.15	3825.23	5100.31	6375.38	7650.46	9563.08
	2 I_R	86.33	172.67	345.33	690.67	1036	1381.33	1726.67	2072	2590
	6 I_R	1	2	4	8	12	16	20	24	30

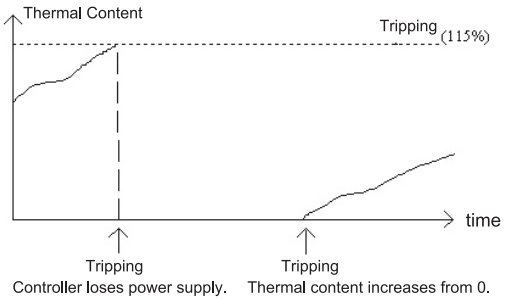
Overload Long Time Characteristics

I/I_R	Trip Time	Delay Error Rate
1.05	>2h Non-tripping	-
1.2	<1h Tripping	-
> 1.2	Calculate according to the equations	±10%

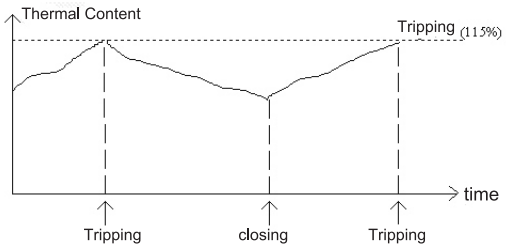
Note: Inherence Error Rate± 40ms.

2.1.1.2 Thermal Content

- To avoid repetitious or periodic overload, the controller will record the thermal effect of the load current, and when the accumulated thermal effect reaches the set level, the controller will trip. The thermal content will be decided by the characteristic of the selected tripping curve.
- The thermal content of all curves except EI(M)for motor protection will only accumulate when the measured current is above 1.1IR. If the breaker trips because of overload, inverse short circuit fault, the breaker shifts from overload to normal, the thermal content will decay by exponential. The user can set the decay time of the thermal content: instantaneous, 10 m, 20 m, 30m, 45m, 1 h, 2 h, 3 h.
- For EI (motor protection) the decay time is not subject to setting, and is always changing with the change of current.
- If the controller is not connected with the auxiliary power, the thermal content will be neglected if the controller is closed immediately after tripping. The thermal content is 0 after the controller is closed and reset.



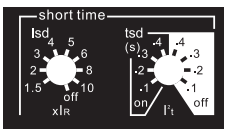
- When the controller is connected with an auxiliary power, the thermal content reduces after the breaker tripping and it is memorized:



2.1.2 Short-circuit Protection

- Short time protection prevents the impedance short circuit of the power distribution system, which is usually caused by short circuit fault of part of the circuit and the current is over the range of overload, but not very serious.
- The tripping delay of the short time short circuit protection is to realize the selective protection.
- The time delay short circuit protection is based on RMS, and is separated into two parts: inverse and fixed time to enhance the cooperation with the downstream protection equipment.
- Zone Selective Interlock

  When the short circuit fault happens at the wire-out side of this grade circuit-breaker, short circuit short time delay will break the circuit-breaker instantly; when the short-circuit error happens at the out-line side of the next grade of this grade circuit-breaker, the short circuit short time delay will break the circuit breaker through the set delay time.



Item	Setting Range	Note
Tripping current setting:Isd	Rough setting: setting by switch(1.5, 2, 3, 4, 5, 6, 8, 10, Off) Accurate setting: setting by intelligent control unit panel	iTR326:only set by switch
Tripping value	common:± 10% ≤0.9 Isd: Non-tripping; ≥1.1 Isd: Tripping;	--
Curve	I^2t: $t=\frac{(8I_R)^2}{I^2}\times tsd$ Isd: Short time short circuit setting current I: Fault current I_R:the setting value of long delay current tsd:the setting value of short delay inverse time	Setting parameter by switch is I^2t curve. Default value:I^2t curve.
Tripping delay time tsd(s)	See table below	Default tripping time of I^2t is 0.2s.
Delay error	See table below	--

Current	Tripping time					
Isd < I ≤ $8I_R$	Inverse	Curve	$I^2t=(8I_R)^2$ tsd			
		Setting s	0.1、0.2、0.3、0.4			
I>$8I_R$ (I^2t on) I≥1.1Isd(I^2t off)	Min fix time is return time.	Setting s	0.1	0.2	0.3	0.4
		Min s	0.08	0.14	0.23	0.35
		Max s	0.14	0.20	0.32	0.50

I^2t:

Fix and inverse 8 I_R:

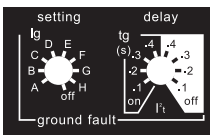
0.1s	0.2s	0.3s	0.4s
80ms-140ms	140ms-200ms	230ms-320ms	350ms-500ms

Inverse: tripping time error: ± 20%

Item	Setting Range	Note
Tripping delay setting	I^2t: Adjusted by switch Fix time(0.1, 0.2, 0.3, 0.4)4 stalls Invers time(0.1, 0.2, 0.3, 0.4)4 stalls Switch on indicates invers time, off indicates fix time.	Default value:I^2t curve
Protection	Trip + Alarm	
Execution	Trip excution mode:the release act and the breaker open. Alarm excution mode: Alarm indicator lamp action,LCD display trip information(except iTR336), fault trip alarm contact output to user.Fault trip alarm can set to DO output for user. Fault history: last 10 fault records ,fault recorder 5 cycles.	

2.1.3 Instantaneous Protection

- The instantaneous protection prevents the short circuit of the distribution system.
- This protection is based on RMS.
- Tripping characteristic: accuracy of tripping value ± 15%.
- Tripping time: not over 50ms.



Item	Setting Range	Note
Tripping delay setting	Rough setting: setting by switch,9 stalls(2, 3, 4, 6, 8, 10, 12, 15, Off) Accurate setting: setting by intelligent control unit panel	iTR326:only set by switch
Tripping value	common: ± 15% ≤ 0.85 Ii: Non-tripping; ≥ 1.15 Ii: Tripping;	
Tripping delay time	Max breaking time 50ms	
Protection	Trip + Alarm	
Execution	Trip excution: release act and breaker open. Alarm excution mode: Alarm indicator lamp action, LCD display trip information(except iTR336), fault trip alarm contact output to user.Fault trip alarm can set to DO output for user. Fault history: last 10 fault records ,fault recorder 5 cycles.	

2.1.4 MCR & HSISC Protection

- The breaker will trip when detect a limit exceeding fault current.
- MCR protects the breaker from switch damage caused by making current that exceeding the making capacity. The protection is enabled instantaneously (within 500ms) after closing. HSISC protects the breaker from carrying a persistent fault current greater than it's withstand capacity. It is effective in 500ms after closing. The accuracy is 0~20% of setting value. Setting value: 16kA,20kA,24kA,28kA,32kA,36kA,41kA,45kA,49kA,53kA,57kA,61kA,65kA,69kA,73kA,77kA, 81kA,85kA,89kA,93kA,97kA,101kA,105kA,109kA,114kA,118kA,122kA，OFF。

Note 1:MCR protection default open,1600 Frame:16 kA; 4000 Frame:41kA.
Note 2:HSISC protection default close.

2.1.5 Neutral Protection

When the cable is relatively thin, half of the setting value can be used. When the cable is normal, the set value can be used. When the mains harmonics are relatively big, double value or 1.6 times the value can be used.

Item	Description
50%N	50% neutral protection ● Neutral phase over load, tripping value is half the set value. ● Neutral phase short time delay trip, tripping value is half the set value. ● Neutral phase instantaneous trip, tripping value is the set value. ● Neutral phase earthing fault, tripping value is the set value.
100%N	100% neutral protection ● Neutral phase over load, tripping value is the set value. ● Neutral phase short time delay trip, tripping value is the set value. ● Neutral phase instantaneous trip, tripping value is the set value. ● Neutral phase earthing fault, tripping value is the set value.
160%N	160% neutral protection ● Neutral phase over load, tripping value is 1.6 time set value. ● Neutral phase short time delay trip, tripping value is 1.6 time the set value. ● Neutral phase instantaneous trip, tripping value is the set value. ● Neutral phase earthing fault, tripping value is the set value.
200%N	200% neutral protection ● Neutral phase over load, tripping value is twice the set value. ● Neutral phase short time delay trip, tripping value is twice the set value. ● Neutral phase instantaneous trip, tripping value is the set value. ● Neutral phase earthing fault, tripping value is the set value.
OFF	None

Note: 3P+N:(50%, 100%, 160%, 200%)N

4P : (50%, 100%)N setting value>100% is forbidden

Default setting: 100%N

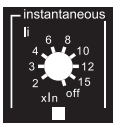
2.1.6 Ground Return Protection

- For single phase metal earth fault protection, there are two types of measures: residual current and earth current.
- Difference type is the four phases (3-phase 4-line system) or a three-phase (3-phase 3-wire system) current vector and protection, its characteristic is suitable for occasions with large grounding current.
- Grounding current type is directly to the transformer and the grounding end signal sampling protection, high precision, and strong anti-interference ability.
- Tripping accuracy is the set value of ± 10%

2 Technical Characteristics

Item	Description
Difference type	Detection of the phase current and neutral line current vector.
Grounding current type	● Controller directly measures the current which go through the ground cable by a special external transformer. ● Simultaneous detection of upper level and lower level circuit breaker fault ● The maximum distance between transformer and circuit breaker is 10 m.

● Ground fault protection and neutral protection can be used separately or together.



