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ARD2F
Intelligent motor Protector
Operating Manual V1.1

ACREL Co., Ltd

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Catalog

1、 Overview.....	1
2、 Product Features.....	1
3、 Model Description.....	1
4、 Main parameters.....	3
5、 Overall dimensions and installation.....	5
6、 Protection function description.....	11
7、 Function setting and description.....	26
8、 Communication Settings and instructions.....	45
9、 Typical applications.....	83
10、 Features and Functions.....	87
11、 Examples of ordering.....	89

1 Overview

The ARD2F intelligent motor protector (hereinafter referred to as the protector) is suitable for low-voltage motor circuits with rated voltage up to 660V and integrates protection, measurement, control, communication, operation and maintenance. Its perfect protection function ensures the safe operation of the motor, with logic programmable function, can meet a variety of control methods.

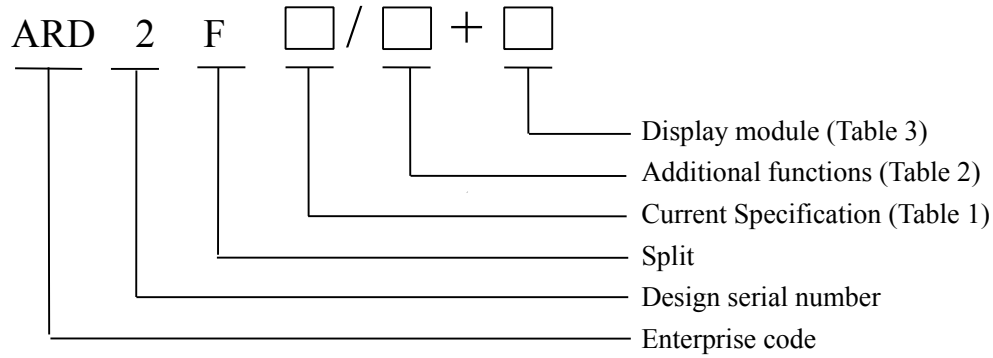
The product adopts split structure, which is composed of main body, display unit, mutual inductor and optional communication module, and can adapt to the installation of various cabinets. Product Implementation standards:

——GB 14048.4-2010 Low-voltage switchgear and control gear -- Part 4-1: Contactors and motor starters -- Electromechanical contactors and motor starters (including motor protectors);
——JB/T 10736-2007 Low voltage motor protector.

2 Product Features

- Support fundamental and full-wave power parameter measurement (U, I, P, Q, S, PF, F, EP, EQ), voltage and current imbalance degree, voltage and current positive sequence, negative sequence, zero sequence component, three-phase voltage phase Angle, residual current.
- Protection functions include overload inverse time, overload definite time, grounding, starting timeout, leakage, underload, locked-rotor, obstruction, short circuit, phase, overflow, imbalance (current, voltage, power, less power, overvoltage, undervoltage, phase sequence, temperature, external fault, tE time, running time alarm, fault alarm).
- 9 channels programmable DI input, the default use of DC24V power supply, or external active wet contact can be selected (see the selection table).
- 5 programmable DO output, to meet the direct starting, star - triangle starting, auto-transformer starting, and other starting modes, can be through the communication bus to achieve the master station to the motor remote control "start/stop".
- Optional anti-shaking function: support immediate restart of shaking power and restart of voltage loss.
- MODBUS_RTU and PROFIBUS DPV1 communication modules are available for selection. 2 MODBUS_RTU communication channels or MODBUS_RTU+PROFIBUS DPV1 communication modules can be chosen.
- Optional 1 channels DC4-20MA analog output interface, connected with DCS system, can realize the monitoring of field equipment.
- With fault record, start record, stop record, DI displacement record, restart record and other records of various events, you can view a number of motor operation and maintenance information.
- The display interface supports Chinese/English LIQUID crystal display

3 Model Description



The corresponding relation between ARD2F current specification and the rated current and power of the applicable motor is shown in Table 1:

Table 1

Protector current specification (A)	Ratio setting	Primary side coil number of transformer	Applicable scope of motor (kW)	Suitable for motor Rated current range (A)
1	Support	5circle	0.12-999	0.1-5000
5		1circle	0.12-999	0.5-5000
1.6	Does not support	1circle	0.12-0.55	0.4-1.6
6.3		1circle	0.75-2.2	1.6-6.3
25		1circle	3-11	6.3-25
100		1circle	15-45	25-100
250		1circle	55-132	63-250
800		1circle	160-250	250-800

Additional features of ARD2F are shown in Table 2:

Table 2

Additional function		Code	Additional function		Code
Starting control (including K function)		Q	Leakage protection		L
Switching input		K	4-20mA analog output		M
Temperature protection		T	Anti - electric shock function		SU
Alarm (Programmable output)		J	SOE event record		SR
1 channel communication	Modbus_RTU	C	2 channels communication	2路 Modbus_RTU	2C
	Profibus_DP	CP		Modbus+Profibus	CCP
Voltage function (phase sequence, power, power factor)		U	tE time protection		tE
Energy metering		Ep			

See Table 3 for the ARD2F display module:

Table 3

Display module	code
90L	LCD display, module size 98×60, opening 92×55 (unit:mm)

Remarks:

(1) 、 Current measuring and 2 channels of relay output DO4(97、 98)、 DO5(95、 96、 94) are

standard for ARD2F.

(2)、When equipped with starting control, the protector provides no more than 2 starting relay for the sequence control of the closing/opening of two external contactors to realize different starting ways of motor (such as Y-Δ transformation starting, positive and negative rotation control, and self-coupling reduced-voltage starting, etc.)

(3)、The additional function SU and Q should be chosen together. Additional function SU is including U(voltage function) and SR(SOE event record).

(4)、The current specifications of 100A and below shall be the same type of current transformer. The transformer is equipped with a secondary line of about 1m. If you need special line length, please contact the manufacturer. The 250A and 800A current specifications use two other types of transformers with no secondary wires. See "External Dimensions and Installation" for the dimensions of the transformer.

(5)、The standard display cable is a network cable with a length of 1.5m. 3 meters and 5 meters are available for optional configuration. You can place an order and remark the corresponding cable length.

(6)、For customers who do not need display modules, a batch of optional several display modules can be used as a programmer, or the configuration software provided by the manufacturer can be used to configure parameters through computer software.

(7)、The temperature measurement support sensor type is PTC or NTC.

(8)、After selecting the leakage function (L), each protector shall be equipped with a leakage transformer. Please refer to the "External Dimensions and Installation" section for the dimensions of the leakage transformer. The leakage transformer is equipped with a secondary wire of 2m±10cm. If other lengths are needed, please contact the manufacturer.

4 Main parameters

4.1 Technical indicators

ARD2F technical indicators are shown in Table 4:

Table 4

Technical parameters	Technical indicators	
Protector auxiliary power supply	AC85-265V/DC100-350V	
Rated working voltage of the motor	AC220V / 380V / 660V, 50Hz / 60Hz	
Rated operating current of the motor	1 (0.1A-5000A)	External current transformer
	5 (0.1A-5000A)	
	1.6A(0.4A-1.6A)	
	6.3A (1.6A-6.3A)	
	25 (6.3A-25A)	
	100 (25A-100A)	
	250 (63A-250A)	
800 (250A-800A)		
Relay output contact capacity	Impedance load	AC250V、10A

Switching input	9 channels of passive dry contact (active DC110V, DC220V, AC220V input can be optional)	
Communication	RS485 Modbus_RTU, Profibus_DP	
Environment	Working temperature	-10°C~55°C
	Storage temperature	-25°C~70°C
	Relative humidity	≤95% No condensation, no corrosive gas
	Altitude	≤2000m
Pollution levels	Class 3	
Protection grade	Main body IP20, split display module IP54 (installed on the cabinet panel)	
Installation category	Level III	

4.2 Functional configuration

The ARD2F functional configuration is shown in Table 5

Table 5

Function		Type	Functional configuration	
			Standard function	Optional function
Protection function	Fixed time overload		√	
	Inverse time overload		√	
	Starting timeout		√	
	Phase loss		√	
	Voltage unbalance		√	
	Current unbalance		√	
	Locked-Rotor		√	
	underload		√	
	External fault		√	
	Block		√	
	Temperature protection (PTC/NTC)		√	
	Residual current	grounding	√	
		leakage		√ (leakage)
	Phase sequence		√	
	Under voltage		√	
	Over voltage		√	
	Under power		√	
	Over power		√	
	tE Time protect		√	
	Overflow protection		√	
	Alarm of starting times		√	
Running time alarm		√		
Fault frequency alarm		√		
Control mode	Protection mode		√	
	Direct start mode			√
	Two-step mode			

	Two-speed mode			
	Y- Δ start mode			
	Voltage loss restart			
Communication	1 channel Modbus-RTU communication			√
	2 channel Modbus-RTU communication			√
	1 channel Profibus-DP communication			√
	1 channel Modbus-RTU+1 channel Profibus-DP			√
Switching input	9 channel DI(programmable)			√
Relay output	2 channel DO(programmable)		√	
	5 channel DO(programmable)			√
Analog output	1 channel DC4-20mA			√
Event record	Start record, stop record, DI displacement record, restart record, (support communication transmission and U disk export)			√
Display unit	Liquid crystal display (LCD)	Black and white dot matrix LCD display		√

5 Overall dimensions and installation

5.1 The product composition of ARD2F is shown in Figure 1, Figure 2

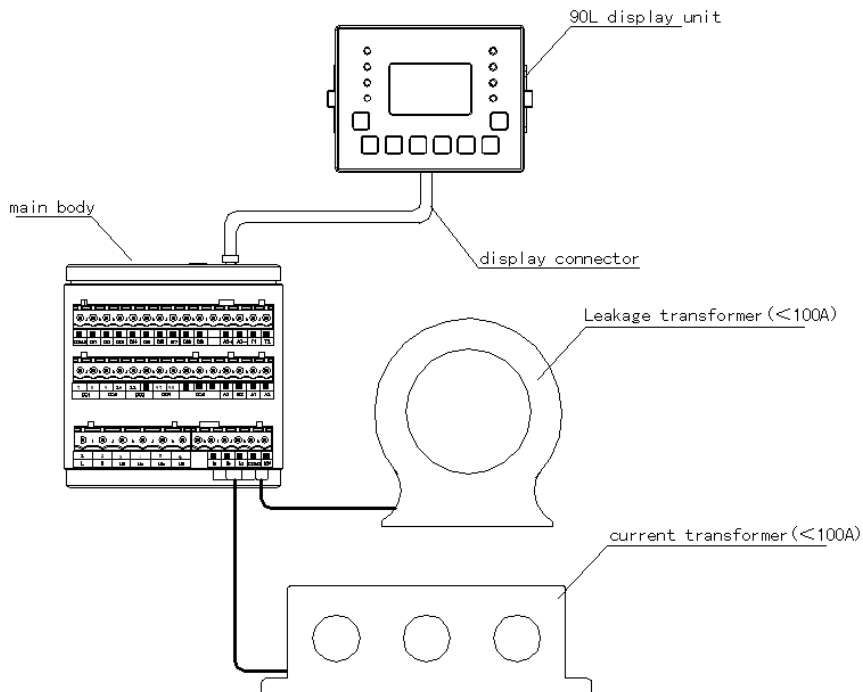


FIG. 1 Composition of products with 100A and below specifications

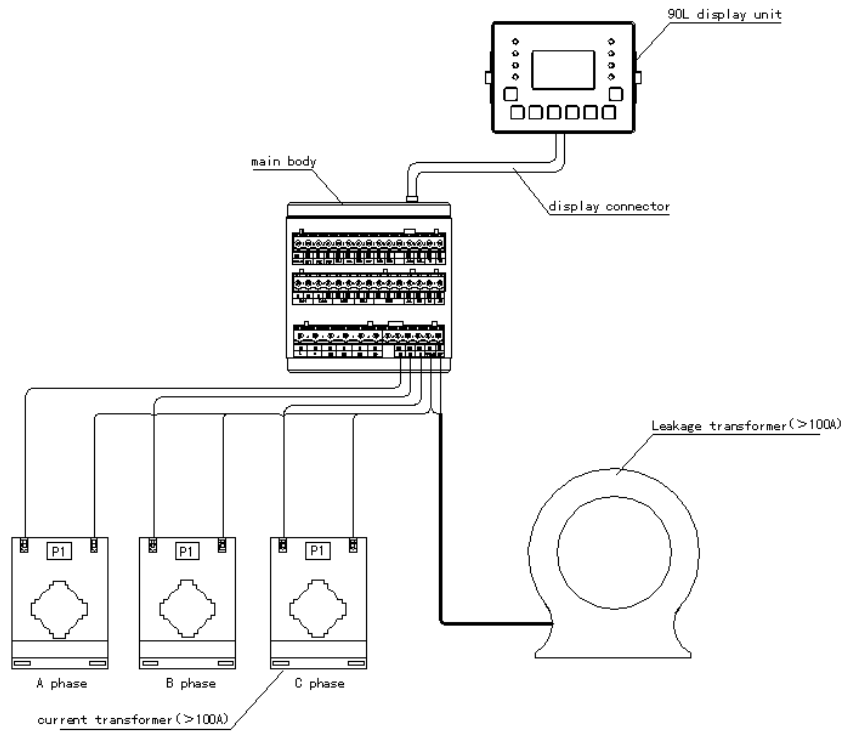


FIG. 2 Composition of 250A and 800A

5.2 Panel size and opening (Unit: mm)

The shape and opening size of the black and white liquid crystal display unit are shown in Figure4:

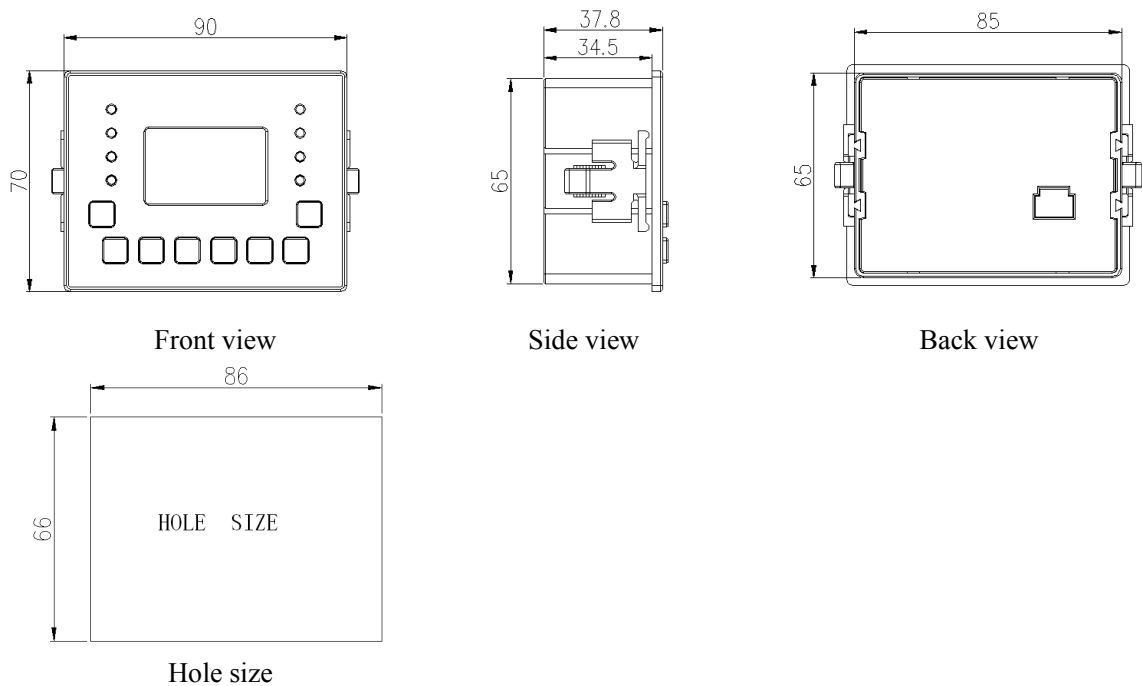


Fig.3 The shape and hole size of 90L display unit

5.3 Size of main body module (unit: mm)

The ARD2F main body is installed with 35mm guide rail, and its external dimensions are shown in Figure 4:

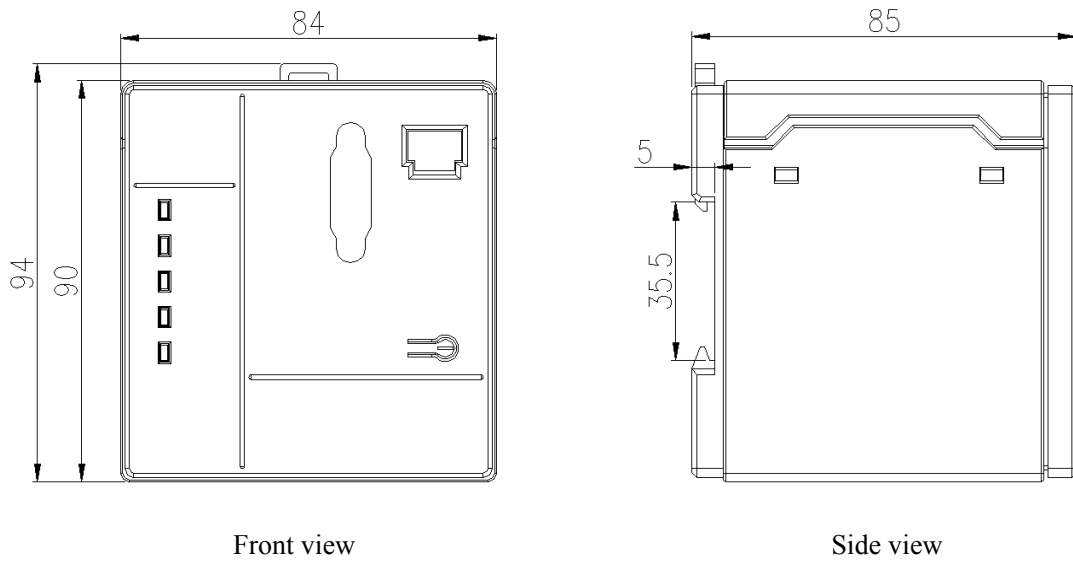


Fig.4 ARD2F main body dimensions

5.4 The external dimensions of current transformers of 100A and the following specifications are shown in FIG. 5 (unit: mm) :

5.4.1 The current transformer with the current specification of the protector is 100A, with the standard secondary connection line length of 1m±10cm. If other lengths are needed, please contact the manufacturer, for example, 3m and 5m lines are optional. The secondary lines of yellow, blue, red and black correspond to the correlation of current A, B, C and the common end of the transformer. A protector is equipped with a set of transformer.

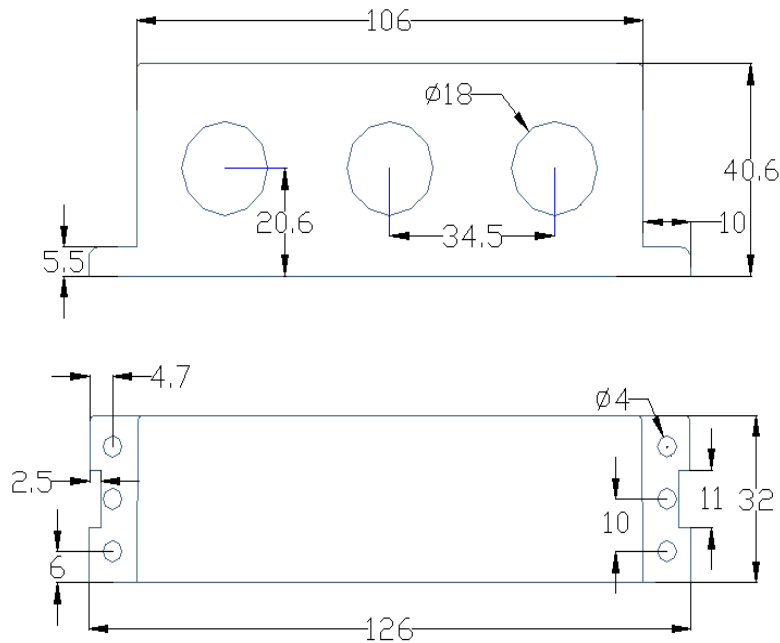


Fig. 5 External dimensions of current transformers with specifications below 100A

5.4.2 The external dimensions of the 250A current transformer are shown in FIG. 6 (unit: mm) : The current specification of the protector is the current transformer matched at 250A. There is no secondary connection wire. One protector is equipped with three transformers.

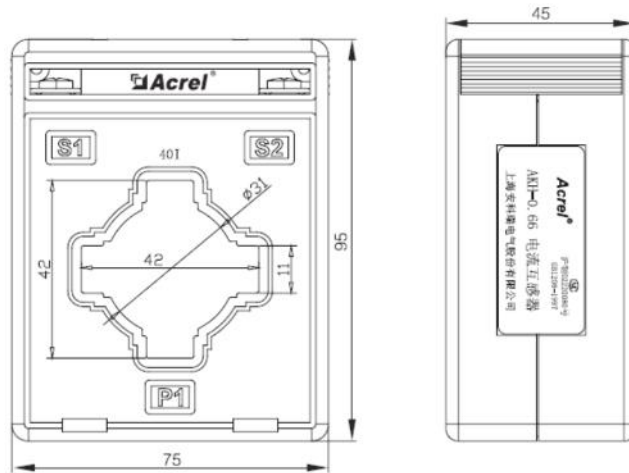


Fig. 6 External dimensions of current transformer 250A

5.4.3 The external dimensions of the current transformer (800A) are shown in FIG. 7 (unit: mm) : The current specification of the protector is 800A and the current transformer is not equipped with secondary connection. One protector is equipped with three transformers.

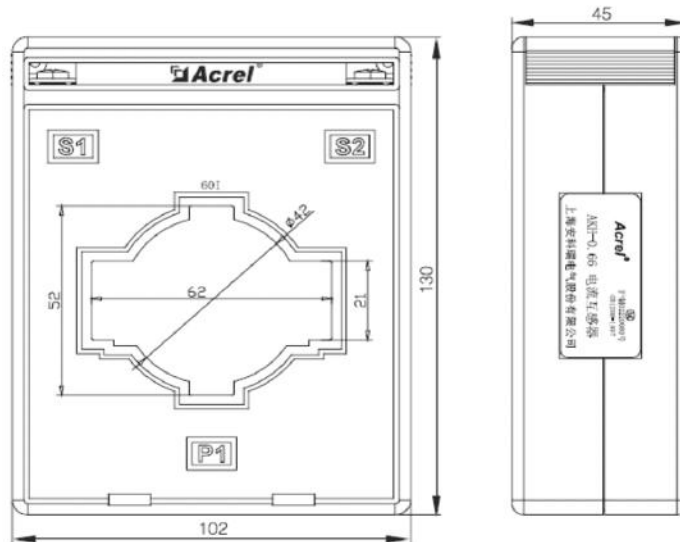


Fig. 7 External dimensions of current transformer 800A

5.4.4 The external dimensions of the leakage current transformer are shown in Figure 8 and Table 6 (unit: mm) :

The protectors with current specifications of 100A and below are equipped with leakage current transformers with specifications of L-45.250A and current protector with specifications L-80 leakage current transformer;800A and current specification protector with L-150 leakage current transformer.The leakage transformer is equipped with a secondary wire of $2m \pm 10cm$. If other lengths are needed, please contact the manufacturer.

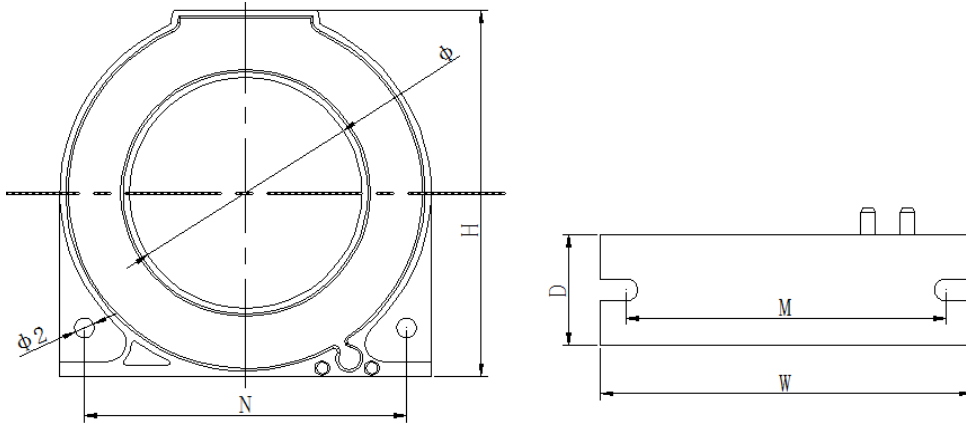


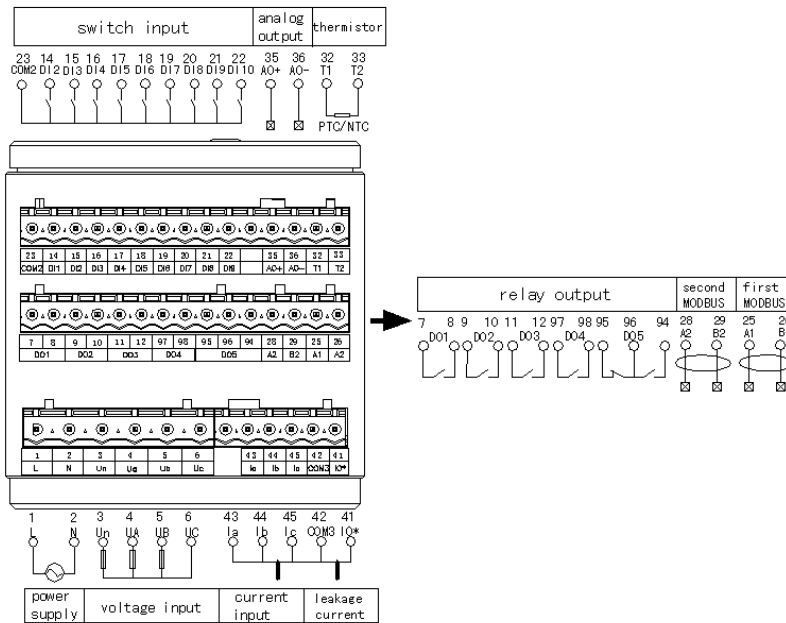
Fig. 8 External dimensions of leakage current transformer

Table 6

Dimension Spec.	Overall size(mm)			Go through size(mm)	Installation size(mm)			Tolerance (mm)	Weight (g)
	W	H	D	Φ	M	N	Φ2		
L-45	75	75	22	46	65	65	4	±1	200±10
L-80	120	120	23	81	105	105	4		380±20
L-150	196	205	24	150	175	180	6		850±50

5.5 Terminal

The wiring terminal arrangement of the ARD2F main body is shown in Figure 9:



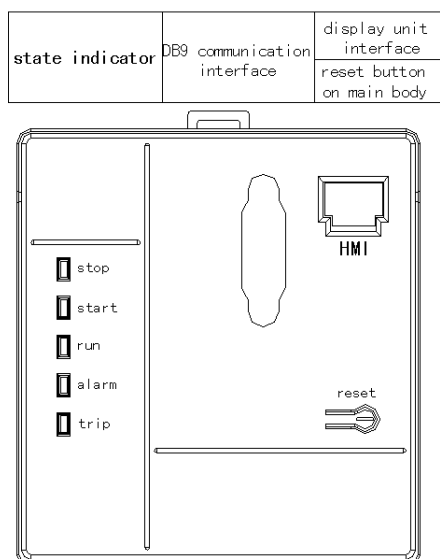


Fig. 9 ARD2F terminal arrangement

See Table 7 for the ARD2F terminal number and function definition:

Table 7

Terminals NO.	Function definition	Remark
1	Power input L (+ at DC time)	The auxiliary power supply is connected to the two terminals
2	Power input N (- at DC time)	
3	Un input	Three-phase voltage input
4	Ua Phase voltage input	
5	Ub Phase voltage input	
6	Uc Phase voltage input	
7、8	DO1, Start 1 output	5-channel programmable relay output (DO) (The function is defined as factory default setting, which can be set by users according to their needs)
9、10	DO2, Start 2 output	
11、12	DO3, Alarm output	
97、98	DO4, Trip output, normally open point signal	
95、96、94	DO5, Trip output, normally closed+normally open with common end	
14	DI1, Stop signal input	9-channel programmable Switching input (DI) (The function is defined as factory default setting, which can be set by users according to their needs)
15	DI2, Start 1 signal input	
16	DI3, Start 2 signal input	
17	DI4, Emergency stop signal input	
18	DI5, Reset signal input	
19	DI6, Control permission 1 input	
20	DI7, Control permission 2 input	
21	DI8, External fault signal input	
22	DI9, ordinary DI	
23	COM2, DI Input common terminal	
35	Analog output AO+	4-20mA analog output
36	Analog output common end AO-	

25	A1	First channel MODBUS communication
26	B1	
28	A2	Second channel MODBUS communication
29	B2	
32	T1 (PTC input A)	Temperature protection (thermistor input)
33	T2 (PTC input B)	
41	IO*	Leakage current measurement
42	COM3(common terminal of current、 leakage current input)	Three phase current input
43	Ia Phase current input	
44	Ib Phase current input	
45	Ic Phase current input	

6 Protection function description

The default action stages of each protection are shown in Table 8:

Table 8

Protection type	Default active period
Overvoltage, undervoltage, voltage imbalance, phase sequence, external fault, overflow protection, starting times, fault times, running time, PTC/NTC temperature protection	whole course
Reverse time overload, locked rotor, phase break, leakage, grounding, starting timeout, short circuit, overflow protection, Overvoltage, undervoltage, voltage imbalance, phase sequence, external fault, number of starts, number of faults, running time, PTC/NTC temperature protection, fixed time overload	When starting
Reverse time-limit overload, blocking, phase break, current imbalance, leakage, grounding, constant time-limit overload, underload, short circuit, overflow protection, overvoltage, undervoltage, voltage unbalance, phase sequence, underpower, overpower, external fault, PTC/NTC temperature protection, number of starts, number of faults, running time	In operation

6.1 Inverse time overload protection

When the motor runs for a long time in excess of its rated current under excessive load, it will overheat the motor, reduce insulation and burn it out. The protector calculates the heat capacity of the motor according to its heating characteristics and simulates its heating characteristics to protect the motor.

