042

Smart Motor Protector ARD3T

User's Manual

V1.3

ACREL Co., Ltd

DECLARATION

We reserve all the rights to revise product specification without notice. Please consult local agent to get the latest information of our products specification.

1 Overview

ARD3T Intelligent Motor Protector (hereinafter referred to as ARD3T) is sub-family product of ARD series low voltage motor protectors by Shanghai Acrel Co., LTd. Among the same domestic industry, ARD3T is the first modular design product and supplies a gap in low voltage motor protector field in China. ARD3T belongs to the projects of Ministry of Science and Technology, this project is granted honors including 12 patents, 2 computer copyrights and product standard for record, and etc. ARD3T takes the lead in technology in China.

ARD3T consists of master module, measurement module, switching value module,analog value module, temperature module, communication module, and LCD module.This product has little volume, compact structure, and is suitable to the motors with the rated voltage up to AC 660V, the rated current up to AC 800A, and 50/60Hz rated frequency.The product can be directly installed for using in low voltage control terminal cabinets or all kinds of drawer cabinets of 1/4 modulus and above, and has improved reliability and automation of the control circuit loop.

Product executive standard:

GB/T14048.1 Low-voltage switchgear and controlgear-Part 1:General rules

GB14048.4 Low-voltage switchgear and controlgear- Electromechanical contactors and motor-starters

JB/T10736—2007 Low-voltage motor protectors

GB/T20540.1-6—2006 Digital data communication for measurement and control - Fieldbus for use in industrial systems Type 3: PROFIBUS specification

2 Features

■ Auxiliary power supply supports AC/DC 110/220V or AC 380V (380V power supply module is needed separately)

■Modular design, it consists of master module, measurement module, switching value module, analog value module, temperature module, communication module, and LCD module.

■Small volume, support guide rail and screw fixed installation

■ Additional module adopt bus power supply, do not need external auxiliary power supply

■ With upper computer configuration software, the product is convenient for customer to set parameter and program.

■ DI/DO programmable freely

■ DI support dry contact(Electronic)or wet contact(Electric) input,and wet contact can choose AC or DC power supply.

■ Standard configuration about overall comprehensive motor protection functions such as overload protection, stalling protection, blocking protection, under-load protection, phase failure protection, phase unbalance protection, PTC protection, external failure protection, and etc.

■ Standard configuration about various starting mode such as protection module mode, direct starting, Y-△ starting, auto-transformer step-down starting, two-directional starting, single winding two-speed starting, duplex winding two-speed starting, and etc.The starting mode can be set at spot.

■ Standard configuration about fault record and operation management information, facilitate to find the cause of fault and maintain the motor.

■ Standard configuration about self-starting function, it can implement anti-interference electricity and voltage off restarting function by using additional anti-interference electricity module.

■ Chinese LCD display

■ Implement 2-channel 4-20mA input test and 2-channel 4-20mA transmitting output by using anlalog value module.Users can freely set the corresponding parameters of 4-20mA transmitting output.

■ Implement 3 channels temperature measure protection by using temperature module, the optional type of external sensor is PT100,PT1000,Cu50,PTC, and NTC.

■ Implement Profibus-Dp communication by using Profibus module.

3 Components, function configuration, type selection description

3.1 Components

ARD3T consists of measurement module, temperature module, analog value module, communication module, switching value module, display module and master module.

Master and measurement module are necessary modules, and others are additional modules.

Function introductions of modular are as follows:

The master takes charge of coordinating all modules, fitted with 4DI,4DO, outward communication network, clock, fault record and PTC measurement function. It can realize various starting modes including direct starting, two-directional starting, two-speed starting, auto-transformer step-down starting, Y-△ starting, and etc. Master is the necessary module for modular motor protector.

Measurement module can measure electric parameters such as current,voltage and leakage current, and etc.The current range is from 0.4A to 800A, the voltage value is AC220V,AC380V,AC660V, the frequency is 45Hz-65Hz, the leakage current is 50mA～5A/3A～30A.Current transformer used for measurement adopts protection level and has strong overload ability which up to 10-times overload unsaturated value.Measurement module is also the necessary module of module motor protector.

Temperature module realizes temperature measurement by external sensor such as PT100,PT1000,Cu50,PTC/NTC.

Analog value module realizes analog value input measurement and transmitting output.

Switching value module expands the switching value of master.If switching value points of the master cannot satisfy user's demand, use switching module to implement the expansion about product's switching value points.

Communication module implements both Modubus and Profibus communication function.

Master and measurement module are necessary modules, also called basic modules, implement basic measurement, protection and control function; other modules are optional modules.The product can realizes complex functions by using basic and optional modules.

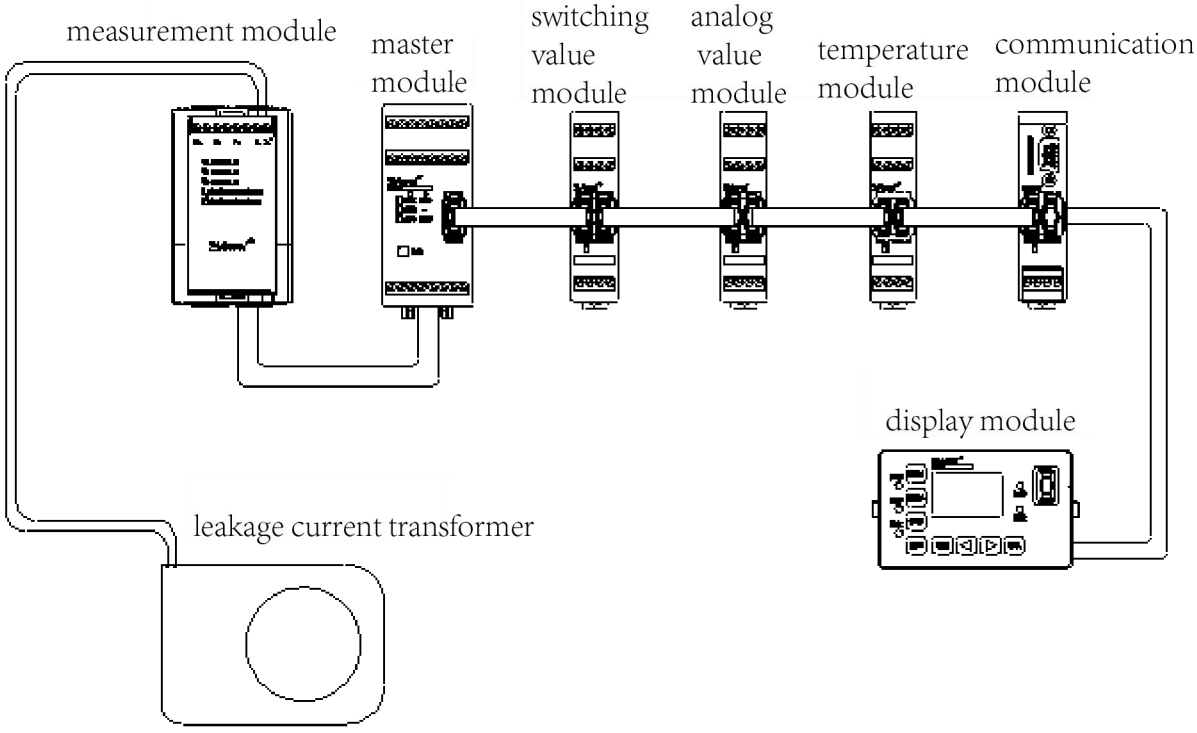


Figure 1 ARD3T of 100A and below product components (measurement module is fitted with current transformer)

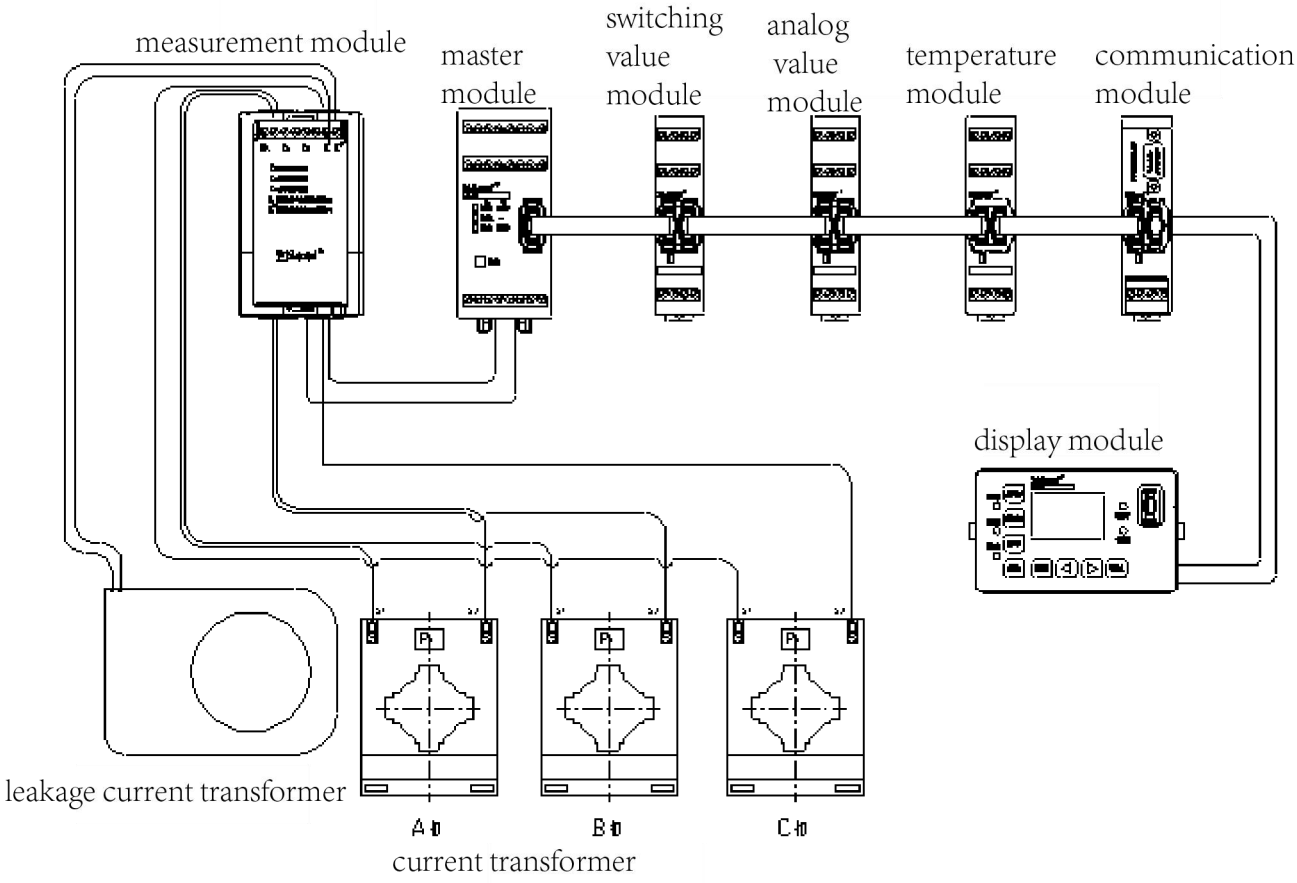


Figure 2 ARD3T of 250A, 800A product components

3.2 Function configuration

Function configuration of ARD3T is as shown in Table 1

Table1 Function configuration

Function \ Type			Function configuration	
			Standard functions	Selected functions
Protection function	Overload		√	
	Phase failure/unbalance		√	
	Rotor clocked		√	
	Blocking		√	
	Short circuit breaking		√	
	Starting overtime		√	
	Underload		√	
	Feedback overtime		√	
	Master temperature protection		√	
	Master temperature sensor fault		√	
	External fault		√	
	Modular structure fault		√	
	Inner fault		√	
	Residual current	Grounding	√	
		Leakage		√(Leakage)
	Phase sequence			√(Voltage function)
	Under voltage			
	Over voltage			
	Under power			

	tE time			√(Special safe protection)
	Voltage off restarting function(anti-interference electricity)			√(Voltage off restarting function(anti-interference electricity))
	4～20mA input protection			√(analog module is fitted with 2 input function)
	Module temperature protection			√(Temperature module)
	Module temperature sensor fault			
Control function	Protection mode		√	
	Direct starting			
	Two-directional starting			
	Single winding two-speed starting			
	Duplex winding two-speed starting			
	Y-△ starting(two relays)			
	Auto transformer starting (two relays)			
	Self-starting			
Communication function	Modbus			√(Master communication function)
	Double Modbus			√(Communication module)
	Profibus			√(Communication module)
Switching input and output	Master 4DI,4DO		√	
	Switching value module 4DI,3DO			√ (Switching value module)
Analog value output	DC 4～20mA			√Analog value module is fitted with output function
Fault record	8 records, record the reason, time and various parameters of the motor when fault occur		√	
Operation information	Record operation information such as starting, stopping, numbers of tripping, operating time, stopping time,and etc		√	
Logic function	Timer		√	
	Counter		√	
	Truth table		√	
Testing parameter	3-phase current		√	
	Leakage current measurement			√(Leakage function)
	3-phase line voltage, power, power factor, electric energy			√(Voltage function)
	PTC/NTC		√Master temperature	
	4-20mA input			√Analog value module fitted with two input function
	Temperature module			√(temperature module)
Parameter setting and query(LCD display)	Parameter query	Parameter measurement		√Display module
		Alarm query		
		Fault query		
		Switching value status		
		Operation information		
	Parameters setting	Protection setting		

		Starting parameters setting		
		System parameters setting		

3.3 Type selection description

ARD3T type selection is as shown in figure 3, model meaning is as shown in table 2-table 10.Please read “function configuration”, “notice” and “order example” in order to know the product function before ordering.

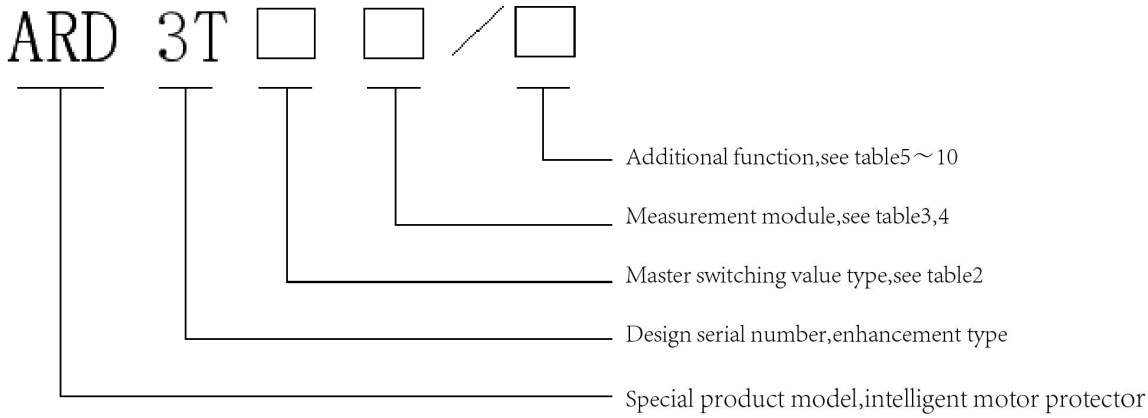


Figure 3 Type selection description

Special product model	intelligent motor protector
Design serial number	enhancement type
Master switching value type	shown in table 2
Measurement module	shown in table 3 and table 4
Additional function	shown in table 5-table 10

Master switching value is 4DI,4DO, the type of switching value is as shown in table 2:

Table 2 Type of master switching value

Classification of master switching value	Code
DI is dry contact, DO controlled operating power supply is AC 220V	K1
DI is wet contact, DC 110V input, DO controlled operating power supply is AC 220V	K2
DI is wet contact, DC 220V input, DO controlled operating power supply is AC 220V	K3
DI is wet contact, AC 220V input, DO controlled operating power supply is AC 220V	K4

Measurement module: it includes current measurement module and current/voltage measurement module.

Classification of current measurement module and current/voltage measurement module are as shown in table 3, corresponding relationship between motor current and ARD3T current measurement module is as shown in table 4.

Table 3 Measurement module classification

Motor voltage	Rated current of protector	Current setting range	Type of current measurement module
Without voltage measurement function	1.6	0.40-2.00	A1.6
	6.3	1.6-6.3	A6.3
	25	6.3-25	A25
	100	25-100	A100
	250	63-250	A250
	800	250-800	A800
AC 380V/660V	1.6	0.40-2.00	UA1.6
	6.3	1.6-6.3	UA6.3

	25	6.3-25	UA25
	100	25-100	UA100
	250	63-250	UA250
	800	250-800	UA800

Notes: 660V voltage function need special mark, otherwise default value is 380V.

Table 4 Corresponding relationship between motor current and measurement module

Rated power of motor(KW)	Rated current of motor(A)	ARD3T current measurement module	Current setting range(A)		Rated power of motor(KW)	Rated current of motor(A)	ARD3T current measurement module	Current setting range(A)
0.12	0.42	A1.6	0.40-2.0		30	57	A 100	25-100
0.37	1	A 1.6	0.40-2.0		37	69	A 100	25-100
0.55	1.5	A 1.6	0.40-2.0		45	81	A 100	25-100
0.75	2	A 6.3	1.6-6.3		55	100	A 100	25-100
1.1	2.5	A 6.3	1.6-6.3		75	135	A 250	63-250
2.2	5	A 6.3	1.6-6.3		90	165	A 250	63-250
3	6.5	A 25	6.3-25		110	200	A 250	63-250
5.5	11	A 25	6.3-25		132	240	A 250	63-250
7.5	14.8	A 25	6.3-25		160	285	A 800	250-800
11	21	A 25	6.3-25		200	352	A 800	250-800
15	28.5	A 100	25-100		220	388	A 800	250-800
18.5	35	A 100	25-100		250	437	A 800	250-800
22	42	A 100	25-100		/	/	/	/

If users need voltage function, change the corresponding model about“ARD3T current measurement module” to “UAXX” in table 4.

For example: 5.5KW motor with voltage measurement function. The measurement module is “UA 25” instead of “A 25” according to table 4.

Switching value module: Classification of switching value is as shown in table 5:

Table 5 Switching value module

Classification of switching value	Code
DI is dry contact, DO controlled operating power supply is AC 220V	K 4 3(4DI,3DO)
DI is wet contact, DC 110V input, DO controlled operating power supply is AC 220V	K 4 3-DC110
DI is wet contact, DC 220V input, DO controlled operating power supply is AC 220V	K 4 3-DC220
DI is wet contact, AC 220V input, DO controlled operating power supply is AC 220V	K 4 3-AC220

Temperature module is as shown in table 6:

Table 6 Temperature module

Temperature module	Code
Connect with various temperature sensors(PT100,PT1000,Cu50,PTC,NTC)	T

Analog value module is as shown in table 7:

Table 7 Analog value module

Analog value module	Code
2-channel 4-20mA output	M2
2-channel 4-20mA input and 2 channel 4-20mA output	2M2
2-channel 4-20mA input	2M

Display module is as shown in table 8:

Table 8 Display module

Display module	Code
Separated LCD display,module size is 98*60, cut out 92*55 (unit mm)	60L

Communication module is as shown in table 9:

Table 9 Communication module

Communication module	Code
PROFIBUS-DP	CP
MODBUS-RTU	C
Double MODBUS-RTU	2C

Leakage current function and types of leakage transformer are as shown in table 10:

Table 10 Leakage current function

Type of leakage current	Type of selected leakage transformer	Code
50mA～1A	AKH-0.66/L-35 1A/2mA	L1
	AKH-0.66/L-70 1A/2mA	L2
	AKH-0.66/L-105 1A/2mA	L3
3A～30A	AKH-0.66/L-70 30A/10mA	L4
	AKH-0.66/L-105 30A/10mA	L5

Anti- interference electricity function: SU (including voltage function).

Notes:

1.The master and measurement module are necessary modules.

2.If users have no special statement about type of master switching value,"K1"DI default as dry contact and DO controlled operating power supply is AC 220V.

3.Switching value, temperature, analog value, display and communication module are optional modules. Users can choose only one kind of each module.

4.The connecting line's length between each standard configuration module is 25mm; the connecting line's length of standard configuration display module is 1m; and the connecting line's length of standard configuration measurement module is 1m.

5.The connecting line's length of display module includes 1m, 2m and 3m.Users can choose 2m, 3m if the standard configuration length (1m) cannot meet the using demand.

6.ARD3T connect each module by connection conductor and the total length from the first module to the last is less than 5m, otherwise the product may not work normally.

7.After adding voltage function, the product can measure line voltage, active power, power factor, apparent power and active electric energy, as well as implement over voltage, under voltage, phase sequence and under power protection. After adding analog value module, the product implement 4-20mA input testing ,4-20mA transmitting output, 4-20mA input protection.Types of transmitting output are A, B, C phase current, AB,BC,CA line voltage, frequency, active power,master PTC,3-channel temperature input of temperature module, 2-channel analog value input of analog value module.

8.After adding temperature module,the product implement 3-channel temperature measurement, the optional sensor's type is PT100,PT1000,Cu50,PTC,NTC.3-channel sensors belong to the same or different types. If sensor's type is PT100,PT1000,Cu50, unit of display and protection value is ℃; If sensor's type is PTC or NTC, unit of display and protection value is Ω.

9.The product implement double Modbus through master fitted with one channel Modbus and communication module

fitted with one channel Modbus.

10.Users shall clearly specify the leakage type and corresponding transformer type when selecting leakage function. L35,L70,L105 refer to the cut out of transformer, and the dimension of cut out is respectively 35mm,70mm,105mm.

11.When selecting anti-interference electricity function, users do not need to choose voltage function because this function is standard configuration.

12.Upper computer configuration software is standard configuration, users can get it by CD, email sending or company website downloading.

13.Users can obtain E-edition of instruction and typical application schematic diagram from company website www.acrel.cn.

Order example:

If users need ARD3T with the following functions:

Protection function: overload, phase failure, stalling; starting mode: protection mode, direct starting, Y-△ starting; LCD display; 5.5kW

The corresponding type is "ARD3T- K1 A25-60L"

Protection function: overload, phase failure, stalling, under voltage, over voltage; starting mode: protection mode, direct starting, Y-△ starting; LCD display; 5.5kW, AC 380V

The corresponding type is "ARD3T- K1 UA25-60L, voltage is 380V

Protection function: overload, phase failure, rotor locked, under voltage, over voltage; starting mode: protection mode, direct starting, Y-△ starting; LCD display; 5.5kW, AC 660V; Profibus communication function; 4-20m transmitting output; with PT100 measuring temperature used for motor winding and bearing temperature measurement ,as well as overheating protection.

The corresponding type is "ARD3T- K1 UA25- T M2 CP 60L voltage id 660V"

Protection function: overload, phase failure, stalling, under voltage, over voltage; starting mode: protection mode, direct starting, Y-△ starting; LCD display; 5.5kW, AC 660V; Profibus communication function; 4-20m transmitting output; PT100 used for motor winding and bear temperature measurement ,as well as overheating protection;leakage protection, measurement range from 50mA to 1A; leakage transformer: AKH-0.66/L-35 1A/2mA

The corresponding type is "ARD3T- K1 UA25- T 2M CP L1 60L voltage 660V"

4 Technical specifications

Technical specifications are shown in table 11.

Table 11 Technical specifications

<table>
<tr><th>Technical parameter</th><th colspan="2">Technical specifications</th></tr>
<tr><td>ARD3T auxiliary power supply</td><td colspan="2">AC/DC 110 / 220V or AC 380V，Power waste≤15VA</td></tr>
<tr><td>Rated voltage of motor</td><td colspan="2">AC 380V / 660V，50Hz / 60Hz</td></tr>
<tr><td rowspan="6">Rated current of motor</td><td>1.6(0.40A-2.00A)</td><td rowspan="4">Adopt measurement module</td></tr>
<tr><td>6.3(1.6A-6.3A)</td></tr>
<tr><td>25(6.3A-25A)</td></tr>
<tr><td>100(25A-100A)</td></tr>
<tr><td>250(63A-250A)</td><td rowspan="2">Adopt outlay current transformer and measurement module</td></tr>
<tr><td>800(250A-800A)</td></tr>
<tr><td rowspan="2">Leakage</td><td>50mA-1A</td><td rowspan="2">Adopt measurement module and leakage current transformer</td></tr>
<tr><td>3A-30A</td></tr>
<tr><td rowspan="2">Relay output contact capacity</td><td>Resistive load</td><td>AC250V,6A;DC24V,6A</td></tr>
<tr><td>Inductive load</td><td>AC250V,2A;DC24V,2A</td></tr>
<tr><td>Master switching input and output</td><td colspan="2">4DI,4DO, DI is dry contact or wet contact, details are as shown in type selection description</td></tr>
<tr><td>Switching value module</td><td colspan="2">4DI,3DO, DI is dry contact or wet contact, details are as shown in type selection</td></tr>
</table>

	description	
Temperature module	Type of external sensor: PT100,PT1000,Cu50,PTC,NTC Channel of the sensor:3 channels Sensor's corresponding measurement range : PT100/PT1000:-50°C～+500°C Cu50:-50°C～+150°C PTC/NTC:100Ω～30kΩ	
Analog module	Implement 2-channel 4-20mA input test and 2-channel 4-20mA transmitting output Accuracy of 4-20m input measurement accuracy is ±0.5% Maximum loading capacity of 4-20mA output is less than 500Ω	
Master communication	RS485:Modbus-RTU	
Communication module	RS485:double Modbus-RTU,Profibus, details are as shown in type selection description	
Environment	Operating temperature range	-10ºC～55ºC
	Storage temperature range	-25ºC～65ºC
	Relative humidity range	≤95％Non-condensing, no corrosive gas
	Altitude	≤2000m
Pollution degree	3 class	
IP class	Master IP20, Separated display module IP 45 (installed in device)	
Installation category	III class	

5 Installation and diagram

5.1 Terminals number

ARD3T terminal number is as shown in table 12.

Table 12 terminal number

Terminal	Function definition	module	Remarks
L	Power supply is L(DC is +)	Master module	When auxiliary power supply is AC/DC 110/220V or AC 380V, insert AC380V power supply module outlet terminals
N	Power supply is M(DC is -)		
R1, R2	PTC/NTC input		Thermal resistance input
A1,B1	RS485 communication interface		communication interface
DO1	Relay output 1		Relay output(DO) programmable
DO2	Relay output 2		
COM2	Common terminal about relay 1 and 2		
DO3	Relay output 3		
DO4	Relay output 3		
COM3	Common thermal about relay 3 and 4		
DI1	Switching input 1		Switching input (DI) is programmable When switching input is DC+24V(dry contact), COM1 is DC+24V output; When switching input are AC220V/DC220V/DC110V (wet contact), COM1 connects N line,negative electrode.
DI2	Switching input 2		
DI3	Switching input 3		
DI4	Switching input 4		
COM1	Common thermal about switching input 1 and 4		
IL,IL*	Leakage current input	Measurement module	IL connects leakage current transformer, IL* connects leakage current transformer S1

Ua	Ua phase voltage input		Three-phase voltage input
Ub	Ub phase voltage input		
Uc	Uc phase voltage input		
AI1+,AI1-	Channel 1 4-20mA input measurement	Analog value module	AI1+ connects positive and AI1- connects negative.
AI2+,AI2-	Channel 2 4-20mA input measurement		AI2+ connects positive and AI2- negative
AO1+,AO1-	Channel 1 4-20mA output		Channel 1 analog value output
AO2+,AO2-	Channel 1 4-20mA output		Channel 2 analog value output
PE	Grounding terminal		grounding
1T1	Compensation terminal	Temperature module	Channel 1 temperature
1T2	Resistance input 1		
1T3	Resistance input 2		
2T1	Compensation terminal		Channel 2 temperature
2T2	Resistance input 1		
2T3	Resistance input 1		
3T1	Compensation terminal		Channel 3 temperature
3T2	Resistance input 1		
3T3	Resistance input 1		
DO5	Relay output 5	Switching value module	Relay output (DO) programmable
DO6	Relay output 6		
DO7	Relay output 7		
COM5	Common terminal about relay output 5,6 and 7		
DI5	Switching input5		Switching input (DI) is programmable When switching input is DC+24V(dry contact), COM4 is DC+24V output; When switching input are AC220V/DC220V/DC110V (wet contact), COM4 connects N line,negative electrode
DI6	Switching input 6		
DI7	Switching input 7		
DI8	Switching input 8		
COM4	Common terminal about switching input		
A2,B2	RS485 communication interface	Communication module	Communication interface
DB9 interface	PROFIBUS communication		PROFIBUS communication
PE	Grounding terminal		Grounding

5.2 Appearance and installation dimensions

Overall dimensions about master are as shown in figure 4:

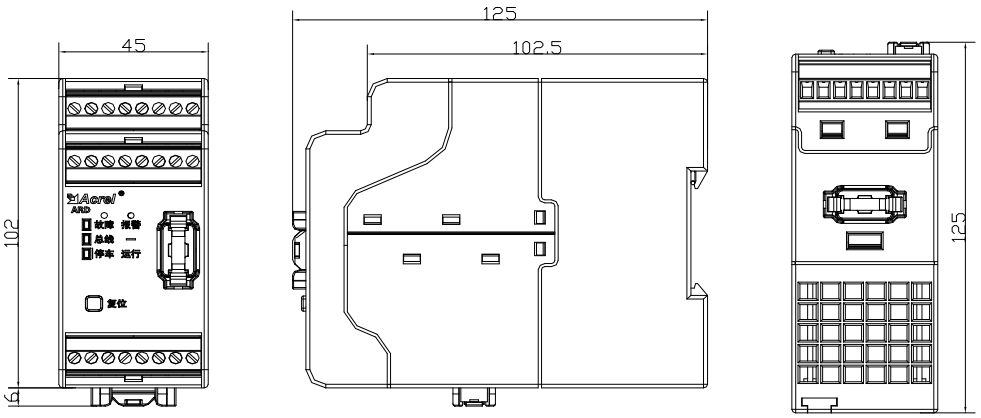


Figure 4 Overall dimensions about master

Dimensions about current measurement module are as shown in figure 5.