Item	Setting Range	Note
Tripping current: Ig	630≤In<1250A: （0.2~1）×In In ≥ 1250A: 500A ～ 1200A	-
Tripping characteristic	±10% < 0.9 Ig: Non-tripping; ≥ 1. 1 Ig: Tripping or delayed tripping;	-
Setting methods	Rough setting: setting by switch,9 stalls(A, B, C, D, E, F, G, H, Off) Accurate setting: setting by intellegent control unit panel	iTR326:only set by switch
Curve	Inverse I^2t: $t = \frac{(I_g)^2}{I^2} \times tg$ Ig :earth fault protection setting value, In ≥1250A,Ig=1200A. In<1250A, Ig=In. I: Fault current value T: Falut tripping delay time tg: the setting value of earth fault inverse time.	-
Tripping time: tg	Earth fault tripping characteristic	Default time: I^2t curve inverse time. 0.4s

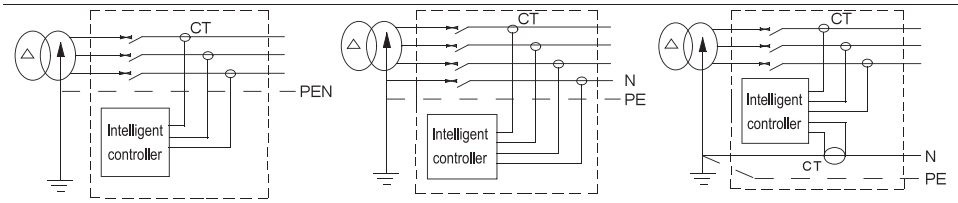
	A	B	C	D	E	F	G	H	OFF
In < 1250	0.2In	0.3In	0.4In	0.5In	0.6In	0.8In	0.9In	In	
In≥1250	500A	600A	700A	800A	900A	1000A	1100A	1200A	

Current	Tripping time					
tg(s)	Invers time	characteristic	$t = \frac{(I_H)^2}{I^2} \times tg$			
		Setting time(s)	0.1, 0.2, 0.3, 0.4			
	Fix time, min time is return time	Setting time(s)	0.1	0.2	0.3	0.4
		min(s)	0.08	0.14	0.23	0.35
		max(s)	0.14	0.20	0.32	0.50

Delay error	I^2t: Fix time trip:			
	0.1s	0.2s	0.3s	0.4s
	80ms-140ms	140ms-200ms	230ms-320ms	350ms-500ms
	Inverse time:inverse time error± 20%			

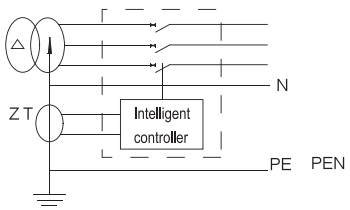
Item	Setting Range	Note
Tripping delay setting	I^2t: Adjusted by switch Fix time(0.1, 0.2, 0.3, 0.4)4 stalls Invers time(0.1, 0.2, 0.3, 0.4)4 stalls Switch on indicates invers time, off indicates fix time.	Default value:I^2t curve
Protection	Trip + Alarm	
Execution	Trip excution mode:the release act and the breaker open. Alarm excution mode: Alarm indicator lamp action,LCD display trip information(except iTR336), fault trip alarm contact output to user.Fault trip alarm can set to DO output for user. Fault history: last 10 fault records ,fault recorder 5 cycles.	

1 Differential Value



(3PT) (4PT) (3P+N)

2 Earth Current



Controller defaults to the difference type of ground protection. Grounding current type needs further order.

2.1.7 Ground Return Alarm

- Trip principle

1. Threshold Value
2. Delay Time
3. Return
4. Return Delay Time

● Tripping based on max value

1. Delayed Alarm start when fault current is over tripping value 1
2. Alarms after a delayed time 2, fault alarm DO act.
3. Return to delay counting after the current is less than return value 3
4. Alarm releases after a return time 4, fault alarm DO reset.

● Return value is no more than tripping value.

Earth alarm	Start value	Start time	Return value	Return time	Execution
	630≤In<1250A：(0.2-1)xIn In ≥ 1250A：500A ～ 1200A	0.1 ～ 1.0s Step 0.1s	0.2In~start value Step 1A	0.1 ～ 1.0s Step 0.1s	Alarm

● Tripping characteristic

fault current <0.9 tripping value: non-tripping; fault current >1.1 tripping value: tripping.

fault current >1.0 return value: non-return; fault current < 0.9 return value: return.

● Delay accuracy

Allowed error: ± 20%, inhere error ± 40ms

2.1.8 Earth Leakage Protection

Earth leakage current is detected by a sensitive and reliable current transformer. It is suitable for a relatively small leakage current and the output is a current signal.

Default setting 5A, 0.42s

● Parameters of earth-leakage protection setting

Item	Setting Range
Tripping Current Setting(A)	I △ n=0.5，1，2，3，5，10，20，30，OFF
Delay time(s)	0（Inst.） 0.06 0.25 0.33 0.42 0.58 0.75 0.83

● Tripping characteristic of earth-leakage protection

Characteristic	Current （I/I △ n）	Conventional time	Allowed delay error
Non-tripping	≤0.8	Non-tripping	-
Tripping	≥1.0	Tripping	-
Tripping Delay	≥ 1.0	Refers to following table	±10%

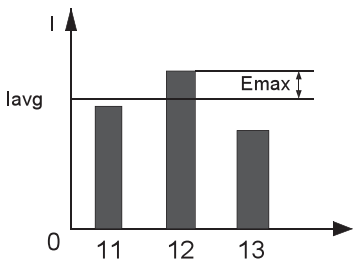
Setting time(s)	0.06	0.25	0.33	0.42	0.58	0.75	0.83	0
Fault current	Max breaking time							
I △ n	0.36	1.5	2	2.5	3.5	4.5	5	0.04
2I △ n	0.18	0.75	1	1.25	1.75	2.25	2.5	0.04
5I △ n	0.072	0.3	0.4	0.5	0.7	0.9	1	0.04
10I △ n								

Note: the tripping current value and tripping time setting can also be operated through the keyboard, realize precise adjusting in the stalls, tripping current setting step is 0.5A, tripping time setting step 0.02s.

2.1.9 Leakage Alarm

The leakage alarm function and the leakage protection function are independent, and each has their own parameters.

Items	Setting Ranges	Step Length	Note
Current setting	0.5 ～ 30.0A	0.1A	
Tripping time delay	Inst. +0.1 ～ 1.0S	0.1S	
Return current	0.5 ～Tripping current	0.1A	
Alarm return delay	Inst. +0.1 ～ 1.0S	0.1S	
Alarm DO output	Set one DO of the signal unit as "Leakage Alarm". (not necessary)		
Execution	Trip + Alarm		



2.1.10 Current Unbalance Protection

- Current unbalance protection is based on RMS value. It is a fixed time protection.
- Iavg is the average current(RMS) of 3 phases.

$$Iavg = \frac{I1 + I2 + I3}{3}$$

- Emax: The maximum dispatch between every phase and the Iavg

$$Iunbal \triangle = \frac{|Emax|}{Iavg}$$

- Tripping characteristic

  fault current <0.9 tripping value: non-tripping; fault current >1.1 tripping value: tripping.

  fault current >1.1 return value: non-return; fault current < 0.9 return value: return.
- Delay accuracy

  Allowed error: ± 20%, inhere error ± 40ms

Note: the return current must be set lower than tripping current, otherwise it will be automatically set as tripping current.It cannot return when execution method is tripping.

Current imbalance	Start value	Start time	Return value	Return time	Execution
	5% ~ 60% Step 1	0.1 ~ 40.0s Step 0.1s	5%~start value Step 1	10 ~ 200s Step 1s	Alarm+trip+close
Accuracy	±10%	±10%	±10%	±10%	±10%

2.1.11 Demand Current Protection

- When the actual current value exceeds the demand current, the controller takes protection action.

  A phase maximum demand current value.

  B phase maximum demand current value

  C phase maximum demand current value.

  N phase maximum demand current value(not influenced by the set of the neutral protection)
- It calculate the demand current value of a selected phase.
- The setting sequence of different phase is same. Now we take the setting of Ia max as sample.

- Tripping characteristic

  fault current < 0.9 tripping value: non-tripping; fault current> 1.1 tripping value: tripping.

  fault current >1.1 return value: non-return; fault current < 0.9 return value: return.

- Delay accuracy

  Allowed error: ± 20%, inhere error ± 40ms

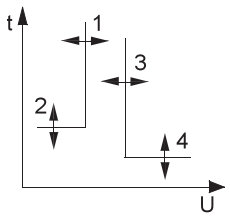
Note: the return current must be set lower than tripping current, otherwise it will be automatically set as tripping current.It cannot return when execution method is tripping.

Phase A demand current	Start value	Start time	Return value	Return time	Execution
	0.2 ～ 1.0In Step 1A	15 ～ 1500s Step 1s	0.2In~start value Step 1A	15 ～ 3000s Step 1s	Alarm+trip+close
Accuracy	±10%	±10%	±10%	±10%	

Note: In>2000A, step length 2A

2.1.12 Under Voltage Protection

- Trip principle



1 Threshold Value

2 Delay Time

3 Return

4 Return Delay Time

- Under voltage protection

1. Alarm or delayed tripping start when fault current is below tripping value 1.
2. Alarm or tripping after a delayed time 2, under voltage DO act.
3. Return to delay counting after the current is over return value 3
4. Alarm release after a return time 4, under voltage DO reset.

- When under voltage protection and over voltage protection are set, the min over voltage value should be above the max under voltage value.
- This function calculates the max RMS voltage of three phases.
- When the voltage of any phase is below the setting value, the breaker will trip.
- Tripping characteristic

  fault current <0.9 tripping value: non-tripping; fault current >1.1 tripping value: tripping.

  fault current >1.1 return value: non-return; fault current < 0.9 return value: return.

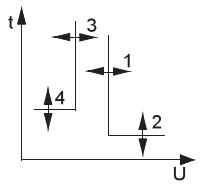
- Delay accuracy

  Allowed error: ± 20%, inhere error ± 40ms

Note: the return current must be set lower than tripping current, otherwise it will be automatically set as tripping current.It cannot return when execution method is tripping.

Under voltage	Start value	Start time	Return value	Return time	Execution
	100V~return value Step 1V	0.2 ～ 60.0S Step 0.1s	start value~1200V Step 1V	0.2 ～ 60S Step 0.1s	Alarm+trip+close
Accuracy	±10%	±10%	±10%	±10%	

2.1.13 Over Voltage Protection



1. Alarm or delayed tripping start when fault current is below tripping value 1.
2. Alarm or tripping after a delayed time 2, under voltage DO act.
3. Return to delay counting after the current is over return value 3
4. Alarm release after a return time 4, under voltage DO reset.

- When under voltage protection and over voltage protection are set, the min over voltage value should be above the max under voltage value.
- This function calculates the max RMS voltage of three phases.
- When the voltage of any phase is below the setting value, the breaker will trip.
- Tripping characteristic

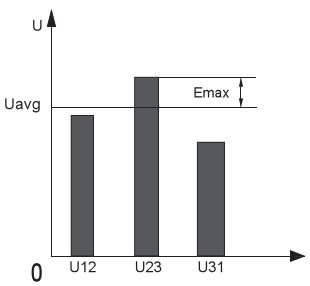
  fault current <0.9 tripping value: non-tripping; fault current >1.1 tripping value: tripping.

  fault current >1.1 return value: non-return; fault current < 0.9 return value: return.
- Delay accuracy

  Allowed error: ± 20%, inhere error ± 40ms

Note: the return current must be set lower than tripping current, otherwise it will be automatically set as tripping current.It cannot return when execution method is tripping.

Over voltage	Start value	Start time	Return value	Return time	Execution
	return value~1200V Step 1V	0.2 ～ 60.0S Step 0.1s	100V~start value Step 1V	0.2 ～ 60S Step 0.1s	Alarm+trip+close
Accuracy	±10%	±10%	±10%	±10%	



2.1.14 Voltage Unbalance Protection

Voltage unbalance protection is based on RMS value.

- The protection is based on the comparison of max phase voltage and the average phase voltage
- Uavg is the RMS average of 3 phase voltage,

$$Uavg = \frac{U12+U23+U31}{3}$$

- Uunbal(voltage unbalance ratio) is caculated as follow,

$$Uunbal = \frac{|E\,max|}{Uavg}$$

- Tripping characteristic

  fault current <0.9 tripping value: non-tripping; fault current >1.1 tripping value: tripping.

  fault current >1.1 return value: non-return; fault current < 0.9 return value: return.
- Delay accuracy

  Allowed error: ± 20%, inhere error ± 40ms

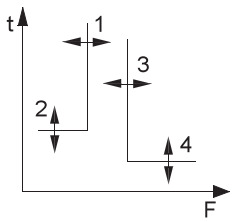
Note: the return current must be set lower than tripping current, otherwise it will be automatically set as tripping current.It cannot return when execution method is tripping.