The starting condition of reverse time-limit overload protection is that the maximum three-phase current reaches the set overload starting value, and the default overload starting value is 1.2 times the motor's rated current.

The current-time comparison table of overload protection is shown in Table 9, and the overload characteristic curve (K curve) is shown in Figure 10:

Table 9

Optional tripping curve grade K	1	2	3	5	10	15	20	25	30	35	40
Tripping delay (S) tolerance $\pm 10\%$	Three - phase balanced load, starting from the cold state										
Rated value $I_e \times 1.2$	25	50	75	125	250	375	500	625	750	875	1000
$\times 1.5$	16	32	48	80	160	240	320	400	480	560	640
$\times 2$	9	18	27	45	90	135	180	225	270	315	360
$\times 3$	4	8	12	20	40	60	80	100	120	140	160
$\times 4$	2.26	4.52	6.78	11.3	22.5	33.8	45	56.3	67.5	78.8	90
$\times 5$	1.44	2.88	4.32	7.2	14.4	21.6	28.8	36	43.2	50.4	57.6
$\times 6$	1	2	3	5	10	15	20	25	30	35	40
$\times 7.2$	0.7	1.4	2.1	3.5	6.9	10.4	13.9	17.4	20.8	24.3	27.8

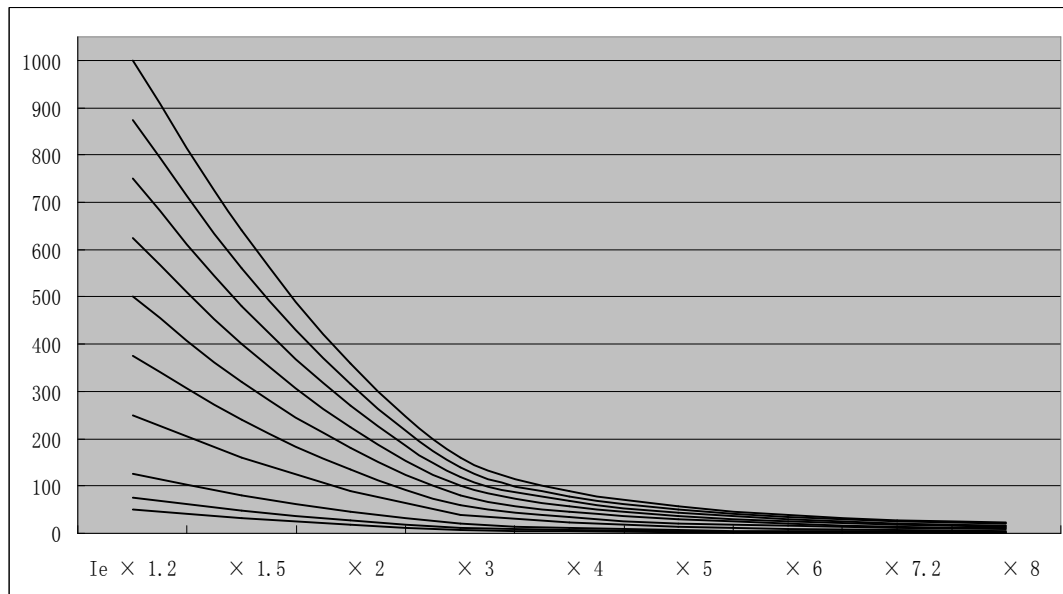
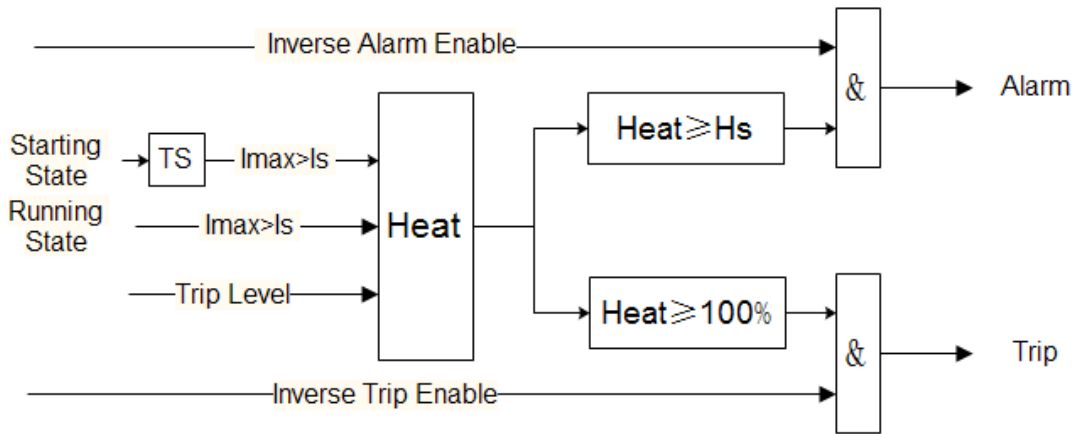


Fig. 10 Characteristic curve of overload (K curve)

Inverse time overload protection improves manual and automatic reset options. When "automatic" is selected, after the overload trip of the motor, the heat capacity will be automatically reset to less than 15%, and the restart operation can be allowed without the need for further reset operation; When "manual" is selected, after the motor overload trip, the heat capacity will be reduced to less than 15%. Manual manual reset is required, otherwise the restart operation is not allowed.



Note:

I_{max} : Maximum three-phase current

I_s : Overload starting fixed value

Heat: Percentage heat capacity

H_s : Heat capacity alarm value

TS: Starting shield time

tE Time protection

For the increased safety type motor, after the ac winding reaches the rated operating stable temperature at the highest ambient temperature, the time required from the beginning of passing through the blocking current until it rises to the limit temperature is tE time. The tE time of the increased safety motor is usually provided by the motor manufacturer, and the user can find this data on the motor nameplate.

It provides thermal overload protection of disconnecting the power supply of the motor within tE time during lock-in. It is only put in after the motor is started, with an independent delay timer. The motion delay comparison of tE protection characteristic curve is shown in Table 10, and the curve is shown in Figure 11:

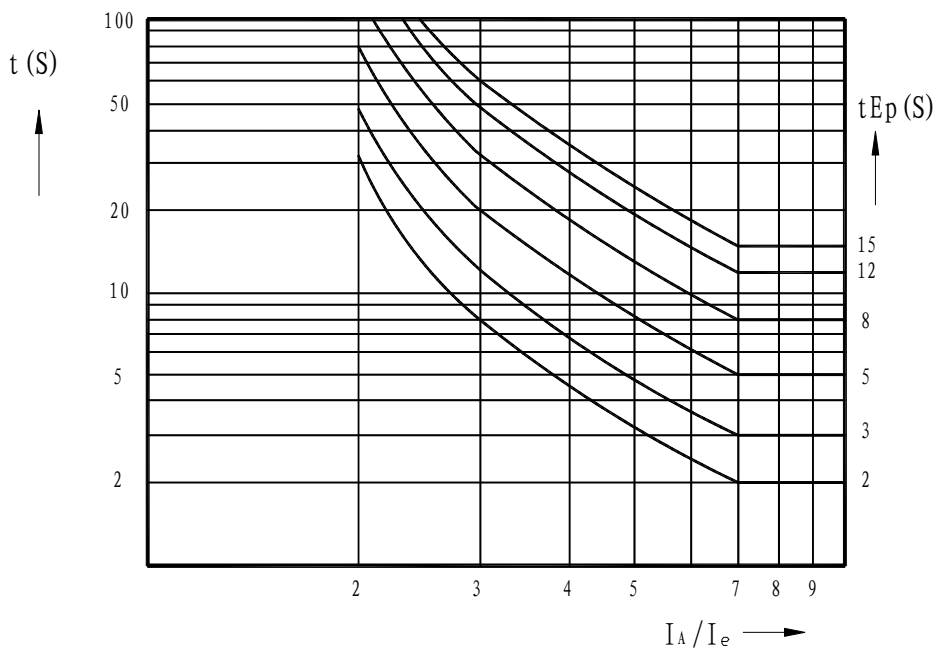


Fig.11 tE Protection delay to blocking current ratio IA/Ie Current-time characteristic curve
 Instructions:tEp: 7 times of the rated current allowed lock-in time;IA: Locked-rotor current;
 Ie: Rated current of the motor.

Table10

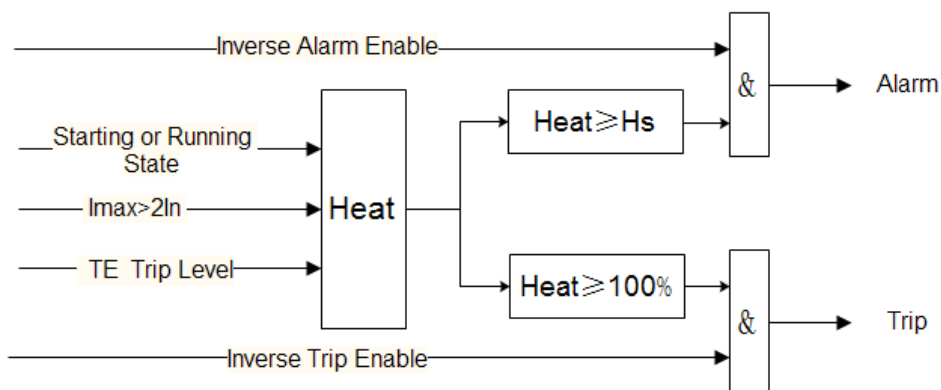
t _{Ep} Set IA/Ie	2 (S)	3 (S)	4 (S)	5 (S)	6 (S)	8 (S)	10 (S)	12 (S)	15 (S)
2.0	32	48	64	80	96	128	160	192	240
2.2	20.27	30.4	40.54	50.67	60.81	81.08	101.35	121.62	152.02
2.4	14.75	22.12	29.5	36.87	44.25	59	73.75	88.5	110.63
2.6	11.54	17.32	23.09	28.87	34.64	46.19	57.74	69.29	86.62
2.8	9.46	14.19	18.92	23.65	28.39	37.85	43.31	56.78	70.97
3.00	8	12	16	20	24	32	40	48	60
3.20	6.91	10.37	13.83	17.29	20.75	27.67	34.59	41.51	51.88
3.40	6.08	9.13	12.17	15.22	18.26	24.35	30.44	36.52	45.66
3.60	5.43	8.14	10.86	13.58	16.29	21.72	27.16	32.59	40.74
3.80	4.9	7.35	9.8	12.25	14.7	19.6	24.5	29.41	36.76
4.00	4.46	6.69	8.93	11.16	13.39	17.86	22.32	26.79	33.48
4.20	4.09	6.14	8.19	10.24	12.29	16.39	20.49	24.59	30.74
4.40	3.79	5.68	7.58	9.47	11.37	15.06	18.95	22.74	28.42
4.60	3.52	5.28	7.05	8.81	10.57	14.1	17.62	21.15	26.43
4.80	3.29	4.94	6.59	8.24	9.88	13.08	16.48	19.77	24.72
5.00	3.09	4.64	6.19	7.74	9.29	12.38	15.48	18.58	23.22
5.20	2.92	4.38	5.84	7.3	8.76	11.68	14.6	17.53	21.91
5.40	2.76	4.15	5.53	6.91	8.3	11.07	13.83	16.6	20.75
5.60	2.63	3.94	5.26	6.57	7.89	10.52	13.15	15.78	19.73
5.80	2.5	3.76	5.01	6.27	7.52	10.03	12.54	15.05	18.81
6.00	2.4	3.6	4.8	6	7.2	9.6	12	14.4	18
6.20	2.3	3.45	4.6	5.75	6.9	9.2	11.51	13.81	17.26
6.40	2.21	3.32	4.42	5.53	6.64	8.85	11.07	13.28	16.6
6.60	2.13	3.2	4.27	5.33	6.4	8.54	10.67	12.81	16.01
6.80	2.06	3.09	4.12	5.16	6.19	8.25	10.32	12.38	15.48
7.00	2	3	4	5	6	8	10	12	15
8.00	2	3	4	5	6	8	10	12	15
9.00	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2

Note:

- (1) The action time of tE protection = the action time /2×t_{Ep} when t_{Ep} is 2 (S)
- (2) When tE is set at 5 (S), the tE value determined according to the starting current ratio IA/ Ie is in accordance with IEC79-7 and GB3836.3-2000 standards. When it is used for tE time protection of increased safety motor, its inverse time overload protection can be set according to this characteristic curve. In order to ensure that the power is disconnected before tE time during the motor's lock-in, the inverse time curve of the overload protection device should be lowered by

about 15%.

(3) The action time of tE protection is achieved by setting "motor type" and "trip level", and the corresponding trip curve is selected by setting tEp (trip level) according to Table 9.(When the motor type is selected as "increased security motor", the tripping level will automatically change to tEp setting;Otherwise, the trip curve is the reverse time-limit overload trip curve of ordinary motor.



Note:

Imax: Maximum three-phase current

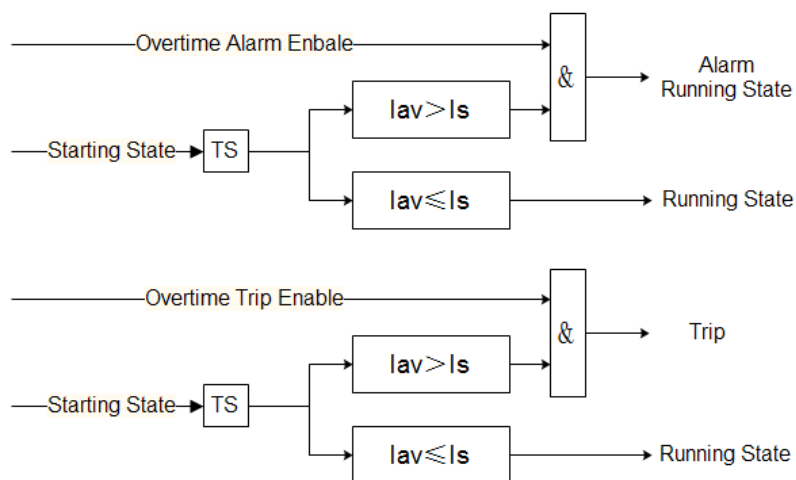
In: Rated current

Heat: Percentage heat capacity

Hs: Heat capacity alarm value

6.2 Start timeout protection

When the starting time of the motor reaches the starting time set by the user, the average three-phase current does not drop below the set tripping threshold, trigger the starting timeout protection, issue tripping command, and stop the motor operation. For the increased safety motor, the starting time setting shall not exceed 1.7 times tE time.