Dimension about current and voltage measurement modules are as shown in figure 6.

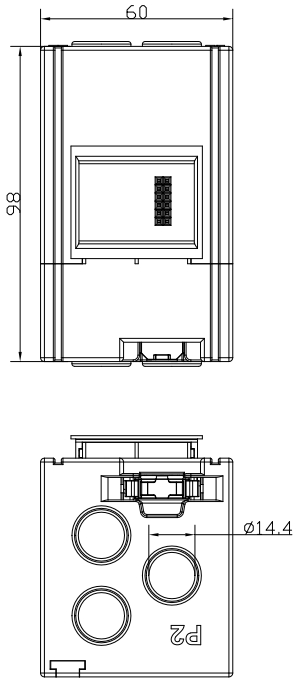


Figure 5 Dimensions about current measurement module

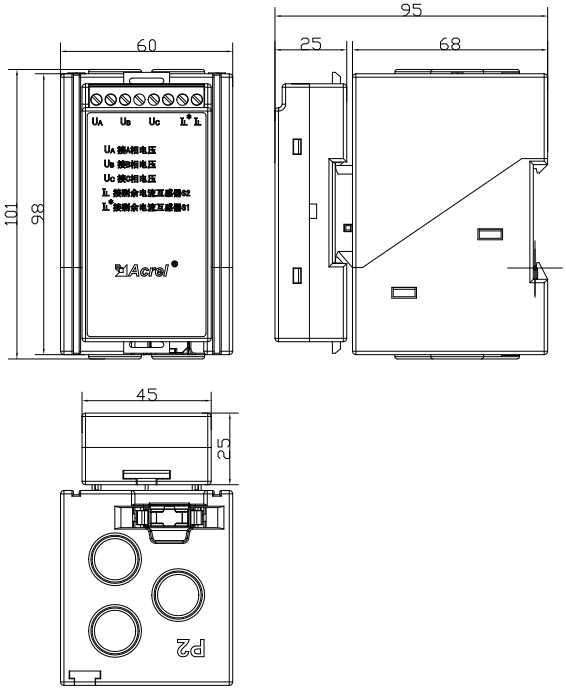


Figure 6 Overall dimensions about current and voltage measurement modules

Dimensions about 250A, 800A external current transformer are as shown in figure 7 and table 13:

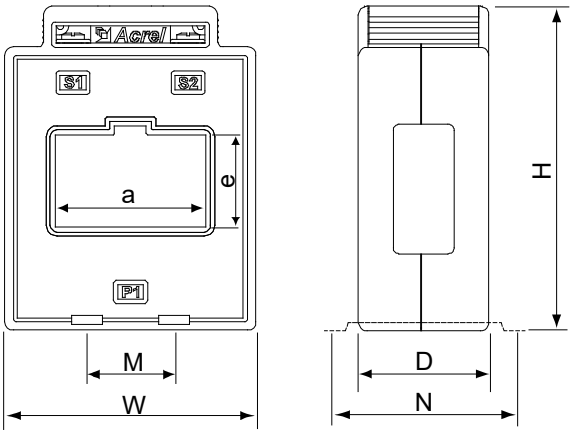


Figure 7 Appearance about external current transformer of 250A

Table 13 Installation dimensions about external current transformer of 250A,800A

Dimension / Type	Overall dimension			Dimension of cut out		Installation dimension	
	W	H	D	a	e	M	N
250A	78	103	45	43	31.5	48	57.5
800A	102	125	45	61	33	42	57.5

Overall dimensions about leakage current transformer are as shown in figure 8 and table 14:

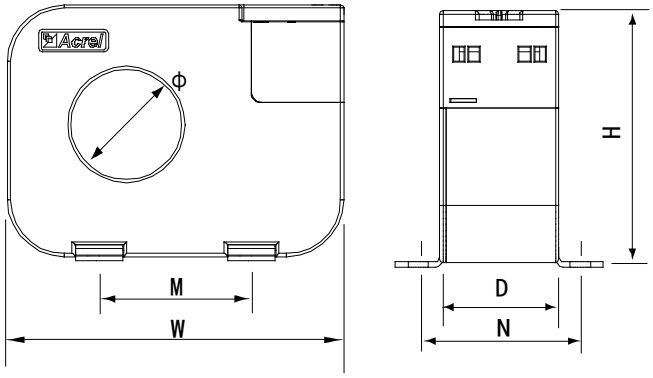


Figure 8 Appearance about leakage current transformer

Table 14 Installation dimensions about leakage current transformer

Dimension / Type	Overall dimension			Dimension of cut out	Installation dimension	
	W	H	D	Φ	M	N
L-35	106	80	32.5	35	48	51
L-70	136	110	32.5	70	66	51
L-105	176	150	32.5	105	92	51

Overall dimensions about temperature, analog and switching value modules are shown in figure 9;
Overall dimensions about communication module are as shown in figure 10:

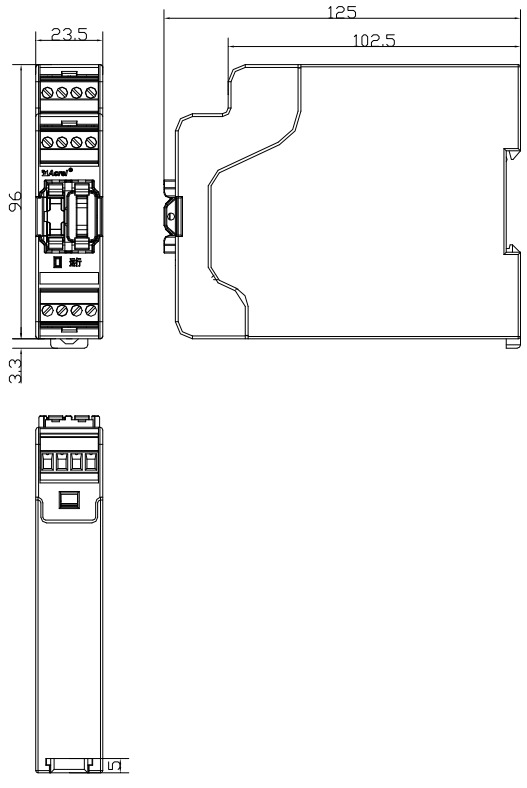


Figure 9 Overall dimensions about temperature, analog and switching value modules

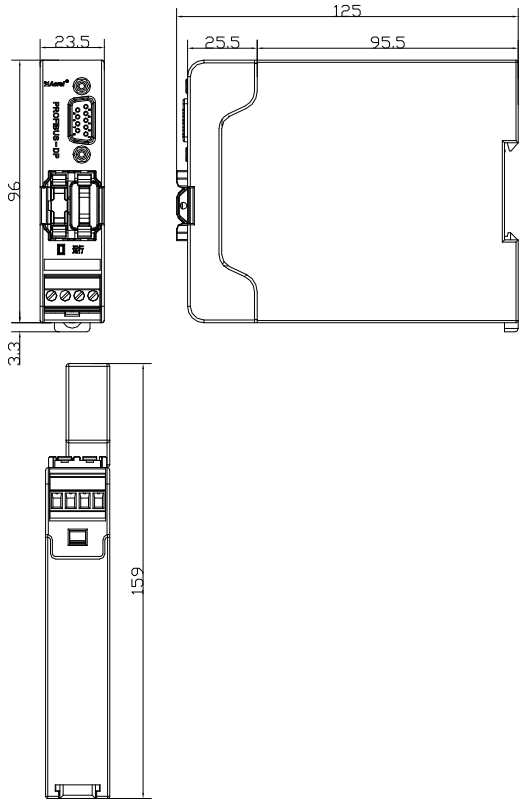


Figure 10 Overall dimensions about communication module

Overall dimensions about 60L LCD display module are as shown in figure11:

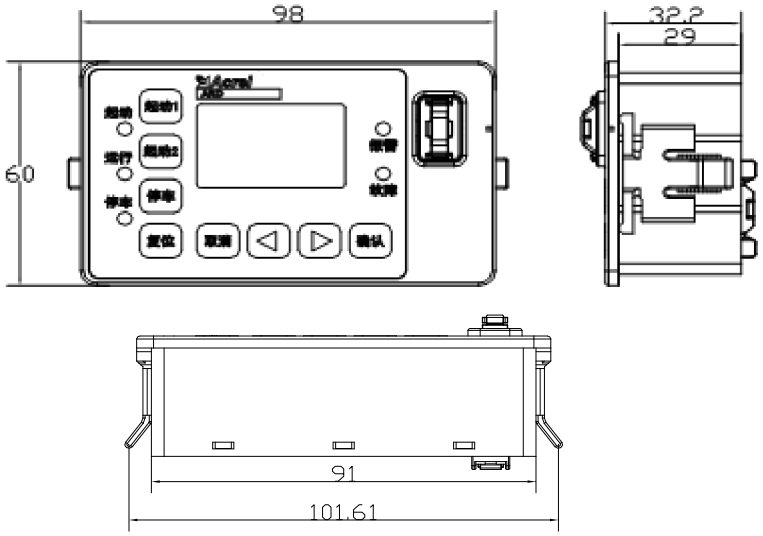


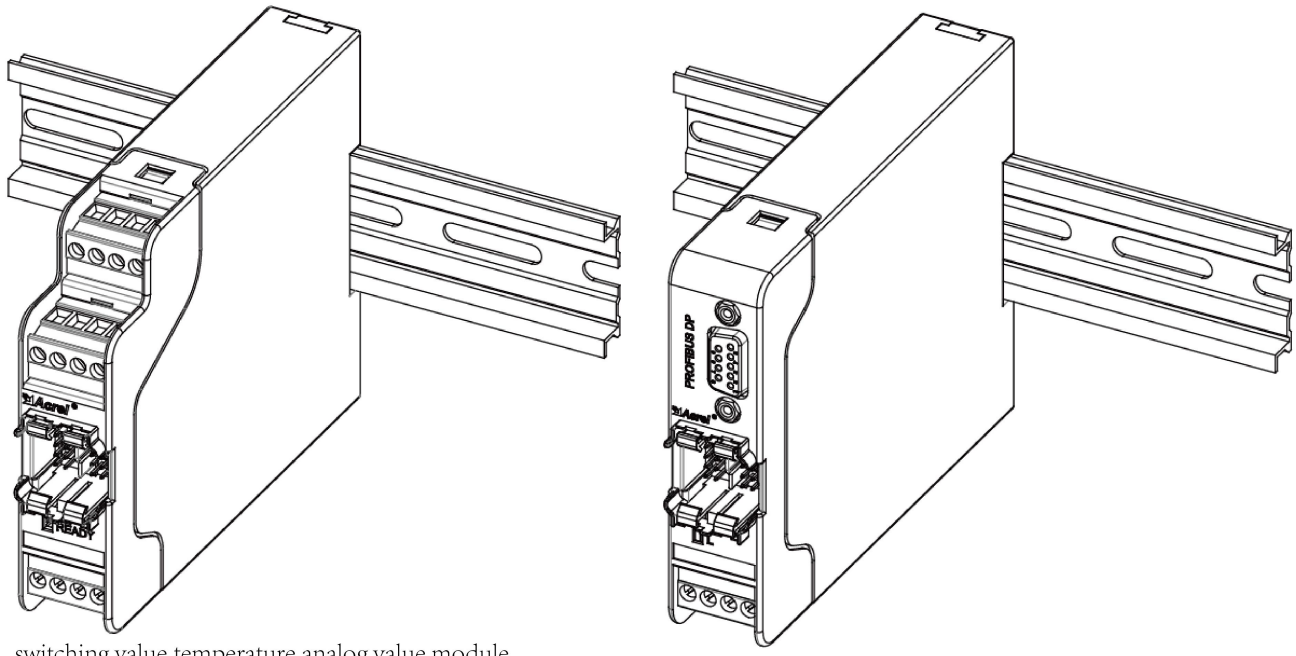
Figure 11 Overall dimensions about 60L LCD display module

6 ARD3T module introduction and setting software instruction

Besides providing basic protection functions, ARD3T can add five kinds of function modules according to users demand.

- ■Switching value module
- ■Temperature module
- ■Analog value module
- ■Communication module
- ■LCD display module

The installation of each function module is shown in figure12 and figure 13, except LCD.



switching value,temperature,analog value module guide rail installation diagram

communication module guide rail installation diagram

Figure 12 Guide rail installation

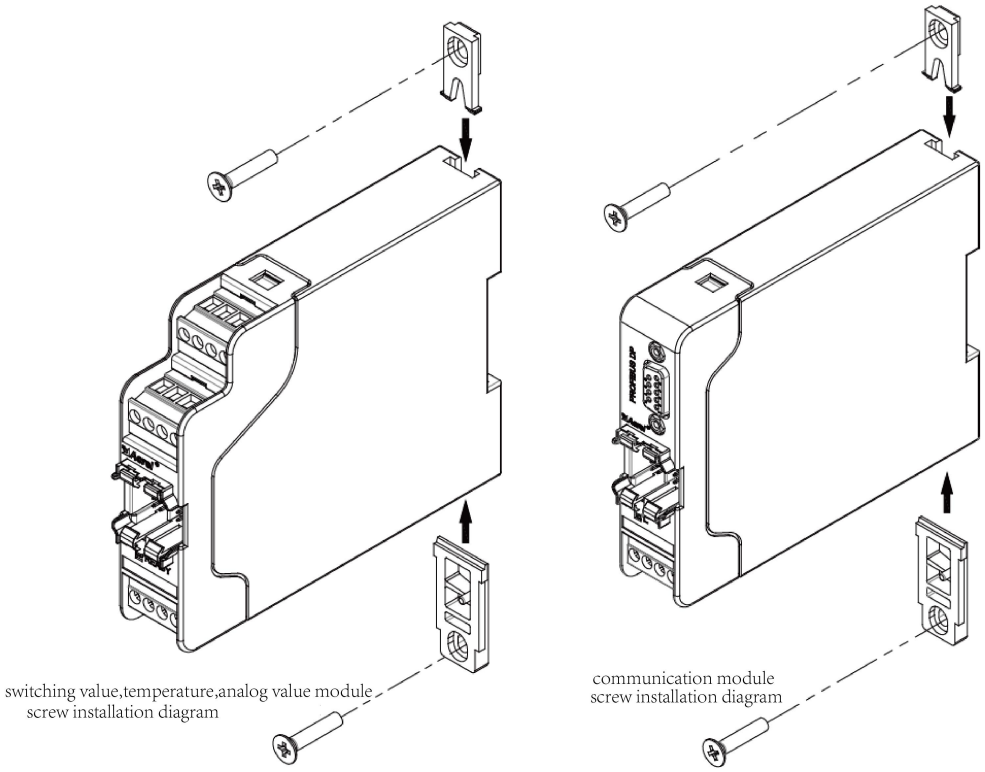


Figure 13 Screw fixed installation

Setting software instruction:

After each motor protector properly connected according to instruction, open Acrel detection system program and enter Acrel motor protection setting software.

Install all modules and contact communication wire, select serial port configuration in communication setting, choose serial port number, device address,baud rate, and click “OK”, then click “connecting device”icon and click “real-time status”icon. Data shown in real-time status means that the motor protector is already connected with setting software, and the module selection displays the already installed modules. Setting software instruction is as shown in figure 14 and figure 15.

Figure 14 Setting software instruction 1

Users can set switching value input about starting, stopping, resetting and basic DI function by DI5-DI8, as well as set switching value output about running, counter, and timer by DO5-DO7.

Temperature module can be set according to external temperature sensors such as PT100,PT1000,Cu50,PTC,NTC.As shown in figure 15, when set basic protection, users can move the mouse to corresponding numerical location and then

double click for modification.Users can also set action value, return value, action time, return time, reset mode, tripping and alarm during temperature protection.

Users can set analog value high or low protection in figure 15, move the mouse to corresponding numerical location and double click to implement the modification.Analog value protection setting includes alarm, tripping threshold and time.

Connect communication according to communication connecting instruction, users implement basic setting about analog value input and output in figure 15. The corresponding relationship between type of ARD3T analog output and 4mA/20mA can program, the programming content is as shown in table 21.

Notes: The meaning of 4mA/20mA corresponding value setting is as follows: take transmitting type “Ia” for example, 4mA corresponding value set to “0” means output is 4mA when Ia equals to 0;20mA corresponding value set to “100” and multiply the unit “0.01”, which means output is 20mA when Ia reaches 1 time rated current.

More details about LCD switching value display and setting are as shown in LCD menu overview.

Figure 15 Setting software instruction 2

Switching value module

Wiring mode:

Connect each circuit according to wiring diagram and binding post, and then connect refer to figure 16.

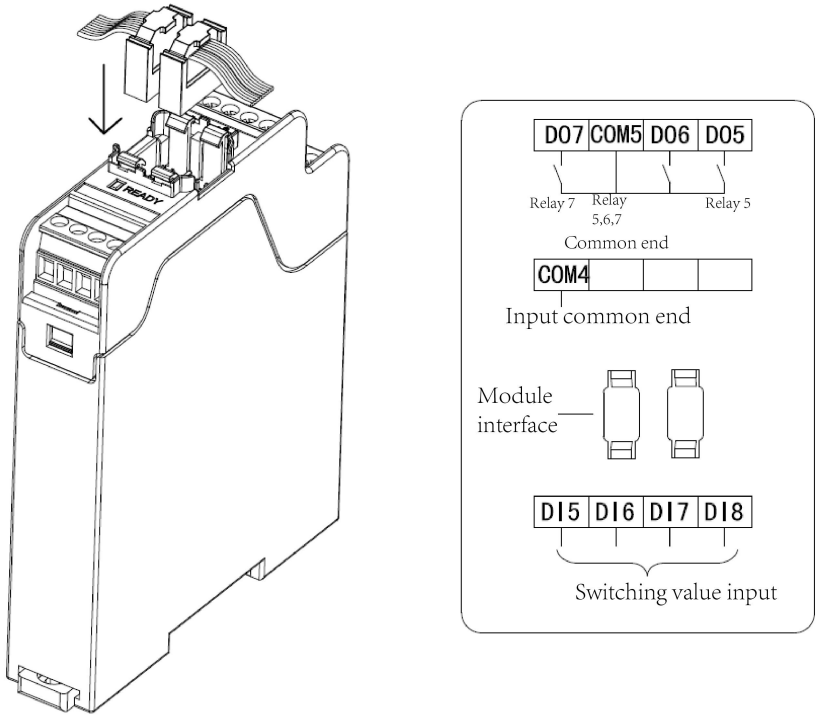


Figure 16 Switching value module wiring diagram

Function introduction:

Switching value module expands the switching value of master. If switching value points of the master cannot satisfy user's demand, users can implement the expansion about product's switching value points by adding switching value module.

After connecting switching value module properly, the indicator light will show green flash. Users can observe and set switching value by upper computer or LCD display module.

Temperature module

Wiring mode:

Connect each circuit according to wiring diagram and binding post, and then connect refer to figure 17.

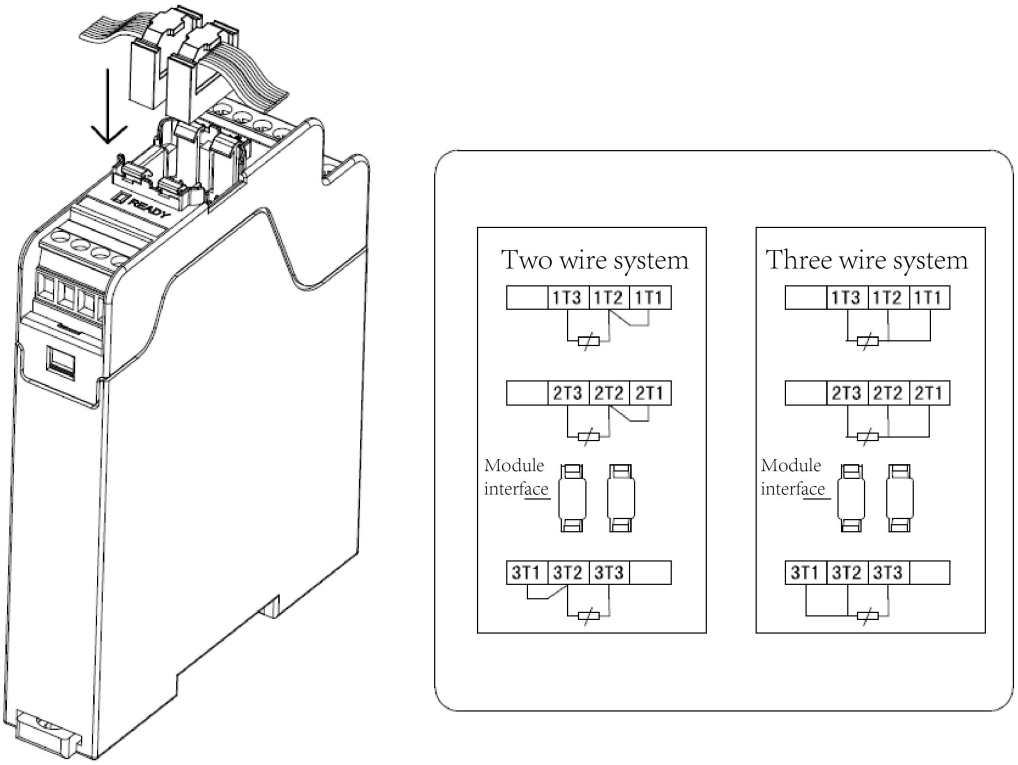


Figure 17 Temperature module wiring diagram

Function introduction:

Temperature module implement temperature measurement using external sensors such as PT100,PT1000,Cu50,PTC/NTC, and etc.

After connecting temperature module properly, the indicator light will show green flash. Users can observe and set analog value by upper computer or LCD display module.

The LCD temperature display and setting are as shown in LCD menu overview for details

Analog value module

Wiring mode:

Connect each circuit according to wiring diagram and binding post, and then connect refer to figure 18.

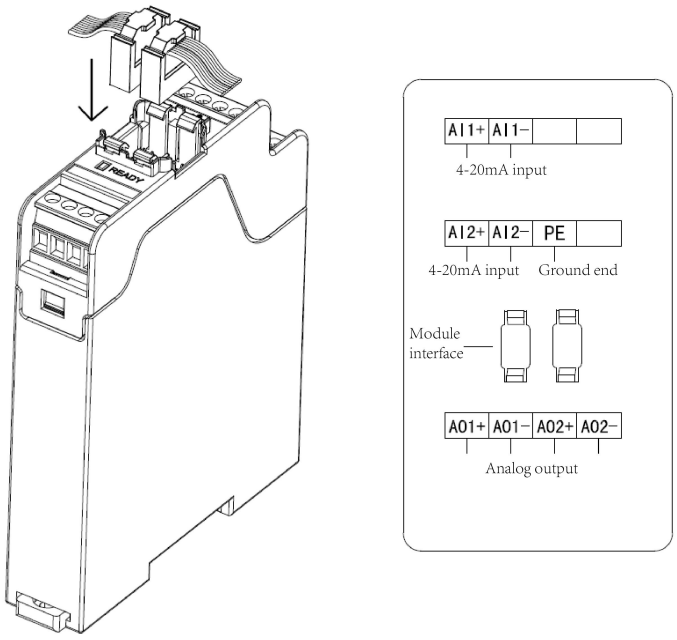


Figure 18 Analog value module wiring diagram

Function introduction:

Analog value module can realize analog value input measurement and transmitting output

After connecting analog value module properly, the indicator light shows green flash. Users can observe and set analog value by upper computer or LCD display module.

Communication module

Wiring mode:

Connect each circuit according to wiring diagram and binding post, and then connect refer to figure 19.

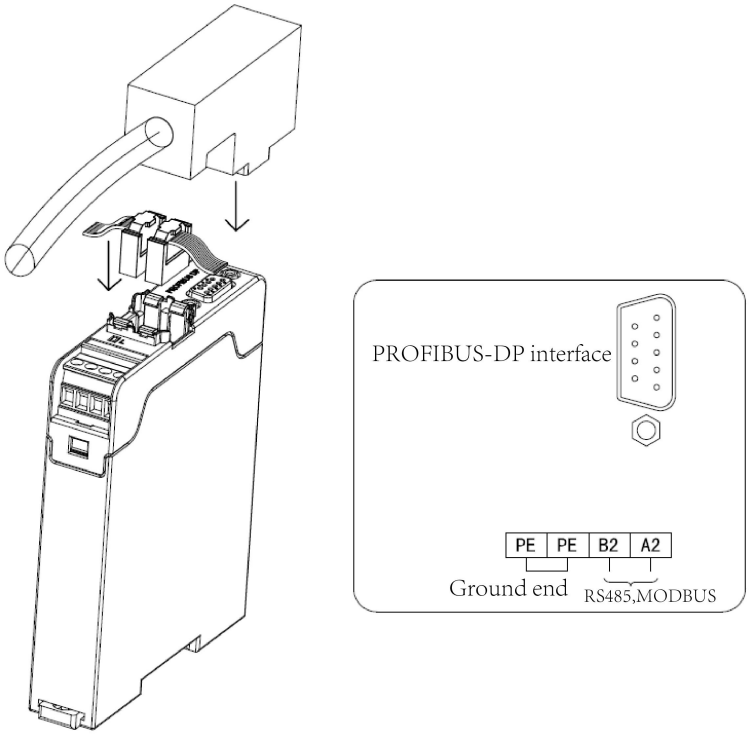


Figure 19 Communication module wiring diagram

Function introduction:

Communication module implement double Modbus and Profibus. Users can observe and set communication address and baud rate by upper computer or LCD display module.

When communication module is Profibus, users can set baud rate 2 as Profibus, then set Profibus slave station address in communication address 2. Green light flash when data exchange between master station and slave station during Profibus communication, otherwise red light is normally on if no data exchange. When communication module is Modbus, indicator light of communication module is normally off, communication indicator light accords with master communication indicator light: green light flash when communication, otherwise the indicator light is normally off.

7 Operation guide

7.1 60L Display module panel

60L Display module panel is as shown in Figure 20.

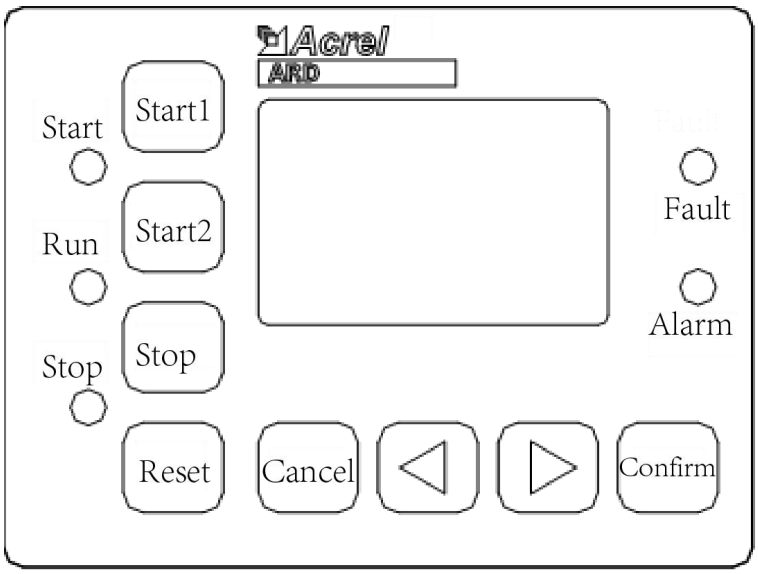


Figure 20 60L display panel

7.2 Display operation guide

The description of the display and operation of 60L display module is as shown in Table 15.