Voltage Unbalance	Start value	Start time	Return value	Return time	Execution
	2% ～ 30% Step 1%	0.2 ～ 60S Step 0.1s	2%~start value Step 1%	0.2 ～ 60S Step 0.1s	Alarm+trip+close
Accuracy	±10%	±10%	±10%	±10%	

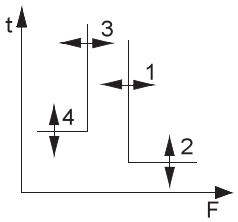
2.1.15 Under Frequency, Over Frequency Protection

● Trip principle

Under Frequency Protection



Over Frequency Protection



1 Threshold Value

2 Delay Time

3 Return

4 Return Delay Time

● Under Frequency, Over Frequency Protection

1. Alarm or delayed tripping start when fault current is below tripping value 1.
2. Alarm or tripping after a delayed time 2, under voltage DO act.
3. Return to delay counting after the current is over return value 3
4. Alarm release after a return time 4, under voltage DO reset.

● When under voltage protection and over voltage protection are set, the min over voltage value should be above the max under voltage value.

● Tripping characteristic

Under Frequency Protection

frequency < 0.9 tripping value: non-tripping; frequency >1.1 tripping value: tripping.

frequency >1.1 return value: non-return; frequency < 0.9 return value: return.

Over Frequency Protection

frequency < 0.9 tripping value: non-tripping; frequency >1.1 tripping value: tripping.

frequency >1.1 return value: non-return; frequency < 0.9 return value: return.

● Delay accuracy

Allowed error: ± 10%, inhere error ± 40ms

● Under voltage protection

Note: the return current must be set lower than tripping current, otherwise it will be automatically set as tripping current.It cannot return when execution method is tripping.

Under frequency	Start value	Start time	Return value	Return time	Execution
	45.0-~return value Step 0.5Hz	0.2 ～ 5.0S Step 0.1s	start value~65Hz Step 0.5Hz	0.2 ～ 36.0S Step 0.1s	Alarm+trip+close
Accuracy	±10%	±10%	±10%	±10%	

● Over voltage protection

Note: the return current must be set lower than tripping current, otherwise it will be automatically set as tripping current.It cannot return when execution method is tripping.

Over frequency	Start value	Start time	Return value	Return time	Execution
	return value~45.0 Step 0.5Hz	0.2 ～ 5.0S Step 0.1s	45.0Hz~start value Step 0.5Hz	0.2 ～ 36.0S Step 0.1s	Alarm+trip+close
Accuracy	±10%	±10%	±10%	±10%	

2.1.16 Reversible Power Protection

- The reversible power protection picks the sum of the three phase active power,
- when the flowing direction is contrary to the user set power direction, and beyond the set value, the protection start.
- Tripping characteristic

  power value < 0.9 tripping value: non-tripping; power value >1.1 tripping value: tripping.

  power value >1.1 return value: non-return; power value < 0.9 return value: return.
- Delay accuracy

  Allowed error: ± 10%, inhere error ± 40ms

Note: the return value must less than tripping value, otherwise it will be automatically set as tripping value. It cannot return when execution method is tripping.

Reversible Power	Start value	Start time	Return value	Return time	Execution
	5 ～ 500kW Step 1kW	0.2 ～ 20S 0.1S	5kW~start value Step 1kW	1.0 ～ 360S 0.1S	Alarm+trip+close
Accuracy	±10%	±10%	±10%	±10%	

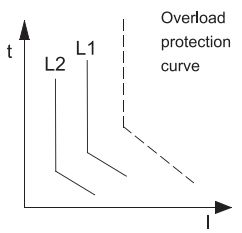
2.1.17 Phase Sequence Protection

- The protection operates when the current phase sequence is different from the primary sequence.

	Start value	Tripping time	Execution
	Δφ: A, B, C Δφ: A, C, B	Tripping time: <40ms	Alarm + trip + close

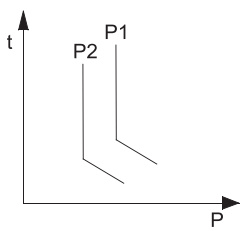
2.1.18 Load Monitor (iTR326H)

Load inspection can be used in fore alarm, and can also be used to control the load of the branch circuit. It has two protection ways. First way, it controls the two way load separately. When the current parameter is beyond the set value, corresponding load inspection DO delayed operates (need to corresponding DO function) to control the branch circuits load ensuring the power supply of the main system. Second way, it generally controls the same circuit. When the current parameter is beyond the set value, "load inspecting 1" DO delayed operates to break the load of the branch circuit; if the current parameter value after breaking is lower than the return value. After the set time, "load inspecting 2" DO operates and the power supply of the system restore.



- Discharge and recover according to the current

  Tripping characteristic relates to overload protection, tripping rate and value can be set separately. When in second way, load recovery delayed time is a fixed time.



Notice

1 In second way, start value must be over return value.

2 Load monitor can not trip the breaker directly, but it controls the breaker with output DO to send an alarm signal.

- Discharge and recover according to the power

  Discharge and recover delayed time is a fixed time.

  Tripping principle is same as discharge and recover according to the current

Execution	Discharge value 1	Discharge time 1	Discharge value 2	Discharge time 2
Current 1	0.2 ～ 1.0I_R, Step 1A (Note 1)	20 ～ 80%tr Step 1% tr	0.2 ～ 1.0I_R, Step 1A (Note 1)	20 ～ 80%tr Step 1% tr
Execution	Discharge value 1	Discharge time 1	Return value	Return time
Current 2	0.2 ～ 1.0×I_R, Step 1A (Note 1)	20 ～ 80%tr Step 1% tr	0.2I_R ～ Discharge value Step 1A (Note 1)	10 ～ 600S, Step 1s
Execution	Discharge value 1	Discharge time 1	Discharge value 2	Discharge time 2
Power 1	200 ～ 10000kW Step 1kW	10 ～ 3600S Step 1s	200 ～ 10000kW Step 1kW	10 ～ 3600s Step 1s
Execution	Discharge value	Discharge time	Return value	Return time
Power 2	200 ～ 10000kW Step 1kW	10S ～ 3600S Step 1s	100 ～ 10000kW Step 1kW	10S ～ 3600s Step 1s
Execution				
OFF	Load monitor off			

Note 1: In≤ 2000A, step length 1A

In>2000A, step length 2A

2.1.19 Harmonic Alarm

Harmonic alarm has current harmonic and voltage harmonic alarm.

Current harmonic alarm

Trip when maximum current harmonic distortion rate is greater than the set value of 1.1 times.

Voltage harmonic alarm

Trip when maximum line voltage harmonic distortion rate is greater than the set value of 1.1 times.

	Start value	Start time	Return value	Return time	Execution
Harmonic alarm	5~100% Step 1	1~20S 0.1S	5~start value Step 1	1.0~360S 0.1S	Alarm + close
Accuracy	± 10%	± 10%	± 10%	± 10%	

2.2 Measuring Function

2.2.1 Measuring

2.2.1.1 Current and Voltage

Current

- Histogram indication

  The controller shows the current of A,B,C and neutral line(select according the system type)in histogram, and indicate the percentage of set value of each current relative overload(when the overload closes relatively rating current).

- Measuring

  Measure the instant current value(RMS)including:I1, I2, I3 and IN, grounding error current Ig, leakage current IΔn. It records the maxi. current of each phase and it can be reset manually.

Demand current

- Record the maximum current of each phase. It can be reset manually

Voltage

- Phase to phase voltage: Uab, Ubc, Uac
- Phase to neutral voltage: Ua, Ub, Uc

Average Voltage

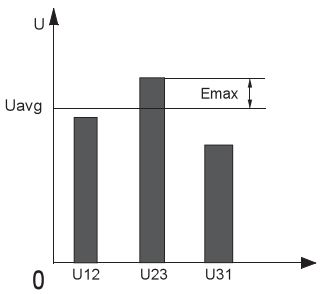
- The average value of phase to phase voltage.

Phase sequence

- Show the order of the phase, when without the voltage function, no phase sequence.

Voltage unbalance

- This function computes the percentage of the imbalance ratio among the three line voltage



$$Uunbal = \frac{|E\,max|}{Uavg}$$

$$Uavg = \frac{U12+U23+U31}{3}$$

Uavg: average value of RMS value of the three line voltage

E max: max different value between each line voltage and Uavg

Instantaneous power and power factor

- System and each phase active power P(kW)
- System and each phase reactive power Q(kvar)
- System and each phase apparent power S(kVA)
- System and each phase power factor PF

Demand Power

- Measuring display system active power, reactive power,apparent power
- Time parameter of required power
- Record the maximum value of each phase. It can be reset manually

Energy

- Total active electrical power(EP),total reactive electrical power(EQ),total apparent electrical power(ES)
- Input active electrical power(EPin),input reactive electrical power(EQin)
- Ouput active electrical power(EPout),ouput reactive electrical power(EQout)
- Measuring record can be reset manually

Note:

- Active power, reactive power symbol, input/output of EP should be set as "upper wire-in" or "lower wire-in" from the item of "wire-in method" under the menu of "measuring meter set" according to the actual status.
- All the computed EP value is "total absolute value". Means the sum of input and output of EQ:

$$EP = \sum EPin + \sum EPout$$

$$EQ = \sum EQin + \sum EQout$$

Frequency

- In distribution system, Hz is the unit of frequency.

2.2.1.2 Harmonic

The harmony wave is the common problem in the modern electrical appliance.

When the harmony wave appears, the wave figure of current or voltage happen aberrance, not the absolute sine curve.

The definition of harmony wave

One signal is made up of factors below:

- Original sine curve signal under the basal wave frequency.
- The frequency of other sine curve signal(harmony wave) is the integer multiples of the basal wave.
- DC heft(in some status)

Any signal can be expressed by the formula below:

$$y(t)=Y_0+\sum_{n=1}^{\infty} Yn \times \sin(n\omega t-\varphi n)$$

In the formula:

- Y_0 is DC heft(regards as 0)
- n is RMS value of the nth harmony wave
- φ is the angle frequency of the basal wave
- n is the phase displacement when the harmony wave at the time of t=0

The harmony wave times n means the nth time harmony wave, it is one sine curve signal with n multiples of the basal wave frequency.

For example, current and voltage wave figure has the trait below:

- Basal frequency 50HZ
- 2 times harmony wave frequency is 100HZ
- 3 times harmony wave frequency is 150HZ
- ……

The effect of the harmony wave

- Enlarge the current, cause overload.
- The device is worn down too much, and aging in advance.
- The voltage harmony wave affects the normal work of load.
- The communication is affected by network.