Note:

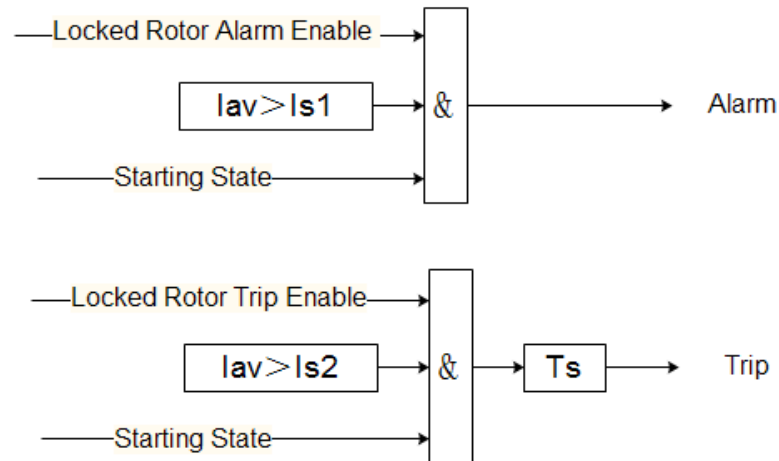
Iav: Three-phase mean current

Is: Set trip threshold

Ts: Starting time

6.3 Locked-rotor protection

In the process of starting, if the motor shaft is stuck due to excessive load or mechanical reasons, and the fault is not removed in time, the motor will overheat and the insulation will be reduced and the motor will be burned out. The locked-rotor protection is applicable to the motor when such faults occur in the starting stage. When the average current percentage reaches the set threshold, the protector will trip or alarm within the set time in time to avoid the motor burning out.



Note:

i_{av} : Three-phase mean current

I_{s1} : Alarm action threshold

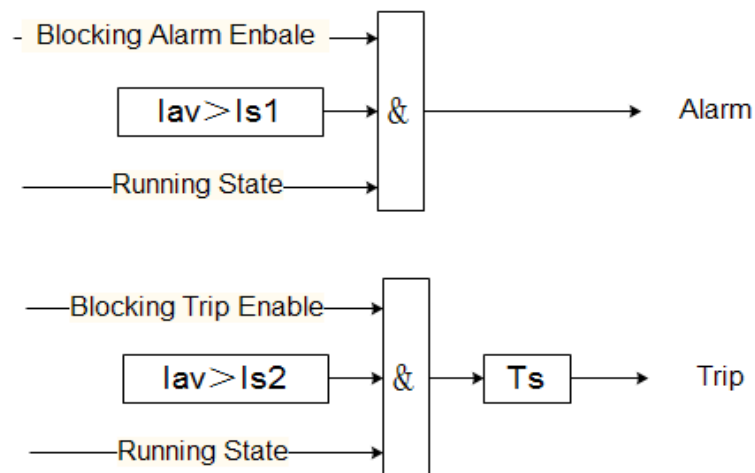
I_{s2} : Tripping threshold

T_{s1} : Alarm action delay time

T_{s2} : Delay time of trip action

6.4 Blocking protection

During the operation of the motor, if the motor shaft is stuck due to excessive load or mechanical reasons, and the fault is not removed in time, the motor will be overheated and the insulation will be reduced and the motor will be burned out. The blocking protection is applicable to protect the motor when such faults occur in the running stage. When the average current reaches the set threshold, the protector will trip or alarm within the set time in time to avoid the motor burning out.



Note:

I_{av} : Three-phase mean current

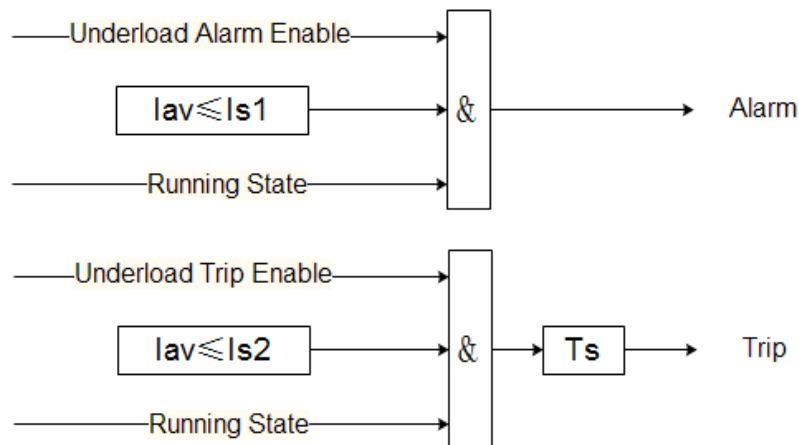
I_{s1} : Alarm action threshold

I_{s2} : Tripping threshold

T_s : Alarm action delay time

6.5 Underload protection

The protector provides underload protection when the motor is loaded with pumping load. When the average three-phase current is lower than the set value, the protector should trip or alarm within the set time.



Note:

I_{av} : Three-phase mean current

I_{s1} : Alarm action threshold

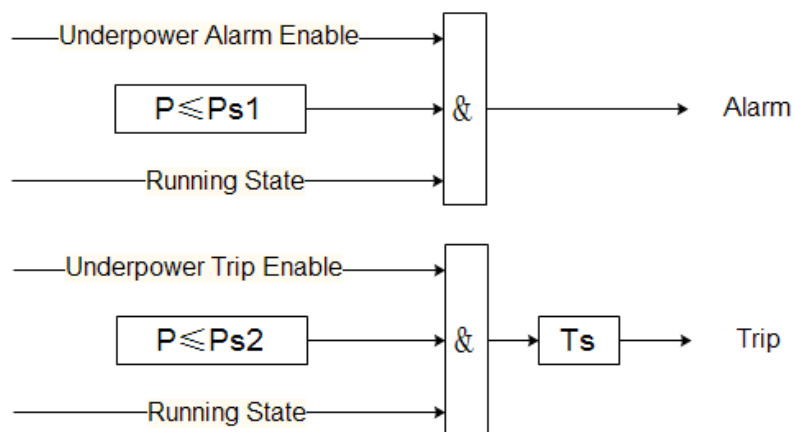
I_{s2} : Tripping threshold

T_{s1} : Delay time of alarm action

T_{s2} : Delay time of trip action

6.6 Underpower protection

When the load power is lower than the set action value, the protector will trip or alarm during the set action time.



Note:

P: Total active power

Ps1: Alarm action threshold

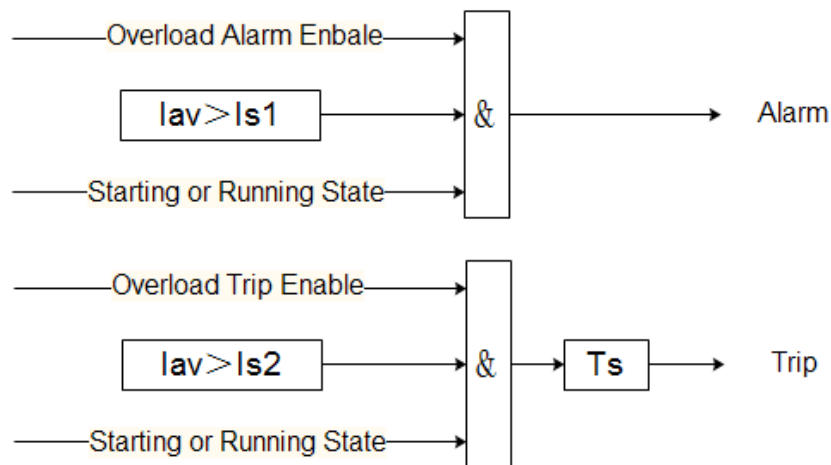
Ps2: Trip action threshold

Ts1: Delay time of alarm action

Ts2: Delay time of trip action

6.7 Overload protection

In addition to reverse Overload protection, the protector can also provide time-limit overload protection. When the percentage of three-phase average current and rated current is greater than the set value, the protector should trip or alarm within the set time.



Note:

I_{av} : Three-phase mean current

I_{s1} : Alarm action threshold

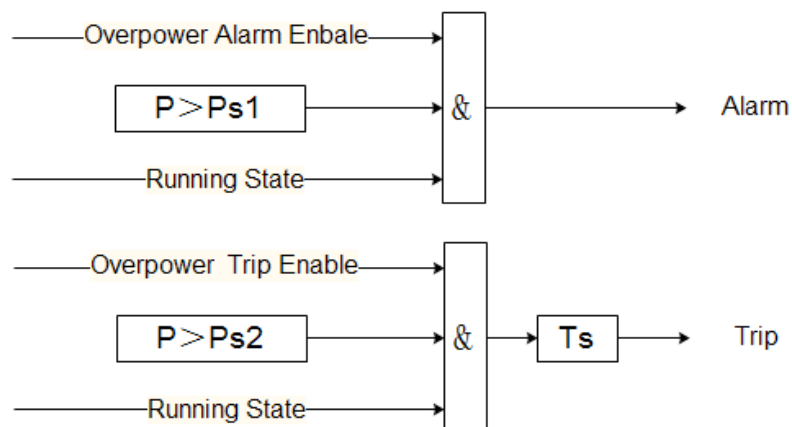
I_{s2} : Tripping threshold

$Ts1$: Delay time of alarm action

$Ts2$: Delay time of trip action

6.8 Overpower protection

When the percentage of load power to rated power is greater than the set action value, the protector will trip or alarm during the set action time.



Note:

P: Total active power

Ps1: Alarm action threshold

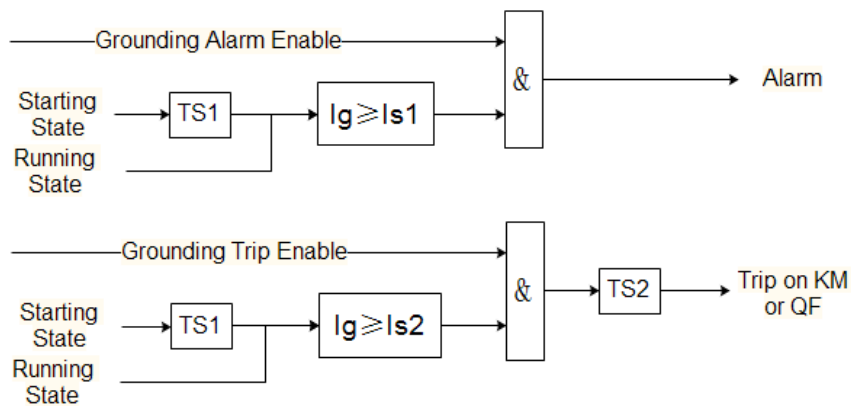
Ps2: Trip action threshold

Ts1: Delay time of alarm action

Ts2: Delay time of trip action

6.9 Ground fault protection

The protector is protected by the ground current according to the three-phase current vector and the calculation of the ground current. The grounding protection can set the starting shielding time. After the starting shielding time, when the grounding current is greater than the set value, the action logic can choose the breaker or breaker or alarm. When the breaker is chosen, the protector should first switch the breaker and then switch the contactor after 200ms



Note:

Ig: Ground current

Is1: Alarm action threshold

Is2: Tripping threshold

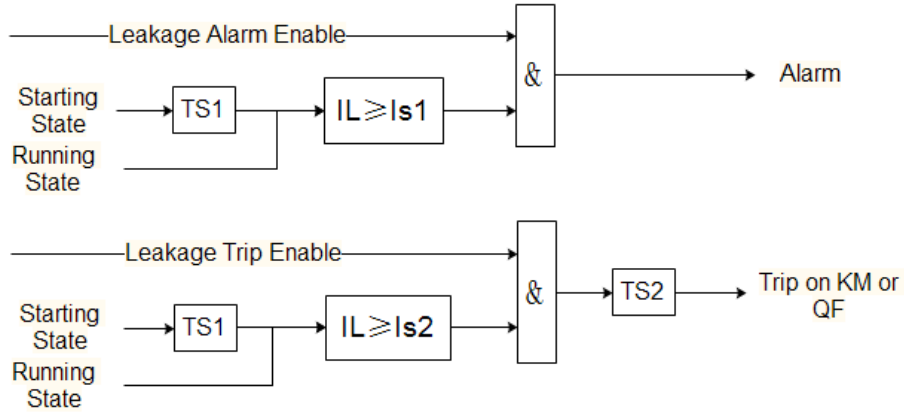
Ts1: grounding start shielding time

Ts2: Delay time of alarm action

Ts3: Delay time of trip action

6.10 Leakage protection

Leakage protection should be equipped with leakage current transformer, which can detect the leakage current through the zero-sequence transformer. The leakage protection can set the starting shielding time. After the starting shielding time, when the leakage current is greater than the set value, the operation logic can choose the breaker or breaker or alarm. When the breaker is chosen, the protector should first switch the breaker and then the breaker after 200ms.



Note:

IL: Leakage current

Is1: Alarm action threshold

Is2: Tripping threshold

Ts1: Shield time for leakage starting

Ts2: Delay time of alarm action

Ts3: Delay time of trip action

6.11 I unbalance protection

The protector calculates the current imbalance degree. When the three-phase current imbalance degree is greater than the set value, it will trip or alarm within the set time. The calculation formula of current imbalance degree is as follows:

$$I_{uf} = \left| \frac{I_{\max(\min)} - I_{av}}{I_{av}} \right| \times 100\%$$

Where, I_{uf} is the current imbalance, I_{\max} is the maximum current, I_{\min} is the minimum current, and I_{av} is the average current.

Note:

I_{uf} : Degree of current imbalance

Is1: Alarm action threshold

Is2: Tripping threshold

Ts1: Delay time of alarm action

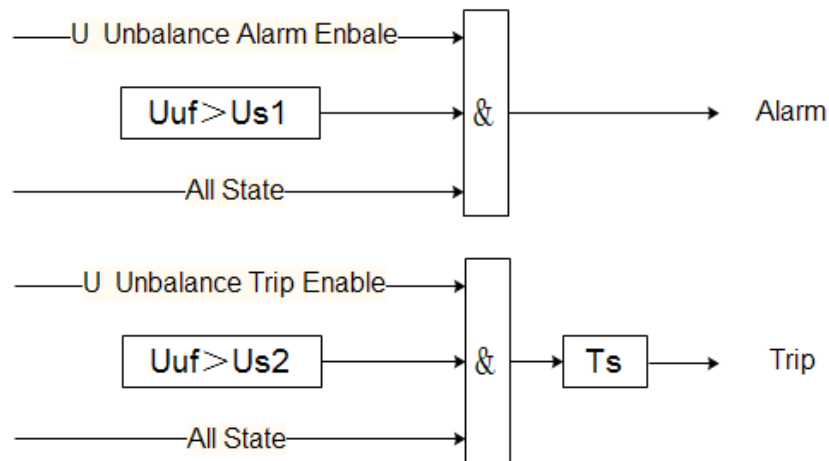
Ts2: Delay time of trip action

6.12 U unbalance protection

The protector calculates the voltage unbalance. When the voltage unbalance is greater than the set value, it will trip or alarm within the set time. The calculation formula of voltage imbalance is as follows:

$$U_{uf} = \left| \frac{U_{\max(\min)} - U_{av}}{U_{av}} \right| \times 100\%$$

Uuf is the voltage imbalance, Umax is the maximum line voltage, Umin is the minimum line voltage, and Uav is the average line voltage.