Table 15 Description of the indicators and keys

No.	Name	Status	Function Description
1	Ready indicator	On/Off	On: Motor is normal, and permit to start motor.
			Off: No-stopping status or having fault tripping
2	Stopping indicator	On/Off	On:Motor is in stopping status
			Off: Motor is in working status
3	Starting indicator	On/Off	On:Motor is in the starting stage
			Off: Motor is in no-starting status
4	Running indicator	On/Off	On: Motor is in working status
			Off: Motor is in no-working status
5	Alarm indicator	On/Off	On:The protector is warning, and alarm relay has operated.
			Off: No warning
6	Tripping indicator	On/Off	On:Motor is at fault, the protector tripping relay has operated.
			Off: no tripping.
7	起动1 Starting 1 key	Click	In non-protective mode, starting1 relay is operated, the motor is started. The control is local.
8	起动2 Starting 2 key	Click	Reverse starting motor in two-directional starting mode in stopping status;start relay 2 in two-speed motor control mode to change the

			speed of motor, the control is local.
9	停车 Stopping button	Click	Release starting relay to make motor stopped. The control is local.
10	停车 + 复位 Stopping + reset button	Press simultaneously	Stop motor urgently, and clear the thermal capacity.
11	复位 Reset button	Click	Reset protector while motor is at fault.
12	确定 Enter button	Click	Enter the menu, and confirm the revised parameters in setting status
13	Direction key	Click	Flip over menu backward and decrease the data in setting status.
		Press for a long time	Decrease the data when revising in the setting status.
14	Direction key	Click	Flip over menu forward and increase the data in setting status
		Press for a long time	Increase the data when revising in the setting status.
17	取消 Cancel button	Click	Exit the menu or cancel the revised operation.
18	+ Direction combination key	Press simultaneously	Operate in the main interface, and the display contrast will change among 50% ,15% and 85% in sequence.(If the display is obscure, revert to the main interface by cancel key. And revert to the visible status by this combination key, regulate the contrast in the menu to the best show)
19	LCD screen		Display all kinds of the measure parameters and setting parameters.

7.3 LCD menu overview

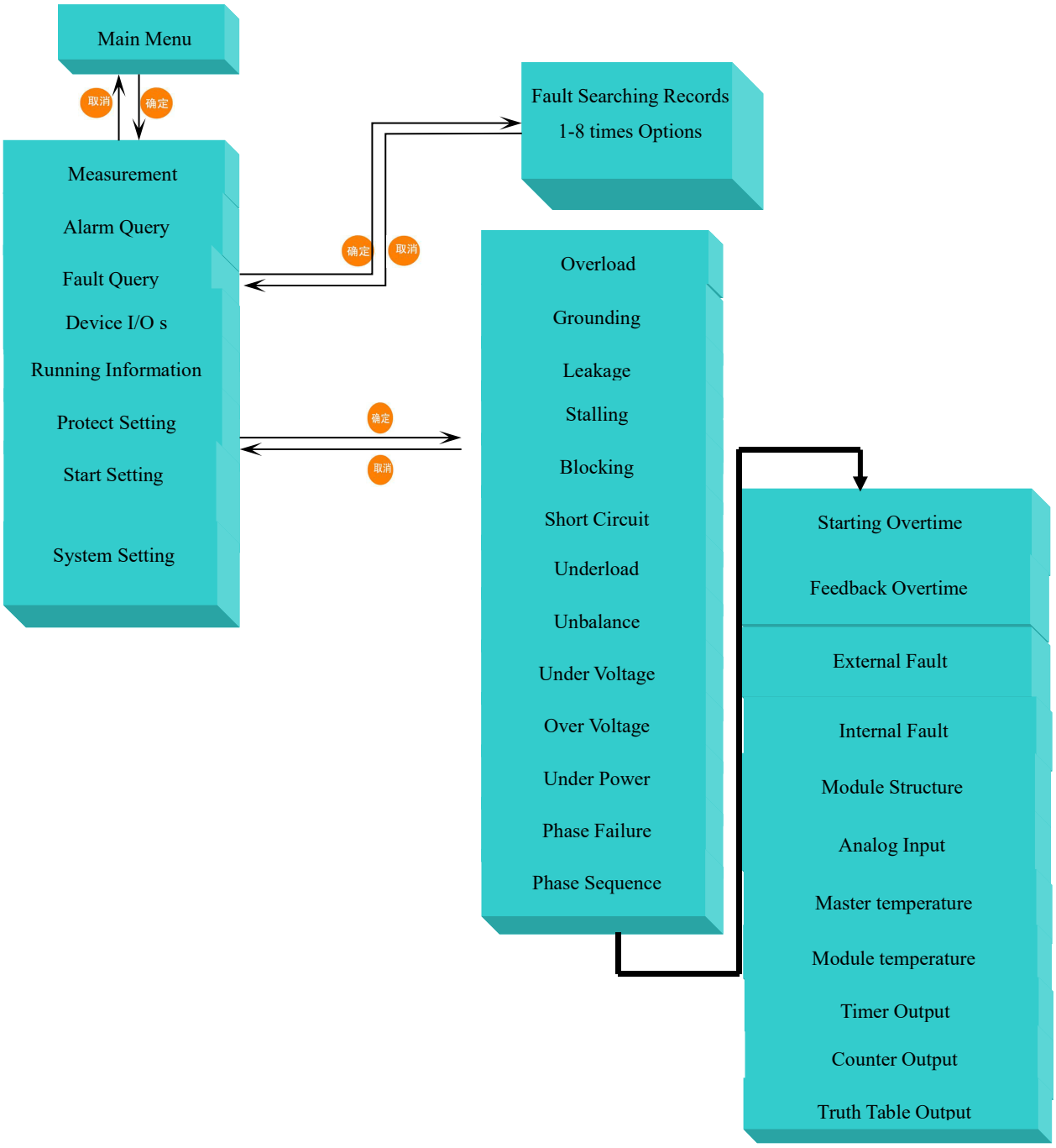
ARD3T LCD module menu show all in Chinese, can show four lines Chinese information simultaneously. Enter the menu interface by click “Enter” button, the menu functions are as shown in Table 16.

Table 16 Menu function

Menu Name	Function	Remarks
Measurement	Check the measure values as current, voltage, frequency, temperature and so on	Check all the measure parameters in this menu.
Alarm Query	Check the current alarm information.	
Fault Query	Check 1-8 fault records.	
Device I/Os	Check the switching value status, and program to DI, DO.	
Running Information	Check the running information.	Can check the running information including running time, stopping time, starting times and so on.
Protect Setting	Set all kinds of protection parameters.	Overload, phase failure, stalling, blocking, over voltage, under voltage and so on.
Start Setting	Set the starting parameters.	Setting allowed: some contents concerned with starting as starting mode, starting time, switching time, self-starting and so on.

System Setting	Set the system parameters.	Setting allowed: information such as motor current, motor voltage, communication address, communication baud rate, system time, transmitting output setting, LCD backlight and so on.

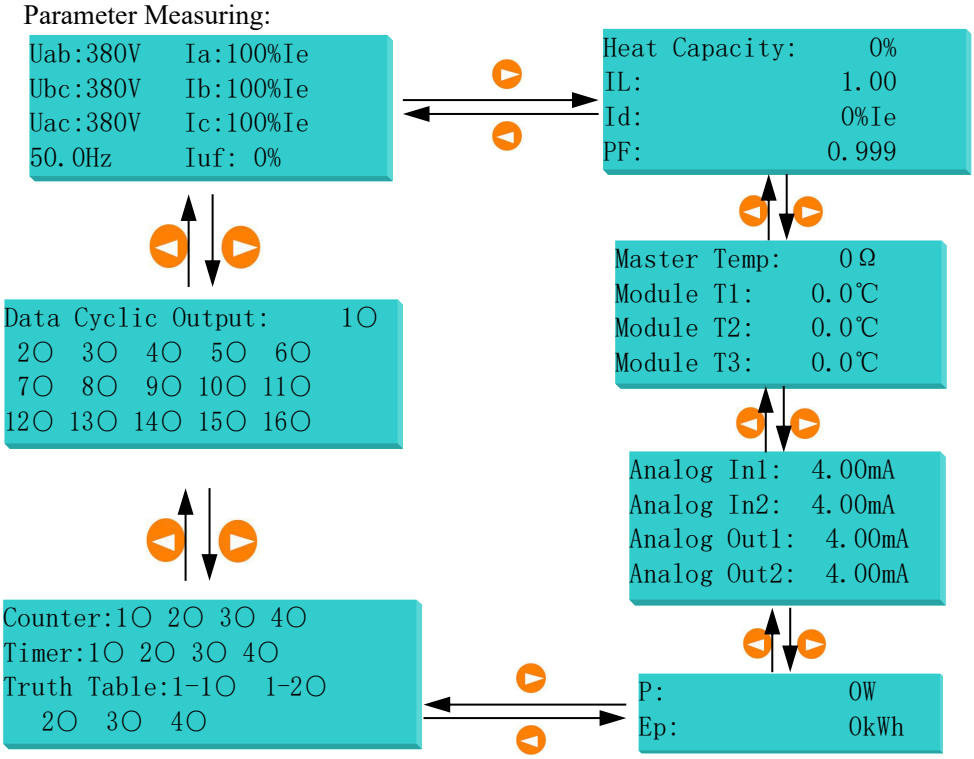
Detailed menu structure as follows:



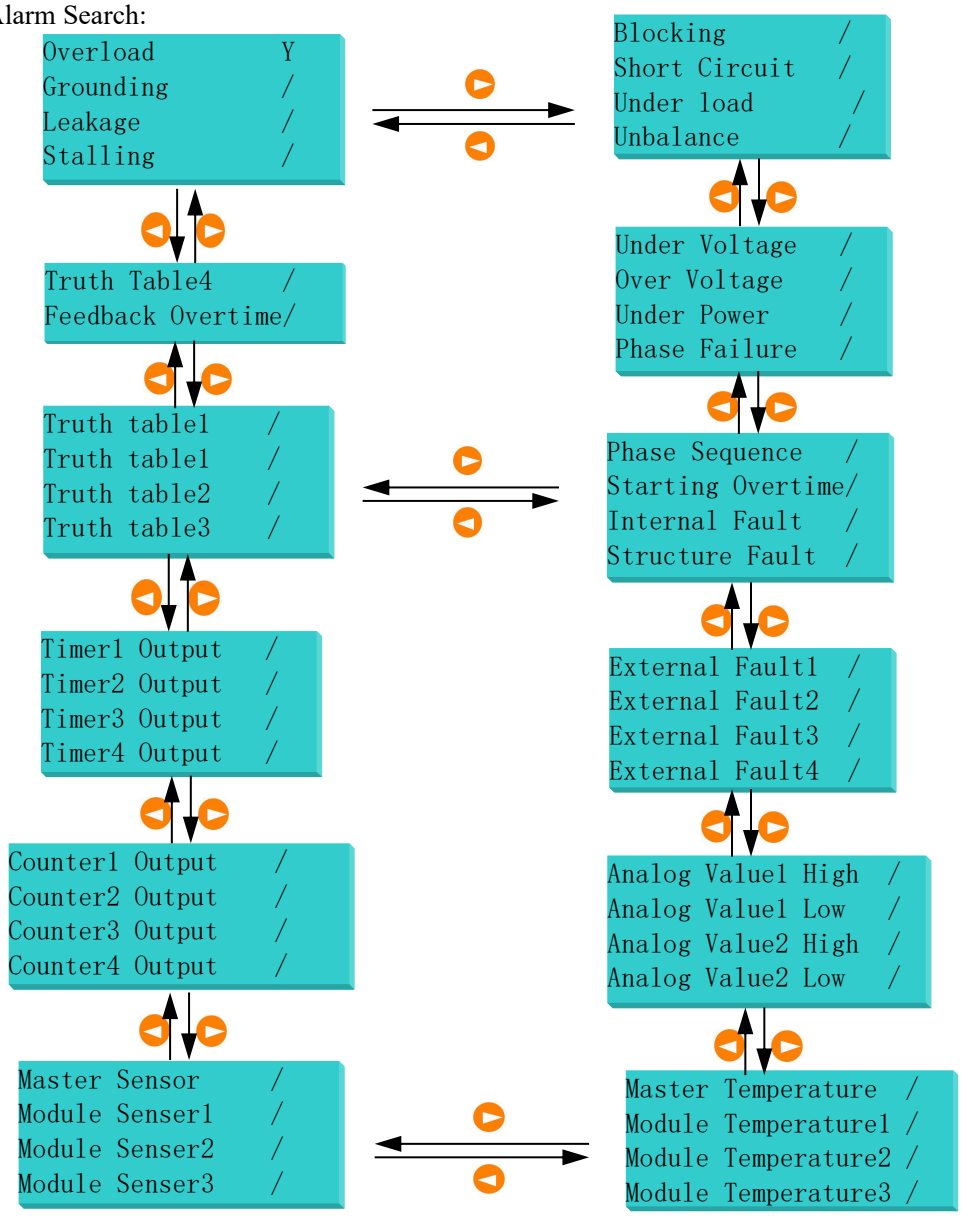
"↑"shows that the current page can be operated, and ◄ key shows paging forward. "⤒" shows that the current page is already the first one, and will turn to the last page if forward.

"↓"shows that the current page can be operated, and ► button shows paging backward. "⤓" shows that the current page is already the last one, and will turn to the first page if backward.

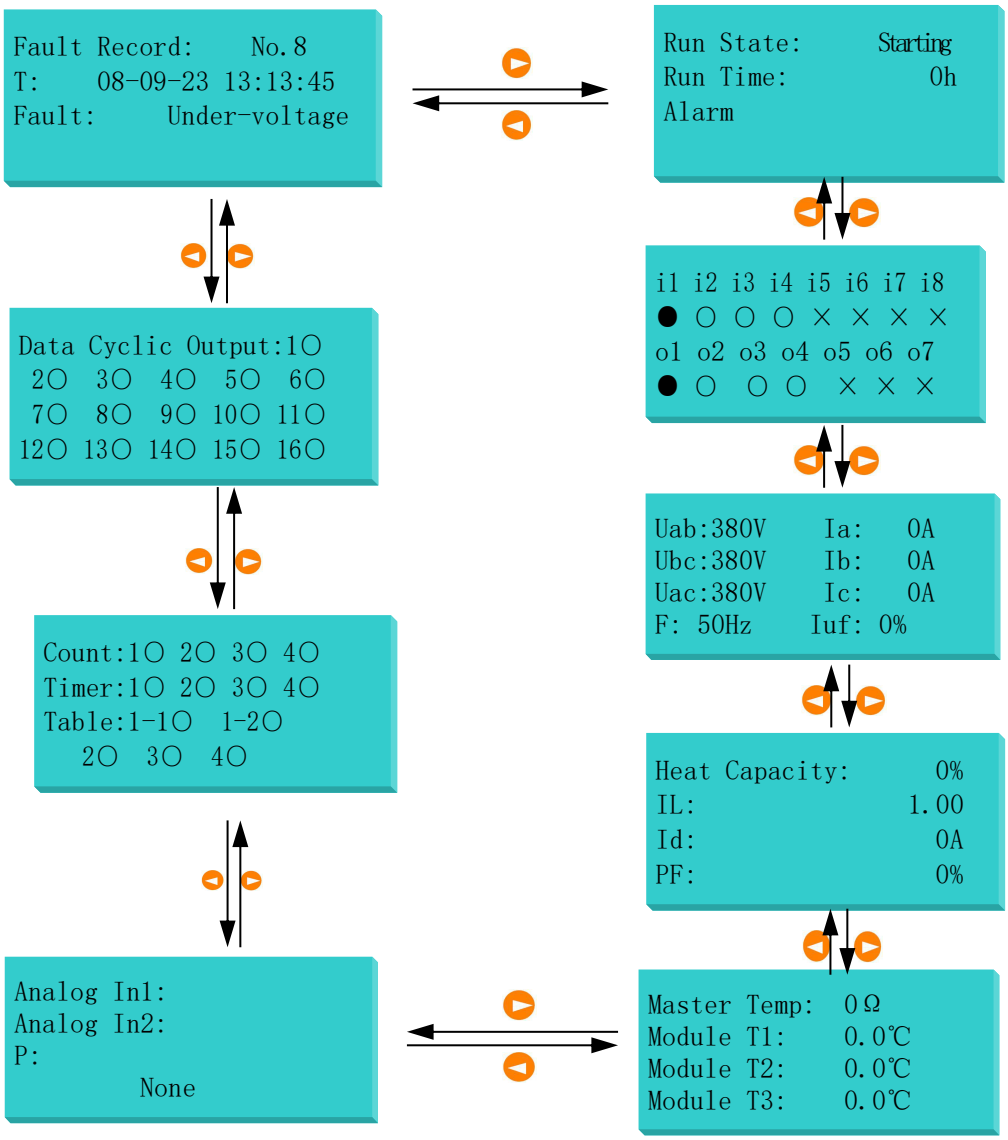
Parameter Measuring:



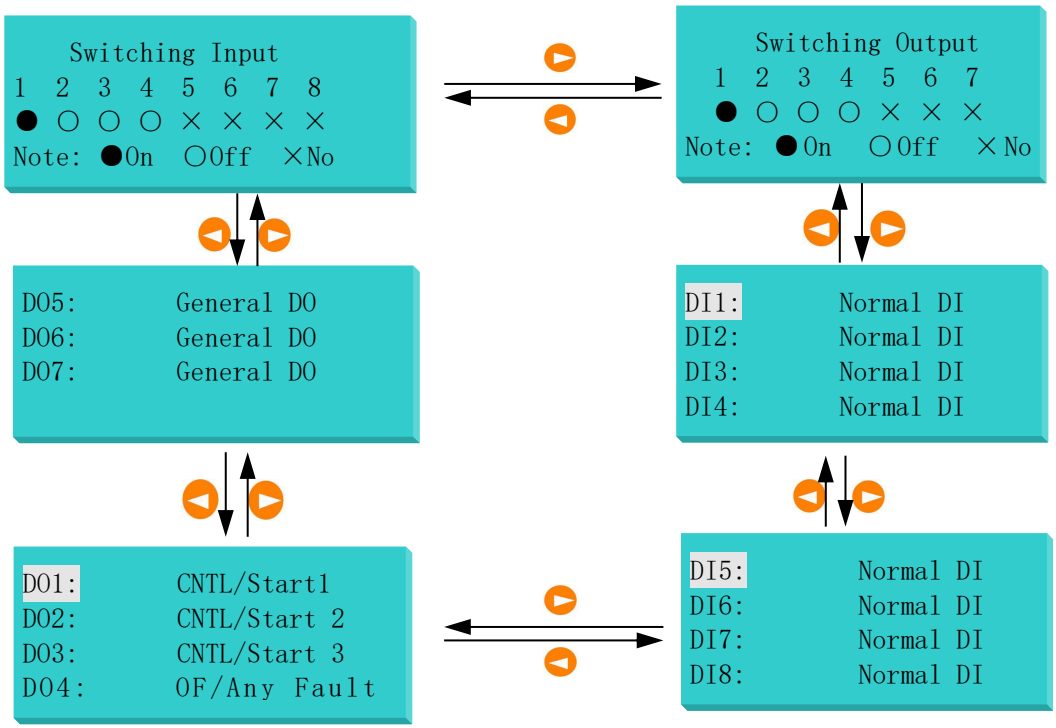
Alarm Search:



Fault Search:

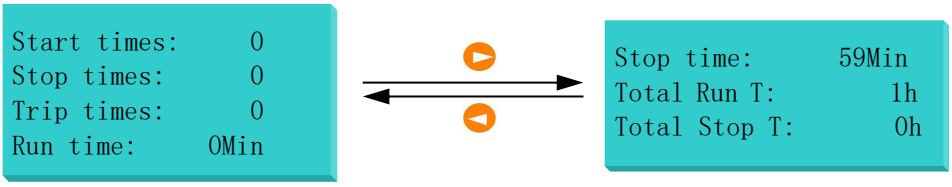


Device I/Os:



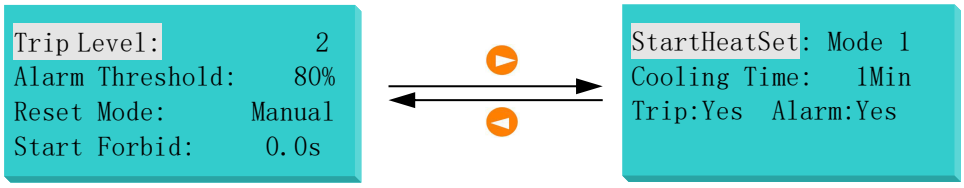
When sub-menu highlight show, adjust ◄, ► to change different sub-menu. When push the 确定 button, enter the sub-menu to change the parameters， now the responding parameters behind the sub-menu are in reverse show. Adjust ◄, ► to change the parameters(push ◄, ► for a long time to adjust the value)， then push 确定 to affirm the parameter modification or push 取消 to cancel the parameter modification and exit to the sub-menu show.

Running Information:

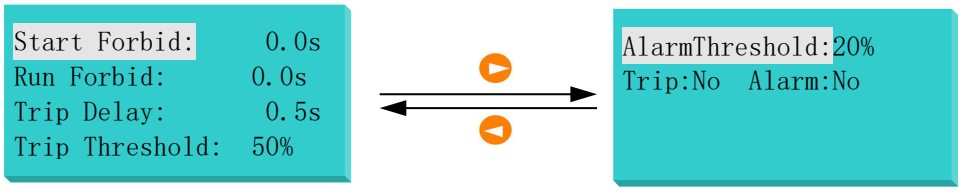


Protection Setting:

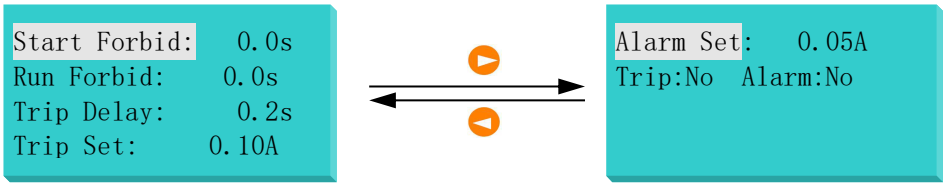
Overload Protection:



Grounding Protection:

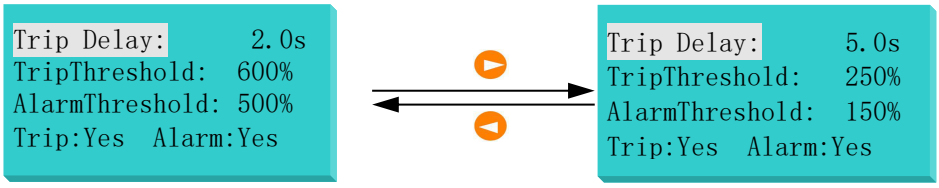


Leakage Protection:



Stalling Protection

Blocking Protection



Short Circuit Protection

Underload Protection

Unbalance Protection

Under-Voltage Protection

Overvoltage Protection

```
TripDelay:          5.0s
TripThreshold:      120%
AlarmThreshold:     110%
Trip:Yes   Alarm:Yes
```

Underpower Protection

```
Trip Delay:        50.0s
TripThreshold:      50%
AlarmThreshold:     70%
Trip: No   Alarm: No
```

Phase Failure Protection

```
Trip Delay:         1.0s
Trip:Yes   Alarm:Yes
```

Phase Sequence Protection

```
Trip Delay:         0.1s
Trip: No   Alarm: No
```

Starting Overtime Protection

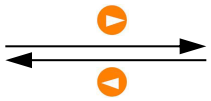
```
Trip:Yes   Alarm:Yes
```

Feedback Overtime Protection

```
Trip:Yes   Alarm:Yes
```

External Fault Protection

```
Fault1 Delay:       0.1s
Trip: No    Alarm: No
Fault2 Delay:       0.1s
Trip: No    Alarm: No
```



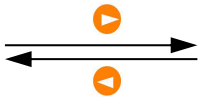
```
Fault3 Delay:       0.1s
Trip: No    Alarm: No
Fault4 Delay:       0.1s
Trip: No    Alarm: No
```

Internal Fault Protection

```
Trip Delay:         0.1s
Trip:Yes   Alarm:Yes
```

Module Structure Fault

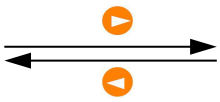
```
Measurement:        Match
Switch I/O:         Match
Analog:             Match
Temperature:        Match
```



```
Trip Enabled:       Yes
Alarm Enable:       Yes
```

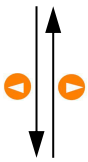
Analog Input Protection

```
Hysteresis:        0.10mA
I1H Period:        Whole
I1H Delay:          1.0s
I1HTripSet:       20.00mA
```



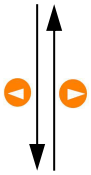
```
I1HAlarmSet:      16.00mA
I1H Trip:              No
I1H Alarm:             No
I1L Period:        Whole
```

```
I1L Delay:          1.0s
I1LTripSet:        8.00mA
I1LAlarmSet:      12.00mA
I1L Trip:              No
```

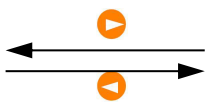


```
I2L Alarm:             No
```

```
I1L Alarm:             No
I2H Period:        Whole
I2H Delay:          1.0s
I2HTripSet:       20.00mA
```

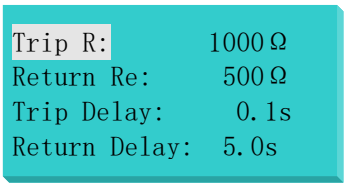


```
I2L Delay:          1.0s
I2LTripSet:        8.00mA
I2LAlarmSet:      12.00mA
I2L Trip:              No
```

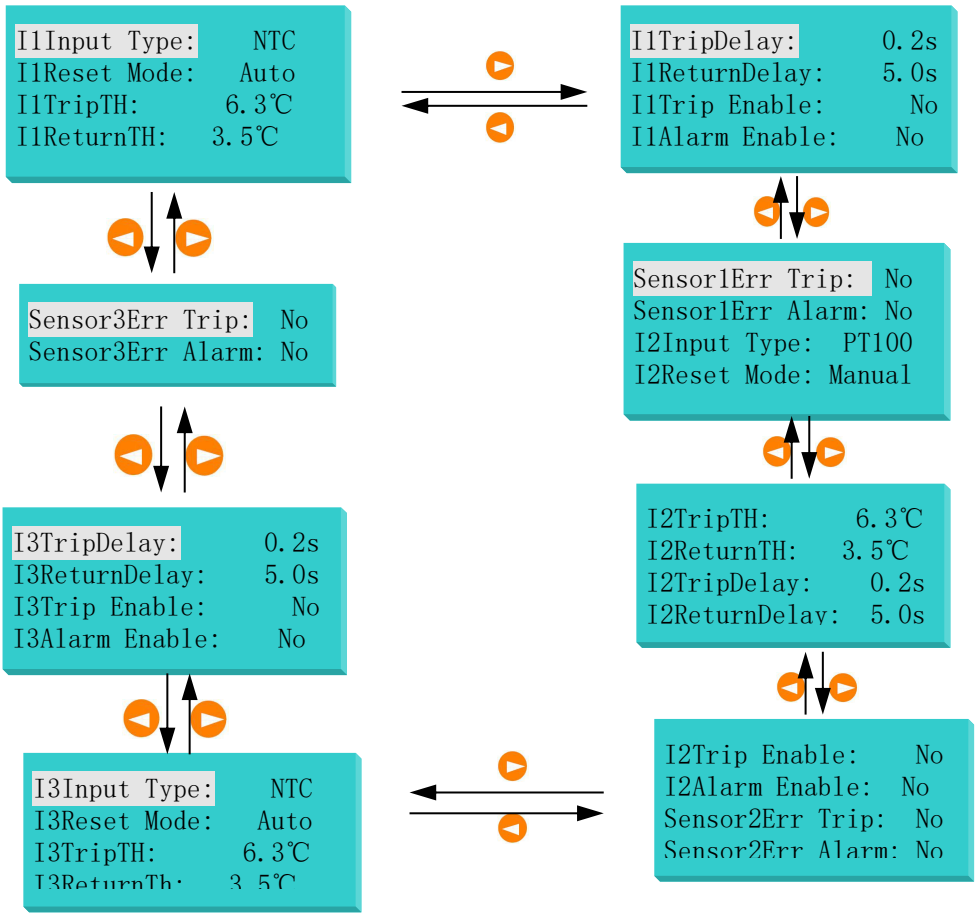


```
I2HAlarmSet:      16.00mA
I2H Trip:              No
I2H Alarm:             No
I2L Period:        Whole
```