Acceptable harmony wave level

Under the conditions below, the harmony wave in the distributing system can be accepted:

- As the prevent method, get the system information, explore the excursion
- As the modifying method, diagnose the disturb, or the validity of the detecting proposal

The standard and provision of the harmony wave disturb:

- Compatible standard of public appliance:
  Low voltage:IEC6000-2-2
  Middle voltage:IEC6000-2-4
- Electromagnetic compatible(EMC)standard:
  Load below 16A:IEC6000-3-2
  Load beyond 16A:IEC6000-3-4
- Recommend of the device

The international has developed some data that can estimate the typical harmony wave value of the distributing system. Below is the harmony wave level table. In the appliance, should not overtop the data listed in the table.

Voltage harmony wave arrayed according to the even and odd sequence, in:

- Low voltage(LV)system
- Middle voltage(MV)system
- Super high voltage(EHV)system

Odd harmony wave(not the multiples of 3)				Odd harmony wave(multiples of 3)				Even harmony wave			
Sequence	LV	MV	EHV	Sequence	LV	MV	EHV	Sequence	LV	MV	EHV
5	6	6	2	3	5	2.5	1.5	2	2	1.5	1.5
7	5	5	2	9	1.5	1.5	1	4	1	1	1
11	3.5	3.5	1.5	15	0.3	0.3	0.3	6	0.5	0.5	0.5
13	3	3	1.5	21	0.2	0.2	0.2	8	0.5	0.2	0.2
17	2	2	1	>21	0.2	0.2	0.2	10	0.5	0.2	0.2
19	1.5	1.5	1					12	0.2	0.2	0.2
23	1.5	1	0.7					>12	0.2	0.2	0.2
25	1.5	1	0.7								

The harmony wave we care about

- Low frequency odd harmony wave
- Mainly the 3rd , 5th , 7th , 11th and 13th times harmony wave

Measuring content of the harmony wave

Basal wave measuring include:

- Current: Ia, Ib, Ic and IN.
- Voltage: Uab, Ubc, Uca and Uan, Ubn, Ucn

2.3 Accessory Function

2.3.1 Fault record

Tripping history

- Tripping history record can show the measuring pars of the last eight times at any time.
- For each tripping, the concrete recording parameter has below:
  - Tripping cause
  - Tripping value
  - Delay time
  - Current or voltage value
  - Error time(year, month, day, time, minute, second)

Alarm history record

- Alarm history record can show the measuring pars of the last eight times at any time.
- For each alarming, the concrete parameter has below:
  - Alarming cause
  - Alarming value
  - Error time(year, month, day, time, minute, second)

Transposition history record

- Transposition history record can show the last ten transposition parameter.
- For each transposition, the concrete transposition recording parameter has below:
  - Transposition type(closing switch, releasing switch or tripping)
  - Transposition cause(local/remote operation, error/measuring trip)
  - Transposition time(year, month, day, time, minute, second)

2.3.2 Self-detecting

The controller can show the error information when EEPROM error, setting parameter. losing, AD sampling error, RAM error or ROM error, also send the alarming signal.

2.3.3 Contactor Maintenance Alarm

The controller computes and displays the wearing status of the contactor point according to the mechanical life , breaking current, that is the life of the contactor point. Its life is zero when out of factory, means no abrasion. When the display value reaches 100%, send the alarm signal, remind users to adopt the maintenance method in time. After changing the contactor point, resume the life of the contactor point to the original value, but the total life still be retained as the total consuming contactor point life of the circuit breaker.

2.3.4 I/O Function

DO output function

- The intelligent controller provides 3 group separate signal contactor point output.

Function set				
Operating way	NO PWL	NC PWL	NO impulse	NC impulse
Impulse time	None		1 ～ 360S	1 ～ 360S

Set table of DO function

Common use	alarm	Error tripping	Self-diagnosis alarm	Load inspecting 1
Load inspecting 2	Overdue fore alarm	Overload error	Short time delay error	Instant error
Grounding/leakage error	Grounding alarm	Current imbalance error	Neutral error	Undervoltage error
Overvoltage error	Voltage imbalance error	Under frequency error	Over frequency error	Demand error
Reverse power error	District interlock	Closing switch	Releasing switch	Phase sequence error
MCR/HSISC error	Grounding interlock	Short circuit interlock	Phase A demand error	Phase B demand error
Phase C demand error	Phase N demand error	Demand over limit		

Note: All these functions depend on different intelligent control unit.

I/O status

- Look over the current the status of I/O.

  DO:"1"means output relay is the closing status;"0"means the outputting relay is the breaking status.

  DI:"1"means operate;"0"means reset.(relative to the set of DI performing way)

2.3.5 Zone Selective Interlock(ZSI)

ZSI includes the short circuit interlock and grounding interlock. In the same electric circuit with two sets or many sets upper and lower grade relative circuit-breaker. When short circuit or grounding error happens at the wire-out side of the lower grade circuit-breaker, the lower grade circuit-breaker instantly trips and send a signal to the upper circuit-breaker not to trip at this time. When the happening position of the short circuit or grounding error between the upper circuit breaker and the lower circuit breaker, the upper circuit breaker did not receive the zone interlock signal, so instantly trip and cut off the error circuit.

Parameter Set:

- The upper circuit breaker has one way DI set as the zone interlock detection at least;
- The lower circuit breaker has one way DO set as zone interlock signal output at least.

2.3.6 Test & Lock

Test tripping

The test devides to three sections protection, grounding/leakage error, and mechanism operating time.

Three sections protection test: input error current simulating overload, short circuit, and instant error.

Grounding/leakage error test : Input the error current simulating these error happens to test the breaker.

Tripping time test: force the flux meter to execute measuring the inherent tripping time of the breaker.

Test type	Three section protection	Grounding/leakage error	Operating time
Test parameter	0~131.0kA(note 1)	0~131.0kA(note 2)	None
Test control	start+stop		

Note: 1,when In≤2000A,0~65.5kA,step length 1A(>10kA,step length is 0.1kA)
when In>2000A,0~131kA,step length 2A(>10kA,step length is 0.2kA)

2, when the grounding error test, same as note 1;
When leakage error test,0~655A,step length 0.01A(>100A,step length 1A)

Remote control lock

Lock	when in "lock" status, the controller will not respond to the remote control instruction of the upper position machine.
Release the lock	in the status of "release the lock", the controller responds releasing, closing, reset.

Lock the parameters.

Lock	users cannot modify the parameter in the status of "lock", users cannot modify the parameter.
Release the lock	users can modify the parameter in the status of "release the lock", .

Note: Input the correct password before enter the interface of "Parameter Lock".

2.3.7 High-low Temperature

iTR336H-L means the storage, transportation, working environment temperature related to climate catalog.

The working ambient temperature is -40° C ~+80° C.

The storage and transportation ambient temperature is -55° C~+85° C.

The installation position air relative humidity of not more than 50% at the highest temperature of +40° C.

2.3.8 Remote Control

The tripping method of ACB determines that once ACB opened, it needs a machinical reset before reclosing (whether a local or remote reset). Remote reset is to be done by remote communication or derectly reset preparing for remote closing. Remote control is especially fit for that the ACB locale and control locale are in different place.

2.3.9 Communication

The intelligent control unit can achieve remote measuring, control, setting and communication.

Protocol	Modbus	Profibus	DeviceNet
Address	0 ～ 255	3 ～ 126	0 ～ 63
Bite rate（bit/S）	9.6k、19.2k、38.4k、115.2k	Auto adjust	125k、250k、500k

Default communication protocol is Modbus, any other needs to be ordered extra.

3 Human Interface

3.1 Menu Structure

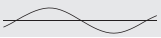
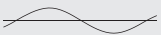
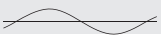
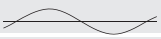
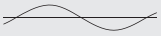
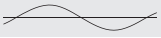
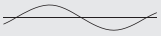
The menu is made up of measuring menu, parameter set menu, and protected parameter set menu, history record and maintenance menu.

Note: Actual menu changes according to the difference of the user's selection function.

3.1.1 Structure of the Measuring Menu

Level 1	Level 2	Level 3	Level 4	Level 5
Current I	Instant value	Ia,Ib,Ic,In	Ia= 1600A	
			Ib= 1605A	
			Ic= 1598A	
			In= 0A	
			Ig= 0A or I Δ n= 0.00A	
		Max value	Ia= 0A	
			Ib= 0A	
			Ic= 0A	
			In= 0A	
			Ig= 0A or I Δ n= 0.00A	
			Reset (+/-)	
		Imbalance ratio	Ia= 0%	
			Ib= 0%	
			Ic= 0%	
	Current heat capacity		100%	
	Demand value	Ia,Ib,Ic,In	60min	
			Ia= 0A	
			Ib= 0A	
			Ic= 0A	
			In= 0A	
		Max value	5min	
			Ia= 0A	
			Ib= 0A	
			Ic= 0A	
			In= 0A	
			Reset (+/-)	
Voltage U	Instant value	Uab= 0V		
		Ubc= 0V		
		Uca= 0V		
		Uan= 0V		
		Ubn= 0V		
		Ucn= 0V		
	Average value	3Ø 0V		
	Imbalance ratio	3Ø 0%		
	Sequence	A，B，C		
Frequency F	50Hz			
Energy Power E	Total EP	EP = 0kWh		
		EQ = 0kvarh		
		ES = 0kVAh		
	Input EP	EP = 0kWh		
		EQ = 0kvarh		
	Output EP	EP = 0kWh		
		EQ = 0kvarh		
	EP reset	Reset		

Level 1	Level 2	Level 3	Level 4	Level 5
Energy Power E	Phase energy	EPa,b,c	EP = 0kWh	
			EQ = 0kvarh	
			ES = 0kVAh	
		EQa,b,c	EP = 0kWh	
			EQ = 0kvarh	
			ES = 0kVAh	
		ESa,b,c	EP = 0kWh	
			EQ = 0kvarh	
			ES = 0kVAh	

Level 1	Level 2	Level 3	Level 4	Level 5
Power P	Instant value	P，Q，S	P = 0kW	
			Q = 0kvar	
			S = 0kVA	
		Power factor	1.00 capacitive	
			PFa = 1.00	
			PFb = 1.00	
			PFc = 1.00	
		Pa,Qa,Sa	Pa = 0kW	
			Qa = 0kvar	
			Sa = 0kVA	
		Pb,Qb,Sb	Pb = 0kW	
			Qb = 0kvar	
			Sb = 0kVA	
		Pc,Qc,Sc	Pc = 0kW	
			Qc = 0kvar	
			Sc = 0kVA	
		PFa,b,c	PFa=1.00	
			PFb=1.00	
			PFc=1.00	
	Demand value	P, Q, S	P = 0kW	
			Q = 0kvar	
			S = 0kVA	
		Max value	P = 0kW	
			Q = 0kvar	
			S = 0kVA	
			Reset (+/-)	
Harmony wave H	Wave figure	Ia,b,c	Ia 	
			Ib 	
			Ic 	
		In	In 	
		Uan,Ubn,Ucn	Uan 	
			Ubn 	
			Ucn 	
	Basic wave	I(A)	Ia=2000A	
			Ib=1990A	
			Ic=1990A	
			In=0A	
	THD	U(V)	Uab=380V	
			Ubc=380V	
			Uca=380V	
			Uan=220V	
			Ubn=220V	
			Ucn=220V	
		I(%)	Ia=10%	
			Ib=10%	
			Ic=10%	
			In=10%	