Note:

Uuf: Voltage imbalance degree

Us1: Alarm action threshold

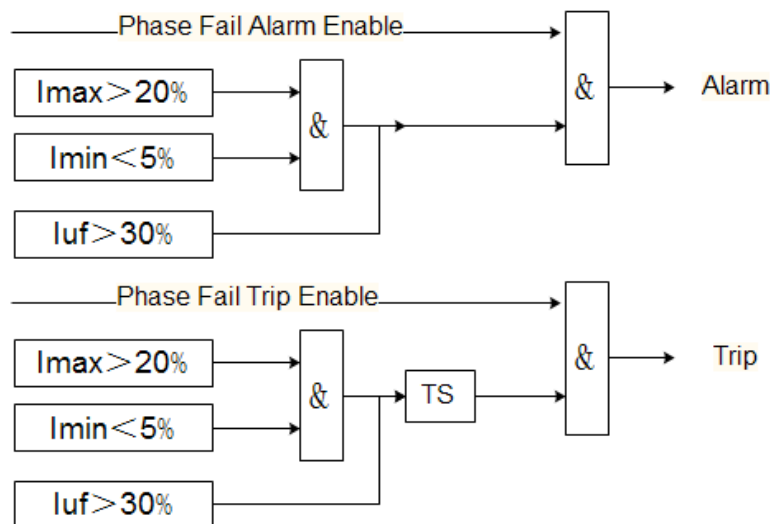
Us2: Trip action threshold

Ts1: Delay time of alarm action

Ts2: Delay time of trip action

6.13 Phase fail protection

When the phase fault runs, it will do great harm to the motor. When the maximum current is greater than 20% rated current and the minimum current is less than 5% rated current, or when the imbalance degree of three-phase current is greater than 30%, the fault protection will trip or alarm within the set time.



Note:

Imax: Maximum current

Imin: Minimum current

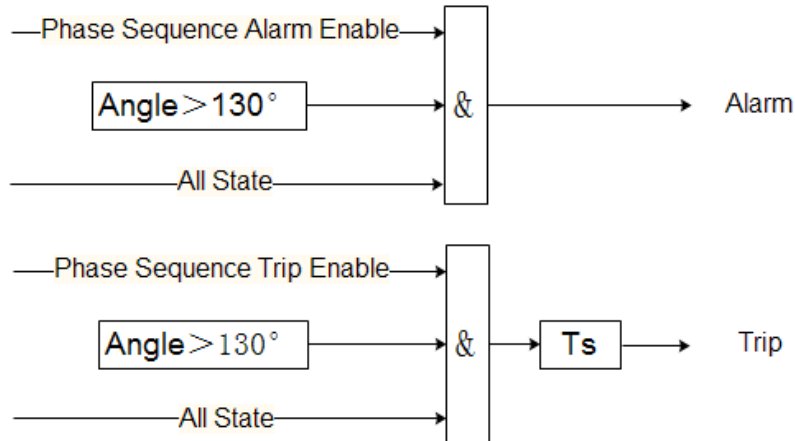
Iuf: Degree of current imbalance

Ts1: Delay time of alarm action

Ts2: Delay time of trip action

6.14 Phase sequence protection

When the error of three-phase voltage phase sequence is detected, the protector will trip or alarm within the set time to protect the safety of the motor.



Note:

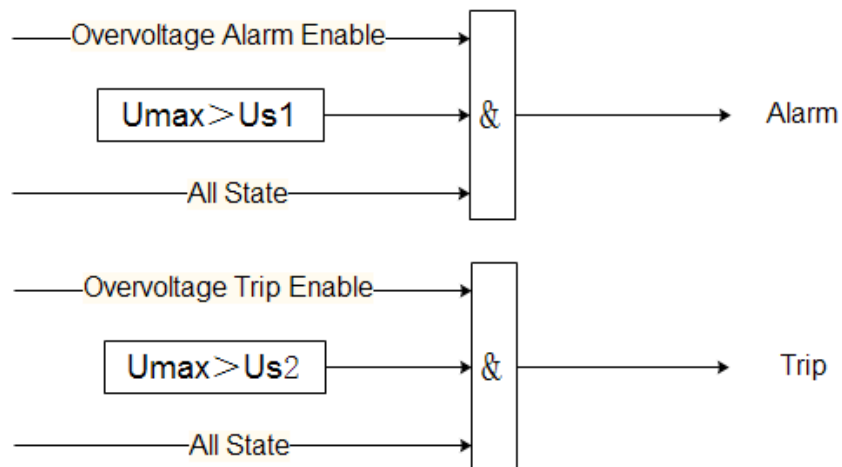
Angle: The Angle between any two - phase voltage

Ts1: Delay time of alarm action

Ts2: Delay time of trip action

6.15 Overvoltage protection

Excessive voltage will cause damage to the insulation of the motor. When the maximum line voltage of the motor exceeds the set value, the protector will trip or alarm within the set time.



Note:

Umax: Maximum line voltage

Us1: Alarm action threshold

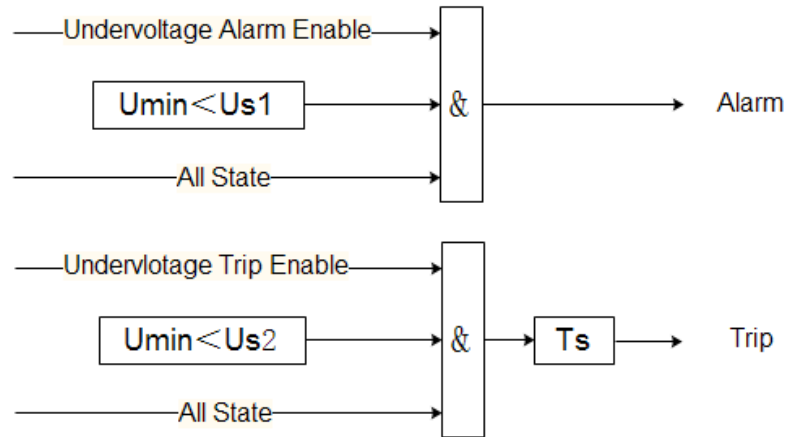
Us2: Trip action threshold

Ts1: Delay time of alarm action

Ts2: Delay time of trip action

6.16 Undervoltage protection

Too low voltage will cause the motor to slow down, or even stop running. When the minimum line voltage of the motor is lower than the set value, the protector will trip or alarm within the set time.



Note:

U_{min} : Minimum line voltage

U_{s1} : Alarm action threshold

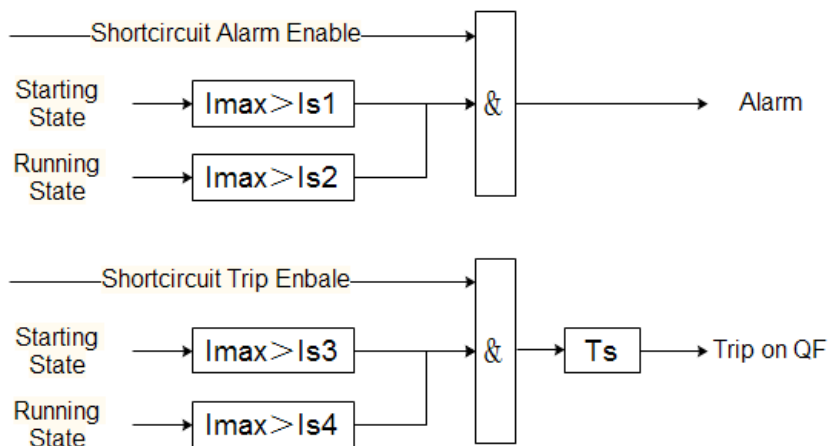
U_{s2} : Trip action threshold

T_{s1} : Delay time of alarm action

T_{s2} : Delay time of trip action

6.17 Short circuit protection

When the motor current exceeds the set value, the protector will switch circuit breaker or alarm within the set time. The short circuit protection is divided into two stages: starting and running. The protection parameters of the two stages can be set independently.



Note:

I_{max} : Maximum current

I_{s1} : Threshold of short circuit alarm during starting stage

I_{s2} : Threshold of short circuit alarm during operation

I_{s3} : Threshold of short-circuit trip during starting stage

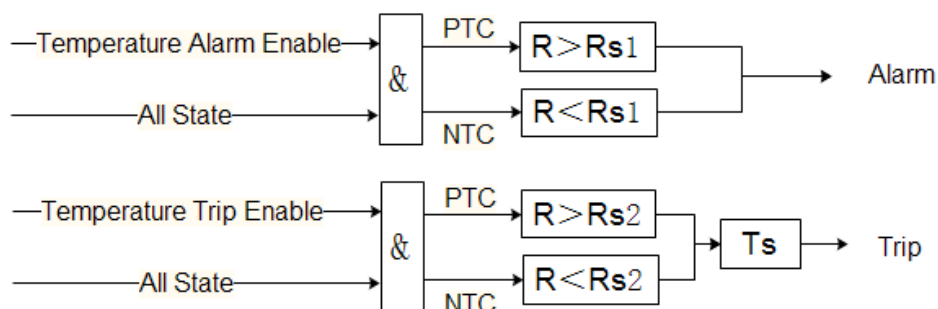
Is4: Threshold of short-circuit trip during operation

Ts1: Delay time of alarm action

Ts2: Delay time of trip action

6.18 Temperature protection

Temperature protection is based on the thermistor resistance embedded in the stator windings or bearings of the motor. According to the type of thermistor selected, the protection logic is different: when the thermistor is PTC, when the detected resistance value is greater than the set value, the protector will trip or alarm within the set time; When the thermistor is NTC, when the detected resistance value is less than the set value, the protector will trip or alarm within the set time



Note:

R: Check the temperature resistance

Rs1: Alarm action temperature resistance value

Rs2: Resistance value of tripping action temperature

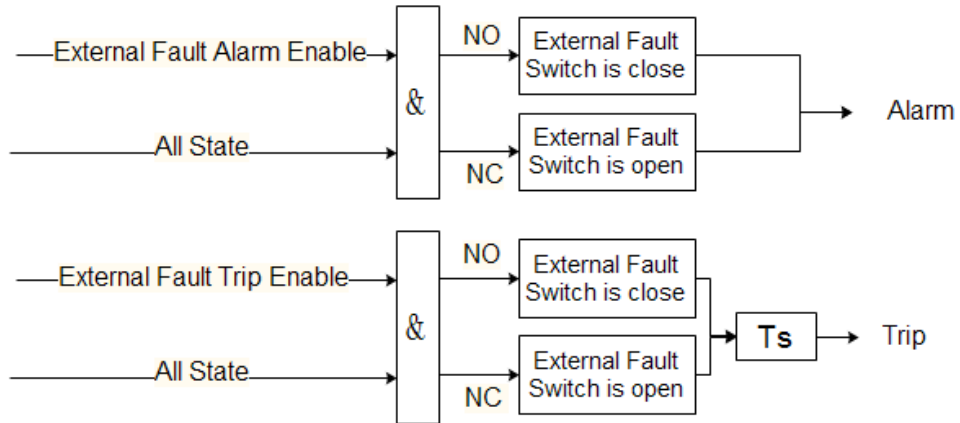
Ts1: Delay time of alarm action

Ts2: Delay time of trip action

The temperature protection can be reset manually or automatically. When "Automatic" is selected, the protector will reset automatically after the temperature protection trip when the resistance value is detected to be less than the set return resistance value. When "manual" is selected, after the temperature protection trip, if the resistance value is detected to be less than the set return resistance value, manual manual reset is required, otherwise it will not be allowed to start again.

6.19 External fault

When the input of switch quantity defined as external fault is set as "normally on", the closing signal is taken as the trigger condition of the fault. When the duration of the fault signal is longer than the set tripping/alarm delay time, tripping/alarm will be generated. When the input of switch quantity defined as external fault is set as "normally closed", the disconnect signal is used as the trigger condition of the fault. When the duration of the fault signal is longer than the set trip/alarm delay time, trip/alarm will be generated.



Note:

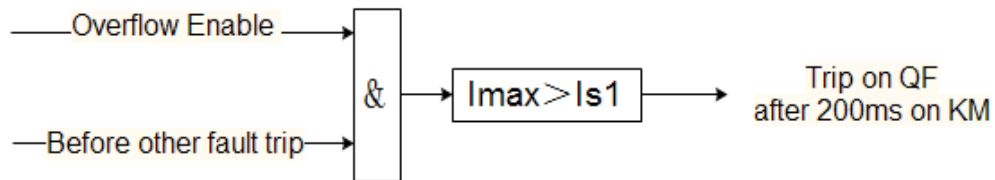
Ts1: Delay time of alarm action

Ts2: Delay time of trip action

6.20 Overflow protection

When the fault occurs, the current exceeds the breaking current of the contactor, and the contactor will be damaged if the contactor is forcibly disconnected. At this point, the breaker should be broken first, and then disconnect the contactor after the fault current is removed.

If the fault current of the protector is greater than the set overflow current before any other tripping fault action, the breaker should be first switched on, and then the contactor should be switched off after 200ms.



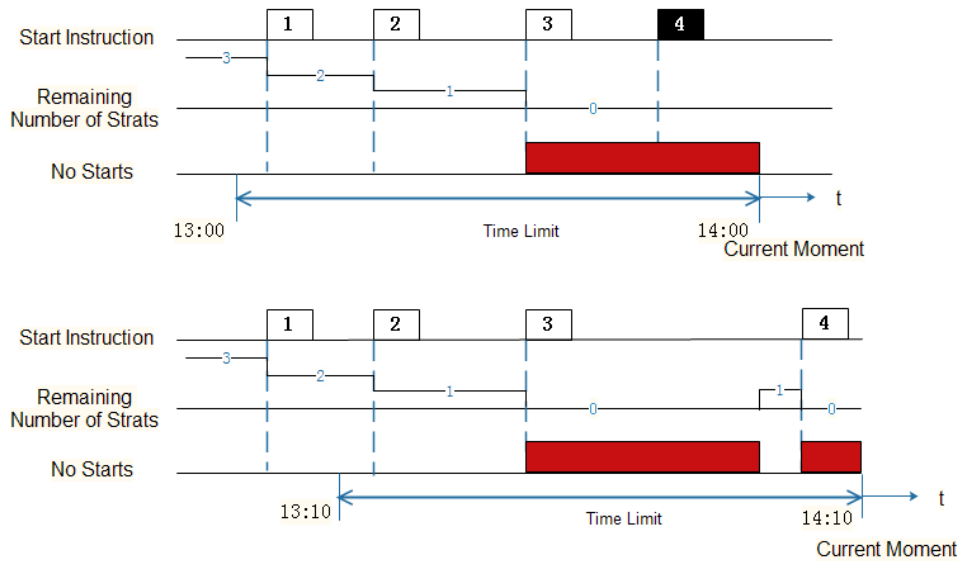
Note:

Imax: Maximum current

Is1: Overflow current

6.21 Number of starts protection

The motor is easy to be damaged due to frequent starting and cutting in a short time. When the remaining starting number of the motor is 0 within the set time, the protector sends an alarm signal. If the starting command is issued again at this time, the protector will release and allow to start again after the cooling time.