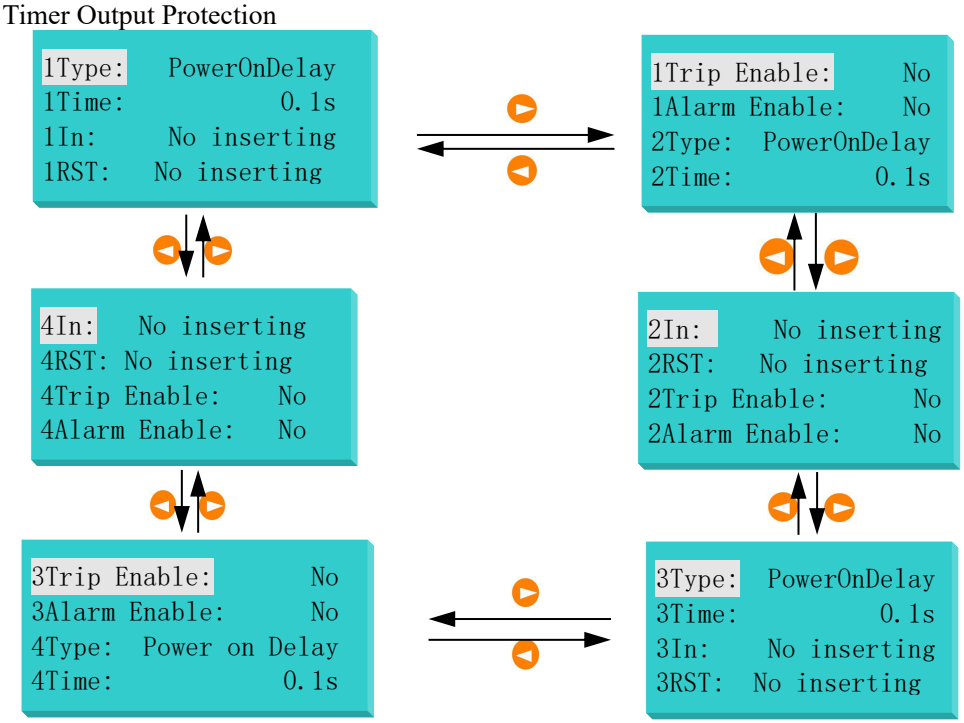
Master Temperature Protection



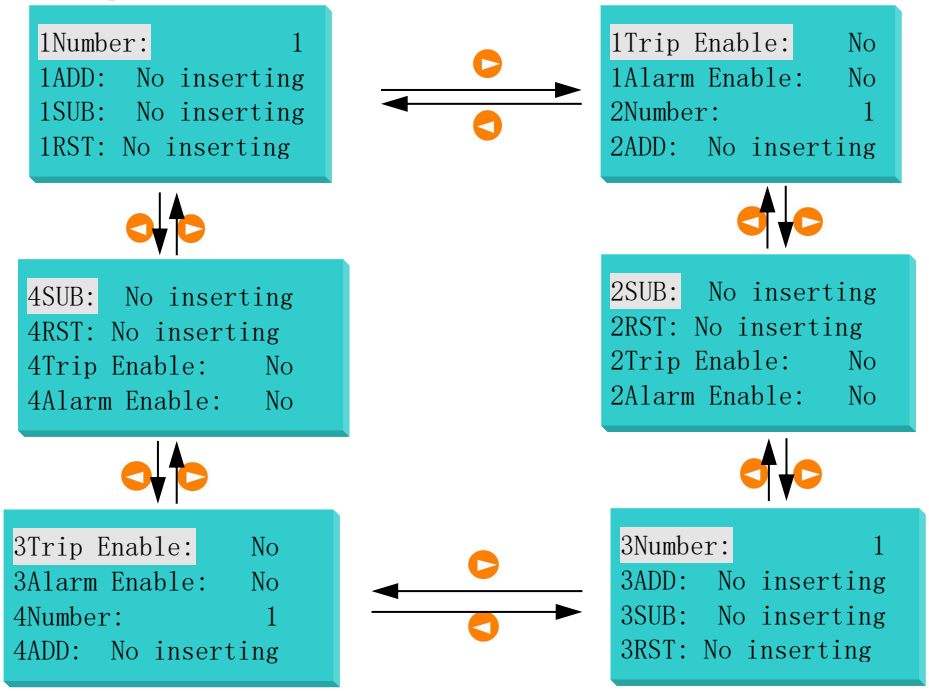
Module Temperature Protection



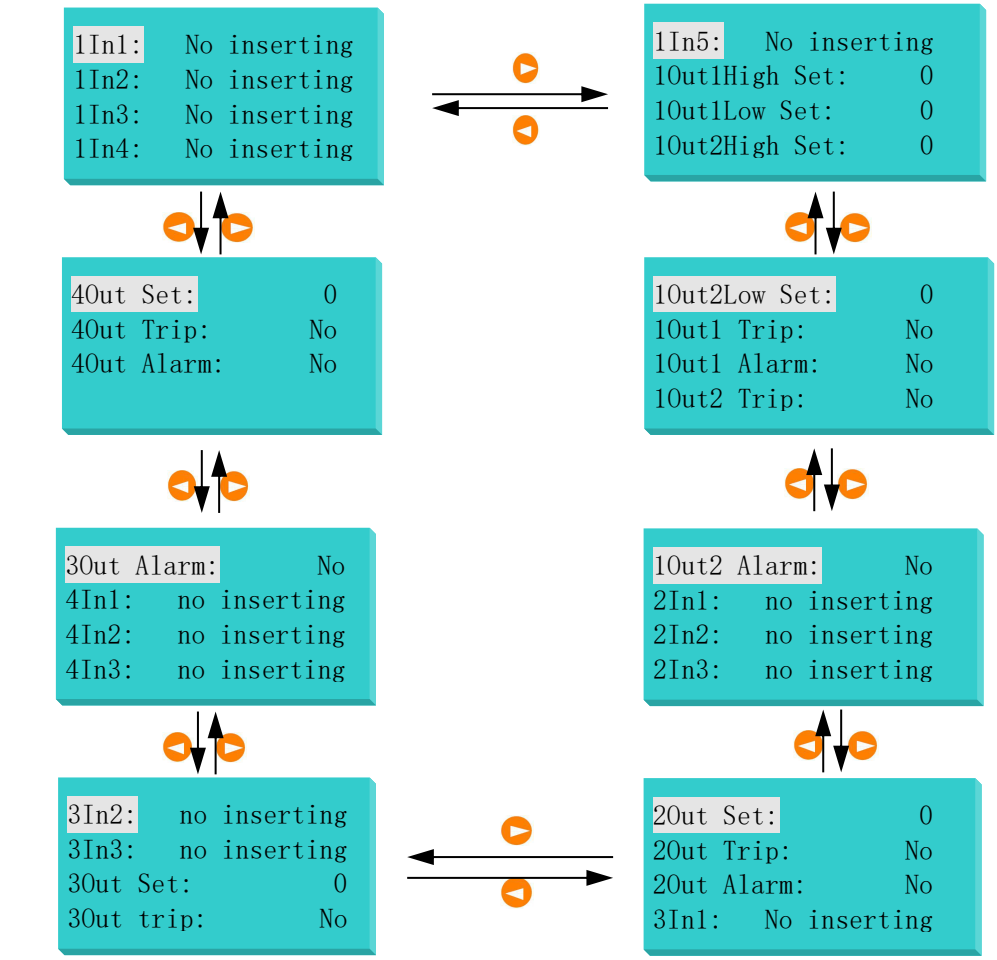
Timer Output Protection



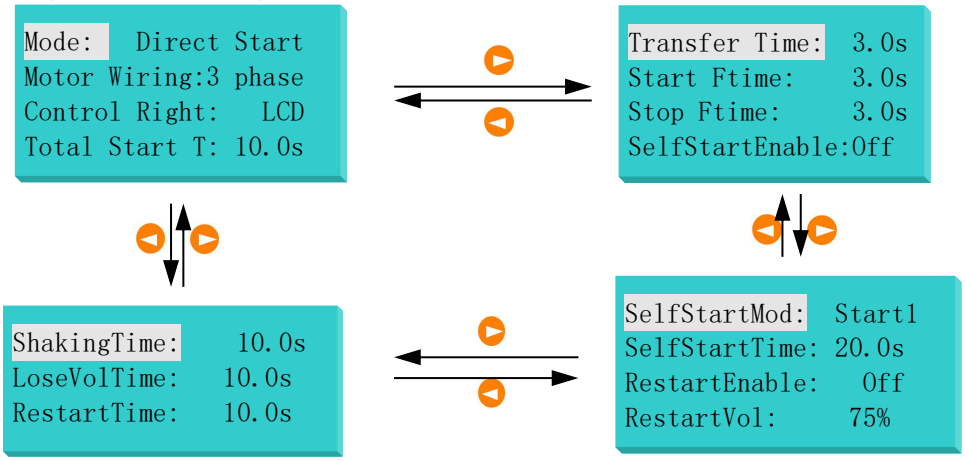
Counter Output Protection



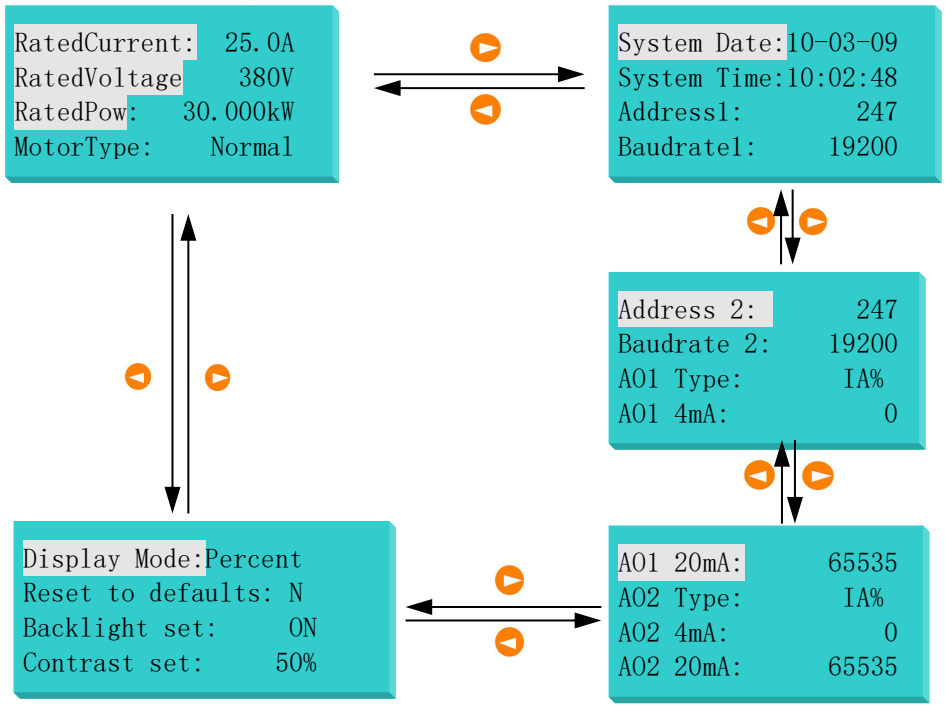
Truth Table Output Protection



Starting Parameter Setting



System Parameter Setting



8 Function introduction

8.1 Protection function

Protection parameter setting is as shown in Table 17.

Table 17 Protection parameter setting

Function	Item	Details
Motor rated current	Ie	1.6(0.40-2.00);6.3 (1.6-6.3);25 (6.3-25); 100 (25-100);250 (63-250);800 (250-800)
Motor rated voltage	Ue	380V,660V。
Overload protection	No-action characteristic	<105%Ie,no action in 2h
	action characteristic	120%Ie, action delay in 1h
	Tripping level	2,3,5,10,15,20,25,30,35,40
	Allowed starting thermal capacity	Mode one, mode two
	Cooling time	0min～120min，unit:1min
	Starting overload shield time	0s～Starting time
	Fault reset mode	Manual/automatic

	Overload protection mode	Alarm, tripping
Phase failure protection	Action scope	Current unbalance greater than 50%
	Action time	0.1S～600.0S
	Protection action mode	Alarm, tripping
Grounding Protection	Setting value scope	(20%～100%)Ie
	Starting no driving time	0.1S～600.0S
	Running no driving time	0.1S～600.0S
	Protection action mode	Alarm, tripping
Leakage protection	Setting value scope	50mA～1A，3A～30A
	Starting no driving tim	0.1S～600.0S
	Running no driving time	0.1S～600.0S
	Protection action mode	Alarm, tripping
Stalling protection	Action value setting range	100% Ie～1000%Ie
	Delay time setting scope	0.1S～600.0S
	Protection action mode	Alarm, tripping
Blocking protection	Action value setting scope	100% Ie～1000%Ie
	Delay time setting scope	0.1S～600.0S
	Protection action mode	Alarm, tripping
Short-circuit protection	Action value setting scope	200%Ie～2000%Ie
	Delay time setting scope	0.1S～600.0S
	Protection action mode	Alarm, tripping, operated by short-circuit protection relay
Under load protection	Action value setting scope	(20%～95%)Ie
	Delay time setting scope	0.1S～600.0S
	Protection action mode	Alarm, tripping
Unbalance protection	Action requirement	Three-phase circuit unbalance is: 10% ～ 100%
	Action time	0.1S～600.0S
	Protection action mode	Alarm, tripping
Starting overtime protection	Starting time scope	0.1S～60.0S
	Action time	Action instantaneously
	Protection action mode	Alarm, tripping
Under voltage protection	Under-voltage setting value	(10%～100%)Ue
	Delay action time	0.1S～600.0S
	Protection action mode	Alarm, tripping
Over voltage protection	Over-voltage setting value	(110%～150%)Ue
	Action time	0.1S～600.0S
	Protection action mode	Alarm, tripping
Under power protection	Under-power setting value	(10%～100%)P
	Action time	0.1S～600.0S
	Protection action mode	Alarm, tripping
Phase sequence protection	Action value setting	Enable/Forbid
	Action time	< 0.5s
	Protection action mode	Alarm, tripping
External fault protection	Delay time setting scope	0.1S～600.0S
	Protection action mode	Alarm, tripping
Master temperature protection	Sensor type	PTC/NTC

	Action resistance setting value	0.1kΩ～30kΩ
	Return resistance setting value	0.1kΩ～30kΩ
	Fault reset mode	Manual/Automatic
	Action time	0.1S～600.0S
	Protection action mode	Alarm, tripping
Module temperature protection	Sensor type	PT100,PT1000,Cu50,PTC,NTC
	Reset mode	Manual/Automatic
	Action resistance setting value	Temperature:-270℃～+850℃; Resistance:0.1kΩ～30kΩ
	Return resistance setting value	Temperature:-270℃～+850℃; Resistance:0.1kΩ～30kΩ
	Protection action mode	Alarm, tripping
Timer Output protection	Type	Power on delay, memory power on delay, power failure delay, instant turnover
	Action time	0.1S～600.0S
	Protection action mode	Alarm, tripping
Counter output protection	Type	Adding, subtract
	Action time	0.1S～600.0S
	Protection action mode	Alarm, tripping
Truth table output protection	Type	Truth value1～Truth value4
	Action time	0.1S～600.0S
	Protection action mode	Alarm, tripping
Module structure fault	Protection action mode	Alarm, tripping
Internal fault protection	Action time	0.1S～600.0S
	Protection action mode	Alarm, tripping
Analog input protection	Input hysteresis value	0～2.3mA
	Protection period	When starting, running, whole course
	Action type	High protection, low protection
	Action time	0.1S～600.0S
	Protection action mode	Alarm, tripping
Power on restarting	Power on restarting	Forbid/Enable
	Power on restarting mode	Recover, start1, start2
	Power on restarting time	0.1S～600.0S
Be under/ voltage off restarting (anti- interference electricity function)	Voltage off restarting	Forbid/Enable
	voltage off restarting voltage	(20%～95%)Ue
	Loss of voltage anti- interference electricity time	0.1S～10.0S
	Loss of voltage to lose power time	0.5S～600.0S
	Voltage off restarting time	0.1S～600.0S
tE protection	No-action characteristic	<150%Ie, no action forever
	Tripping level	2，3，4，5，6，8，10，12，15,20
	Allowed starting thermal capacity	Mode one, mode two
	Cooling time	0min～120min，unit:1min
	Starting shield time	0s-starting time
	Fault reset mode	Manual/automatic
	Over-load protection mode	Alarm, tripping

Overload protection

When the motor is running in the situation of overload, the current exceed its rated current for a long time. The motor will overheat and burn down because the insulation decreases. The protector computes the heat capacity according to the heat generation characteristics of the motor, and simulates heat generation characteristics to protect the motor.

When the allowed starting thermal capacity is mode one, the motor can be allowed to restart only if the thermal capacity drop under 15%. When the allowed starting thermal capacity is mode two, the motor can start while the thermal capacity drop to the starting thermal capacity (100% thermal capacity-the starting thermal capacity last time -2%) or under 15% thermal capacity.

■ Overload protection current-Time table of comparison is shown as Table 18, the Overload characteristic curve graph (K curve graph) is shown as Figure 21.

Table 18 Tripping curve table

Selectable tripping curve level K	2	3	5	10	15	20	25	30	35	40
Tripping delay (s)	Three-phases balance load, from the cold state									
Rated value Ie ×1.2	50	75	125	250	375	500	625	750	875	1000
×1.5	32	48	80	160	240	320	400	480	560	640
×2	18	27	45	90	135	180	225	270	315	360
×3	8	12	20	40	60	80	100	120	140	160
×4	4.52	6.78	11.3	22.5	33.8	45	56.3	67.5	78.8	90
×5	2.88	4.32	7.2	14.4	21.6	28.8	36	43.2	50.4	57.6
×6	2	3	5	10	15	20	25	30	35	40
×7.2	1.4	2.1	3.5	6.9	10.4	13.9	17.4	20.8	24.3	27.8
×8	1.12	1.68	2.8	5.6	8.4	11.3	14.1	16.9	19.7	22.5

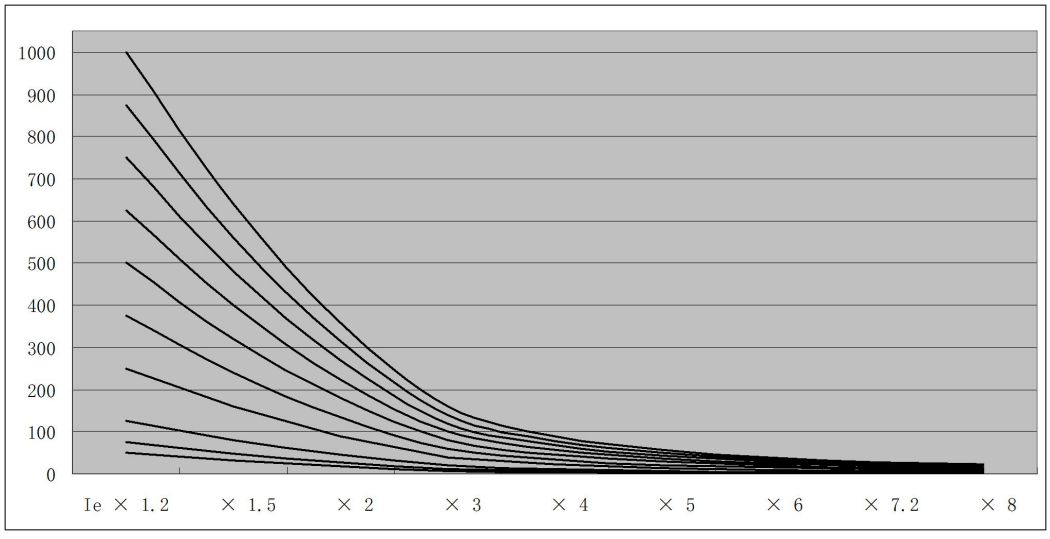


Figure 21 Overload characteristics graph

Phase failure/unbalance protection

Running in the condition of phase failure/unbalance fault have great harm to motor. When phase failure or serious unbalance of three-phase current occurs, such as the unbalance rate achieves the protection setting value, the protector will operate according to the set demands, stopping or giving an alarm to ensure the secure running of the motor.

The calculating formulas of the three-phase unbalance rate is: |I-Iav|/IX， Iav is the mean value of the three phases current, When Iav less than Ie, the denominator IX =Ie; When Iav greater than Ie, the denominator IX =Iav.

Residual current protection (grounding/leakage)

ARD3T has the function of grounding and leakage protection. Grounding protection calculates the surplus current automatically, without external joining transformer, to execute the short circuit protection of the motor metal shell by the phase line. Leakage protection detects the fault current by adding the leakage mutual inductance device, and is used for the protection of the non-direct grounding to ensure the personal safety.

Stalling protection

Because of the too much load or mechanical causes of the motor itself, in the starting process, the motor shaft is locked. If the fault can not be get rid of immediately, the motor will overheat and burn down because of the decreasing insulation. Stalling protection is suitable for such fault protection in the starting process. When the current achieves the operation setting value, the protector will operate timely in the operation (delay) set time or give an alarm to avoid burning motor.

Blocking protection

Blocking protection is used for the blocking in the running of the motor. When the current achieve the operation set current, the protector will operate timely in the operation (delay) set time or give an alarm to avoid burning motor.

Under load (undercurrent) protection

When the load of the motor is the pump, no load or under-load will damage the motor. The protector provides under-load protection. When the percent of the mean current and rated current is less than under-load set value, the protector should operate in the operation (delay) set time or give an alarm.

Starting overtime protection

While the starting time is up, the protection will take effect on the condition that the protector detect the loop current is still not under 110% Ie. To the increased safety, the starting time can not be set to over 1.7 times tE.

Under voltage protection

Too low voltage will cause to reduce the speed of the motor, even stop running. If the main loop voltage is less than the set under-voltage protection value, the protector will execute the protection according to the set demands to operate in the operation set time or give an alarm.

Over voltage protection

Over-voltage will cause to damage the insulation of the motor. If the main loop voltage is greater than the set protection voltage, the protector will execute the protection according to the set demands. It will operate in the operation set time or give an alarm to ensure the device safety of the motor.

Under power protection

The motor will lose the mechanical output ability and run in under-load state because of the damage of the drive device. The motor power factor is very low, but the motor current is very big to consume a lot of inactive power of the system. If the percent of the load power and the rated power is less than the set operation value, the protector will operate in the operation set time or give an alarm.

Phase sequence protection

When the protector detects the voltage phase fault of the motor, the locked motor will start to ensure the motor safety.

External fault protection

When detecting out the external fault input signal, the protector will operate according to the set demands to ensure the

motor device safety.

Temperature protection

Execute the temperature protection by detecting the embedded temperature-test sensor on the motor coil.

Temperature protection is used for the small capacity motor of low voltage (380V). It execute the protection of the over-high temperature caused by the over-load for a long time, changing load, and running repeatedly and shortly in the case of over-load phase failure, three phases unbalance, power frequency change, bad ventilating, too high environment temperature and so on.

When the sensor is positive temperature coefficient PTC, the protector operate after delay on the condition of the actual measurement thermal resistance≥ operation resistance set value. After the operation, the protector can reset the alarm or fault output contact when the actual measurement thermal resistance＜ return resistance set value to enable the motor run normally. When the sensor is NTC, the situation is on the contrary.

When the sensor is PT100,PT1000,Cu50, the protector operate after delay on the condition of the actual measurement temperature≥ operation set value. After the operation, the protector can reset the alarm or fault output contact when the actual measurement value＜ return set value to enable the motor run normally.

Short circuit protection

When the main loop current is greater than the max breaking current of the contactor, the contactor can not be broken by protection relay. The contact of the contactor can be damaged if it is forced to be broken. The main loop can be broken directly by breaker, and it also can be broken by sending signal to the magnetic coil of the breaker.

Under power or loss power restarting (anti-interference electricity)

“Interference electricity” is the voltage shaking shortly of the power grid or power failure for short time because of the thunder, short circuit or any other reasons. When the field motor stops because of anti-interference electricity, the protector can restart the motor if the grid voltage can get right in the allowable time (return to morn than the set recovery voltage). The protector will lock the program and will not to restart the motor is the grid voltage can not get right in the allowable time.

To avoid the great shock to the power grid because of voltage off restarting simultaneously by several motors, the restart delay time of these motors need an interval. The specific interval time can be set according toe the actual technological requirements.

Under/ voltage off restarting (anti-interference electricity) parameters setting scope:

Voltage off restarting Forbid/enable

Voltage off restarting voltage 20%Ue～95%Ue

Anti- interference electricity time 0.1S～10.0S

Losing power time 1.0s～600.0s

Voltage off restarting delay 0.1s～600.0s

Power on restarting

When the function is enabled, the protector will execute the time sharing restarting after the power recover according to the system setting in the process of power on.

If the power on restarting function of the system is set to “Enabled”, the restarting mode is set to “Recover”, ARD3T will decide to restart or not according to the status before the power down. If the system is running status before the power down, It will start to run automatically according to the set delay time.

If the power on to start automatically function of the system is set to “Enabled”, the start mode is set to “Start”, ARD3T will start automatically according to the set delay time.

If the power on restarting function of the system is set to “Forbid”, the function exit.

tE time protection (Applied to special safe motor)

For the special safe motor, after AC winding in the maximum environment temperature reached the rated stable running temperature, recording the process time tE from passing stalling current to the limiting temperature. The tE time is usually provided by motor manufacturers, the user may found this data from motor nameplate.

The heat over-load protection act which break power supply of motor locked motor in tE time act only after finishing motor starting with independent delay timer. The table of comparisons of tE protection characteristic curve operation delay is shown in Table 19, the curve graph is shown Figure 22.