Level 1	Level 2	Level 3	Level 4	Level 5
Harmony wave H		U(%)	Uab=2.0%	
			Ubc=2.0%	
			Uca=2.0%	
			Uan=1.5%	
			Ubn=1.5%	
			Ucn=1.5%	
	thd	I(%)	Ia=10%	
			Ib=10%	
			Ic=10%	
			In=10%	
		U(%)	Uab=1.5%	
			Ubc=1.5%	
			Uca=1.5%	
			Uan=1.5%	
			Ubn=1.5%	
			Ucn=1.5%	
	FFT	I(3,5,7…31)		Ia FFT THD= 0.0% 
			Ib(3,5,7…31)	Ib FFT THD= 0.0% 
			Ic(3,5,7…31)	Ic FFT THD= 0.0% 
			In(3,5,7…31)	In FFT THD= 0.0% 
		U(3,5,7…31)	Uab(3,5,7…31)	Uab FFT THD= 0.0% 
			Ubc(3,5,7…31)	Ubc FFT THD= 0.0% 
			Uca(3,5,7…31)	Uca FFT THD= 0.0% 

3.1.2 Structure of the Parameter Set Menu

Level 1	Level 2	Level 3	Level 4	Level 5
Time set	Date	2012/02/15		
	Time	19：50：35		
Measure meter setting	System type	3Ø4W 4CT		
	Wire-in way	up line		
	Power direction	P		
	Demand current	Caculate method	Counting method	
		Time window type	Slide	
		Selecting time	60min	
	Demand power	Caculate method	Counting method	
		Time window type	Slide	
		Selecting time	60min	
Trial & lock	Trial tripping	Test type	3 section protection	
		Test parameter	I：9999A	
		Test control	Start	
	Remote lock	Remote lock	Unlock	
	Para lock	Locked	Para lock locked	
		Input password 0000	User password 0000	
Language set	Language set	English		
Communication set (iTR336H,iTR336H-L)	Add	3		
	Baud rate	9.6K		
I/O set (iTR336H,iTR336H-L)	Function set	DI1 ZSI		
	performing way	DO1 NO / impulse 360S		
	I/O status	I/O status DO1 DO2 DO3 DI1 1 1 1 1		

3.1.3 Structure of the Protected Parameter

Level 1	Level 2	Level 3	Level 4	Level 5
Current protection	Long time delay	I_R	2500A=100%In	
		Curve	I^2t	
		Delay time	C9, 30S@6.0Ir	
		Cooling time	3h	
	Short time delay	Fixed time	Tripping current	5000A2.0Ir
			Delay time	0.1 S
		Reverse time	Tripping current	5000A 2.0Ir
			Delay time	C16,1.92S@6Ir
	Instant	Tripping current	25000A = 10.0In	
	I imbalance	Performing way	Alarm	
		Start value	30%	
		Start time	1.0s	
		Return value	10%	
		Return time	10.0s	
	Neutral protection	Neutral protection	200%	
	Demand current	Ia max Ib max Ic max In max	Performing way	Alarm
			Start value	2000 A
			Start time	15S
			Return value	1800A
			Return time	15s

Level 1	Level 2	Level 3	Level 4	Level 5
Current protection	Grounding protection	Tripping current	2500A	
		Delay time	0.4s	
		Grounding ratio	6.0	
	Grounding alarm	Start value	2000A	
		Start time	0.1s	
		Return value	1000A	
		Return time	0.1s	
	Leakage protection	Tripping current	8.0A	
		Delay time	0.75s	
	Leakage alarm	Start value	5.0A	
		Start time	0.1s	
		Return value	4.0A	
		Return time	0.1s	
Load monitor (iTR336H,iTR336H-L)	Performing way			
	Uninstall value 1	2500A		
	Uninstall time 1	20%tr		
	Uninstall value 2	2000A		
	Uninstall time 2	20%tr		
	Performing way	Power 2		
	Uninstall value 1	200kW		
	Uninstall time 1	10S		
	Resume value	300kW		
	Resume time	3600S		
Voltage protection	Undervoltage	Performing way		
		Start value		
		Start time		
		Return value		
		Return time		
	Overvoltage	Performing way		
		Start value		
		Start time		
		Return value		
		Return time		
	U imbalance	Performing way		
		Start value		
		Start time		
		Return value		
		Return time		
Other protection	Under frequency	Performing way		
		Start value		
		Start time		
		Return value		
		Return time		
	Over frequency	Performing way		
		Start value		
		Start time		
		Return value		
		Return time		
	Phase sequence	Performing way		
		Start value		
	Reverse frequency	Performing way		
		Start value		
		Start time		
		Return value		
		Return time		
	Com. Failure	Performing way		
		Timeout		

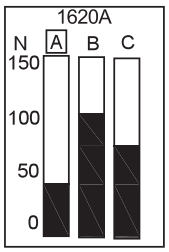
Level 1	Level 2	Level 3	Level 4	Level 5
	Voltage harmonic	Performing way	=Alarm	
		Start value	=30.0%	
		Start time	=20.0s	
		Return value	=20.0%	
		Return time	=30.0s	
	Current harmonic	Performing way	=Alarm	
		Start value	=30.0%	
		Start time	=20.0s	
		Return value	=20.0%	
		Return time	=30.0s	

3.1.4 History Record and Maintenance Menu

Level 1	Level 2	Level 3	Level 4	Level 5
Current alarm	e.g.: phase sequence alarm, reverse power alarm, over frequency alarm.....			
Operating times	Total times	300		
	Operating times	219		
Contacts abrasion	Total abrasion	120		
	Contacts abrasion	20		
	Temperature			
Tripping record	For example: 1 Undervoltage Trip 2012/03/30	Undervoltage Trip T= 0.20S Umax= 0V 11:24:59 3/30		
		F = 0.00Hz Uab 0V Ubc 0V Uca 0V		
	2011/07/16	.....		
	For example: 8 Short fix 2012/03/30	Short fix T= 0.4S I= 4300A 15:28:25 3/30		
		Ia 4300A Ib 4200A Ic 4000A In 4150A		
Alarm record	For example: 1 DI input alarm 2012/03/30	DI input alarm DI1 2012/03/30 20:38:45		
	.....	.....		
	For example: 8 Undervoltage alarm 2012/03/30	Undervoltage alarm Umax 0V 2012/03/30 22:29:40		
Transposition	For example: 1 Local close 2012/03/30	Local close 2012/03/30 9:30:56		
	.....	.....		
	For example: 1 Local close 2012/03/30	1 Local close 2012/03/30 9:30:56		
	.....	.....		
	For example: 8 Test trip 2012/03/30	8 Test trip 2012/03/30 10:30:20		
Fault wave				

3.2 iTR326H Menu Interface

● Default interface



display default interface when the controller power on

In every theme menu push Reset button or the corresponding subject key returns the default interface

5 minutes without any key operation box automatic cursor indicates the current maximum phase

If not In a fault pop-up interface, if within 20 minutes without any key operation will automatically return to the default interface

● Measuring menu

Push enter main measuring menu.

Push or Reset return default interface.

In other no fault or unedit interface,push then jump to the measuring menu.

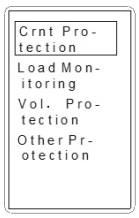
● System parameter setting

Push into system parameter setting interface.

push Reset return default interface.

In other no fault or unedit interface,push then jump to system parameter setting menu or history record and maintenance menu.

- Parameter of protection setting



push or Reset return default interface

In other no fault or unedit interface,push then return to the protection menu.

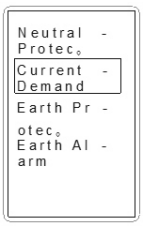
- History record and maintenance menu

Push Reset return default interface

In other no fault or unedit interface,push return to system parameter setting menu or history record and maintenance menu

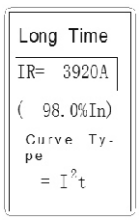
3.2.1 Protection Setting

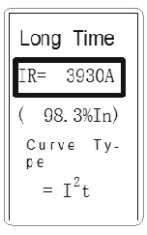
3.2.1.1 Current Protection Setting

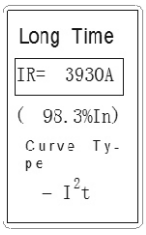


Adjust the parameter by the switches. Precisely adjust in follow interfaces.

3.2.1.1.1 Overload Protection Setting





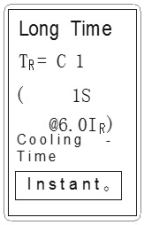


then

select one to set

Adjust the setting value

save the setting value

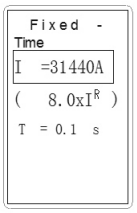


According to the similar method can be modified and saved to a set value.
Curve type EI (M), no cooling time setting.

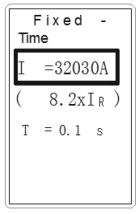
Enter second page, return to previous page

3.2.1.1.2 Short-circuit Protection Setting

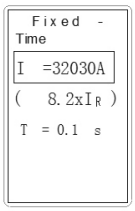
- Enter "short -time delay" menu



then
select one to set

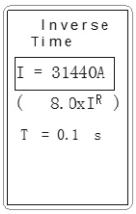


Adjust the setting value



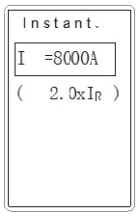
save the setting value

- Set switch to I^2t on, indicate inverse time delay.

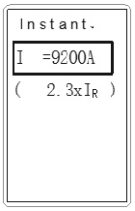


set switch to I^2t on 0.1s

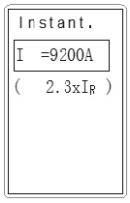
3.2.1.1.3 Instant Protection Setting



select one to set

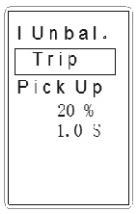


Adjust the setting value

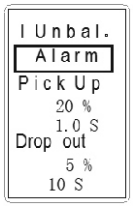


save the setting value

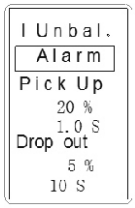
3.2.1.1.4 Current Imbalance Protection Setting



then
select one to set

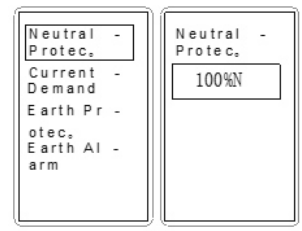


Adjust the setting value

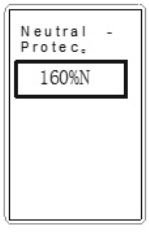


save the setting value

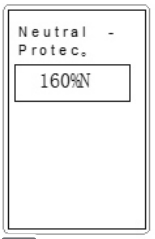
3.2.1.1.5 Neutral Protection Setting



then select one to set



Adjust the setting value



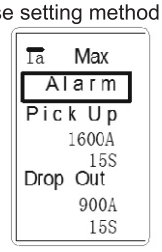
save the setting value

3.2.1.1.6 Demand Current Protection Setting

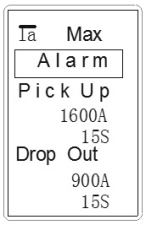
- In A phase current demand protection setting is an example.
  Each of the other phase setting method is similar to this.

then

select one to set



Adjust the setting value

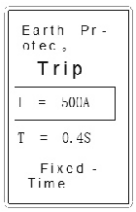


save the setting value

Execution mode is "trip", there is no setting of return parameter.