Example: Set the time limit of 1 hour to allow 3 starts.

Figure above: It has been started for 3 times between 13:00 and 14:00, and there is no number of starts at the fourth time, so the fourth time fails.

Figure below: Before the fourth start, the remaining number of starts is restored to 1, so the fourth start is successful.

6.22 Running time alarm

When the accumulated running time of the motor exceeds the set value, the protector will send an alarm signal to remind the staff to overhaul and maintain the motor.

6.23 Fault frequency alarm

When the cumulative number of protection trips exceeds the set value, the protector will send an alarm signal.

7 Function setting and description

7.1 Key of main module and LED indicator light are shown in Table 11:

Table 11

Serial No.	Name	State	Function Description
1	Stop indicator light	bright	The indicator light indicates that the motor is in a stopped state
2	Start indicator light	bright	The indicator light indicates that the motor is in a starting state
3	Run indicator light	bright	The indicator light indicates that the motor is in a running state
4	Alarm LED indicator light	bright	The light indicates an alarm
5	Trip LED indicator light	bright	The indicator light indicates fault trip

6	Reset button	press	Use in fault state and restore the fault
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7.2 The 90L display module button and LED indicator light are shown in Table 12:

Table 12

Serial No.	Name	State	Function Description
1	Start 1 button	press	Manual mode, two-part mode, two-speed mode, star triangle operation start 1 relay
2	Start 2 button	press	Operate and start the 2 relay in manual mode and two-speed mode
3	Stop button	press	Release starting relay
4	Reset button	press	Use in fault state and restore the fault
5	Cancel button	press	Exit menu;Cancel the operation
6	Left keys	press	Upside-down menu;Data is shifted when data is modified
7	Right key	press	Scroll down menu;Modify the data
8	Confirm button	press	Enter the Settings menu and write the modified data
9	Ready LED indicator	bright	The indicator light is always on to indicate that the motor is ready to start
10	Start 1 LED indicator	bright	When this indicator light is on,it indicate that the Start 1 relay output is closed
11	Start 2 LED indicator	bright	When this indicator light is on,it indicate that the Start 2 relay output is closed
12	Stop LED indicator light	bright	The indicator light is always on to indicate that the motor is stopped
13	Starting LED indicator light	bright	The indicator light is always on to indicate that the motor is in starting state
14	Running LED indicator light	bright	The indicator light is always on to indicate that the motor is in running state
15	Alarm LED indicator light	bright	The light indicates an alarm
16	Trip LED indicator light	bright	This indicator light indicates fault trip

7.3 90L display module introduction

7.3.1Data display interface

After the protector is powered on, it enters the data display interface. Press "◀" and "▶" to scroll through the current, voltage, DI/DO state and other information. The specific display content is shown in Figure 16 (the figure below shows the display value in the stopped state)

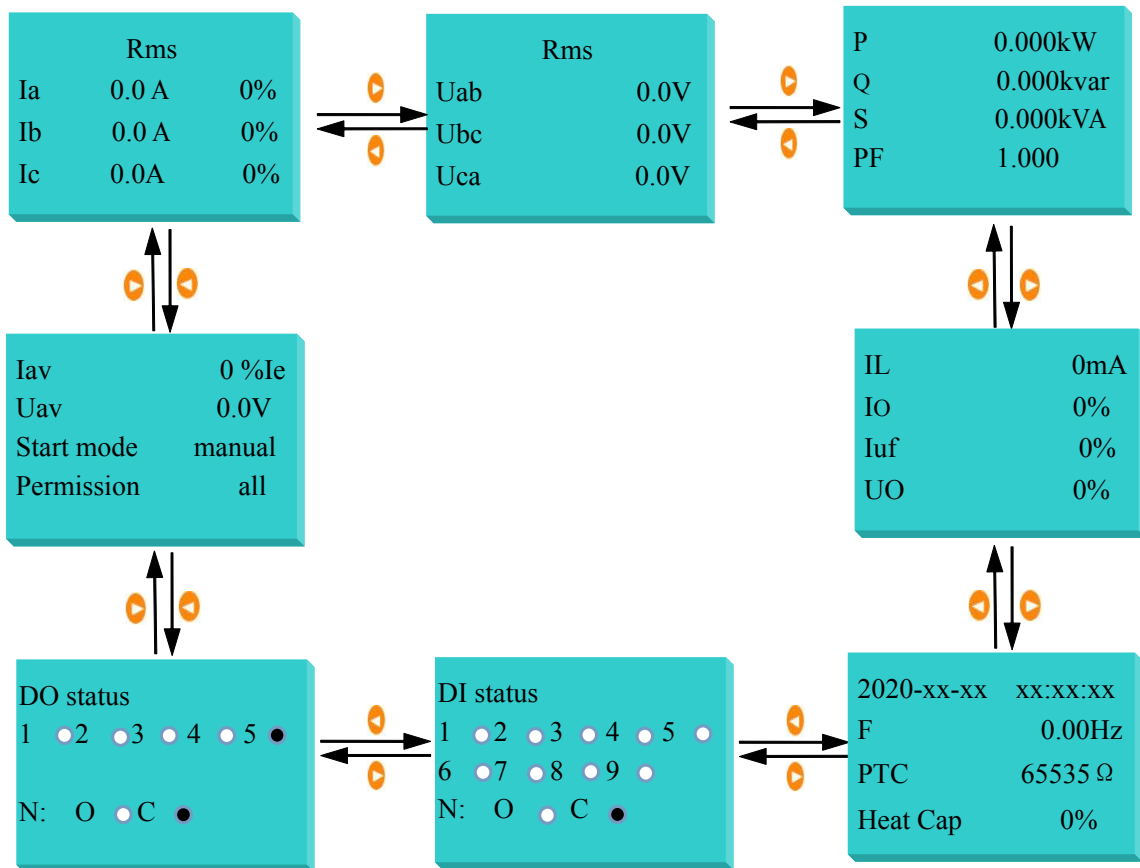
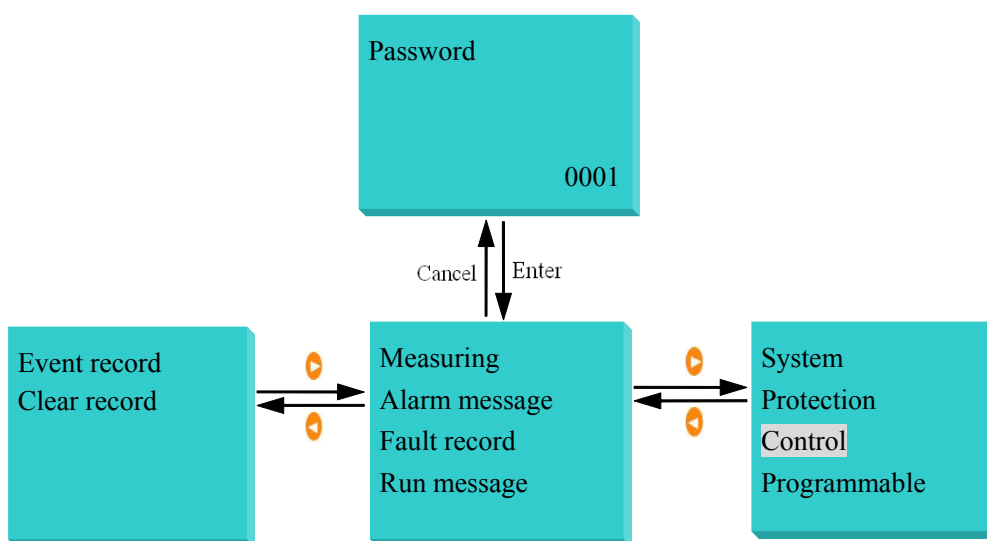


Fig.12 90L display unit data display interface

7.3.2 Parameter viewing and setting

When you need to view or set a parameter, first press "OK" to enter the password interface and enter the correct password (default 0001) before entering the main menu. Press the arrow key to move the cursor to the corresponding option, press the "OK" key to enter, and select the corresponding sub-menu for viewing or modification. Figure 13 shows an example of how to modify the control authority:



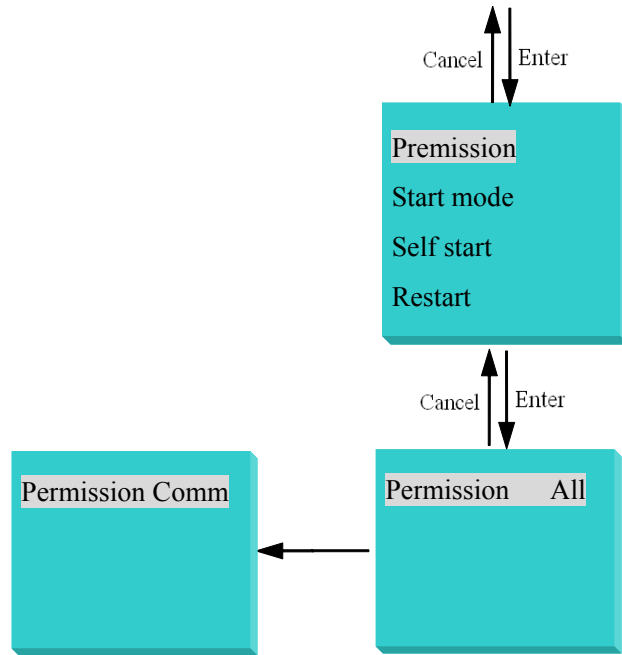


Fig.13 Shows the operation diagram of Ethernet communication parameters

7.4 Menu description

See Table 13 for the ARD2F menu:

Table 13

Serial No.	Main menu	Function	Type	Setting Range	Default value	Unit
1	Measured parameters	Fundamental wave current	—	—	—	A
		Effective current	—	—	—	A
		Fundamental wave voltage	—	—	—	V
		RMS voltage	—	—	—	V
		Voltage phase Angle	—	—	—	
		Other electrical parameters	—	—	—	
2	Alarm information	—	—	—	—	
3	Fault record	—	—	—	—	
4	Runing information	Running time of this time	—	—	—	h
		Stop time of this time	—	—	—	h
		Total running time	—	—	—	h

		Total stop time	—	—	—	h
		Start qty	—	—	—	
		Trip qty	—	—	—	
		Maximum start current	—	—	—	A
		Maximum running current	—	—	—	A
5	System parameters	Rated current	—	0.1~5000	1	A
				0.1~5000	5	
				6.3~25	25	
				25-100	100	
				63~250	250	
				250~800	800	
		Rated voltage	—	57-1200V	380	V
		Rated power	—	0.12-999kW	—	
		Rated frequency	—	45-70	50	Hz
		Motor type	—	Common motor, increased safety motor	Common motor,	
		High speed motor setting	Rated current	0.1~5000	1	
				0.1~5000	5	
				6.3~25	25	
				25-100	100	
				63~250	250	
				250~800	800	
			Rated power	0.12-999kW	—	
		Connection mode	—	1P2L、3P3L、3P4L	3P4L	
		CT ratio	—	1A spec.: 1-5000 5A spec.: 1-1000	1	
		Protection selection	—	Fundamental wave value, full wave value	Full wave value	
		Modbus RTU setting	ADD 1	1-247	1	
Baud rate1	1200、2400、4800、9600、19200、38400		9600	bps		
Check digit 1	None/2stop/Odd/Even		None			
ADD 2	1-247		2			
Baud rate2	2400、4800、9600、19200、38400		9600	bps		
Check digit 2	None/2stop/Odd/Even		None			
Transmitting	Type 1	a、Ib、Ic、Iav、Uab、	Iav			

		set		Ubc、Uca、Uav、PTC、 Heat capacity、P、F			
			Full value 1			2 times rated current	
			Type 2	a、Ib、Ic、Iav、Uab、 Ubc、Uca、Uav、PTC、 Heat capacity、P、F	Iav		
			Full value 2			2 times rated current	
		Language selection	—	Chinese, English	Chinese		
		backlight	—	1-30s, 0 is normally on	0		
		Liquid crystal contrast	—	0-100	50	%	
		password	—	0001-9999	0001		
		Time Setting	—	—	—		
		Main interface index	—	0-8	—		
		Software version	—	—	—		
		Factory reset	—	Yes, no	—		
6	Protection parameter s (low speed)	Fixed time overload	Alarm delay	0.1-600.0s	0.1s	s	
			Trip delay	0.1-600.0s	5.0s	s	
			Alarm threshold	100-800%	110%	%	
			Trip threshold	100-800%	120%	%	
			Action stage	Start: allowed/forbidden	Allow		
				Run: Allow/forbidden	Allow		
				Stop: Allowed/forbidden	forbidden		
			Return coefficient		5%		
			Alarm, trip allowed	Alarm: Allowed/forbidden	Allow		
				Trip: Allowed/forbidden	Allow		
		Inverse time overload	Trip level	1、2、3、5、10、15、 20、25、30、35、40	5	Class	
			tE Trip level	2、3、4、5、6、8、 10、12、15	2	Class	

			Start setting	100~800%	120	%	
			Reset method	Off/on	Off		
			Cooling time	0-30min	1min	min	
			Alarm threshold	1-99%	80%	%	
			Action stage	Start: allowed/forbidden	Allow		
				Run: allowed/forbidden	Allow		
				Stop:allowed/forbidde n	Forbidden		
			Starting screen time	0-25.0s	0.5s	s	
			Alarm, trip allowed	Alarm:allowed/forbid den	Allow		
				Trip:allowed/forbidde n	Allow		
			Underload protection	Alarm delay	0.1-600.0s	1.0s	s
				Trip delay	0.1-600.0s	5.0s	s
	Alarm threshold	10-99%		70%	%		
	Trip threshold	10-99%		50%	%		
	Action stage	Start: allowed/forbidden		allow			
		Run: allowed/forbidden		Forbidden			
		Stop: Allowed/forbidden		Forbidden			
	Return coefficient			5%			
	Alarm, trip allowed	Alarm:allowed/forbid den		Allow			
		Trip:allowed/forbidde n		Forbidden			
	phase loss protection	Alarm time delay		0.1-600.0s	0.1s	s	
		Trip delay		0.1-600.0s	1.0s	s	
		Action stage	Start: allowed/forbidden	Allow			
			Run: allowed/forbidden	Allow			
Stop: Allowed/forbidden			Forbidden				
Return coefficient			5%				