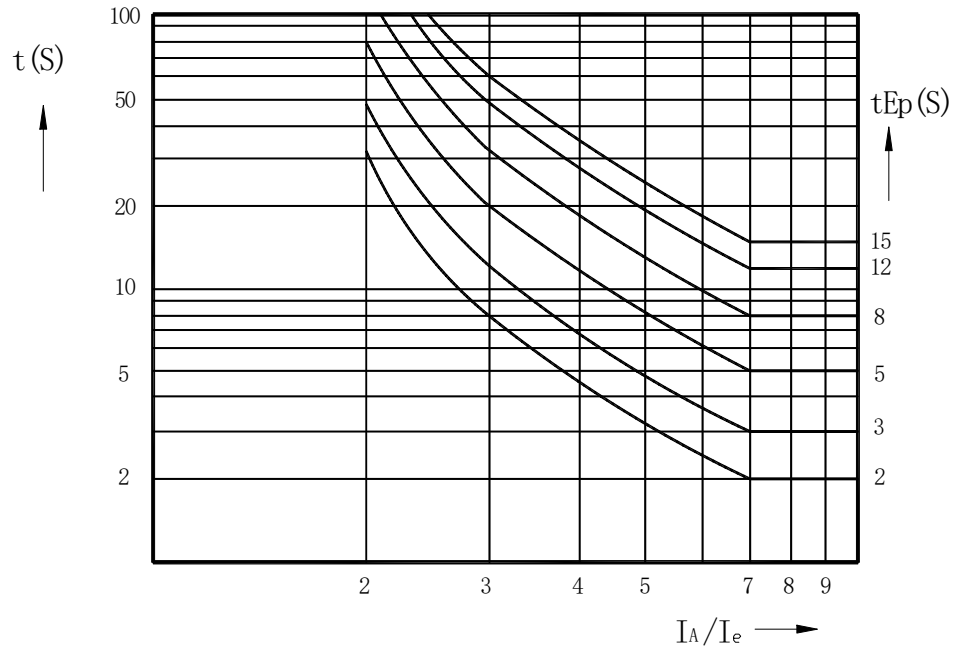


Figure22 Time characteristic of IA/Ie ratio of tE protection delay and stalling current

Notes: tEp:Allowable stalling time at 7 times rated current

IA: Stalling current

Ie:Motor rated current

Table19 Table of comparison of TE curve tripping time

tEp / IA/Ie	2(s)	3(s)	4(s)	5(s)	6(s)	8(s)	10(s)	12(s)	15(s)	20(s)
2.0	32	48	64	80	96	128	160	192	240	320
2.2	20.27	30.4	40.54	50.67	60.81	81.08	101.35	121.62	152.02	202.7
2.4	14.75	22.12	29.5	36.87	44.25	59	73.75	88.5	110.63	147.5
2.6	11.54	17.32	23.09	28.87	34.64	46.19	57.74	69.29	86.62	115.4
2.8	9.46	14.19	18.92	23.65	28.39	37.85	43.31	56.78	70.97	94.6
3.00	8	12	16	20	24	32	40	48	60	80
3.20	6.91	10.37	13.83	17.29	20.75	27.67	34.59	41.51	51.88	69.1
3.40	6.08	9.13	12.17	15.22	18.26	24.35	30.44	36.52	45.66	60.8
3.60	5.43	8.14	10.86	13.58	16.29	21.72	27.16	32.59	40.74	54.3
3.80	4.9	7.35	9.8	12.25	14.7	19.6	24.5	29.41	36.76	49
4.00	4.46	6.69	8.93	11.16	13.39	17.86	22.32	26.79	33.48	44.6
4.20	4.09	6.14	8.19	10.24	12.29	16.39	20.49	24.59	30.74	40.9
4.40	3.79	5.68	7.58	9.47	11.37	15.06	18.95	22.74	28.42	37.9
4.60	3.52	5.28	7.05	8.81	10.57	14.1	17.62	21.15	26.43	35.2
4.80	3.29	4.94	6.59	8.24	9.88	13.08	16.48	19.77	24.72	32.9
5.00	3.09	4.64	6.19	7.74	9.29	12.38	15.48	18.58	23.22	30.9

5.20	2.92	4.38	5.84	7.3	8.76	11.68	14.6	17.53	21.91	29.2
5.40	2.76	4.15	5.53	6.91	8.3	11.07	13.83	16.6	20.75	27.6
5.60	2.63	3.94	5.26	6.57	7.89	10.52	13.15	15.78	19.73	26.3
5.80	2.5	3.76	5.01	6.27	7.52	10.03	12.54	15.05	18.81	25
6.00	2.4	3.6	4.8	6	7.2	9.6	12	14.4	18	24
6.20	2.3	3.45	4.6	5.75	6.9	9.2	11.51	13.81	17.26	23
6.40	2.21	3.32	4.42	5.53	6.64	8.85	11.07	13.28	16.6	22.1
6.60	2.13	3.2	4.27	5.33	6.4	8.54	10.67	12.81	16.01	21.3
6.80	2.06	3.09	4.12	5.16	6.19	8.25	10.32	12.38	15.48	20.6
7.00	2	3	4	5	6	8	10	12	15	20
8.00	2	3	4	5	6	8	10	12	15	20
9.00	0.2									

8.2 Switching value programmable function

ARD3T switching input and output support programmable function. The programmable details are shown in Table20.

Table20 Switching value programmable function

Switching value type	Programmable function	
DI	General DI, starting 1 (start directly ,left rotation, low speed), field starting 2(right rotation, high speed), stopping, resetting, emergency stopping, permission input1, permission input 2, external fault 1, external fault 2, external fault 3, external fault 4, starting/stopping, emergency starting1, emergency starting 2	
DO	No inserting	
	Motion control	Starting 1, starting 2, starting 3, starting ready, permission indication 1, permission indication 2, running output
	Any fault tripping closing	
	Fault tripping closing	Overload, phase failure, grounding, stalling, blocking, under load, external fault 1, external fault 2, external fault 3, external fault 4, start overtime, feedback overtime, over voltage, under voltage, phase sequence, under power, analog input, temperature protection, timer, counter, truth table
	Any fault tripping breaking	
	Fault tripping breaking	Overload, phase failure, grounding, stalling, blocking, under load, unbalance, external fault 1, external fault 2, external fault 3, external fault 4, starting overtime, feedback overtime, over voltage, under voltage, phase sequence, under power, analog input, temperature protection, timer, counter, truth table
	Any fault alarm	
	Fault alarm	Overload, phase failure, grounding, stalling, blocking, under load, unbalance, external fault 1, external fault 2, external fault 3, external fault 4, starting overtime, feedback overtime, over voltage, under voltage, phase sequence, under power, analog input, temperature protection, timer, counter, truth table
	DI controlling	DI1～DI8
	Circulating register	Bit0～Bit15
	Counter	Counter 1～Counter 4
	Timer	Timer 1～Timer 4
	Truth table	Truth table 1 input 1, truth table 1 input 2, truth table 2～truth table 4
	Bus controlling	

8.3 Analog value programmable function

ARD3T analog value output type, 4mA,20mA corresponding relation programmable. The programmable contents are shown in Table 21.

Tbale21 Analog value programmable output

Transfer type	4mA corresponding value	20mA corresponding value	unit
Ia, Ib ,Ic, Imax(%)	0～65535	1～65535	0.01
Ia, Ib ,Ic, Imax actual value			1.6-0.001;6.3-0.01;25-0.01;100-0.1; 250-0.1;800-1
Ua, Ub, Uc (%)			0.01
Master temperature resistance value			1
Module temperature value			When display is temperature:0.1 When display is resistance :1
4～20mA input measuring value			0.01
P			0.01
F			0.01
Current unbalance			0.01

Eg1:

Transfer type is Ia(%), % is the percent of Ia and Ie (rated current). The setting relation is:" When the current is 0, the output is 4mA, when the current is 100% Ie, the output is 20 mA". The setting as follows: "0"is set in 4mA,and "100" is set in 20mA.

Eg2:

Transfer type is Ia actual value. The setting relation is: "When the current is 0, the output is 4mA, when the current is rated current, the output is 20 mA." Supposed the rated current of the motor is 1.0A, the corresponding motor protector rated current is 1.6. According to Table21, the decimal point is 3, the setting as follows: "0"is set in 4mA,and "1000" is set in 20mA.

8.4 Timer, counter, truth table function

The setting interface of ARD3T programmable counter upper computer setting software is shown as Figure 23. The programmable contents are shown in Table22.

Figure 23 Counter

Table22 Counter programmable function

Counter	Programmable function	
Counter adding, Counter subtracting, Counter resetting	No inserting	
	Motion control	Starting 1, starting 2, starting 3, starting ready, permission indication 1, permission indication 2, running output
	Any fault tripping closing	

	Fault tripping closing	Overload, phase failure, grounding, stalling, blocking, under load, unbalance, external fault 1, external fault 2, external fault 3, external fault 4, start overtime, feedback overtime, over voltage, under voltage, phase sequence, under power, analog input, temperature protection, timer, counter, truth table
	Any fault tripping breaking	
	Fault tripping breaking	Overload, phase failure, grounding, stalling, blocking, under load, unbalance, external fault 1, external fault 2, external fault 3, external fault 4, starting overtime, feedback overtime, over voltage, under voltage, phase sequence, under power, analog input, temperature protection, timer, counter, truth table
	Any fault alarm	
	Fault alarm	Overload, phase failure, grounding, stalling, blocking, under load, unbalance, external fault 1, external fault 2, external fault 3, external fault 4, starting overtime, feedback overtime, over voltage, under voltage, phase sequence, under power, analog input, temperature protection, timer, counter, truth table
	DI Control	DI1～DI8
	Circulating register	Bit0～Bit15
	Counter	Counter 1～Counter 4
	Timer	Timer 1～Timer 4
	Truth table	Truth table 1 input 1, truth table 1 input 2, truth table 2～truth table 4
	Bus controlling	

ARD3T programmable timer is divided into 4 types: power on delay, power on delay with memory, power down delay, turning over immediately. The operation characteristic meet the following Figure24～Figure27, the programmable contents are shown in Table23. The min unit of the timing is 0.1s. When the output tripping / output alarm is enabled, it can execute the output tripping / output alarm function if the setting timing is met. Tripping/ alarm meet “tripping alarm operation mark”. When the time is tripped, reset the tripping by resetting firstly, and then reset the counter by counting reset triggering.

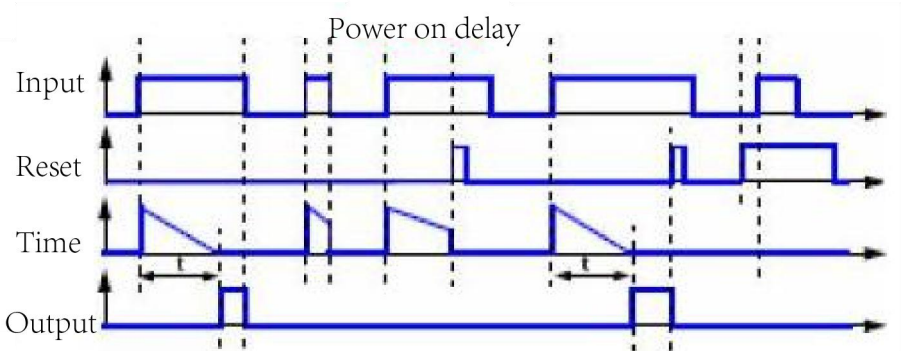


Figure24 Power on delay timer operation diagram

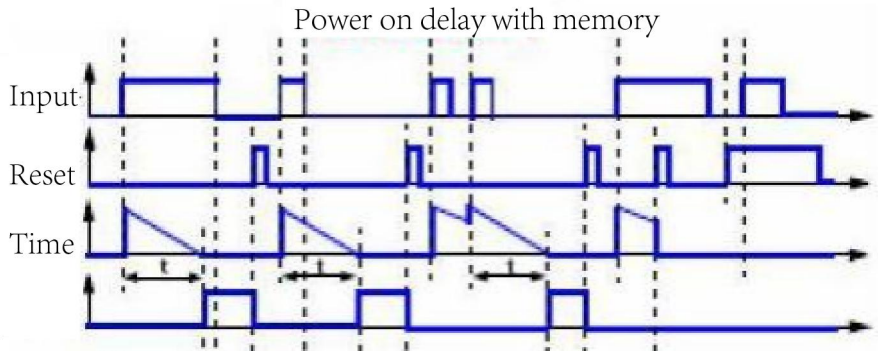


Figure 25 Power on delay with memory timer operation diagram

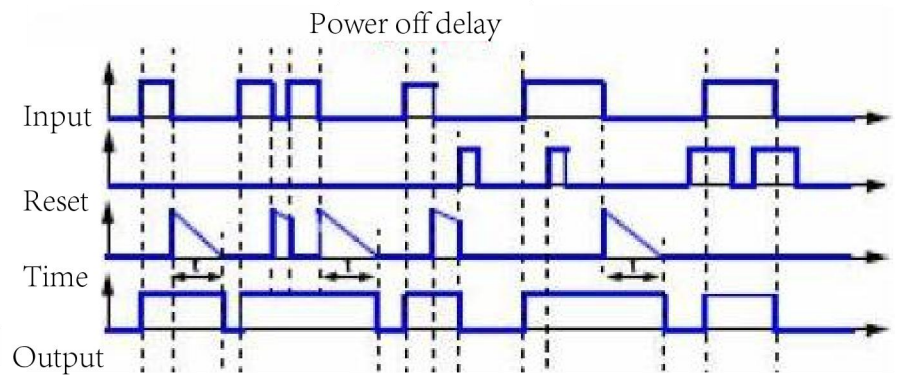


Figure26 Power down delay timer operation diagram

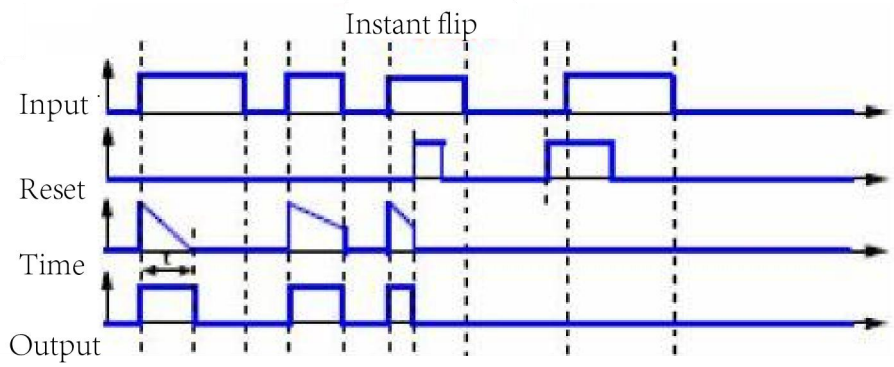


Figure27 Turning over immediately timer operation diagram

The setting interface of ARD3T programmable timer upper computer setting software is shown as Figure23.

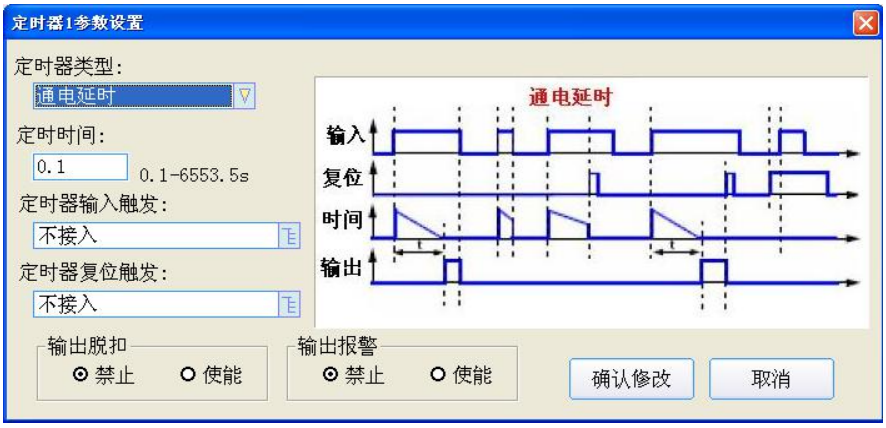


Figure 28 Timer

Table 23 Timer programmable function

Timer	Programmable function	
Timer input trigging, timer reset trigging	No inserting	
	Motion controlling	Starting 1, starting 2, starting 3, starting ready, permission indication 1, permission indication 2, running output
	Any fault tripping closing	
	Fault tripping closing	Overload, phase failure, grounding, stalling, blocking, under load, unbalance, external fault 1, external fault 2, external fault3, external fault4, starting overtime, feedback overtime, over voltage, under voltage, phase sequence, under power, analog input, temperature protection, timer, counter, truth table
	Any fault tripping breaking	
	Fault tripping breaking	Overload, phase failure, grounding, stalling, blocking, under load, unbalance,

		external fault 1, external fault 2, external fault 3, external fault 4, starting overtime, feedback overtime, over voltage, under voltage, phase sequence, under power, analog input, temperature protection, timer, counter, truth table
	Any fault alarm	
	Fault alarm	Overload, phase failure, grounding, stalling, blocking, under load, unbalance, external fault 1, external fault 2, external fault 3, external fault 4, starting overtime, feedback overtime, over voltage, under voltage, phase sequence, under power, analog input, temperature protection, timer, counter, truth table
	DI controlling	DI1～DI8
	Circulating register	Bit0～Bit15
	Counter	Counter 1～Counter 4
	Timer	Timer 1～Timer 4
		Truth table1 input 1, truth table1 input 2, truth table 2～truth table 4
	Bus controlling	

ARD3T truth table: ARD3T truth table is divided into: truth table1 (5 inputs,2 outputs), truth table2,3,4 (3 inputs, 1 output), programmable contents are shown in Table 24. The setting interface of the upper computer setting software is shown as Table29, 30.

Figure 29 Truth table1

Figure 30 Truth table2

Table 24 Truth table programmable function

Truth table	Programmable function	
Truth table input	No inserting	
	Motion controlling	Starting 1, starting 2, starting 3, starting ready, permission indication 1, permission indication 2, running output
	Any fault tripping closing	
	Fault tripping closing	Overload, phase failure, grounding, stalling, blocking, under load, unbalance, external fault 1, external fault 2, external fault 3, external fault 4, starting overtime, feedback overtime, over voltage, under voltage, phase sequence, under power, analog input, temperature protection, timer, counter, truth table
	Any fault tripping breaking	
	Fault tripping breaking	Overload, phase failure, grounding, stalling, blocking, under load, unbalance, external fault 1, external fault 2, external fault 3, external fault 4, starting overtime, feedback overtime, over voltage, under voltage, phase sequence, under power, analog input, temperature protection, timer, counter, truth table
	Any fault alarm	
	Fault alarm	Overload, phase failure, grounding, stalling, blocking, under load, unbalance,

		external fault 1, external fault 2, external fault 3, external fault 4, starting overtime, feedback overtime, over voltage, under voltage, phase sequence, under power, analog input, temperature protection, timer, counter, truth table
	DI controlling	DI1～DI8
	Circulating register	Bit0～Bit15
	Counter	Counter 1～counter 4
	Timer	Timer 1～timer 4
	Truth table	Truth table 1 input 1, truth table 1 input 2, truth table 2～truth table 4
	Bus controlling	

8.5 Modbus communication

Modbus RTU communication protocol overview

Electrical interface: RS485 half-duplex

Baud rate: 1200/2400/4800/9600/19200/38400

ADDR: composed by a byte (8-bit binary digits), decimal system is 0～255, only use of 1～247 in system, other reserves.

Error detection: CRC

Data format::	address code	function code	data field	CRC checkout
Data length:	one byte	one byte	N bytes	2 bytes

Bits of each byte: 1 bit start bit, 8 bits data bit (minimum significance bit sent firstly), no odd-even check bit, 1 bit stop bit

Modbus function code supported by ARD3T

03(0x03) function code: read holding register

16(0x10) function code: write multiple holding register

Notes:

1) Parameters are written at master station, and if the parameter is beyond the data limits, reply exception code 03 (illegality data)

2) Operational control bit or output control bit is written into by 16 function code.

Communication application

The examples cited by this section should be adopted the style (data are hexadecimal) as shown in table below as far as possible.

Addr.	Fun	Data start		Data		CRC16	
		reg Hi	reg Lo	reg Hi	reg Lo	Lo	Hi
01H	03H	00H	00H	00H	06H	C5H	C8H
Address.	function code	data initial address		data read number		CRC code	

Read data

Example 1:Using of 03 function read register: read address 247 ARD3T, start reading 3 data from address 00.

Inquired data frames	F7 03 00 00 00 03 11 5D
Returned data frames	F7 03 06 00 00 00 00 00 00 OE D1

Explanations:

F7: slave address 03: function code

06: 16 band, 10 band is 6, which means 6 bytes data behind. OE D1: CRC code

ARD3T communication address is as shown in table 25 to 27. Address 80 to 286, and address 300 to 359 are readable and writable, and other addresses are readable.

Table 25 Communication address table

Address	Name	Range	Data type	Remarks
0	Version number		Unsigned int	0x0102 means version 1.2
1	Identification number	0x070F	Unsigned int	
2	A phase current actual value		Unsigned int	I= reading current value / current multiplying power Eg: A phase current read value is 3000, current multiplying power is 100, then actual current is 300A.
3	B phase current actual value		Unsigned int	
4	C phase current actual value		Unsigned int	
5	3-phase current maximum value		Unsigned int	
6	Current multiplying power		Unsigned int	Current magnification is 1 or 10 or 100 or 1000
7	Unbalance degree of current		Unsigned int	Unit %
8	AB line voltage actual value		Unsigned int	A bit decimal point owned, eg: 0x0BB8 means 300.0V
9	BC line voltage actual value		Unsigned int	A bit decimal point owned, eg: 0x0BB8 means 300.0V
10	CA line voltage actual value		Unsigned int	A bit decimal point owned, eg: 0x0BB8 means 300.0V
11	Present frequency		Unsigned int	2 bits decimal point fixed (0.01Hz)
12	Power factor		Signed int	3 bits decimal point fixed
13	High byte of present power actual value		Signed long	3 bits decimal point, unit Kw (0.001kW)
14	Low byte of present power actual value			
15	High byte of present electric energy		Unsigned long	1 bit decimal point, unit kWh (0.1kWh)
16	Low type of present electric energy			
17	Actual grounding current		Unsigned int	Decimal point is the same as address 6.
18	High byte of leakage current		Unsigned long	3 bits decimal point, unit A (0.001A)
19	Low byte of leakage current			
20	Present heat capacity		Unsigned int	Unit %
21	Predicting tripping time		Unsigned int	Unit second
22	Total operation time		Unsigned int	Unit hour
23	Total stopping time		Unsigned int	Unit hour
24	Present operating time		Unsigned int	Unit minute
25	Present stopping time		Unsigned int	Unit minute
26	Starting times		Unsigned int	
27	Stopping times		Unsigned int	
28	Tripping times		Unsigned int	
29	Master temperature resistance		Unsigned int	Unit Ω
30	Temperature module input 1	Type of sensor that is PT100 or PT1000 or Cu50, is set as unit ℃, and 1 bit decimal point, and signed int type. The type is also set PTC or NTC, and now unit Ω, no decimal point, unsigned int type.		
31	Temperature module input 2			
32	Temperature module input 3			
33	Analog module input 1		Unsigned int	Unit mA, 2 bits decimal point (0.01mA)
34	Analog module input 2		Unsigned int	
35	Analog module output 1		Unsigned int	
36	Analog module output 2		Unsigned int	
37	Percentage of grounding current		Unsigned int	
38	Percentage of present power		Unsigned int	
39	Percentage of AB line voltage		Unsigned int	
40	Percentage of BC line voltage		Unsigned int	

41	Percentage of CA line voltage		Unsigned int	
42	Percentage of 3-phase maximum current		Unsigned int	
43	Percentage of 3-phase average current		Unsigned int	
44	Percentage of A phase current		Unsigned int	
45	Percentage of B phase current		Unsigned int	
46	Percentage of C phase current		Unsigned int	
47	Tripping status 1	Bit0: overload; Bit1: grounding current; Bit2: leakage current; Bit3: stalling; Bit4: blocking; Bit5: circuit breaker breaking; Bit6: under load; Bit7: unbalance; Bit8: under voltage; Bit9: over voltage; Bit10: under power; Bit11: phase failure; Bit12: phase sequence; Bit13: external fault 1; Bit14: external fault 2; Bit15: external fault 3		
48	Tripping status 2	Bit0: external fault 4; Bit1: internal fault; Bit2: starting overtime; Bit3: analog input 1 high protection; Bit4: analog input 1 low protection; Bit5: analog input 2 high protection; Bit6: analog input 2 low protection; Bit7: master temperature protection; Bit8: module temperature input 1 protection; Bit9: module temperature input 2 protection; Bit10: module temperature input 3 protection; Bit11: master temperature sensor fault; Bit12: module temperature input 1 sensor protection; Bit13: module temperature input 2 sensor fault; Bit14: module temperature input 3 sensor fault; Bit15: module structure fault		
49	Tripping status 3	Bit0: output of counter 1; Bit1: output of counter 2; Bit2: output of counter 3; Bit3: output of counter 4; Bit4: output of timer 1; Bit5: output of timer 2; Bit6: output of timer 3; Bit7: output of timer 4; Bit8: output 1 of truth table 1; Bit9: output of truth table 2; Bit11: output of truth table 3; Bit12: output of truth table 4; Bit13: reserved; Bit14: reserved; Bit15: feedback time protection		
50	Alarm status 1	Bit0: overload; Bit1:grounding current; Bit2:leakage current; Bit3:stalling; Bit4:blocking; Bit5:short circuit breaking; Bit6:under load; Bit7:unbalance; Bit8:under voltage; Bit9:over voltage; Bit10:under power; Bit11:phase failure; Bit12:phase failure; Bit13: external fault 1; Bit14: external fault 2; Bit15: external fault 3		
51	Alarm status 2	Bit0:external fault 4; Bit1:internal fault; Bit2:starting overtime; Bit3:analog input 1high protection; Bit4:analog input 1low protection; Bit5:analog input 2high protection; Bit6:analog input 2 low protection; Bit7:master temperature protection; Bit8:module temperature input 1protection; Bit9:module temperature input 2 protection; Bit10:module temperature input 3 protection; Bit11:master temperature sensor fault; Bit12:module temperature input 1 sensor fault; Bit13:module temperature input 2 sensor fault;Bit14:module temperature input 3 sensor fault; Bit15:module structure fault		
52	Alarm status 3	Bit0:output of counter 1;Bit1:output of counter 2 ; Bit2:output of counter 3 ; Bit3:output of counter 4; Bit4:output of timer 1; Bit5:output of timer 2; Bit6:output of timer 3; Bit7:output of timer 4; Bit8:output 1 of truth table 1; Bit9:output 2 of truth table 1; Bit10:output of truth table 2; Bit11:output of truth table 3 ; Bit12:output of truth table 4; Bit13: reserve; Bit14:reserve; Bit15:feedback time protection		
53	Motor operation status		Unsigned int	1: Normal stopping; 2: fault stopping; 3: emergency stopping; 4: starting stage1; 5: starting stage 2; 6: running 1; 7: running 2
54	Communication address of present newest fault recording		Unsigned int	The same as address 1000
55	Output status of present timer counter truth table	Bit0:output of counter 1; Bit1:output of counter 2; Bit2:output of counter 3;Bit3:output of counter 4; Bit4:output of timer 1; Bit5:output of timer 2; Bit6:output of timer 3; Bit7:output of timer 4; Bit8: output 1 of truth table 1; Bit9:output 2 of truth table		

		1;Bit10:output of truth table 2;Bit11: output of truth table 3; Bit12:output of truth table 4;		
56	Switching input status bit		Unsigned int	Bit0 1st channel, 1 means being on actuation, while
57	Switching output status bit		Unsigned int	0 means being off.
58	Master transformer status		Unsigned int	0 normal, 1 fault
59	Version of switching module		Unsigned int	0x0102 means the version is V1.2.
60	Number of switching module	Channel number of high byte DO, channel number of low byte DI.		
61	Version of temperature module		Unsigned int	0x0102 means the version is V1.2.
62	Temperature module type	Bit3-Bit0 1st channel(0=PT100,1=PT1000,2=Cu50,3=PTC,4=NTC) Bit7-Bit4 2nd channel(0=PT100,1=PT1000,2=Cu50,3=PTC,4=NTC) Bit11-Bit8 3rd channel(0=PT100,1=PT1000,2=Cu50,3=PTC,4=NTC)		
63	Temperature module status	Bit3-Bit0 1st channel(0 means being off,1 means being normal, other fault) Bit3-Bit0 2nd channel (0 means being off,1 means being normal, other fault) Bit3-Bit0 3rd channel (0 means being off,1 means being normal, other fault)		
64	Version of analog module		Unsigned int	0x0102 means the version is V1.2
65	Number of analog module	Output channel number of high byte analog, input channel number of low byte analog		
66	Version of testing module		Unsigned int	0x0102 means the version is V1.2
67	Testing module type	Bit7-Bit0 means(0=0.4-2A;1=1.6-6.3;2=6.3-25A;3=25-100A; 4=63-250A;5=250-800A); Bit11-Bit8 means(1=380V，2=660V，other no voltage module); Bit13-Bit12 means(1=1A leakage current module，2=30A leakage current module); Bit15means1 phase failure indication		
68	Control status indication	Bit0:starting 1 relay; Bit1:starting 2 relay; Bit2: starting 3 relay; Bit3: be ready;Bit4: permission 1; Bit5:permission 2;Bit6:running indication;		
69-79	Reserved			
80	Permission set		permission input of bit2=0DI is working (setting “DI control permission input” on LCD) bit2=1 permission set on LCD takes effect. bit1bit0: 0 0 LCD 0 1 DI 1 1 whole control	
81	Data circulation		Unsigned int	
82	Motor control	1-7	Unsigned int	1:stopping; 2:starting 1; 3:starting 2; 4:resetting (auto resetting to clear after operation)5:emergency stopping 1; 6:emergency starting 1;7:emergency starting 2;
83	Switching output	0-0x007f	Unsigned int	
84	Time : minuter and second	BCD	Unsigned int	High byte is minute.
85	Time : date and hour	BCD	Unsigned int	High byte is date.
86	Time : year and month	BCD	Unsigned int	High byte is year.
87	Communication address 1	1-247	Unsigned int	
88	Communication baud rate 1	1200,2400,4800,9600,19200,38400	Unsigned int	
89	Communication address 2	MODBUS:1-247	Unsigned int	