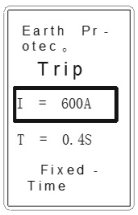
Execution mode is "close", there are no settings of start parameter and return parameter.

3.2.1.1.7 Grounding Protection Setting

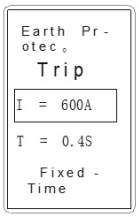


then

select one to set

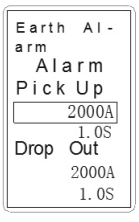


Adjust the setting value



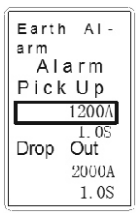
save the setting value

3.2.1.1.8 Grounding Alarm Setting

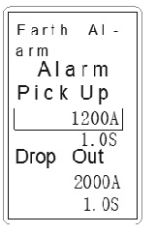


then

select one to set

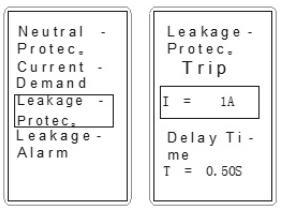


Adjust the setting value

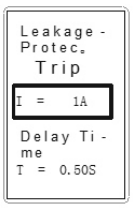


save the setting value

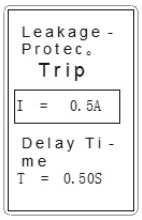
3.2.1.1.9 Leakage Protection Setting



then select one to set

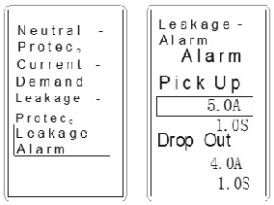


Adjust the setting value

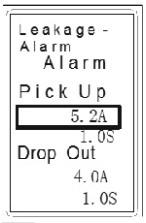


save the setting value

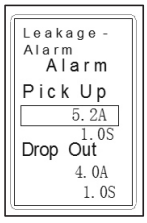
3.2.1.1.10 Leakage Alarm Setting



then select one to set

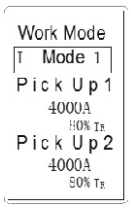


Adjust the setting value



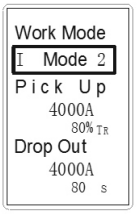
save the setting value

3.2.1.2 Load Monitor Protection Setting

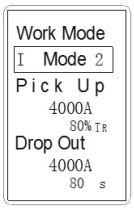


then

select one to set



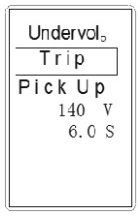
Adjust the setting value



save the setting value

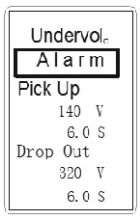
3.2.1.3 Voltage Protection Setting(under voltage, over voltage, voltage unbalance)

● Undervoltage protection

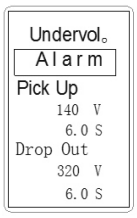


then

select one to set



Adjust the setting value

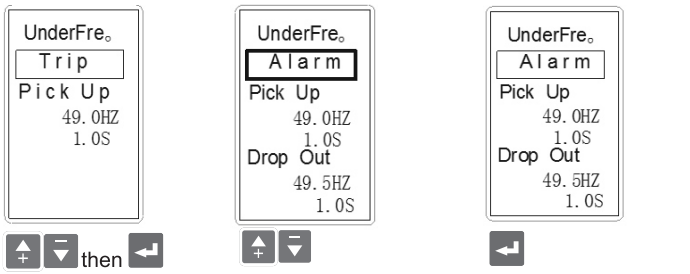


save the setting value

● Overvoltage, and voltage unbalance protection parameter settings as same as undervoltage protection parameter setting

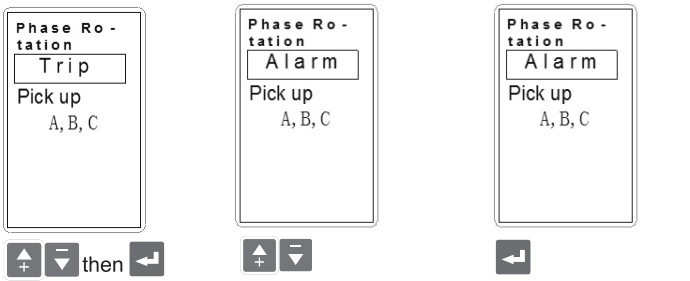
3.2.1.4 Other Protection Setting

● Under frequency protection

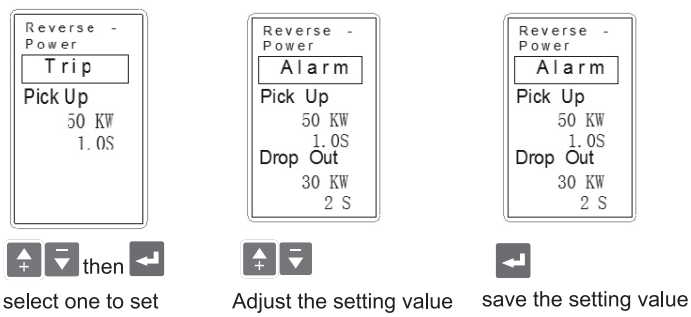


● Over frequency protection parameter setting is similar to under frequency.

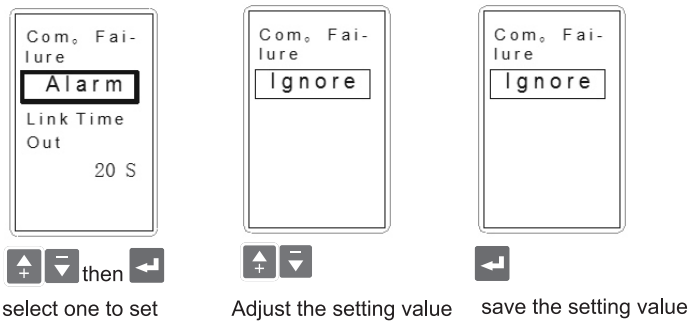
● Phase rotation protection



● Reverse power protection



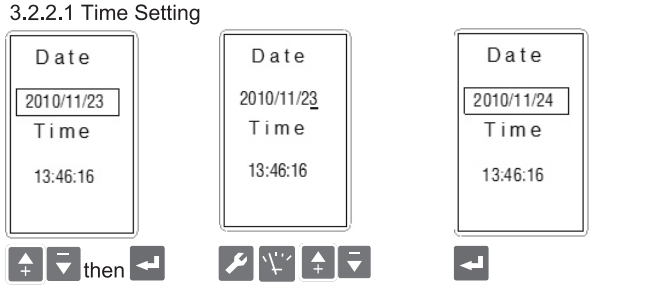
● Communication failure alarm



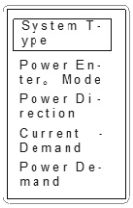
select one to set　　Adjust the setting value　　save the setting value

3.2.2 System Setting

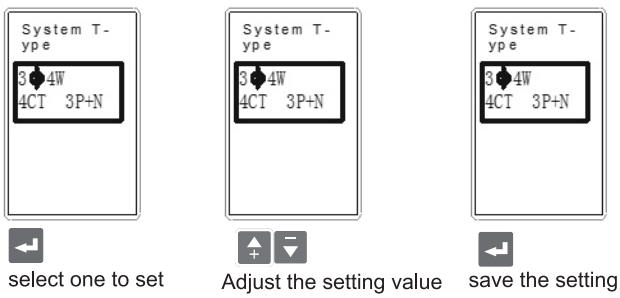
3.2.2.1 Time Setting



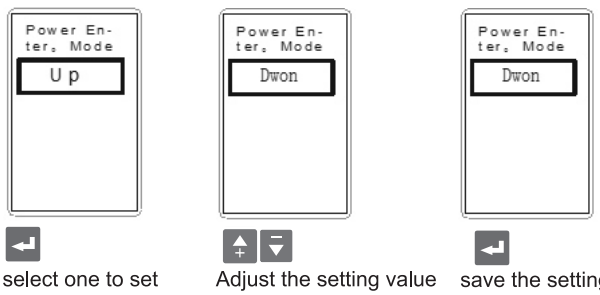
3.2.2.2 Measuring Meter Setting



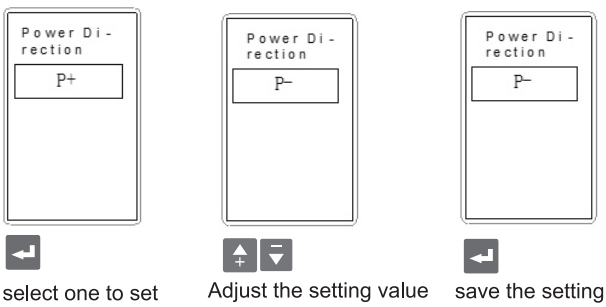
3.3.2.2.1 System Type Setting



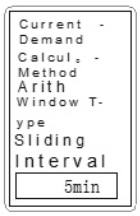
3.2.2.2.2 Input Direction Setting



3.2.2.2.3 Power Direction Setting



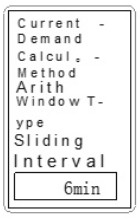
3.2.2.2.4 Demand Current Setting



then

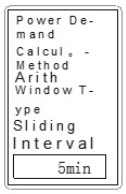
select one to set

Adjust the setting value



save the setting value

3.2.2.2.5 Demand Power Setting



then

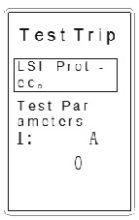
select one to set

Adjust the setting value

save the setting value

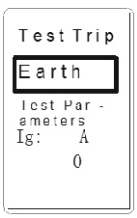
3.2.2.3 Test & Lock Setting

3.2.2.3.1 Test Setting

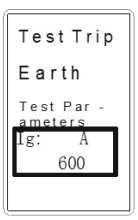


then

select one to test



save the test



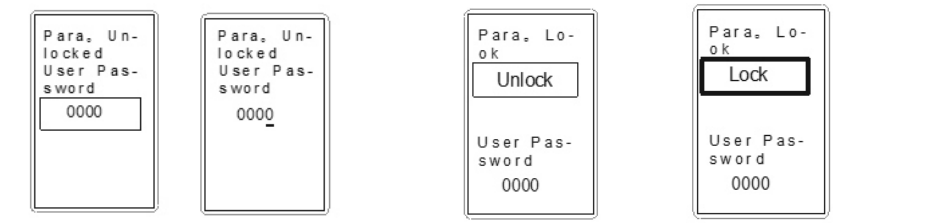
Adjust the test value

start to test

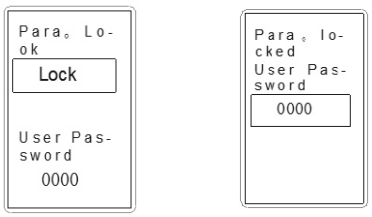
3.2.2.3.2 Remote Lock Setting

select one to set　　Adjust the setting value　　save the setting value

3.2.2.3.3 Lock Setting



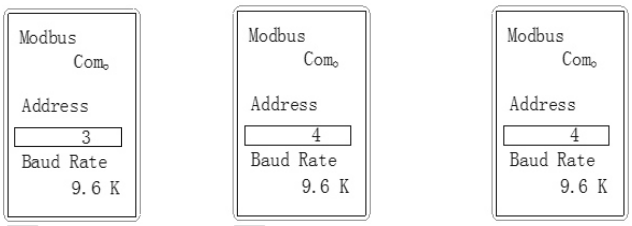
Enter the correct password then　　set　　Selection operation　　Perform the operation