			Alarm, trip allowed	Alarm:allowed/forbidden	Allow	
				Trip:allowed/forbidden	Allow	
Current imbalance			Tripping delay	0.1~600	1.0	S
			Alarm	on/off	on	
			Tripping	on/off	on	
			Alarm threshold	10~80%	20	%
			Alarm threshold	10~80%	30	%
			Tripping delay	0.1~600	5.0	S
			Action stage	Start: allowed/forbidden	Forbidden	
				Run: allowed/forbidden	Allow	
				Stop: Allowed/forbidden	Forbidden	
			Alarm	on/off	On	
			Tripping	on/off	On	
Locked rotor Protection			Alarm delay	0.1-600.0s	0.1s	s
			Tripping delay	0.1-600.0s	5.0s	s
			AlarmThreshold	100-700%	500%	%
			Trip Threshold	100-700%	600%	%
			Action stage	Start: allowed/forbidden	Allow	
				Run: allowed/forbidden	Forbidden	
				Stop: Allowed/forbidden	Forbidden	
			Return coefficient		5%	
			Alarm, trip allowed	Alarm:allowed/forbidden	Allow	
				Trip:allowed/forbidden	Allow	
Ground fault protection			Alarm delay	0.1-600.0s	0.1s	s
			Tripping delay	0.1-600.0s	0.1s	s
			Alarm threshold	20-100%	20%	%
			Trip Threshold	20-100%	50%	%
			Action stage and tripping mode	Start: allowed/forbidden	Allow	
				Run:	Allow	

				allowed/forbidden			
				Stop: Allowed/forbidden	Forbidden		
				Trip mode: circuit breaker/contactor	circuit breaker		
			Return coefficient		5%		
			Starting screen time	0.0-600s	0.0	s	
			Alarm, Tripping allowed	Alarm:allowed/forbid den	Allow		
				Trip:allowed/forbidde n	Allow		
		Electric leakage protection	Alarm delay	0.1-600.0s	0.1s	s	
			Tripping delay	0.1-600.0s	0.5s	s	
			Alarm threshold	100-1000mA	200mA	mA	
			Trip Threshold	100-1000mA	300mA	mA	
			Action stage and tripping mode	Start: allowed/forbidden	Allow		
				Run: allowed/forbidden	Allow		
				Stop: allowed/forbidden	Forbidden		
				Trip mode: circuit breaker/contactor	circuit breaker		
				Return coefficient		5%	
				Starting screen time	0.0-600s	0.0	s
			Alarm, Tripping allowed	Alarm:allowed/forbid den	Allow		
				Trip: allowed/forbidden	Allow		
		Short circuit protection	Alarm delay	0.1-25.0s	0.1s	s	
			Tripping delay	0.1-25.0s	0.1s	s	
			Alarm threshold	100-800%	Start Alarm400 %	%	
					Run Alarm400 %		
			Trip Threshold	100-800%	Start trip 500%	%	

					Run trip 500%	
			Action stage	Start: allowed/forbidden	Allow	
				Run: allowed/forbidden	Allow	
				Stop: allowed/forbidden	Forbidden	
			Return coefficient		5%	
			Alarm, Tripping allowed	Alarm:allowed/forbid den	Allow	
				Trip: allowed/forbidden	Allow	
	Overflow protection	Protec threshold	100~700%	600	%	
		Alarm, trip allowed	Alarm:allowed/forbid den	Allow		
			Trip: allowed/forbidden	Allow		
	Blocking protection	Alarm delay	0.1-600.0s	0.1s	s	
		Tripping delay	0.1-600.0s	5.0s	s	
		Alarm threshold	100-700%	150%	%	
		Trip Threshold	100-700%	250%	%	
		Action stage	Start: allowed/forbidden	Forbidden		
			Run: allowed/forbidden	Allow		
			Stop: allowed/forbidden	Forbidden		
			Return coefficient		5%	
		Alarm, trip allowed	Alarm:allowed/forbid den	Allow		
			Trip: allowed/forbidden	Allow		
	Start timeout	action threshold	100%-200%	110%	%	
		Timeout time	0.1-600s	10.0s	s	
		Alarm, trip allowed	Alarm:allowed/forbid den	Allow		
			Trip: allowed/forbidden	Allow		
	Start times	Timeout	1-10	10	Time	

			quantity			s
			Time range	10-300min	30min	min
			Alarm, trip allowed	Alarm:allowed/forbid den	Allow	
				Trip: allowed/forbidden	Allow	
	overvoltage		Alarm delay	0.1-600.0s	0.1s	s
			Tripping delay	0.1-600.0s	5.0s	s
			Alarm threshold	110-150%	110%	%
			Trip Threshold	110-150%	120%	%
			Action stage	Start: allowed/forbidden	Allow	
				Run: allowed/forbidden	Allow	
				Stop: allowed/forbidden	Allow	
			Return coefficient		5%	
			Alarm, trip allowed	Alarm:allowed/forbid den	Allow	
				Stop: allowed/forbidden	Allow	
	Under voltage		Alarm delay	0.1-600.0s	0.1s	s
			Tripping delay	0.1-600.0s	5.0s	s
			Alarm threshold	50-90%	90%	%
			Trip Threshold	50-90%	80%	%
			Action stage	Start: allowed/forbidden	Allow	
				Run: allowed/forbidden	Allow	
				Stop: allowed/forbidden	Allow	
			Return coefficient		5%	
			Alarm, trip allowed	Alarm:allowed/forbid den	Forbidden	
				Stop: allowed/forbidden	Forbidden	
	Voltage imbalance		Alarm delay	0.1-600.0s	0.1s	s
			Tripping delay	0.1-600.0s	0.5s	s
			Alarm threshold	10-99%	15%	%
			Trip Threshold	10-99%	20%	%

			Action stage	Start: allowed/forbidden	Allow		
				Run: allowed/forbidden	Allow		
				Stop: allowed/forbidden	Allow		
			Return coefficient		5%		
			Alarm, trip allowed	Alarm:allowed/forbid den	Forbidden		
				Trip: allowed/forbidden	Forbidden		
			Phase sequence	Alarm delay	0.1-25.0s	0.1s	s
				Tripping delay	0.1-25.0s	1.0s	s
				Alarm threshold	0.5-5.0°	5.0°	°
		Trip Threshold		0.5-5.0°	9.9°	°	
		Action stage		Start: allowed/forbidden	Allow		
				Run: allowed/forbidden	Allow		
				Stop: allowed/forbidden	Allow		
		Return coefficient			0.5°		
		Alarm, trip allowed		Alarm:allowed/forbid den	Forbidden		
				Trip: allowed/forbidden	Forbidden		
		over power	Alarm delay	0.1-600.0s	0.1s	s	
			Tripping delay	0.1-600.0s	5.0s	s	
			Alarm threshold	100-700%	150%	%	
			Trip Threshold	100-700%	250%	%	
			Action stage	Start: allowed/forbidden	Allow		
Run: allowed/forbidden	Allow						
Stop: allowed/forbidden	Forbidden						
Return coefficient			5%				
Alarm, trip allowed	Alarm:allowed/forbid den		Forbidden				
	Trip: allowed/forbidden		Forbidden				

				allowed/forbidden		
		under-power	Alarm delay	0.1-600.0s	0.1s	s
			Tripping delay	0.1-600.0s	5.0s	s
			Alarm threshold	0-100%	80%	%
			Trip Threshold	0-100%	50%	%
			Action stage	Start: allowed/forbidden	Allow	
				Run: allowed/forbidden	Allow	
				Stop: allowed/forbidden	Forbidden	
			Return coefficient		5%	
			Alarm, trip allowed	Alarm:allowed/forbid den	Forbidden	
				Trip: allowed/forbidden	Forbidden	
		temperature protection	NTC/PTC	NTC/PTC	PTC	
			Alarm delay	0.1-600.0s	0.1s	s
			Tripping delay	0.1-600.0s	5.0s	s
			Alarm threshold	100-30000 Ω	1600 Ω	Ω
			Trip Threshold	100-30000 Ω	3600 Ω	Ω
			Action stage	Start: allowed/forbidden	Allow	
				Run: allowed/forbidden	Allow	
				Stop: allowed/forbidden	Forbidden	
			Reset method	Manual and automatic	automatic	
			Return resistanse value	100-30000 Ω	1500 Ω	
		Alarm, trip allowed	Alarm:allowed/forbid den	Forbidden		
			Trip: allowed/forbidden	Forbidden		
		external fault	Alarm delay	0.1-600.0s	0.1s	s
			Tripping delay	0.1-600.0s	5.0s	s
			Action stage	Start: allowed/forbidden	Allow	
				Run: allowed/forbidden	Allow	
				Stop:	Forbidden	

				allowed/forbidden			
			Alarm, trip allowed	Alarm:allowed/forbidden	Forbidden		
				Trip: allowed/forbidden	Forbidden		
		Insulation fault	Alarm time delay	0.1-600.0s	0.1s	s	
				Tripping delay	0.1-600.0s	5.0s	s
				Action stage	Start: allowed/forbidden	Forbidden	
					Run: allowed/forbidden	Forbidden	
					Stop: allowed/forbidden	Allow	
				Alarm, trip allowed	Alarm:allowed/forbidden	Forbidden	
					Trip: allowed/forbidden	Forbidden	
		Run timeout	Alarm threshold		10000h	h	
				Action stage	Start: allowed/forbidden	Allow	
					allowed/forbidde	Allow	
					Stop: allowed/forbidden	Forbidden	
			Alarm allowed	allowed/forbidden	Forbidden		
		Failure frequency	Alarm threshold	—	1000 times	times	
				Action stage	Start: allowed/forbidden	Allow	
					Run: allowed/forbidden	Allow	
					Stop: allowed/forbidden	Allow	
				Alarm allowed	allowed/forbidden	Forbidden	
		Overpower protection	Alarm threshold	100~700%	150	%	
				Trip Threshold	100~700%	250	%
				Tripping delay	0.1-600	5.0	S
				Alarm	on/off	Off	
				Tripping	on/off	Off	
		Underpower protection	Alarm threshold	0~100%	80	%	
				Trip Threshold	0~100%	50	%
				Tripping delay	0.1-600	5.0	S

			Alarm	on/off	Off			
			Tripping	on/off	Off			
		Temperature protection	PTC type	PTC type	on/off	On		
				Return resistance value	0 (Shut down) 、 100-30000	0	Ω	
			Alarm resistance value	100~30000	1600	Ω		
			Tripping resistance value	100~30000	3600	Ω		
			Tripping delay	0.1~600	5.0	S		
			Alarm	on/off	On			
			Tripping	on/off	On			
		External fault	Tripping delay	0.1~600	5.0	S		
			Alarm	on/off	Off			
			Tripping	on/off	Off			
		Protect the parameters (high speed)	Refer to the low speed protection setting sheet					
		7	Control parameters	Control access	Control access	Display unit, in - place, communication, remote, three choice one, two choice one, full control	All control	
						Start method	Start mode	Protection mode, manual mode, two-step mode, two-speed mode, star triangle, auto-step-down
start1delay	0.1-600			3.0	S			
Self start	Self start mode			recover/start	start			
	Self start delay			0.1~600	5.0	S		
	Self start control			on/off	Off			
Voltage loss restart	Recovery voltage			70-95%	80	%		
	Voltage drop			50-90%	50	%		
	Sway electric time			0.5-300.0	5.0	S		

8	Programmable Settings		Restart delay	1.0-60.0s	30.0	S
			Immediate restart time	0.1-10.0s	0.5	S
			Restart function	on/off	Off	
		DI setting	DI1 type	Normally on/normally off	Normally on	
			DI1	1-Ordinary DI, 2-starting 1(in situ), 3-starting 1(remote), 4-starting 2(in situ), 5-starting 2(remote), 6-parking (in situ), 7-parking (remote), 8-reset, 9-emergency stop, 10-external fault, 11-single point 1 (in situ) start-stop, 12-single point 1 (remote) start-stop, 13-single point 2 (in situ) start-stop, 14-single point 2 (remote) start-stop, 15-single point 1 start/stop, 16-single point 2 start/stop, 17-control over 1, 18-control over 2	Stop	
			DI2	Ditto	Start 1	
			DI3	Ditto	Start2	
			DI4	Ditto	Urgent Stop	
			DI5	Ditto	Reset	
			DI6	Ditto	control right 1	
			DI7	Ditto	control right 2	
			DI8	Ditto	External fault	
			DI9	Ditto	Ordinary DI	
			DO1 type	Normally on/normally off	Normally on	

		DO setting	DO1 Definition	0-No input, 1-star 1, 2-start 2,3-start3, 4-parking,5-starting jumped contactor,6-circuit breakers,7-fault Alarm output,8-tripping fault output,9-the output state stopped,10-the starting state output,11-the output operation state,12-the communication control output,13-the output device self-checking,14-the device output power,15-nowhere electric process output chain,16-electric reset signal output,17-protected mode have nowhere electricity output 1,18-protected mode electricity output 2,19-logic diagram output 1,20-logic diagram output 2, 21-logic diagram output 3, 22-30 corresponding DI1-9 control the DO output	start1	
			Pulse time	0.3-25.0s	0.0s	s
			DO2	Ditto	start2	
			DO3	Ditto	alarm	
			DO4	Ditto	trip	
			DO5	Ditto	trip	

			DO6	Ditto	trip		
Logic diagram setting	inputA	Input A definition	Close;DI1-19;DO1 - DO6;Starting 1;Starting 2;Starting 3;Stop;Emergency shutdown;Stop state;Starting state;Running state;Alarm status;Trip status;Trip type (choose one of 22 fault types);Alarm types (choose one of 24 Alarm types))	DI1			
		Input A logic	Positive logic/Reserve logic	Positive logic			
		Input A delay	0.0-60.0s	0.0s			
		inputB	Input B definition	Ditto	Off		
			Input B logic	Positive logic/Reserve logic	Positive logic		
			Input B delay	0.0-60.0s	0.0s		
		inputC	Input C definition	Ditto	Off		
			Input C logic	Positive logic/Reserve logic	Positive logic		
			Input C delay	0.0-60.0s	0.0s		
	inputD	Input D definition	Ditto	Off			
		Input D logic	Positive logic/Reserve logic	Positive logic			
		Input D delay	0.0-60.0s	0.0s			
	inputE	Input E definition	Ditto	Off			
		Input E logic	Positive logic/Reserve logic	Positive logic			
		Input E delay	0.0-60.0s	0.0s			

			Logic diagram 1	Off, A、A*B、A+B、 A*B*C、(A+B)*C、 (A*B)+C、A+B+C、 A*B*C*D、 (A+B)*C*D、 (A*B+C)*D、 (A+B+C)*D、 A*B*C+D、 (A+B)*C+D、 A*B+C+D、 A+B+C+D、 A*B*C*D+E、 (A+B)*C*D+E、 (A*B+C)*D+E、 (A+B+C)*D+E、 (A*B*C+D)*E、 ((A+B)*C+D)*E、 (A*B+C+D)*E、 (A+B+C+D)*E、 A*B*C*D+E、 (A+B)*C*D+E、 (A*B+C)*D+E、 (A+B+C)*D+E、 A*B*C+D+E、 (A+B)*C+D+E、 A*B+C+D+E、 A+B+C+D+E	A	
			Logic diagram 2	Ditto	A	
			Logic diagram 3	Ditto	A	
		Test	DO1	Off/on	Off	
			DO2	Off/on	Off	
			DO3	Off/on	Off	
			DO4	Off/on	Off	
			DO5	Off/on	Off	
			DO6	Off/on	Off	
9	Event log	DI displace records	—	—	—	
		Start recording	—	—	—	
		Restart record	—	—	—	
		Restart record	—	—	—	
10	Clear record	Clear record password	—	0000-9999	0001	

8 Communication Settings and instructions

8.1 Modbus RTU Communication Protocol Overview

Electrical interface: RS485 half duplex

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

Address: Consists of one byte (8-bit binary), 0 to 255 in decimal, only 1 to 247 in the system, the rest reserved

Error detection: CRC

Data format:	Address code	Function code	Data area	CRC check
Data length:	1 byte	1 byte	N byte	2 byte

Each byte bit: 1 bit start, 8 bit data (least significant bit sent first), no parity, 1 bit stop

MODBUS function code supported by ARD2F:

01 (0x01) Function code: Read coil state (relay output DO, address 0 corresponds to DO1)

02 (0x02) Function code: Read switch input state (DI, address 0 corresponds to DI1)

03/04 (0x03, 0x04) Function code: read hold register

05 (0x05) Function code: write coil state (control relay output DO, address 0 corresponds to DO1)

06 (0x06) Function code: Write a single register

16 (0x10) function code: Write multiple registers

Note: The operation control bit and output control bit are written in 16 function codes.