		PROFIBUS:0-126		
90	Communication baud rate 2	1200,2400,4800,9600,19200,38400,PROFIBUS	Unsigned int	
91	Analog output type 1	0-22	Unsigned int	0-22 are A phase current (%), B phase current (%), C phase current (%), maximum current of three phase (%), A phase actual current, B phase actual current, in turn,C phase actual current, maximum actual current, A phase voltage (%), B phase voltage (%), C phase voltage (%), active power (%), frequency, unbalance degree of A phase current, unbalance degree of B phase current, unbalance degree of C phase current, current maximum unbalance degree, master temperature resistance value, module temperature input 1, module temperature input 2, module temperature input 3, analog input 1, analog input 2
92	Analog output 1 (0%)		Unsigned int	The corresponding is the value of no decimal point.Eg: the transmission corresponds to the input for 4-20mA, which inputting decimal point displayed is 2 bits, that is to say the value of 4.00mA is 400, so the value of 0% is 400, and the value of 100% is 2000.
93	Analog output 1 (100%)		Unsigned int	
94	Analog output type 2	0-19	Unsigned int	The same as above
95	Analog output 2 (0%)		Unsigned int	
96	Analog output 2 (100%)		Unsigned int	
97	Rated current of motor	4-8000	Unsigned int	The range of 0.4-2.0A is 4-20 The range of 1.6-6.3 A is 16-63 The range of 6.3-25 A is 63-250 The range of 25-100 A is 250-1000 The range of 63-250 A is 630-2500 The range of 250-800 A is 2500-8000
98	Rated voltage of motor	110-1100	Unsigned int	Unit V
99	Rated power of motor MSB		Unsigned long	Unit W
100	Rated power of motor LSB			
101	Motor type	0/1	Unsigned int	0 means normal motor, and 1 means increased safety motor.
102	Motor wiring	0/1	Unsigned int	0 means three phase motor, and 1 means single phase motor.
103	Total starting time	1-6000	Unsigned int	Unit 0.1s
104	Starting transfer time	1-3000	Unsigned int	Unit 0.1s
105	Starting feedback time	1-3000	Unsigned int	Unit 0.1s
106	Stopping feedback time	1-3000	Unsigned int	Unit 0.1s
107	Starting mode	0-6	Unsigned int	0 means protection mode, and 1 means directly starting, and 2 means converse starting, and 3 means

				Y-△ starting (2 relays), and 4 means single winding two speed motor starting, and 5 means duplex winding double speed motor starting, and 6 means the comments step-down starting (2 relays)
108	Zero-voltage restarting permitted	0/2	Unsigned int	0 means forbidden, and 1 means operating starting 1 after restarting, and 2 means operating starting 2 after restarting.
109	Zero-voltage restarting voltage setting value	30-90	Unsigned int	Unit % Ue
110	Zero-voltage restarting relay time	1-6000	Unsigned int	Unit 0.1s
111	Zero-voltage restarting maximum losing power time	5-3000	Unsigned int	Unit 0.1s
112	Zero-voltage restarting shaking time	1-200	Unsigned int	Unit 0.1s
113	Power on self-starting permitted	0/1	Unsigned int	0 means forbidden, and 1 means permission.
114	Power on self-starting mode	0/2	Unsigned int	1 means operating starting 1, and 2 means operating starting 2, and 3 means operating recover.
115	Self-starting time	1-6000	Unsigned int	Unit 0.1s
116	Tripping enable 1	Bit0:overload;Bit1:grounding current ;Bit2:leakage current;Bit3:stalling;Bit4:blocking;Bit5:short circuit breaking;Bit6:under load;Bit7:unbalance;Bit8:under voltage;Bit9:over voltage;Bit10:under power;Bit11:phase failure;Bit12:phase sequence;Bit13:external fault 1;Bit14:external fault 2;Bit15:external fault 3;		
117	Tripping enable 2	Bit0:external fault 4;Bit1:internal fault ;Bit2:starting overtime;Bit3:hith protection of analog input 1;Bit4:low protection of analog input ;Bit5:high protection of analog input 2;Bit6: low protection of analog input 2;Bit7:master temperature protection;Bit8:protection of module temperature input 1;Bit9:protection of module temperature input 2;Bit10:protection of module temperature input 3;Bit11:master temperature sensor fault;Bit12:sensor fault of module temperature input 1;Bit13:sensor fault of module temperature input 2;Bit14:sensor fault of module temperature input 3;Bit15:module structure fault		
118	Tripping enable 3	Bit0:output of counter 1;Bit1:output of counter 2 ; Bit2:output of counter 3 ; Bit3:output of counter 4; Bit4:output of timer 1; Bit5:output of timer 2; Bit6:output of timer 3; Bit7:output of timer 4; Bit8:output 1 of truth table 1; Bit9:output 2 of truth table 1; Bit10:output of truth table 2; Bit11:output of truth table 3 ; Bit12:output of truth table 4; Bit13: reserve; Bit14:reserve; Bit15:feedback time protection		
119	Alarm enable 1	Bit0:overload; Bit1:grounding current; Bit2:leakage current; Bit3:stalling; Bit4:blocking; Bit5:short circuit breaking; Bit6:under load; Bit7:unbalance; Bit8:under voltage; Bit9:over voltage; Bit10:under power; Bit11:phase failure; Bit12:phase sequence; Bit13:external fault 1; Bit14:external fault 2; Bit15:external fault 3;		
120	Alarm enable 2	Bit0: external fault 4; Bit1: internal fault; Bit2: starting overtime; Bit3: analog input 1 high protection; Bit4: analog input 1 low protection; Bit5: analog input 2 high protection; Bit6: analog input 2 low protection; Bit7: master temperature protection; Bit8: module temperature input 1 protection; Bit9: module temperature input 2 protection; Bit10: module temperature input 3 protection; Bit11: master temperature sensor fault; Bit12: module temperature input 1 sensor protection; Bit13: module temperature input 2 sensor fault; Bit14: module temperature input 3 sensor fault; Bit15: module structure fault		
121	Alarm enable 3	Bit0:output of counter 1;Bit1:output of counter 2 ; Bit2:output of counter 3 ;		

		Bit3:output of counter 4; Bit4:output of timer 1; Bit5:output of timer 2; Bit6:output of timer 3; Bit7:output of timer 4; Bit8:output 1 of truth table 1; Bit9:output 2 of truth table 1; Bit10:output of truth table 2; Bit11:output of truth table 3 ; Bit12:output of truth table 4; Bit13: reserve; Bit14:reserve; Bit15:feedback time protection		
122	Heat capacity mode of permitted starting	0/1	Unsigned int	Mode 1, mode 2
123	Cooling time	1-120	Unsigned int	Unit minute
124	Starting shielding time of overload protection	1-3000	Unsigned int	Unit 0.1s
125	Overload tripping grade	0-8	Unsigned int	Normal motor 0-8 means the class 2,3,5,10,15,20,25,30,35,40 in turn. Increased safety motor 0-8 means the class 2,3,4, 5, 6, 8,10,12,15,20 in turn.
126	Overload resetting mode	0/1	Unsigned int	0 means manually operation, 1 means automation.
127	Warning threshold of overload fault	10-100	Unsigned int	Unit % Ie
128	Tripping value of grounding protection	20-100	Unsigned int	Unit % Ie
129	Warning value of grounding protection	20-100	Unsigned int	Unit % Ie
130	Operation time of grounding protection	1-6000	Unsigned int	Unit 0.1s
131	Starting no-driving time of grounding protection	1-6000	Unsigned int	Unit 0.1s
132	Operation no-driving time of grounding protection	1-6000	Unsigned int	Unit 0.1s
133	Tripping value of leakage current protection	5-3000	Unsigned int	Range : 0.05~30.00A, unit 0.01A
134	Warning value of leakage current protection	5-3000	Unsigned int	Range : 0.05~30.00A, unit 0.01A
135	Operation time of leakage current protection	1-6000	Unsigned int	Unit 0.1s
136	Starting no-driving time of leakage current	1-6000	Unsigned int	Unit 0.1s
137	Operation no-driving time of leakage current	1-6000	Unsigned int	Unit 0.1s
138	Tripping value of stalling protection	100-700	Unsigned int	Unit % Ie
139	Warning value of stalling protection	100-700	Unsigned int	Unit % Ie
140	Operation time of stalling protection	1-6000	Unsigned int	Unit 0.1s
141	Tripping value of blocking protection	100-600	Unsigned int	Unit % Ie
142	Warning value of blocking protection	100-600	Unsigned int	Unit % Ie
143	Operation time of blocking protection	1-6000	Unsigned int	Unit 0.1s
144	Tripping value of short circuit breaking protection	200-2000	Unsigned int	Unit % Ie
145	Warning value of short circuit breaking protection	200-2000	Unsigned int	Unit % Ie
146	Operation time of short circuit breaking protection	1-6000	Unsigned int	Unit 0.1s
147	Tripping value of under load protection	20-95	Unsigned int	Unit % Ie
148	Warning value of under load protection	20-95	Unsigned int	Unit % Ie
149	Operation time of under load protection	1-6000	Unsigned int	Unit 0.1s
150	Tripping value of unbalance protection	10-100	Unsigned int	Unt %
151	Warning value of unbalance protection	10-100	Unsigned int	Unt %

152	Operation time of unbalance protection	1-6000	Unsigned int	Unit 0.1s
153	Tripping value of under voltage protection	45-90	Unsigned int	Unit % Ue
154	Warning value of under voltage protection	45-90	Unsigned int	Unit % Ue
155	Operation time of under voltage protection	1-6000	Unsigned int	Unit 0.1s
156	Tripping value of over voltage protection	110-150	Unsigned int	Unit % Ue
157	Warning value of over voltage protection	110-150	Unsigned int	Unit % Ue
158	Operation time of over voltage protection	1-6000	Unsigned int	Unit 0.1s
159	Tripping value of under power protection	10-100	Unsigned int	Unit % Pe
160	Warning value of under power protection	10-100	Unsigned int	Unit % Pe
161	Operation time of under power protection	1-6000	Unsigned int	Unit 0.1s
162	Operation time of phase failure protection	1-6000	Unsigned int	Unit 0.1s
163	Operation time of phase sequence protection	1-6000	Unsigned int	Unit 0.1s
164	Operation time of external fault 1	1-6000	Unsigned int	Unit 0.1s
165	Operation time of external fault 2	1-6000	Unsigned int	Unit 0.1s
166	Operation time of external fault 3	1-6000	Unsigned int	Unit 0.1s
167	Operation time of external fault 4	1-6000	Unsigned int	Unit 0.1s
168	Operation time of internal fault	1-6000	Unsigned int	Unit 0.1s
169	Monitoring time interval of analog 1-2	0,1,2	Unsigned int	Low byte is analog 1, and 0 means overall process, and 1 means at the time of starting, and 2 means at the time of running.High byte is analog 2, and 0 means overall process, and 1 means at the time of starting, and 2 means at the time of running.
170	Input protection return volume of analog 1,2	0-230	Unsigned int	Unit 0.01mA
171	High protection tripping value of analog input 1	400-2000	Unsigned int	Unit 0.01mA
172	High protection warning value of analog input 1	400-2000	Unsigned int	Unit 0.01mA
173	High protection operating time of analog input 1	1-6000	Unsigned int	Unit 0.1s
174	Low protection tripping value of analog input 1	400-2000	Unsigned int	Unit 0.01mA
175	Low protection warning value of analog input 1	400-2000	Unsigned int	Unit 0.01mA
176	Low protection operating time of analog input 1	1-6000	Unsigned int	Unit 0.1s
177	High protection tripping value of analog input 2	400-2000	Unsigned int	Unit 0.01mA
178	High protection warning value of analog input 2	400-2000	Unsigned int	Unit 0.01mA
179	High protection operating time of analog input 2	1-6000	Unsigned int	Unit 0.1s
180	Low protection tripping value of analog input 2	400-2000	Unsigned int	Unit 0.01mA
181	Low protection warning value of analog input 2	400-2000	Unsigned int	Unit 0.01mA

182	Low protection operating time of analog input 2	1-6000	Unsigned int	Unit 0.1s
183	Temperature tripping resetting mode		Unsigned int	bit0:master，bit1:module 1，bit2:module 2，bit3:module 3,corresponding bit 0 means manually resetting，and 1 means automation resetting
184	Master temperature type	0-1	Unsigned int	0 means PTC, and 1 means NTC.
185	Master temperature operating resistance value	100-30000	Unsigned int	Unit Ω
186	Master temperature return resistance value	100-30000	Unsigned int	Unit Ω
187	Master temperature operating time	1-6000	Unsigned int	Unit 0.1s
188	Master temperature return time	1-6000	Unsigned int	Unit 0.1s
189	Transformer type of temperature module	Each channel 0-4	Unsigned int	0=PT100,1=PT1000,2=CU50,3=PTC,4=NTC Each channel 0-4, bit0-bit3 1st channel, bit4-bit7 2nd channel, bit8-bit11 3rd channel, 0=PT100,1=PT1000,2=CU50,3=PTC,4=NTC
190	Operating setting value of temperature module input 1	Type is set 0=PT100,1=PT1000,2=CU50, and unit is ℃, and type is Signed int, and 1 bit decimal point. And type is set 3=PTC,4=NTC, and unit is Ω, and type is Unsigned int, and no decimal point.		
191	Return setting value of temperature module input 1			
192	Operating time of temperature module input 1	1-6000	Unsigned int	Unit 0.1s
193	Return time of temperature module input 1	1-6000	Unsigned int	Unit 0.1s
194	Operating setting value of temperature module input 2	Type is set 0=PT100,1=PT1000,2=CU50, and unit is ℃, and type is Signed int, and 1 bit decimal point. And type is set 3=PTC, 4=NTC, and unit is Ω, and type is Unsigned int, and no decimal point.		
195	Return setting value of temperature module input 2			
196	Operating time of temperature module input 2	1-6000	Unsigned int	Unit 0.1s
197	Return time of temperature module input 2	1-6000	Unsigned int	Unit 0.1s
198	Operating setting value of temperature module input 3	Type is set 0=PT100,1=PT1000,2=CU50, and unit is ℃, and type is Signed int, and 1 bit decimal point. And type is set 3=PTC, 4=NTC, and unit is Ω, and type is Unsigned int, and no decimal point.		
199	Return setting value of temperature module input 3			
200	Operating time of temperature module input 3	1-6000	Unsigned int	Unit 0.1s
201	Return time of temperature module input 3	1-6000	Unsigned int	Unit 0.1s
202	Counting number of counter 1		Unsigned int	
203	Addition of trigger input for counter 1	0-145	Unsigned int	See the remark 1
204	Subtraction of trigger input for counter 1	0-145	Unsigned int	
205	Reset condition of counter 1	0-145	Unsigned int	
206	Counting number of counter 2		Unsigned int	
207	Addition of trigger input for counter 1	0-145	Unsigned int	See the remark 1
208	Subtraction of trigger input for counter 2	0-145	Unsigned int	
209	Reset condition of counter 2	0-145	Unsigned int	
210	Counting number of counter 3		Unsigned int	
211	Addition of trigger input for counter 3	0-145	Unsigned int	See the remark 1
212	Subtraction of trigger input for counter 3	0-145	Unsigned int	

213	Reset condition of counter 3	0-145	Unsigned int	
214	Counting number of counter 4		Unsigned int	
215	Addition of trigger input for counter 4	0-145	Unsigned int	See the remark 1
216	Subtraction of trigger input for counter 4	0-145	Unsigned int	
217	Reset condition of counter 4	0-145	Unsigned int	
218	Input type of timer 1	0-3	Unsigned int	0 means power on delay, and 1 means power on delay with memory, and 2 means power off delay, and 3 means timely overturn.
219	Timing time of timer 1	1-6000	Unsigned int	Unit 0.1s
220	input trigger of timer 1	0-145	Unsigned int	See the remark 1
221	Reset trigger of timer 1	0-145	Unsigned int	
222	Input type of timer 2	0-3	Unsigned int	The same as address 218
223	Timing time of timer 2	1-6000	Unsigned int	Unit 0.1s
224	Input trigger of timer 2	0-145	Unsigned int	See the remark 1
225	Reset trigger of timer 2	0-145	Unsigned int	
226	Input type of timer 3	0-3	Unsigned int	The same as address 218
227	Timing time of timer 3	1-6000	Unsigned int	Unit 0.1s
228	Input trigger of timer 3	0-145	Unsigned int	See the remark 1
229	Reset trigger of timer 3	0-145	Unsigned int	
230	Input type of timer 4	0-3	Unsigned int	The same as address 218
231	Timing time of timer 4	1-6000	Unsigned int	Unit 0.1s
232	Input trigger of timer 4	0-145	Unsigned int	See the remark 1
233	Reset trigger of timer 4	0-145	Unsigned int	
234	Input 1 selection of truth table 1 (I5_O2)	0-145	Unsigned int	
235	Input 2 selection of truth table 1 (I5_O2)	0-145	Unsigned int	
236	Input 3 selection of truth table 1 (I5_O2)	0-145	Unsigned int	
237	Input 4 selection of truth table 1 (I5_O2)	0-145	Unsigned int	
238	Input 5 selection of truth table 1 (I5_O2)	0-145	Unsigned int	
239	Output 1 selection high byte of truth table (I5_O2)		Unsigned int	The value of truth table (address 234-238 matching the value 2^5 of condition component 0-31) output 1 and output 2 are separately correspondence to the should output value of bit0-31 in different status.
240	Output 1 selection low byte of truth table 1 (I5_O2)		Unsigned int	
241	Output 2 selection high byte of truth table 1 (I5_O2)		Unsigned int	
242	Output 2 selection low byte of truth table 1 (I5_O2)		Unsigned int	
243	Input 1 selection of truth table 2 (I3_O1)	0-145	Unsigned int	See the remark 1
244	Input 2 selection of truth table 2 (I3_O1)	0-145	Unsigned int	
245	Input 3 selection of truth table 2 (I3_O1)	0-145	Unsigned int	
246	Output selection of truth table 2 (I3_O1)		Unsigned int	The value of truth table (address 243-245 matching the value 2^3 of condition component 0-7) the expected values of bit0-7 are separately corresponded to the different status.
247	Input 1 selection of truth table 3 (I3_O1)	0-145	Unsigned int	See the remark 1
248	Input 2 selection of truth table 3 (I3_O1)	0-145	Unsigned int	
249	Input 3 selection of truth table 3 (I3_O1)	0-145	Unsigned int	
250	Output selection of truth table 3 (I3_O1)		Unsigned int	The value of truth table (the value of address

				247-249 matching condition component 0-7 is 2^3) the should output value of bit0-7 are separately corresponded to the different status.
251	Input 1 selection of truth table 4 (I3_O1)	0-145	Unsigned int	See the remark 1
252	Input 2 selection of truth table 4 (I3_O1)	0-145	Unsigned int	
253	Input 3 selection of truth table 4 (I3_O1)	0-145	Unsigned int	
254	Output selection of truth table 4 (I3_O1)		Unsigned int	The value of truth table (the value of address 251-253 matching condition component 0-7 is 2^3) the should output value of bit0-7 are separately corresponded to the different status.
255	DI1 function selection	0-14	Unsigned int	0-14 means as shown separately: Normal DI function Starting 1 (direct / turn left / low speed) Starting 2 (turn right / high speed) reset Emergency stopping Permission input 1 Permission input 2 External fault 1 External fault 2 External fault 3 External fault 4 Starting / stopping (close stopping, open starting 1) Emergency starting 1 Emergency starting 2
256	DI2 function selection	0-14	Unsigned int	
257	DI3 function selection	0-14	Unsigned int	
258	DI4 function selection	0-14	Unsigned int	
259	DI5 function selection	0-14	Unsigned int	
260	DI6 function selection	0-14	Unsigned int	
261	DI7 function selection	0-14	Unsigned int	
262	DI8 function selection	0-14	Unsigned int	
263	DI9 function selection	0-14	Reserved	
264	DI10 function selection	0-14	Reserved	
265	DI11 function selection	0-14	Reserved	
266	DI12 function selection	0-14	Reserved	
267	DI13 function selection	0-14	Reserved	
268	DI14 function selection	0-14	Reserved	
269	DI15 function selection	0-14	Reserved	
270	DI16 function selection	0-14	Reserved	
271	DO1 function selection	0-186	Unsigned int	See the remark 2
272	DO2 function selection	0-186	Unsigned int	
273	DO3 function selection	0-186	Unsigned int	
274	DO4 function selection	0-186	Unsigned int	
275	DO5 function selection	0-186	Unsigned int	
276	DO6 function selection	0-186	Unsigned int	
277	DO7 function selection	0-186	Unsigned int	
278	DO8 function selection	0-186	Reserved	
279	DO9 function selection	0-186	Reserved	
280	DO10 function selection	0-186	Reserved	
281	DO11 function selection	0-186	Reserved	
282	DO12 function selection	0-186	Reserved	
283	DO13 function selection	0-186	Reserved	
284	DO14 function selection	0-186	Reserved	
285	DO15 function selection	0-186	Reserved	
286	DO16 function selection	0-186	Reserved	
287-300	Reserved			
300	Measuring module of set last time	Used to read the project status of the configuration	Unsigned int	The same as above

301	Switching set last time whether installation	Used to read the project status of the configuration	Unsigned int	
302	Channel numbers of analog module set last time	Used to read the project status of the configuration	Unsigned int	
303	Channel numbers of temperature module set last time	Used to read the project status of the configuration	Unsigned int	
304	High speed rated current		Unsigned int	The same as the contents in address 80-286
305	High speed overload tripping grade		Unsigned int	
306	High speed overload resetting mode		Unsigned int	
307	High speed grounding protection tripping value		Unsigned int	
308	High speed grounding protection warning value		Unsigned int	
309	High speed grounding protection operating time		Unsigned int	
310	High speed leakage current protection tripping value		Unsigned int	
311	Hith speed leakage current protection warning value		Unsigned int	
312	High leakage current protection operating time		Unsigned int	
313	High speed stalling protection tripping value		Unsigned int	
314	High stalling protection warning value		Unsigned int	
315	High speed stalling protection operating time		Unsigned int	
316	High speed blocking protection tripping value		Unsigned int	
317	High speed blocking protection warning value		Unsigned int	
318	High speed blocking protection operating time		Unsigned int	
319	High speed short circuit breaking protection tripping value		Unsigned int	
320	High speed short circuit breaking protection warning value		Unsigned int	
321	High speed short circuit breaking protection operating time		Unsigned int	
322	High speed under load protection tripping value		Unsigned int	
323	High speed under load protection warning		Unsigned int	

	value			
324	High speed under load protection operating time		Unsigned int	
325	High speed unbalance protection tripping value		Unsigned int	
326	High speed unbalance protection warning value		Unsigned int	
327	High speed unbalance protection operating time		Unsigned int	
328	High speed under voltage protection tripping value		Unsigned int	
329	High speed under voltage protection warning value		Unsigned int	
330	High speed under voltage protection operating time		Unsigned int	
331	High speed over voltage protection tripping value		Unsigned int	
332	High speed over voltage protection warning value		Unsigned int	
333	High speed over voltage protection operating time		Unsigned int	
334	High speed under power tripping value		Unsigned int	
335	High speed under power protection warning value		Unsigned int	
336	High speed under power protection operating time		Unsigned int	
337	High speed phase failure protection operating time		Unsigned int	
338	High speed phase sequence protection operating time		Unsigned int	
339	Resetting mode of temperature tripping		Unsigned int	
340	High speed master temperature operating resistance value		Unsigned int	
341	High speed master temperature returning resistance value		Unsigned int	
342	High speed master temperature operating time		Unsigned int	
343	High speed master temperature returning time		Unsigned int	
344	Operation setting value of high speed temperature module input 1		Unsigned int	
345	Return setting value of high speed temperature module input 1		Unsigned int	
346	Operation time of high speed temperature module input 1		Unsigned int	
347	Return time of high speed temperature module input 1		Unsigned int	

348	Operation setting value of high speed temperature module input 2		Unsigned int	
349	Return setting value of high speed temperature module input 2		Unsigned int	
350	Operation time of high speed temperature module input 2		Unsigned int	
351	Return time of high speed temperature module input 2		Unsigned int	
352	Operation setting value of high speed temperature module input 3		Unsigned int	
353	Return setting value of high speed temperature module input 3		Unsigned int	
354	Operation time of high speed temperature module input 3		Unsigned int	
355	Return time of high speed temperature module input 3		Unsigned int	
356	Tripping condition 1	Bit0: overload; Bit1: grounding current; Bit2: leakage current; Bit3: stalling; Bit4: blocking; Bit5: circuit breaker breaking; Bit6: under load; Bit7: unbalance; Bit8: under voltage; Bit9: over voltage; Bit10: under power; Bit11: phase failure; Bit12: phase sequence; Bit13: external fault 1; Bit14: external fault 2; Bit15: external fault 3		
357	Tripping condition 2	Bit0: external fault 4; Bit1: internal fault; Bit2: starting overtime; Bit3: analog input 1 high protection; Bit4: analog input 1 low protection; Bit5: analog input 2 high protection; Bit6: analog input 2 low protection; Bit7: master temperature protection; Bit8: module temperature input 1 protection; Bit9: module temperature input 2 protection; Bit10: module temperature input 3 protection; Bit11: master temperature sensor fault; Bit12: module temperature input 1 sensor protection; Bit13: module temperature input 2 sensor fault; Bit14: module temperature input 3 sensor fault; Bit15: module structure fault		
358	Warning condition 1	Bit0: overload; Bit1: grounding current; Bit2: leakage current; Bit3: stalling; Bit4: blocking; Bit5: circuit breaker breaking; Bit6: under load; Bit7: unbalance; Bit8: under voltage; Bit9: over voltage; Bit10: under power; Bit11: phase failure; Bit12: phase sequence; Bit13: external fault 1; Bit14: external fault 2; Bit15: external fault 3		
359	Warning condition 2	Bit0: external fault 4; Bit1: internal fault; Bit2: starting overtime; Bit3: analog input 1 high protection; Bit4: analog input 1 low protection; Bit5: analog input 2 high protection; Bit6: analog input 2 low protection; Bit7: master temperature protection; Bit8: module temperature input 1 protection; Bit9: module temperature input 2 protection; Bit10: module temperature input 3 protection; Bit11: master temperature sensor fault; Bit12: module temperature input 1 sensor protection; Bit13: module temperature input 2 sensor fault; Bit14: module temperature input 3 sensor fault; Bit15: module structure fault		
360-999	Reserved			
1000	Communication address of present newest fault records	1001 1051 1101 1151 1201 1251 1301 1351	Unsigned int	
1001	Fault occurrence time: minute second	All is 8 channels, and each channel has 50 words. The parameters meaning is the same as above.		
1002	Fault occurrence time: date hour			

1003	Fault occurrence time: year month	
1004	Tripping condition 1	
1005	Tripping condition 2	
1006	Tripping condition 3	
1007	Warning condition 1	
1008	Warning condition 2	
1009	Warning condition 3	
1010	Motor running status	
1011	DI condition	
1012	DO condition	
1013	A phase current actual value	
1014	B phase current actual value	
1015	C phase current actual value	
1016	Current decimal point	
1017	Current unbalance degree	
1018	AB line voltage actual value	
1019	BC line voltage actual value	
1020	CA line voltage actual value	
1021	Present frequency	
1022	Power factor	
1023	Present power actual value	
1024	Present power actual value	
1025	Grounding current	
1026	Leakage current	
1027	Leakage current	
1028	Present heat capacity	
1029	Master temperature protection resistance value	
1030	Module temperature type	
1031	Data of module temperature 1	
1032	Data of module temperature 2	
1033	Data of module temperature 3	
1034	Analog input 1	
1035	Analog input 2	
1036	Output status of present timer counter truth table	
1037	Operation time of the present motor	
1038	Condition of present data circulating register	
1039	Measuring module: reserved	
1040	Switching module: reserved	
1041	Temperature module : reserved	
1042	Analog module : reserved	
1043-1050	Reserved	
1051-1100	Failure logging data 2	The same as 1001-1050
1101-1150	Failure logging data 3	The same as 1001-1050