3.2.2.4 Language Setting

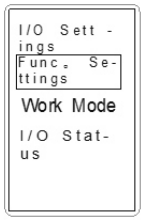
select one to set　　Adjust the setting value

3.2.2.5 Communication Setting



then
select one to set　　Adjust the setting value　　save the setting value

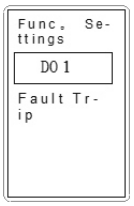
3.2.2.6 DI/DO setting



then

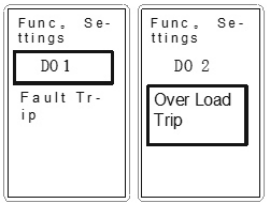
select one to set

3.2.2.6.1 Function Setting



then

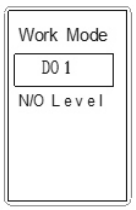
select one to set



Adjust the setting value

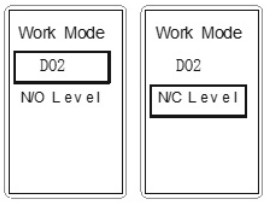
save the setting value

3.2.2.6.2 Execution Mode Setting

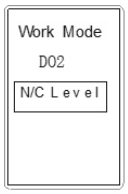


then

select one to set

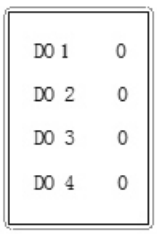


Adjust the setting value



save the setting value

3.2.2.6.3 I/O Status Setting



DO: " 1" means the output relay;is closed;

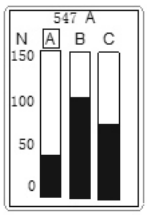
" 0" indicates the output relay is open.

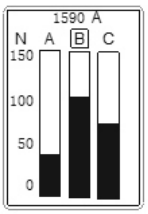
DI: " 1 " means the tripping; " 0 " means reset.

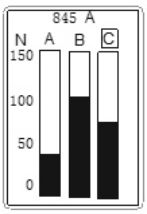
3.2.3 Measuring Function

3.2.3.1 Current Meter

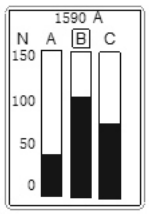
● Default interface







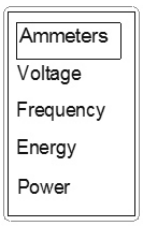
 It can be used to display the current readings



It will automatic cursor indicates the current maximum phase in 5 minutes without any key operation box.

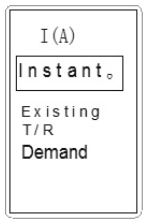
● Current meter

● Instantaneous current measurement



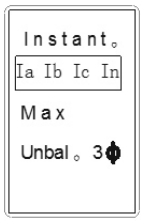
 then

select



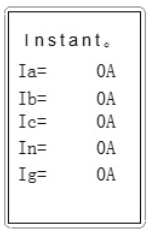
 then

select



 then

select

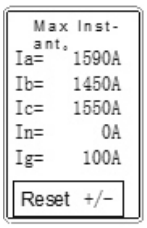


 return previous menu

● The max instantaneous value

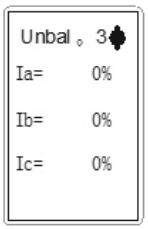
 then

select



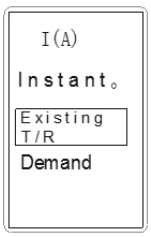
Push together can reset the max instantaneous value

● Instantaneous current unbalance rate



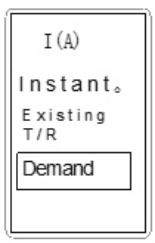
select

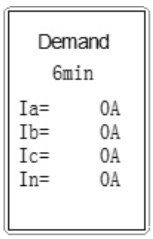
● Current thermal capacity



select

● Current demand

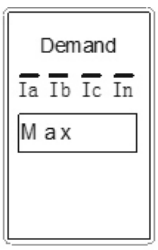


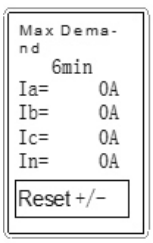


select

select

● Max Current demand



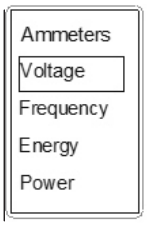


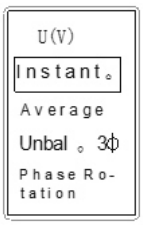
select

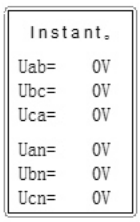
push  together can reset

3.2.3.2 Voltage Meter

● Voltage instantaneous value





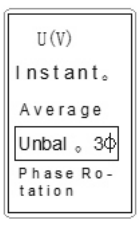


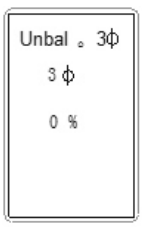
select

select

Note: Uan, Ubn, Ucn can be check when it is 3 phase 4 wire system.

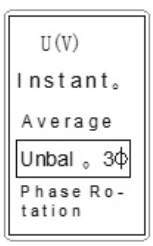
● Voltage unbalance rate

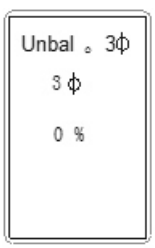




select

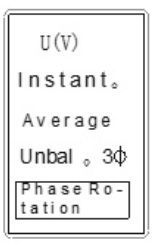
● Voltage unbalance rate

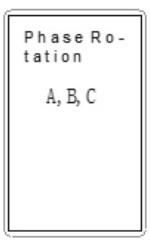




select

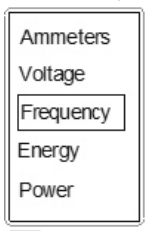
● Phase sequence

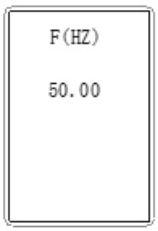




select

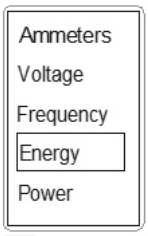
3.2.3.3 Frequency Meter

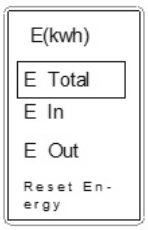




select

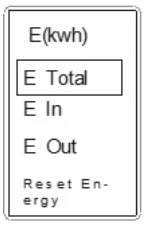
3.2.3.4 Energy Meter

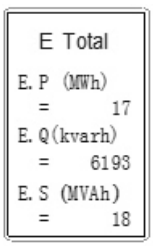




select

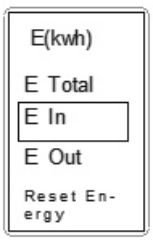
- Total energy

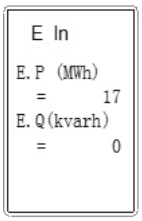




select

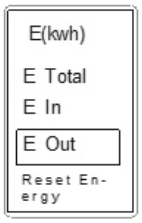
- Input energy

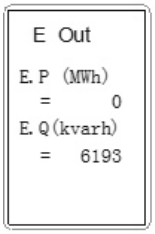




select

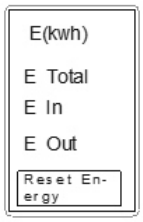
● Output energy





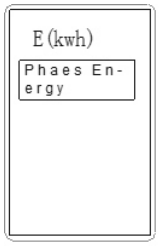
select

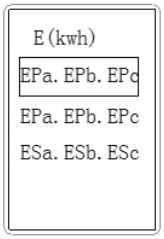
● Reset energy

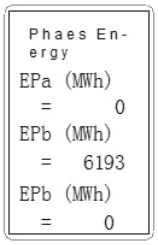


select

● Phase energy





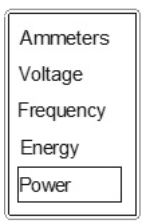


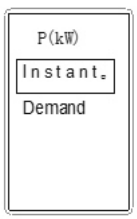
select

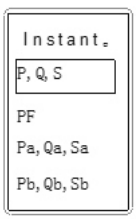
select

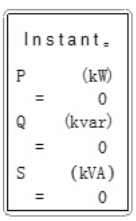
3.2.3.5 Power Meter

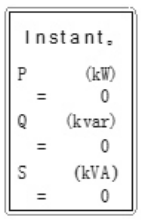
● Instantaneous power







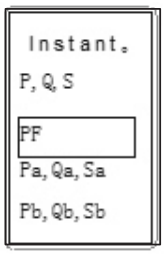




select

select

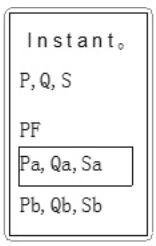
● Power factor

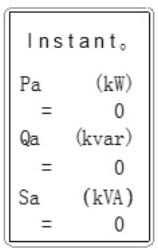


then

select

● Power factor of phase A





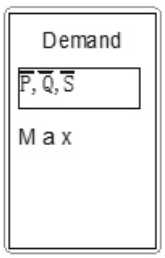
then

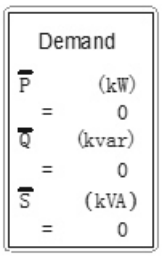
They can be check when it is 3 phase 4 wire system.

select

Note: B, C phase power read as same s A power.