1151-1200	Failure logging data 4	The same as 1001-1050		
1201-1250	Failure logging data 5	The same as 1001-1050		
1251-1300	Failure logging data 6	The same as 1001-1050		
1301-1350	Failure logging data 7	The same as 1001-1050		
1351-1400	Failure logging data 8	The same as 1001-1050		
Reserved				
1500	Maximum value of three-phase current		Unsigned int	I= current value read / 10^ current decimal point
1501	A phase current actual value		Unsigned int	
1502	B phase current actual value		Unsigned int	
1503	C phase current actual value		Unsigned int	
1504	Switching output, input status bit		Unsigned int	bit0 ～ bit7 1st channel to 8th channel switching input status, bit8～bit15 1st to 8th channel switching output status. 1 means actuation, and 0 means break off.
1505	Current decimal point index number bit, motor running status		Unsigned int	Bit0-bit7:1 normal stopping;2:fault stopping;3:emergency stopping;4:starting stage 1;5:starting stage 2;6:running 1;7:running 2; Bit8-bit15:0-3
1506	Tripping condition 1	Bit0: overload; Bit1: grounding current; Bit2: leakage current; Bit3: stalling; Bit4: blocking; Bit5: circuit breaker breaking; Bit6: under load; Bit7: unbalance; Bit8: under voltage; Bit9: over voltage; Bit10: under power; Bit11: phase failure; Bit12: phase sequence; Bit13: external fault 1; Bit14: external fault 2; Bit15: external fault 3		
1507	Tripping condition 2	Bit0: external fault 4; Bit1: internal fault; Bit2: starting overtime; Bit3: analog input 1 high protection; Bit4: analog input 1 low protection; Bit5: analog input 2 high protection; Bit6: analog input 2 low protection; Bit7: master temperature protection; Bit8: module temperature input 1 protection; Bit9: module temperature input 2 protection; Bit10: module temperature input 3 protection; Bit11: master temperature sensor fault; Bit12: module temperature input 1 sensor protection; Bit13: module temperature input 2 sensor fault; Bit14: module temperature input 3 sensor fault; Bit15: module structure fault		
1508	Tripping condition 3	Bit0: output of counter 1; Bit1: output of counter 2; Bit2: output of counter 3; Bit3: output of counter 4; Bit4: output of timer 1; Bit5: output of timer 2; Bit6: output of timer 3; Bit7: output of timer 4; Bit8: output 1 of truth table 1; Bit9: output of truth table 2; Bit11: output of truth table 3; Bit12: output of truth table 4; Bit13: reserved; Bit14: reserved; Bit15: feedback time protection		
1509	Warning condition 1	Bit0: overload; Bit1: grounding current; Bit2: leakage current; Bit3: stalling; Bit4: blocking; Bit5: circuit breaker breaking; Bit6: under load; Bit7: unbalance; Bit8: under voltage; Bit9: over voltage; Bit10: under power; Bit11: phase failure; Bit12: phase sequence; Bit13: external fault 1; Bit14: external fault 2; Bit15: external fault 3		
1510	Warning condition 2	Bit0: external fault 4; Bit1: internal fault; Bit2: starting overtime; Bit3: analog input 1 high protection; Bit4: analog input 1 low protection; Bit5: analog input 2 high protection; Bit6: analog input 2 low protection; Bit7: master temperature protection; Bit8: module temperature input 1 protection; Bit9: module temperature input 2 protection; Bit10: module temperature input 3 protection; Bit11: master temperature sensor fault; Bit12: module temperature input 1 sensor protection; Bit13: module temperature input 2 sensor fault; Bit14: module temperature input 3 sensor fault; Bit15: module structure fault		

1511	Warning condition 3	Bit0:output of counter 1;Bit1:output of counter 2 ; Bit2:output of counter 3 ; Bit3:output of counter 4; Bit4:output of timer 1; Bit5:output of timer 2; Bit6:output of timer 3; Bit7:output of timer 4; Bit8:output 1 of truth table 1; Bit9:output 2 of truth table 1; Bit10:output of truth table 2; Bit11:output of truth table 3 ; Bit12:output of truth table 4; Bit13: reserve; Bit14:reserve; Bit15:feedback time protection		
1512	Analog module input 1		Unsigned int	Unit mA, 2 bits decimal point (0.01mA)
1513	Analog module input 2		Unsigned int	
1514	Analog module output 1		Unsigned int	
1515	Analog module output 2		Unsigned int	
1516	Master temperature resistance		Unsigned int	Unit Ω
1517	Temperature module input 1	Type of transformer is set PT100 or PT1000 or Cu50, and now unit ℃, and 1 bit decimal point, and signed int type. The type is also set PTC or NTC, and now unit Ω, no decimal point, unsigned int type.		
1518	Temperature module input 2			
1519	Temperature module input 3			
Reserved				
1603	Maximum value of three-phase current		Unsigned int	I= current read / 10^ current decimal point Eg.: 0x0BB8, current decimal point 0x0001 means 300.0A
1604	Switching output, input status bit		Unsigned int	The same as address 1504
1605	Current decimal point index number bit, motor running status		Unsigned int	The same as address 1505
1606	Tripping condition 1	The same as address 1506		
1607	Tripping condition 2	The same as address 1507		
1608	Tripping condition 3	The same as address 1508		
1609	Warning condition 1	The same as address 1509		
1610	Warning condition 2	The same as address 1510		
1611	Warning condition 3	The same as address 1511		
1612	Analog module input 1		Unsigned int	Unit mA, 2 bits decimal point (0.01mA)
1613	Analog module input 2		Unsigned int	
1614	Analog module output 1		Unsigned int	
1615	Analog module output 2		Unsigned int	
1616	Master temperature resistance		Unsigned int	Unit Ω
1617	Temperature module input 1	Type of transformer is set PT100 or PT1000 or Cu50, and now unit ℃, and 1 bit decimal point, and signed int type. The type is also set PTC or NTC, and now unit Ω, no decimal point, unsigned int type.		
1618	Temperature module input 2			
1619	Temperature module input 3			
Reserved				
1700	Percentage of the three-phase maximum current		Unsigned int	
1701	Percentage of A phase current		Unsigned int	
1702	Percentage of B phase current		Unsigned int	
1703	Percentage of C phase current		Unsigned int	
1704	Switching output, input status bit		Unsigned int	The same as 1504
1705	Motor running status		Unsigned int	1: Normal stopping; 2: fault stopping; 3: emergency stopping; 4: starting stage1; 5: starting stage 2; 6: running 1; 7: running 2
1706	Tripping condition 1	The same as 1506		
1707	Tripping condition 2	The same as 1507		
1708	Tripping condition 3	The same as 1508		

1709	Warning condition 1	The same as 1509		
1710	Warning condition 2	The same as 1510		
1711	Warning condition 3	The same as 1511		
1712	Analog module input 1		Unsigned int	Unit mA, 2 bits decimal point (0.01mA)
1713	Analog module input 2		Unsigned int	
1714	Analog module output 1		Unsigned int	
1715	Analog module output 2		Unsigned int	
1716	Master temperature resistance		Unsigned int	Unit Ω
1717	Temperature module input 1	Type of transformer is set PT100 or PT1000 or Cu50, and now unit ℃, and 1 bit decimal point, and signed int type. The type is also set PTC or NTC, and now unit Ω, no decimal point, unsigned int type.		
1718	Temperature module input 2			
1719	Temperature module input 3			
Reserved				
1803	Percentage of three-phase maximum current		Unsigned int	
1804	Switching output, input status bit		Unsigned int	The same as 1504
1805	Motor running status		Unsigned int	1: Normal stopping; 2: fault stopping; 3: emergency stopping; 4: starting stage1; 5: starting stage 2; 6: running 1; 7: running 2
1806	Tripping condition 1	The same as 1506		
1807	Tripping condition 2	The same as 1507		
1808	Tripping condition 3	The same as 1508		
1809	Warning condition 1	The same as 1509		
1810	Warning condition 2	The same as 1510		
1811	Warning condition 3	The same as 1511		
1812	Analog module input 1		Unsigned int	Unit: mA, 2 bits decimal point (0.01mA)
1813	Analog module input 2		Unsigned int	
1814	Analog module output 1		Unsigned int	
1815	Analog module output 2		Unsigned int	
1816	Master temperature resistance		Unsigned int	Unit Ω
1817	Temperature module input 1	Type of transformer is set PT100 or PT1000 or Cu50, and now unit ℃, and 1 bit decimal point, and signed int type. The type is also set PTC or NTC, and now unit Ω, no decimal point, unsigned int type.		
1818	Temperature module input 2			
1819	Temperature module input 3			

Remark 1: 0-145 is corresponded as follows (each input setting corresponded menu setting, such as timer, counter, triggering input of truth table, resetting, and etc.)

Table 26 input setting

0	no inserting	73	fault warning \\ internal fault
1	Motion control \\ starting 1 (direct starting, turn left, low speed, Y-△ Y starting, protection mode)	74	Fault warning \\ starting overtime
2	Motion control \\ starting 2 (turn right, high speed Y-△ Y starting)	75	Fault warning \\ feedback overtime
3	Motion control \\ starting 3 (single winding high speed)	76	Fault warning \\ analog input \\ In1 high protection
4	Motion control \\ starting ready to output	77	Fault warning \\ analog input \\ In1 low protection
5	Motion control \\ permission indication 1	78	Fault warning \\ analog input \\ In2 high protection
6	Motion control \\ permission indication 2	79	Fault warning \\ analog input \\ In2 low protection
7	Motion control \\ motion output	80	Fault warning \\ temperature protection \\ master temperature protection

8	Any fault tripping	81	Fault warning \\ temperature protection \\ module input 1
9	Fault tripping \\ overload	82	Fault warning \\ temperature protection \\ module input 2
10	Fault tripping \\ grounding current	83	Fault warning \\ temperature protection \\ module input 3
11	Fault tripping \\ leakage current	84	Fault warning \\ temperature protection \\ master temperature sensor fault
12	Fault tripping \\ stalling	85	Fault warning \\ temperature protection \\ sensor fault of module input 1
13	Fault tripping \\ blocking	86	Fault warning \\ temperature protection \\ sensor fault of module input 2
14	Fault tripping \\ short circuit breaking	87	Fault warning \\ temperature protection \\ sensor fault of module input 3
15	Fault tripping \\ under load	88	Fault warning \\ module structure fault
16	Fault tripping \\ unbalance	89	Fault warning \\ counter \\ output of counter 1
17	Fault tripping \\ under voltage	90	Fault warning \\ counter \\ output of counter 2
18	Fault tripping \\ over voltage	91	Fault warning \\ counter \\ output of counter 3
19	Fault tripping \\ under power	92	Fault warning \\ counter \\ output of counter 4
20	Fault tripping \\ phase failure	93	Fault warring \\ timer \\ output of timer 1
21	Fault tripping \\ phase sequence	94	Fault warring \\ timer \\ output of timer 2
22	Fault tripping \\ external fault 1	95	Fault warring \\ timer \\ output of timer 3
23	Fault tripping \\ external fault 2	96	Fault warring \\ timer \\ output of timer 4
24	Fault tripping \\ external fault 3	97	Fault warning \\ truth table \\ output 1 of truth table 1
25	Fault tripping \\ external fault 4	98	Fault warning \\ truth table \\ output 2 of truth table 1
26	Fault tripping \\ internal fault	99	Fault warning \\ truth table \\ output of truth table 2
27	Fault tripping \\ starting overtime	100	Fault warning \\ truth table \\ output of truth table 3
28	Fault tripping \\ feedback overtime	101	Fault warning \\ truth table \\ output of truth table 4
29	Fault tripping \\ analog input \\ In1 high protection	102	DI status \\ DI1
30	Fault tripping \\ analog input \\ In1 low protection	103	DI status \\ DI2
31	Fault tripping \\ analog input \\ In2 high protection	104	DI status \\ DI3
32	Fault tripping \\ analog input \\ In2 low protection	105	DI status \\ DI4
33	Fault tripping \\ temperature protection \\ master temperature protection	106	DI status \\ DI5
34	Fault tripping \\ temperature protection \\ module input 1	107	DI status \\ DI6
35	Fault tripping \\ temperature protection \\ module input 2	108	DI status \\ DI7
36	Fault tripping \\ temperature protection \\ module input 3	109	DI status \\ DI8
37	Fault tripping \\ temperature protection \\ master temperature sensor fault	110	DO status \\ DO1
38	Fault tripping \\ temperature protection \\ sensor fault of module input 1	111	DO status \\ DO2
39	Fault tripping \\ temperature protection \\ sensor fault of module input 2	112	DO status \\ DO3
40	Fault tripping \\ temperature protection \\ sensor fault of module input 3	113	DO status \\ DO4
41	Fault tripping \\ module structure fault	114	DO status \\ DO5
42	Fault tripping \\ counter \\ output of counter 1	115	DO status \\ DO6
43	Fault tripping \\ counter \\ output of counter 2	116	DO status \\ DO7
44	Fault tripping \\ counter \\ output of counter 3	117	Circulating register \\ Bit0
45	Fault tripping \\ counter \\ output of counter 4	118	Circulating register \\ Bit1

46	Fault tripping \\ timer \\ output 1 of timer 1	119	Circulating register \\ Bit2
47	Fault tripping \\ timer \\ output 1 of timer 2	120	Circulating register \\ Bit3
48	Fault tripping \\ timer \\ output 1 of timer 3	121	Circulating register \\ Bit4
49	Fault tripping \\ timer \\ output 1 of timer 4	122	Circulating register \\ Bit5
50	Fault tripping \\ truth table \\ output 1 of truth table 1	123	Circulating register \\ Bit6
51	Fault tripping \\ truth table \\ output 1 of truth table 2	124	Circulating register \\ Bit7
52	Fault tripping \\ truth table \\ output of truth table 2	125	Circulating register \\ Bit8
53	Fault tripping \\ truth table \\ output of truth table 3	126	Circulating register \\ Bit9
54	Fault tripping \\ truth table \\ output of truth table 4	127	Circulating register \\ Bit10
55	Any fault warning	128	Circulating register \\ Bit11
56	Fault warning \\ overload	129	Circulating register \\ Bit12
57	Fault warning \\ grounding current	130	Circulating register \\ Bit13
58	Fault warning \\ leakage current	131	Circulating register \\ Bit14
59	Fault warning \\ stalling	132	Circulating register \\ Bit15
60	Fault warning \\ blocking	133	Counter \\ output of counter 1
61	Fault warning \\ short circuit breaking	134	Counter \\ output of counter 2
62	Fault warning \\ under load	135	Counter \\ output of counter 3
63	Fault warning \\ unbalance	136	Counter \\ output of counter 4
64	Fault warning \\ under voltage	137	Timer \\ output of timer 1
65	Fault warning \\ over voltage	138	Timer \\ output of timer 2
66	Fault warning \\ under power	139	Timer \\ output of timer 3
67	Fault warning \\ phase failure	140	Timer \\ output of timer 4
68	Fault warning \\ phase sequence	141	Truth table \\ output 1 of truth table 1
69	Fault warning \\ external fault 1	142	Truth table \\ output 2 of truth table 1
70	Fault warning \\ external fault 2	143	Truth table \\ output of truth table 2
71	Fault warning \\ external fault 3	144	Truth table \\ output of truth table 3
72	Fault warning \\ external fault 4	145	Truth table \\ output of truth table 4

Remark 2: 0-186 is corresponded as follows (DO output setting in corresponded menu)

Table 27 DO output setting

0	no inserting	94	Fault tripping breaking off \\ timer \\ output of timer 2
1	Motion control \\ starting 1 (direct starting , turn left, low speed, Y-△ Y starting, protection mode)	95	Fault tripping breaking off \\ timer \\ output of timer 3
2	Motion control \\ starting 2 (turn right, high speed, Y-△ △ starting)	96	Fault tripping breaking \\ timer \\ output of timer 4
3	Motion control \\ starting 3 (single winding high speed)	97	Fault tripping breaking \\ truth table \\ output 1 of truth table 1
4	Motion control \\ starting ready to output	98	Fault tripping breaking \\ truth table \\ output 2 of truth table 1
5	Motion control \\ permission indication 1	99	Fault tripping breaking \\ truth table \\ output of truth table 2
6	Motion control \\ permission indication 2	100	Fault tripping breaking \\ truth table \\ output of truth table 3
7	Motion control \\ running output	101	Fault tripping breaking \\ truth table \\ output of truth table 4
8	Any fault tripping closing	102	Any fault warning
9	Fault tripping closing \\ overload	103	Fault warning \\ overload
10	Fault tripping closing \\ grounding current	104	Fault warning \\ grounding current
11	Fault tripping closing \\ leakage current	105	Fault warning \\ leakage current
12	Fault tripping closing \\ stalling	106	Fault warning \\ stalling
13	Fault tripping closing \\ blocking	107	Fault warning \\ blocking
14	Fault tripping closing \\ short circuit breaking	108	Fault warning \\ short circuit breaking
15	Fault tripping closing \\ under load	109	Fault warning \\ under load

16	Fault tripping closing \\ unbalance	110	Fault warning \\ unbalance
17	Fault tripping closing \\ under voltage	111	Fault warning \\ under voltage
18	Fault tripping closing \\ over voltage	112	Fault warning \\ over voltage
19	Fault tripping closing \\ under power	113	Fault warning \\ under power
20	Fault tripping closing \\ phase failure	114	Fault warning \\ phase failure
21	Fault tripping closing \\ phase sequence	115	Fault warning \\ phase sequence
22	Fault tripping closing \\ external fault 1	116	Fault warning \\ external fault 1
23	Fault tripping closing \\ external fault 2	117	Fault warning \\ external fault 2
24	Fault tripping closing \\ external fault 3	118	Fault warning \\ external fault 3
25	Fault tripping closing \\ external fault 4	119	Fault warning \\ external fault 4
26	Fault tripping closing \\ internal fault	120	Fault warning \\ internal fault
27	Fault tripping closing \\ starting overtime	121	Fault warning \\ starting overtime
28	Fault tripping closing \\ feedback overtime	122	Fault warning \\ feedback overtime
29	Fault tripping closing \\ analog input \\ In1 high protection	123	Fault warning \\ analog input \\ In1 high protection
30	Fault tripping closing \\ analog input \\ In1 low protection	124	Fault warning \\ analog input \\ In1 low protection
31	Fault tripping closing \\ analog input \\ In2 high protection	125	Fault warning \\ analog input \\ In2 high protection
32	Fault tripping closing \\ analog input \\ In2 low protection	126	Fault warning \\ analog input \\ In2 low protection
33	Fault tripping closing \\ temperature protection \\ master temperature protection	127	Fault warning \\ temperature protection \\ master temperature protection
34	Fault tripping closing \\ temperature protection \\ module input 1	128	Fault warning \\ temperature protection \\ module input 1
35	Fault tripping closing \\ temperature protection \\ module input 2	129	Fault warning \\ temperature protection \\ module input 2
36	Fault tripping closing \\ temperature protection \\ module input 3	130	Fault warning \\ temperature protection \\ module input 3
37	Fault tripping closing \\ temperature protection \\ master temperature sensor fault	131	Fault warning \\ temperature protection \\ master temperature sensor fault
38	Fault tripping closing \\ temperature protection \\ sensor fault of module input 1	132	Fault warning \\ temperature protection \\ sensor fault of module input 1
39	Fault tripping closing \\ temperature protection \\ sensor fault of module input 2	133	Fault warning \\ temperature protection \\ sensor fault of module input 2
40	Fault tripping closing \\ temperature protection \\ sensor fault of module input 3	134	Fault warning \\ temperature protection \\ sensor fault of module input 3
41	Fault tripping closing \\ module structure fault	135	Fault warning \\ module structure fault
42	Fault tripping closing \\ counter \\ output of counter 1	136	Fault warning \\ counter \\ output of counter 1
43	Fault tripping closing \\ counter \\ output of counter 2	137	Fault warning \\ counter \\ output of counter 2
44	Fault tripping closing \\ counter \\ output of counter 3	138	Fault warning \\ counter \\ output of counter 3
45	Fault tripping closing \\ counter \\ output of counter 4	139	Fault warning \\ counter \\ output of counter 4
46	Fault tripping closing \\ timer \\ output of timer 1	140	Fault warning \\ timer \\ output of timer 1
47	Fault tripping closing \\ timer \\ output of timer 2	141	Fault warning \\ timer \\ output of timer 2
48	Fault tripping closing \\ timer \\ output of timer 3	142	Fault warning \\ timer \\ output of timer 3
49	Fault tripping closing \\ timer \\ output of timer 4	143	Fault warning \\ timer \\ output of timer 4
50	Fault tripping closing \\ truth table \\ output 1 of truth table 1	144	Fault warning \\ truth table \\ output 1 of truth table 1
51	Fault tripping closing \\ truth table \\ output 2 of truth table 1	145	Fault warning \\ truth table \\ output 2 of truth table 1
52	Fault tripping closing \\ truth table \\ output of truth table 2	146	Fault warning \\ truth table \\ output of truth table 2
53	Fault tripping closing \\ truth table \\ output of truth table 3	147	Fault warning \\ truth table \\ output of truth table 3
54	Fault tripping closing \\ truth table \\ output of truth table 4	148	Fault warning \\ truth table \\ output of truth table 4
55	Any fault tripping breaking	149	DI control \\ DI1
56	Fault tripping breaking \\ overload	150	DI control \\ DI2
57	Fault tripping breaking \\ grounding current	151	DI control \\ DI3
58	Fault tripping breaking \\ leakage current	152	DI control \\ DI4

59	Fault tripping breaking \\ stalling	153	DI control \\ DI5
60	Fault tripping breaking \\ blocking	154	DI control \\ DI6
61	Fault tripping breaking \\ short circuit breaking	155	DI control \\ DI7
62	Fault tripping breaking \\ under load	156	DI control \\ DI8
63	Fault tripping breaking \\ unbalance	157	Circulating register \\ Bit0
64	Fault tripping breaking \\ under voltage	158	Circulating register \\ Bit1
65	Fault tripping breaking \\ over voltage	159	Circulating register \\ Bit2
66	Fault tripping breaking \\ under power	160	Circulating register \\ Bit3
67	Fault tripping breaking \\ phase failure	161	Circulating register \\ Bit4
68	Fault tripping breaking \\ phase sequence	162	Circulating register \\ Bit5
69	Fault tripping breaking \\ external fault 1	163	Circulating register \\ Bit6
70	Fault tripping breaking \\ external fault 2	164	Circulating register \\ Bit7
71	Fault tripping breaking \\ external fault 3	165	Circulating register \\ Bit8
72	Fault tripping breaking \\ external fault 4	166	Circulating register \\ Bit9
73	Fault tripping breaking \\ internal fault	167	Circulating register \\ Bit10
74	Fault tripping breaking \\ starting overtime	168	Circulating register \\ Bit11
75	Fault tripping breaking \\ feedback overtime	169	Circulating register \\ Bit12
76	Fault tripping breaking \\ analog input \\ In1 high protection	170	Circulating register \\ Bit13
77	Fault tripping breaking \\ analog input \\ In1 low protection	171	Circulating register \\ Bit14
78	Fault tripping breaking \\ analog input \\ In2 high protection	172	Circulating register \\ Bit15
79	Fault tripping breaking \\ analog input \\ In2 low protection	173	Counter \\ output of counter 1
80	Fault tripping breaking \\ temperature protection \\ master temperature protection	174	Counter \\ output of counter 2
81	Fault tripping breaking \\ temperature protection \\ module input 1	175	Counter \\ output of counter 3
82	Fault tripping breaking \\ temperature protection \\ module input 2	176	Counter \\ output of counter 4
83	Fault tripping breaking \\ temperature protection \\ module input 3	177	Timer \\ output of timer 1
84	Fault tripping breaking \\ temperature protection \\ master temperature sensor fault	178	Timer \\ output of timer 2
85	Fault tripping breaking \\ temperature protection \\ sensor fault of module input 1	179	Timer \\ output of timer 3
86	Fault tripping breaking \\ temperature protection \\ sensor fault of module input 2	180	Timer \\ output of timer 4
87	Fault tripping breaking \\ temperature protection \\ sensor fault of module input 3	181	Truth table \\ output 1 of truth table 1
88	Fault tripping breaking \\ module structure fault	182	Truth table \\ output 2 of truth table 1
89	Fault tripping breaking \\ counter \\ output of counter 1	183	Truth table \\ output of truth table 2
90	Fault tripping breaking \\ counter \\ output of counter 2	184	Truth table \\ output of truth table 3
91	Fault tripping breaking \\ counter \\ output of counter 3	185	Truth table \\ output of truth table 4
92	Fault tripping breaking \\ counter \\ output of counter 4	186	Bus control output
93	Fault tripping breaking \\ timer \\ output of timer 1		

Remark 3:

Address 80-286 and 300-359 are rewritable, and the data written must be in the range of setting, otherwise beep on error by returning exception code. And other addresses are in the status of reading only.

8.6 PROFIBUS communication

8.6.1 Profibus-DP physical layer

Transmission media

PROFIBUS-DP transmission technology adopts RS485 for transmission, and transmission media can be chosen from 2 kinds of wires: Line A and Line B. Line A is shielded twisted pair, and line B is normal twisted pair. Line A is ruled in standard EN50 170, and the introductions of comparing A with B are as shown in table 28, and the specification recommend to adopt Line A.

Table 28 Introductions of Line A and Line B

Cable parameters	Line A	Line B
Characteristic impedance (Ω)	135~165Ω(f＝3MHz~20MHz)	100~130Ω(f＞100kHz)
Capacity of unit length (PF/m)	＜30pF/m	＜60pF/m
Loop resistance (Ω/km)	≤110Ω/km	-
Wire core cross-sectional area(mm2)	≥0.34mm2(22 AWG)	≥0.22mm2(22 AWG)

Optical fiber can also be chosen as the transmission media of PROFIBUS-DP. Optical fiber (POF) includes polymer optical fiber and glass optical fiber (GOF). The transmission distance of POF is less than 50m, and that of GOF is many kilometers away.

Transmission distance

Standard Profibus-DP stands by the transmission rate as follows: (unit:kbps)9.6, 19.2, 31.25, 45.45, 93.75, 187.5, 500, 1500, 3000, 6000, 12000. The maximum data of input or output in each DP slave station is 244B. The maximum communication distance of using shielded twisted pair is 9.6 km(need to add relay), and that of using optical fiber is 90 km.

The maximum length of each Profibus-DP cable is concerned with transmission rate. In different medium, or at different baud rate, the distance of signal transmitted is also different, which is as shown in table 29.

Table 29 Ration of transmission rate and distance

Baud rate kbps/s	9.6	19.2	93.75	187.5	500	1500	3000	6000	12000
(Line A) Cable length (m)	1200	1200	1200	1000	400	200	200	100	100
(Line B) Cable length (m)	1200	1200	1200	600	200	Not recommend	Not recommend	Not recommend	Not recommend

Note: The transmission distance means the one of not adding repeaters. Besides, the transmission distance is theoretical value, and the actual transmission distance is effected by the field environment.

PROFIBUS-DP bus network structure

PROFIBUS supports topological structure of bus , star and tree topology, as shown in figure 31 and figure 32. Standard Profibus-DP system can connect 127 station maximally (station no. are 0～126 , no relay). PROFIBUS supports relay connection, and if adopting relay, the number of station connected and the length of cable are added.

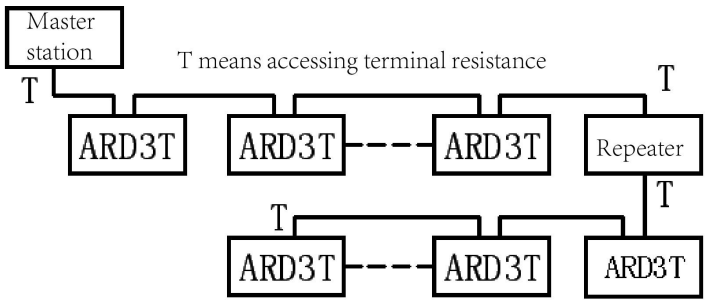


Figure 31 DP bus topology 1

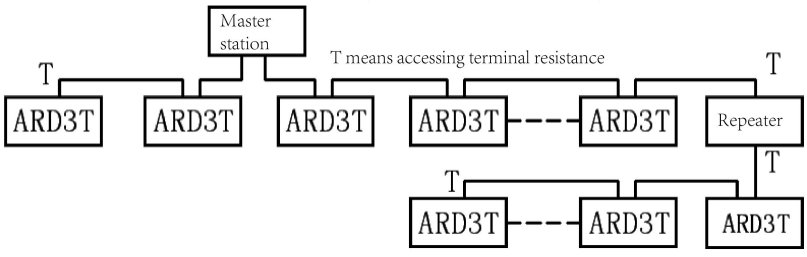


Figure 32 DP bus topology 2

According to standard EIA RS485, in order to minimize cable reflection and to insure noise grade defined in data line, the terminating resistor must be used to terminate a network segment in both ends of data transmitting cable. The terminating resistor has to be used in both ends of each PROFIBUS-DP network segment, while has not to be set in other position. Some terminal devices, such as relays or slave stations , have terminating resistor, and in this case, avoid to insert the terminating resistor of devices and the one of connector at the same time.

The information above is just for reference, and due to many contents in Profibus-DP, for more details, please refer to installation related standard in PROFIBUS.

8.6.2 ARD3T Profibus-DP communication function configuration

8.6.2.1 ARD3T-Profibus communication interface wiring

Figure 33 is Profibus communication interface of ARD protector, and the interface is connected with PROFIBUS communication network.

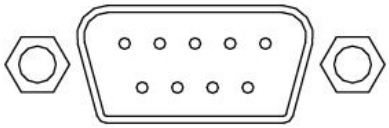


Figure 33 Communication interface of ARD3T-Profibus

8.6.2.2 ARD3T slave station setting

(1)Enter into the main menu, select the system parameter setting interface, as shown in table 34.

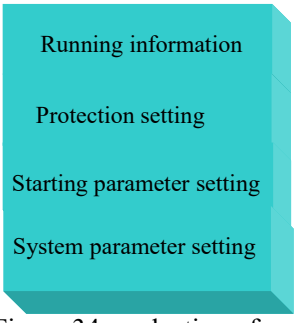


Figure 34 selection of system parameter setting

Press key 确定 in the default parameter displaying interface, and go into the system main menu, and switch to the menu of system parameter setting by the key ► or ◄. If the main menu is on the displaying interface, firstly quit the menu by pressing the key 取消, and then switch into the menu of system parameter setting by ► or ◄.

(2)Press key 确定 into the system menu setting, and switch into the interface of communication address 2 by ► or ◄. Firstly set the value of baud rate 2 as “Profibus”, and then set the slave station address of Profibus. These are as shown in figure 35.

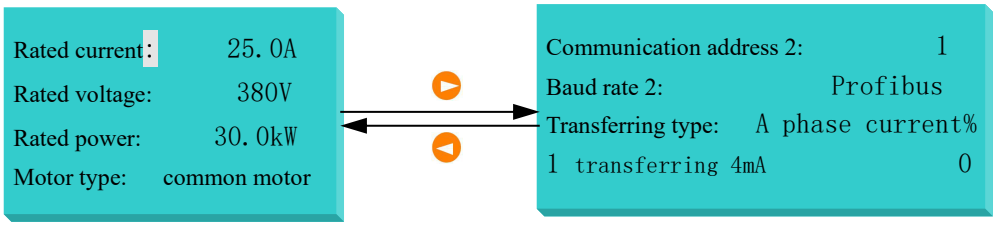


Figure 35 Save station setting of profibus

Notes:

(1)If the slave station address of ARD3T (address setting range is 1～126) changes after powered on, ARD3T needs to be powered on again, and the slave address changed can be effective (the function follows the protocol of PROFIBUS-DP).

(2)After adopting Profibus communication, the baud rate of communication interface is self-adaption 9.6 kbit/s～12000 kbit/s.

8.6.2.3 Profibus communication variable table

The communication protocol of ARD3T Profibus is developed according to DPV0. DPV0 adopts periodic data exchange, that is to say the data exchanged is periodic data in each DP circulation.

Input data: the feedback from ARDET to the response data of DP master station (ARD3T→DP master station)

Output data : the control command transferred from DP master station to ARD3T (DP main station→ARD3T)

Deal with the circulating data by programming the input and output data in PLC. The length of input or output exchanging data depends on the file type of hardware configuration GSD. Input and output data in specific are as shown in table 30 and 31.

Table 30 input data is 17 byte (ARD3T→DP master station)

input	Parameter name	Data type	Remarks
[0][1]	Maximum of three- phase current	word	1.6-3 bits decimal point;6.3-2 bits decimal point;25-2 bits decimal point; 100-1 bit decimal point;250-1 bit decimal point;800-no decimal point
[2][3]	Switching output, input status bit	word	bit0～bit7 1st channel to 8th channel switching input status, bit8～bit15 1st to 8th channel switching output status. 1 means actuation, and 0 means break off.
[4][5]	Current decimal point index bit, motor running status	word	Bit0-bit7:1 normal stopping;2:fault stopping;3:emergency stopping;4:starting stage 1;5:starting stage 2;6:running 1;7:running 2; Bit8-bit15:0-3
[6][7]	Tripping status 1	word	Bit0: overload; Bit1: grounding current; Bit2: leakage current; Bit3: stalling; Bit4: blocking; Bit5: circuit breaker breaking; Bit6: under load; Bit7: unbalance; Bit8: under voltage; Bit9: over voltage; Bit10: under power; Bit11: phase failure; Bit12: phase sequence; Bit13: external fault 1; Bit14: external fault 2; Bit15: external fault 3
[8][9]	Tripping status 2	word	Bit0: external fault 4; Bit1: internal fault; Bit2: starting overtime; Bit3: analog input 1 high protection; Bit4: analog input 1 low protection; Bit5: analog input 2 high protection; Bit6: analog input 2 low protection; Bit7: master temperature protection; Bit8: module temperature input 1 protection; Bit9: module temperature input 2 protection; Bit10: module temperature input 3 protection; Bit11: master temperature sensor fault; Bit12: module temperature input 1 sensor protection; Bit13: module temperature input 2 sensor fault; Bit14: module temperature input 3 sensor fault; Bit15: module structure fault
[10][11]	Tripping status 3	word	Bit0: output of counter 1; Bit1: output of counter 2; Bit2: output of counter 3; Bit3: output of counter 4; Bit4: output of timer 1; Bit5: output of timer 2; Bit6: output of timer 3; Bit7: output of timer 4; Bit8: output 1 of truth table 1; Bit9: output of truth table 2; Bit11: output of truth table 3; Bit12: output of truth table 4; Bit13: reserved; Bit14: reserved; Bit15: feedback time protection
[12][13]	Warning status 1	word	Bit0: overload; Bit1: grounding current; Bit2: leakage current; Bit3: stalling; Bit4: blocking; Bit5: circuit breaker breaking; Bit6: under load; Bit7: unbalance; Bit8: under voltage; Bit9: over voltage; Bit10: under power; Bit11: phase failure; Bit12: phase sequence; Bit13: external fault 1; Bit14: external fault 2; Bit15: external fault 3
[14][15]	Warning status 2	word	Bit0: external fault 4; Bit1: internal fault; Bit2: starting overtime; Bit3: analog input 1 high protection; Bit4: analog input 1 low protection; Bit5: analog input 2 high protection; Bit6: analog input 2 low protection; Bit7: master temperature protection; Bit8: module temperature input 1 protection; Bit9: module temperature input 2 protection; Bit10: module temperature input 3 protection; Bit11: master temperature sensor fault; Bit12: module temperature input 1 sensor protection; Bit13: module

			temperature input 2 sensor fault; Bit14: module temperature input 3 sensor fault; Bit15: module structure fault
[16][17]	Warning status 3	word	Bit0:output of counter 1;Bit1:output of counter 2 ; Bit2:output of counter 3 ; Bit3:output of counter 4; Bit4:output of timer 1; Bit5:output of timer 2; Bit6:output of timer 3; Bit7:output of timer 4; Bit8:output 1 of truth table 1; Bit9:output 2 of truth table 1; Bit10:output of truth table 2; Bit11:output of truth table 3 ; Bit12:output of truth table 4; Bit13: reserve; Bit14:reserve; Bit15:feedback time protection
[18][19]	Analog module input 1	word	Unit mA, 2 bits decimal point (0.01mA)
[20][21]	Analog module input 2	word	
[22][23]	Analog module output 1	word	
[24][25]	Analog module output 2	word	
[26][27]	Master temperature resistance	word	Unit Ω
[28][29]	Temperature module input 1	word	Type of transformer is set PT100 or PT1000 or Cu50, and now unit ℃, and 1 bit decimal point, and signed int type. The type is also set PTC or NTC, and now unit Ω, no decimal point, unsigned int type.
[30][31]	Temperature module input 2	word	
[32][33]	Temperature module input 3	word	

Notes: high byte is ahead, and low byte is behind, eg [0][1] , [0] is high 8 bits, [1] is low 8 bits, and other analogy.

Table 31 output data is 1 byte (DP master station→ARD3T)

output	Parameter name	Data value range	remarks
[00][01]	Control byte	1:stopping; 2:starting 1; 3:starting 2; 4:resetting (auto resetting to clear after operation)5:emergency stopping 1; 6:emergency starting 1;7:emergency starting 2;	
		Bit15:effective enable bit of output data	When the bit is 1, operation of bit0-bit4 is in effective. While 0, operation is invalid.

The output data (control data) of Profibus, such as starting mode is selected “starting 1” in remote starting, output data is 0x8002 (hexadecimal number).

Note: PROFIBUS-DP V0 is circulating data exchange, and should adopt prudently the control information to avoid the damages caused by repeating setting or circulating setting.

8.6.2.4 About GSD file specification

GSD file acquiring way:

The GSD file of instrument can be downloaded from company website www.acrel.cn.

The name of GSD file is “ARD3T.GSD”. When configuring PROFIBUS master station, install GSD file, and GSD file contents are as shown in figure. ARD3T includes 16 modules. “2 words principal values”～“17 words principal values”means the length of input data is “2 words” ～“17 words”. Addition file of GSD is as shown in figure 36.

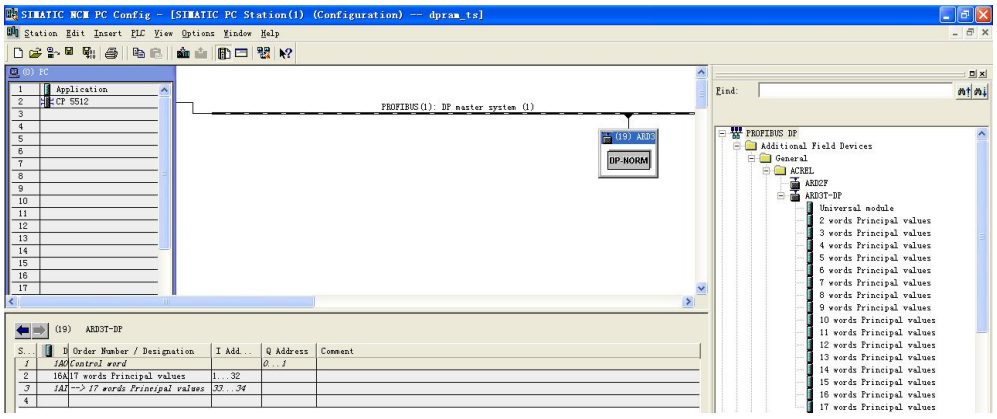


Figure 36 Addition file of GSD

The user parameters of reading 17 words input data are shown in figure 37.

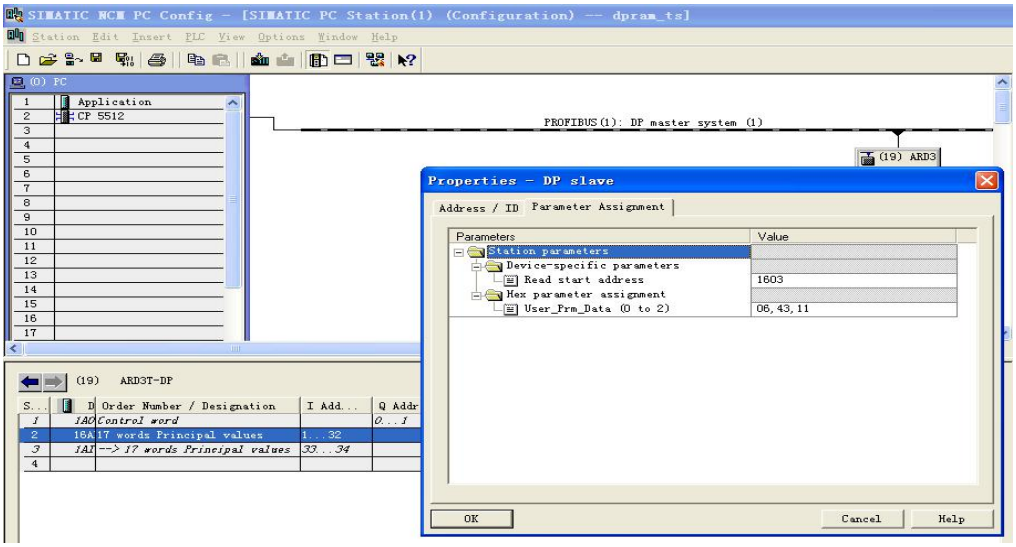


Figure 37 User parameters of 17 words input data

The user parameters of writing output data are as shown in figure 38.

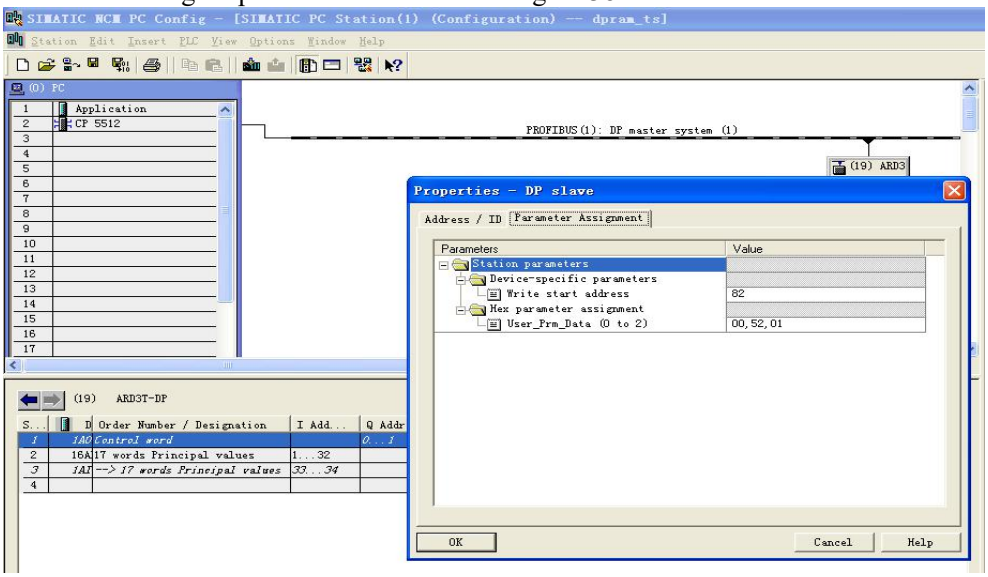
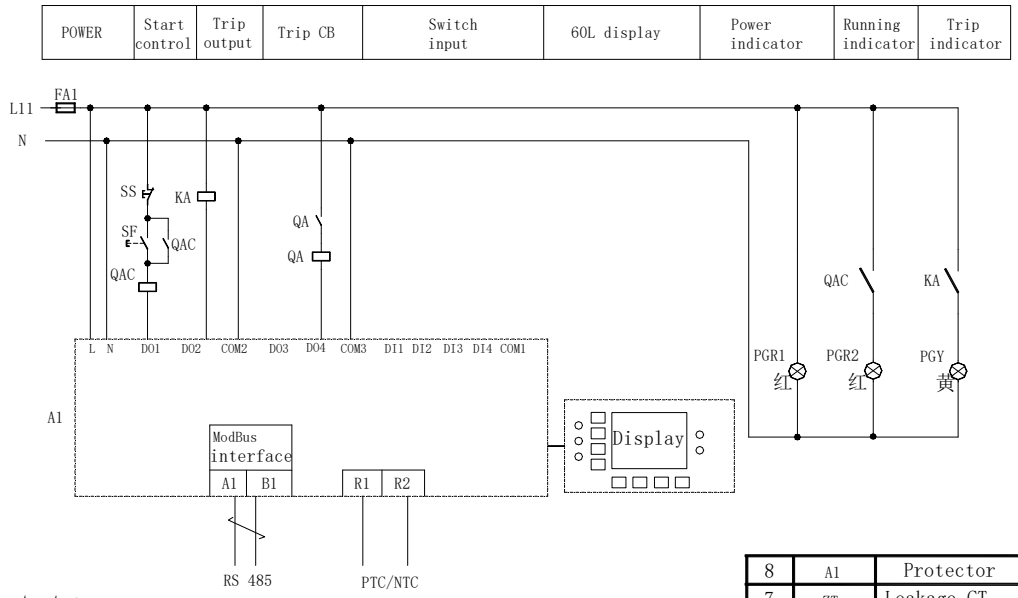
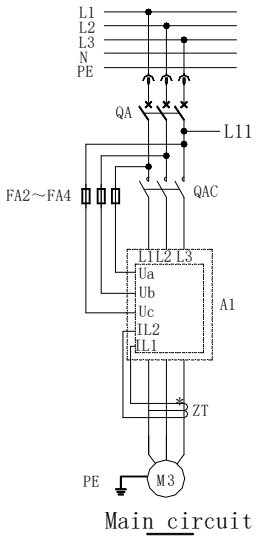


Figure 38 User parameters of output data

9 Typical application schematic diagram

9.1 ARD3T of 100A and below protection mode





Main circuit

Illustrate:

1. When there is no voltage, leakage function and temperature protection, do not wire the corresponding terminals;
2. In this figure, DO1 is programmed as start 1; DO2 is programmed as any fault tripping closure; DO4 is programmed as the fault output that needs to break the circuit breaker,
   For example: short circuit, grounding, etc.;
3. The current transformer wiring in this figure is suitable for ARD3T of 100A and below;
4. The switch input (DI) is programmable. When the switch value is DC+24V, COM1 is DC+24V output; the switch value is
   When AC220V/DC220V/DC110V, COM1 is connected to the N line and the negative pole of the power supply.

No.	Symbol	Name	Type		Note
8	A1	Protector	ARD3T K1X/XXX	1	
7	ZT	Leakage CT	By design	1	
6	KA	Intermediate relay	MY2ND AC220V	1	By design
5	PGR1,PGR2、PGY	Indicator light	AD11-22/41-7GZ	3	red2、yellow
4	SS、SF	Button	By design	2	
3	FA1～FA4	Fuse	RT18-32X/4A	4	By design
2	QAC	Contactor	NDC1-09	1	By design
1	QA	Cuicirt breaker	CM2-63M	1	By design

Protection mode diagram (Below 100A) — No. 1

Notes:

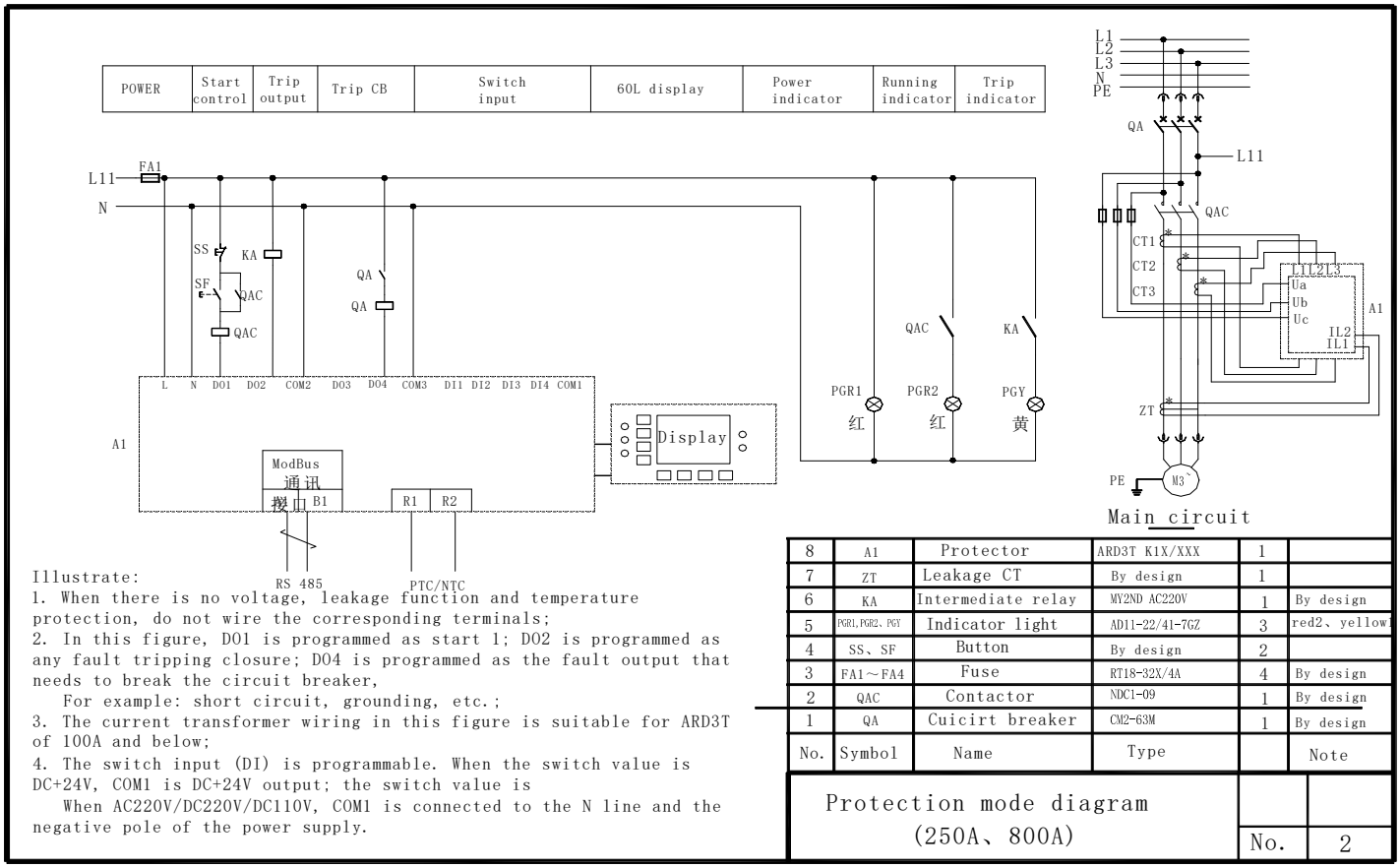
1.Without voltage, leakage, temperature protection function, the corresponding terminals should not be wired.

2.This figure defines D01 as starting1, D02 as any fault tripping close, and D04 as fault output of circuit breaker which need disjunction, for example: short circuit or grounding.

3.The standard configuration connecting line between master and measurement module is 1m, and the connecting line between master and display module is also 1m.

4.The wiring of current transformer in this figure is used for ARD3T of 200A and below.

9.2 ARD3T of 250A, 800A protection mode



Illustrate:
1. When there is no voltage, leakage function and temperature protection, do not wire the corresponding terminals;
2. In this figure, DO1 is programmed as start 1; DO2 is programmed as any fault tripping closure; DO4 is programmed as the fault output that needs to break the circuit breaker,
   For example: short circuit, grounding, etc.;
3. The current transformer wiring in this figure is suitable for ARD3T of 100A and below;
4. The switch input (DI) is programmable. When the switch value is DC+24V, COM1 is DC+24V output; the switch value is
   When AC220V/DC220V/DC110V, COM1 is connected to the N line and the negative pole of the power supply.

No.	Symbol	Name	Type		Note
8	A1	Protector	ARD3T K1X/XXX	1	
7	ZT	Leakage CT	By design	1	
6	KA	Intermediate relay	MY2ND AC220V	1	By design
5	PGR1,PGR2、PGY	Indicator light	AD11-22/41-7GZ	3	red2、yellow1
4	SS、SF	Button	By design	2	
3	FA1～FA4	Fuse	RT18-32X/4A	4	By design
2	QAC	Contactor	NDC1-09	1	By design
1	QA	Cuicirt breaker	CM2-63M	1	By design

Protection mode diagram (250A、800A) — No. 2

Notes:

1.Without voltage, leakage, temperature protection function, the corresponding terminals should not be wired.

2.This figure defines D01 as starting1, D02 as any fault tripping close, and D04 as fault output of circuit breaker which need disjunction,for example:short circuit or grounding.

3.The standard configuration connecting line between master and measurement module is 1m, and the connecting line between master and display module is also 1m.

4.The wiring of current transformer in this figure is used for ARD3T of 250A, 800A.

9.3 ARD3T of 100A and below single field direct starting

Notes:

1.Switching input adopts dry contact, ARD3T provides DC+24V power supply itself.

2.Without voltage, leakage, temperature protection function, the corresponding terminals should not be wired.

3.This figure defines D01 as starting1, D02 as any fault tripping close, and D04 as fault output of circuit breaker which need disjunction, for example: short circuit or grounding.

4.This figure defines DI1 as starting1, DI2 as starting 2, and DI3 as stopping.

5.The standard configuration connecting line between master and measurement module is 1m, and the connecting line between master and display module is also 1m.

6.The wiring of current transformer in this figure is used for ARD3T of 100A and below.

9.4 ARD3T of 100A and below single bidirectional field starting

Notes:

1.Switching input adopts dry contact, ARD3T provides DC+24V power supply itself.

2.Without voltage, leakage, temperature protection function, the corresponding terminals should not be wired.

3.This figure defines D01 as starting1, D02 as any fault tripping close, and D04 as fault output of circuit breaker which need disjunction, for example :short circuit or grounding.

4.This figure defines DI1 as starting1, DI2 as starting 2, and DI3 as stopping.

5.The standard configuration connecting line between master and measurement module is 1m, and the connecting line between master and display module is also 1m.

6.The wiring of current transformer in this figure is used for ARD3T of 100A and below.

9.5 ARD3T of 100A and below single Y-△ field starting

Notes:

1.Switching input adopts dry contact, ARD3T provides DC+24V power supply itself.

2.Without voltage, leakage, temperature protection function, the corresponding terminals should not be wired.

3.This figure defines D01 as starting1, D02 as any fault tripping closing, and D04 as fault output of circuit breaker which need disjunction, for example: short circuit or grounding.

4.This figure defines DI1 as starting1, and DI3 as stopping.

5.The standard configuration connecting line between master and measurement module is 1m, and the connecting line between master and display module is also 1m.

6.The wiring of current transformer in this figure is used for ARD3T of 100A and below.

9.6 ARD3T of 100A and below single auto-transformer step-down field starting

Notes:

1.Switching input adopts dry contact, ARD3T provides DC+24V power supply itself.

2.Without voltage, leakage, temperature protection function, the corresponding terminals should not be wired.

3.This figure define D01 as starting1, D02 as any fault tripping closing, and D04 as fault output of circuit breaker which need disjunction,for example:short circuit or grounding.

4.This figure defines DI1 as starting1, and DI3 as stopping.

5.The standard configuration connecting line between master and measurement module is 1m, and the connecting line between master and display module is also 1m.

6.The wiring of current transformer in this figure is used for ARD3T of 100A and below.

9.7 ARD3T of 100A and below single two-speed single winding field starting

Note:

1.Switching input adopts dry contact, ARD3T provides DC+24V power supply itself.

2.Without voltage, leakage, temperature protection function, the corresponding terminals should not be wired.
3.This figure defines D01 as starting1, D02 as any fault tripping closing, and D04 as fault output of circuit breaker which need disjunction, for example: short circuit or grounding.
4.This figure define DI1 as starting1, DI1 as starting2，and DI3 as stopping.
5.The standard configuration connecting line between master and measurement module is 1m, and the connecting line between master and display module is also 1m.
6.The wiring of current transformer in this figure is used for ARD3T of 100A and below.

9.8 ARD3T of 100A and below single two-speed duplex winding field starting

Notes:
1.Switching input adopts dry contact, ARD3T provides DC+24V power supply itself.
2.Without voltage, leakage, temperature protection function, the corresponding terminals should not be wired.
3.This figure defines D01 as starting1, D02 as any fault tripping closing, and D04 as fault output of circuit breaker which need disjunction,for example:short circuit or grounding.
4.This figure define DI1 as starting1, DI1 as starting2，and DI3 as stopping.
5.The standard configuration connecting line between master and measurement module is 1m, and the connecting line between master and display module is also 1m.
6.The wiring of current transformer in this figure is used for ARD3T of 100A and below.

9.9 ARD3T single frequency conversion starting

Notes:
1.Switching input adopts dry contact, ARD3T provides DC+24V power supply itself.
2.Without voltage, leakage, temperature protection function, the corresponding terminals should not be wired.
3.This figure defines D01 as starting1, D02 as any fault tripping closing, and D04 as fault output of circuit breaker which need disjunction,for example:short circuit or grounding.
4.This figure defines DI1 as starting1, and DI3 as stopping.
5.The standard configuration connecting line between master and measurement module is 1m, and the connecting line between master and display module is also 1m.
6.The wiring of current transformer in this figure is used for ARD3T of 100A and below.

9.10 ARD3T soft starting wiring diagram(1)

Notes:
1.This figure defines starting mode as protection mode, D01 as starting1, D02 as any fault tripping closing
2.The standard configuration connecting line between master and measurement module is 1m, and the connecting line between master and display module is also 1m.
3.Current transformer's wiring refers to other ARD3T illustration.

9.11 ARD3T soft starting wiring diagram(2)

Notes:
1.This figure define stating mode as direct mode, D01 as starting1, D02 as any fault tripping closing
2.This figure defines DI1 as starting, DI3 as stopping, and DI4 as resetting.
3.The standard configuration connecting line between master and measurement module is 1m, and the connecting line between master and display module is also 1m.
4.Current transformer's wiring refers to other ARD3T illustration.

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