● Power demand





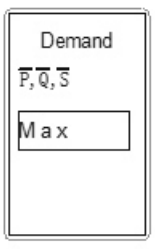
then

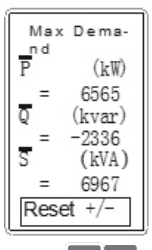
select

then

select

● Power max value



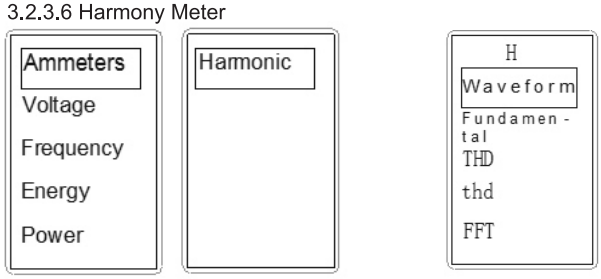


then

select

push together can reset max power value

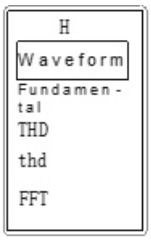
3.2.3.6 Harmony Meter



then

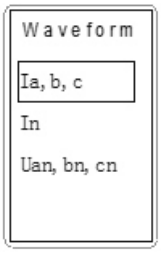
select

● Current wave



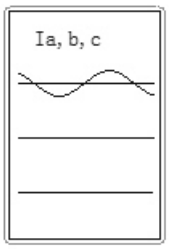
then

select



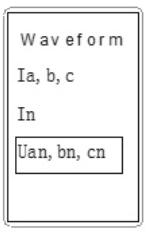
then

select



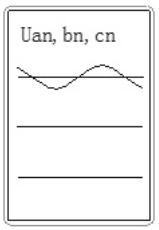
Check the current waveform of A, B, C or N.
(N depends on system types.)

● Voltage wave



then

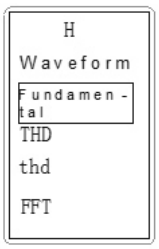
select

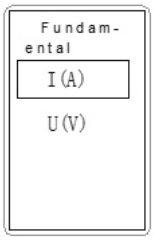


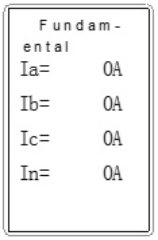
Check the waveform figure of Uan, Ubn and Ucn

Note: Uab, Ubc, Uca can be check when it is 3 phase system.

● Current fundamental wave



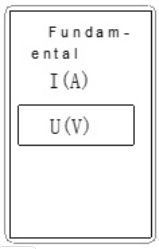


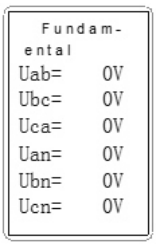


select

select

● Voltage fundamental wave



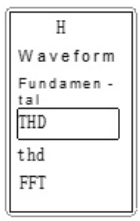


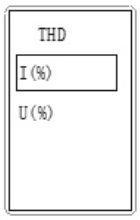
select

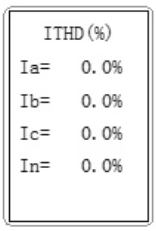
Note: Uan, Ubn, Ucn can be check when it is 3 phase 4 wire system.

● Harmonic THD

Current THD

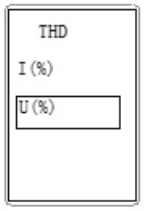


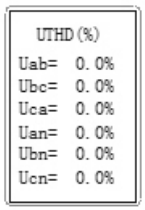




select

● Voltage THD



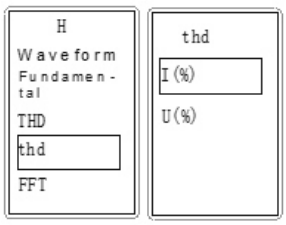


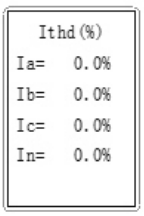
select

Note: Uan, Ubn, Ucn can be check when it is 3 phase 4 wire system.

● Harmonic thd

Current thd

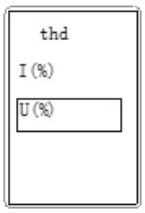


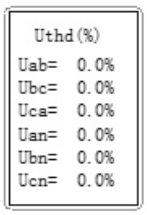


then

select

Voltage thd





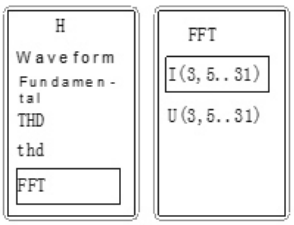
then

select

Note: Uan, Ubn, Ucn can be check when it is 3 phase 4 wire system.

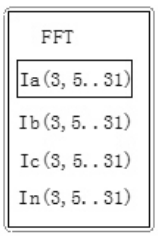
● Harmonic FFT

Current FFT



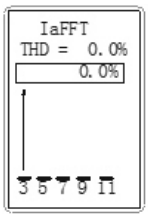
then

select



then

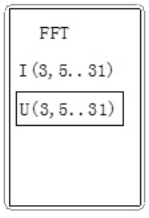
select Ia



check 3 to 31 harmonic distortion

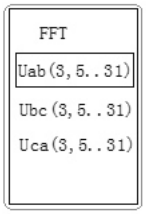
Note: check method of B, C phase is as same as A phase

Voltage FFT



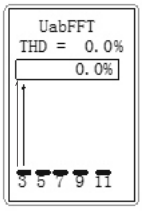
then

select



then

select Uab



check 3 to 31 harmonic distortion

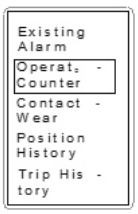
3.2.4 History Record and Maintenance Menu

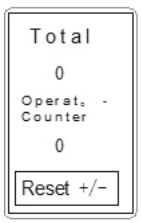
● Current alarm

+ − then ↵ select

Inquire current alarm

● Operation time

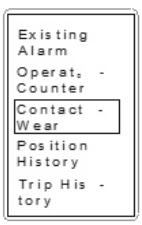


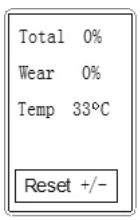


+ − then ↵ select

Push + − together then pop reset interface

● Contact wear

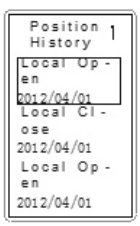




+ − then ↵ select

Push + − together then pop reset interface

● Position history



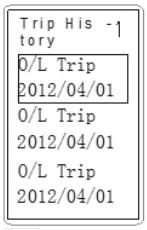
+ − then ↵ select

+ − then ↵ select

● Tripping history

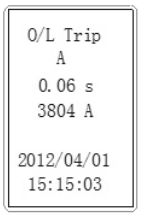
then

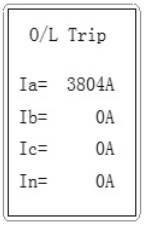
select



then

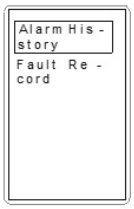
select





Check content, according to the fault types, display different content

● Alarm history



then

select

then

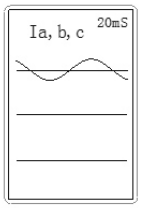
select

According to the fault types, display different content

● Fault record

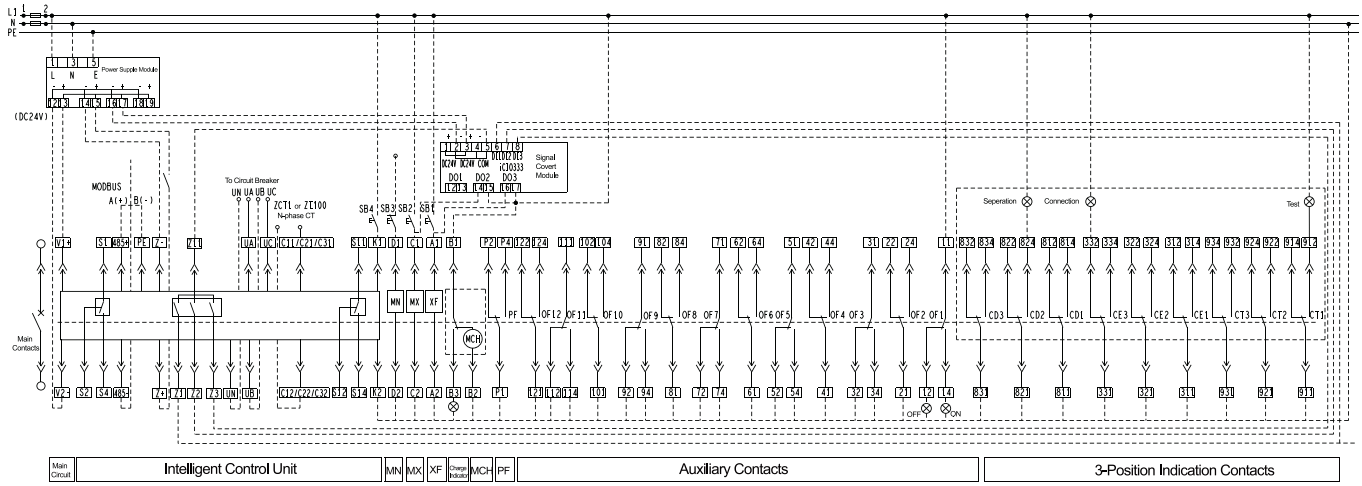
then

select



1600N,4000H1,4000H2

iTR336H iTR336H-L



Note:

UM: Voltage test signal input

UN, UA, UB, UC stand for voltage signal form N, A, B, C.

ZSI: Zone selective interlock

Z+, Z- are ZSI input port, AC24V .

Pow: Power input

Connect V1+, V2- to positive and negative poles on power supply module.

SWT: Fault-trip indication output

S1, S2, S4 are switch contacts, S1 is common port. Contact capacity: AC400V 5A

COM: Communication output

485+, 485- are communication output port; PE is protecting earth of the communication wire.

CT: External current transformer

C11, C12 are input port of CT

C21, C22 are input port of ZT100

C31, C32 are input port of ZCT1

Res: Remote reset

K1, K2 are the input port of remote reset.

SWT2: Fault-trip indication output 2

S11, S12, S14 are switch contacts, S11 is common port. Contact capacity: AC400V 5A

Client Preparation	Component		
SB1-Closing button	MN-Under-voltage release	PF-Ready to close contact	CD1~CD3-Seperation position indication contacts
SB2-Opening button	MX-Opening release	OF1~OF12-Auxillary contacts	CT1~CT3-Test position indication contacts
SB3-Emergency stop button	XF-Closing release	ZCT1-Earth-leakage CT	CE1~CE3-Connect position indication contacts
SB4-Remote reset button	MCH-Electric motor	ZT100-Ground return CT	

Remark 1: Intelligent control units work with power supply module. The input volatage of iAPU331 is AC220/230V; The input voltage of iAPU332 is AC380/400V; The input volatage of iAPU332D is DC220V.

Remark 2: ZT100 and ZCT1 offer as optional. This CT port can connect with one kind of CT only.

Remark 3: For remote control, iCIO333 signal convert module is necessary. The contact capacity of the module is AC240V 10A, DC24V 10A.

Remark 4: CDW9-1600N offers 4NO 4NC auxiliary contacts.CDW9-4000H1&H2 offer 4NO 4NC auxiliary contacts as standard. 8NO 8NC or 12NO 12NC offer as optional.

Remark 5: Communication protocol is Modbus as standard. Profibus module and Devicenet module should order for additional. Power supply module is necessary when communication module is used.

Remark 6: CDW9-1600N offers CT1, CD1 and CD2.

Remark 7: Res and SWT2 are optional parts, they are not compatible with each other.

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