Communications applications

The examples in this section use the following tabular format (in hexadecimal data) whenever 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
Add	Function code	Data starting address		Data read qty		Cyclic redundancy check code	

Read the data

Example 1: Read register using the 01 function: read the OUTPUT status of DO1-DO5 relay of the 01 ARD2F protector

Check data frame	01 02 00 00 00 05 B8 09
Return data frame	01 02 01 10 A0 44

Example 2: Register read using the 02 function: read the di1-DI5 switch input status of the 01 ARD2F protector

Check data frame	01 01 00 00 00 05 FC 09
Return data frame	01 01 01 0C 51 8D

Example 3: Register read using the 03 or 04 function: read 01 ARD2F and read 3 data from address 00

Check data frame	01 03 00 00 00 03 11 5D
Return data frame	01 03 06 00 00 00 00 00 0E D1

Write the data

Example 4: Use the 05 function to write registers

Close DO1 relay no. 01 ARD2F:

Check data frame	01 05 00 00 FF 00 8C 3A
Return data frame	01 05 00 00 FF 00 8C 3A

Disconnect DO1 relay of No. 01 ARD2F:

Check data frame	01 05 00 00 00 00 CD CA
Return data frame	01 05 00 00 00 00 CD CA

Example 5: Write register using 06 function: output DO2 of 01 ARD3M. The indicating register address of switch input/output state is 0013H, bit 0-9 corresponds to Di1-10, bit 10 corresponds to DO6, and bit 11-15 corresponds to DO1-5.

Check data frame	01 06 00 13 10 00 75 CF
Return data frame	01 06 00 13 10 00 75 CF

Example 6: Write register with 16 function: output DO2 of 01 ARD2F. The indicating register address of switch input/output state is 0013H, bit 0-9 corresponds to Di1-10, bit 10 corresponds to DO6, and bit 11-15 corresponds to DO1-5.

Check data frame	01 10 00 13 00 01 02 10 00 A9 33
Return data frame	01 10 00 13 00 01 F0 0C

The detailed MODBUS address of ARD2F is shown in table 16 and 17 : (table 12 is the original ARD3 address, which is used for compatibility with the original ARD3 product)

Table 14

Classification	Addr.	Addr.	Parameter	Read write attribute	Value range	Type
Addr.	0	0x00	L1 Phase current (full wave/fundamental wave)	R	0-65535 When the fundamental switch is on, the fundamental value/current	word
				R		word
	1	0x01	L2 Phase current (full wave/fundamental wave)	R		word
				R		word

2	0x02	L3 Phase current (full wave/fundamental wave)	R	scaling factor is the actual value	word
			R		word
3	0x03	leakage current	R	0-3000mA	word
		Ground current percent	R	0-100%	
4	0x04	Uab Line voltage (full wave/fundamental wave)	R	0~1999.9	word
5	0x05	Ubc Line voltage (full wave/fundamental wave)	R	0~1999.9	word
6	0x06	Uca Line voltage (full wave/fundamental wave)	R	0~1999.9	word
7	0x07	Apparent power (full wave/fundamental wave)	R	32 bit signed number, High characters before, low characters after	高字
8	0x08		R		低字
9	0x09	Active power (full wave/fundamental wave)	R	The fundamental value is when the fundamental switch is turned on	高字
10	0x0A		R		低字
11	0x0B	Active electric energy (full wave/fundamental wave)	R	32 bit unsigned number, High characters before, low characters after The fundamental value is when the fundamental switch is turned on	高字
12	0x0C		R		低字
13	0x0D	Power factor (full wave/fundamental wave)	R	-1.000-1.000 Unit 0.001	word
14	0x0E	Current imbalance Degree	R	0-100%	word
15	0x0F	Cumulative heat capacity Percentage	R	0-100%	word
16	0x10	Temperature value	R	0-65535 Ω	word
17	0x11	motor this run time	R	0-65535 hour	word
18	0x12	motor this stop time	R	0-65535 hour	word
19	0x13	Switching input/output	R/W	Bit0-bit9 corresponds to switch volume input Di1-DI10, Bit10 corresponds to DO6, and BIT11-15 corresponds to DO1-DO5	word

	20	0x14	Trip fault indication 1	R	Bit0 reverse time overload trip Bit1 ground trip Bit2 underload trip Bit3 phase break trip Bit4 underpressure trip Bit5 overpressure trip Bit6 blocking trip Bit7 blocking trip Bit8 unbalanced trip Bit9PTC temperature trip Bit10 external fault trip Bit11 start timeout trip Bit12 overpower trip Bit13 underpower trip Bit14 phase sequence trip Bit15 short circuit trip	word	
	21	0x15	Trip fault indication 2	R	Bit0 constant time overload trip Bit1 voltage imbalance trip Bit2 overflow trip Bit3 insulation monitoring trip Bit4 trip number of starts Bit7 leakage current trip	word	
	22	0x16	Trouble indication 1	warning	R	Bit0 reverse time overload alarm Bit1 ground alarm Bit2 underload alarm Bit3 phase break alarm Bit4 undervoltage alarm Bit5 overpressure alarm Bit6 block turn alarm Bit7 blocking alarm Bit8 current imbalance alarm Bit9PTC temperature alarm Bit10 external fault alarm Bit11 start timeout alarm Bit12 overpower alarm Bit13 low power alarm Bit14 phase sequence alarm Bit15 short circuit alarm	word
	23	0x17	Trouble	warning	R	Bit0 fixed time overload	word

		indication 2		alarm Bit1 voltage imbalance alarm Bit2 overflow alarm Bit3 insulation monitoring alarm Start times of Bit4 alarm Bit5 running time alarm Bit6 failure times alarm Bit7 leakage current alarm	
24	0x18	Current specification	R	0-1.6、1-6.3、2-25、3-100、4-250、5-800、6-1、7-5	word
		Current scaling factor	R	1、10、100	
25	0x19	A Phase overload percentage	R	0-999%	word
26	0x1A	B Phase overload percentage	R	0-999%	word
27	0x1B	C Phase overload percentage	R	0-999%	word
28	0x1C	Overload percentage	R	0-999%	word
29	0x1D	Frequency	R	15.00-75.00	word
30	0x1E	Motor State	R	Motor thermal overload cooling remaining time	word
			R	Bit0 ready;Bit1 stop Bit2 start; Bit3 to run;Bit4 alarm;Bit5 tripping	
31-40	0x1F-0x28	Reserve	R		word
41	0x29	Operation control bit	R/W	1 stop, 2 start 1, 3 start 2	word
42	0x2A	Reserve	R		word
43	0x2B	factory data reset	R/W	0xFFFF	word
44	0x2C	Total running time	R/W	0-65535 Hour	word
45	0x2D	Total stop time	R/W	0-65535 Hour	word
46	0x2E	Total number of starts	R/W	0-65535	word
47	0x2F	Total tripping times	R/W	0-65535	word
48	0x30	Year	R/W	2020-2099	word

49	0x31	Month	R/W	1-12	word
50	0x32	Day	R/W	1-31	
51	0x33	Hour	R/W	0-23	word
52	0x34	Min	R/W	0-59	word
53	0x35	Second	R/W	0-59	word
54-93	0x36-0x5D	Reserve	R		word
94	0x5E	Variable feed type setting	R	0-Ia、1-Ib、2-Ic、3-Iav、4-Uab、5-Ubc、6-Uca、7-Uav、8-PTC、9-Heat capacity、10-P、11-F	word
95	0x5F	Mark the input of the residual current transformer	R/W	0 no input 1 input	word
96	0x60	Fundamental wave switch	R/W	1:Fundamental wave;0:RMS	word
97	0x61	Motor type	R/W	0:Ordinary motor;1:Increased safety motor	word
98	0x62	CT ratio	R/W	1A: 1-5000 5A: 1-1000 Other specifications are not available	word
99	0x63	Rated frequency	R/W	45-70	word
100	0x64	Motor rated current	R/W	1A: 0.1-5000.0A 5A:0.5-5000.0A 1.6A:0.4-1.6A 6.3A:1.6-6.3A 25A:6.3-25.0A 100A:25.0-100.0A 250A:63.0-250.0A 800A:250.0-800.0A	word
101	0x65	Motor rated voltage	R/W	57-1200V	word
102	0x66	Motor rated power	R/W	High bit (Unit: W)	word
103	0x67		R/W	Low bit (Unit: W)	word
104	0x68	Starting time setting	R/W	0.1-600.0	word
105	0x69	Wiring mode	R	0:1P;1:3P4L;2:3P3L	word
106	0x6A	Trip level	R/W	1、2、3、5、10、15、20、25、30、35、40	word
		TE trip time setting	R/W	2、3、4、5、6、8、10、12、15	word
107	0x6B	Overload automatic reset	R/W	1:ON 0:Off	High byte
		Overload cooling time		1-255min	Low byte
108	0x6C	reserve	R/W		word

	109	0x6D	Trip Breakdown fault indication 1	R/W	Bit0 reverse time limit overload tripping; Bit1 grounding tripping; Bit2 underload tripping Bit3 disconnection; Bit4 underpressure release; Bit5 overpressure release; Bit6 blocking and tripping; Bit7 blocking tripping; Bit8 current imbalance tripping; Bit9 PTC temperature tripping; Bit10 external failure tripping; Bit11 start timeout release; Bit12 power tripping; Bit13 underpower tripping; Bit14 phase sequence tripping; Bit15 short circuit tripping. (0- No tripping, (1)	word
	110	0x6E	Trip Breakdown fault indication 2	R/W	Bit0 fixed time limit overload tripping; Bit1 voltage unbalanced tripping; Bit2 overflow protection tripping; Bit3 starting times tripping.	word
	111	0x6F	reserve	R/W		word
	112	0x70	Alarm fault indication 1	R/W	Bit0 anti-time overload alarm; Bit1 ground alarm; Bit2 underload alarm; Bit3 fault phase alarm; Bit4 undervoltage alarm; Bit5 overvoltage alarm; Bit6 blocking alarm; Bit7 blocking alarm; Bit8 current imbalance alarm; Bit9 PTC temperature alarm; Bit10 external fault alarm;	word

					Bit11 start timeout alarm; Bit12 power alarm; Bit13 underpower alarm; Bit14 phase sequence alarm; Bit15 short circuit alarm. (0- No alarm, 1- Alarm)	
113	0x71	Alarm fault indication 2	R/W	Bit0 fixed time limit overload alarm; Bit1 voltage imbalance alarm; Bit2 overflow protection alarm; Bit3 starting times alarm; Bit4 running time alarm; Bit5 fault times alarm	word	
114	0x72	reserve	R/W		word	
115	0x73	Overload alarm threshold	R/W	1~99%	word	
116	0x74	Phase loss trip delay	R/W	0.1~600	word	
117	0x75	Leakage alarm threshold	R/W	100~1000mA	word	
118	0x76	Leakage trip threshold	R/W	100~1000mA	word	
119	0x77	Leakage trip delay	R/W	0.1~600	word	
120	0x78	Locked-rotor alarm threshold	R/W	100~700%	word	
121	0x79	Locked-rotor trip threshold	R/W	100~700%	word	
122	0x7A	Locked-rotor trip delay	R/W	0.1~600	word	
123	0x7B	Blocking alarm threshold	R/W	100~700%	word	
124	0x7C	Blocking trip threshold	R/W	100~700%	word	
125	0x7D	Blocking trip delay	R/W	0.1~600	word	
126	0x7E	Underload alarm threshold	R/W	10~99%	word	
127	0x7F	Underload trip threshold	R/W	10~99%	word	
128	0x80	Underload trip delay	R/W	0.1~600	word	
129	0x81	Current unbalance alarm threshold	R/W	10~80%	word	
130	0x82	Current unbalance trip threshold	R/W	10~80%	word	
131	0x83	Current unbalance trip delay	R/W	0.1~600	word	
132	0x84	NTC /PTC setting	R/W	0 NTC; 1PTC	word	
133	0x85	Temperature alarm threshold	R/W	100~30000	word	
134	0x86	Temperature trip threshold	R/W	100~30000	word	

135	0x87	Temperature trip delay	R/W	0.1~600	word
136	0x88	Temperature return resistance	R/W	0Off,100~30000	word
137	0x89	Under voltage alarm threshold	R/W	50~90%	word
138	0x8A	Under voltage trip threshold	R/W	50~90%	word
139	0x8B	Under voltage trip delay	R/W	0.1~600	word
140	0x8C	Over voltage alarm threshold	R/W	110~150%	word
141	0x8D	Over voltage trip threshold	R/W	110~150%	word
142	0x8E	Over voltage trip delay	R/W	0.1~600	word
143	0x8F	Over power alarm threshold	R/W	100~700%	word
144	0x90	Over power trip threshold	R/W	100~700%	word
145	0x91	Over power trip delay	R/W	0.1-600	word
146	0x92	Under power alarm threshold	R/W	0~100%	word
147	0x93	Under power trip threshold	R/W	0~100%	word
148	0x94	Under power trip delay	R/W	0.1-600	word
149	0x95	Short-circuit alarm threshold when starting	R/W	400%-800% rated current	word
150	0x96	Short-circuit trip threshold when starting	R/W	400%-800% rated current	word
151	0x97	Short-circuit trip delay	R/W	0.1-600	word
152	0x98	Phase sequence trip delay	R/W	0.1-600	word
153	0x99	External fault trip delay	R/W	0.1-600	word
154	0x9A	Ground fault alarm percentage	R/W	10~100%	word
155	0x9B	Ground fault trip percentage	R/W	10~100%	word
156	0x9C	Ground fault trip delay	R/W	0.1~600	word
157-160	0x9D-0xA0	reserve	R/W		word
161	0xA1	Self-start mode	R/W	0 start;1 restore	word
162	0xA2	Self-start delay	R/W	0.1-60.0s	word
163	0xA3	Self-start control	R/W	0:Off、1:ON	word
164	0xA4	Restart voltage setting	R/W	75-95%	word
165	0xA5	Immediate restart time	R/W	0.1-10.0	word
166	0xA6	Sway electric time	R/W	0.5-300.0	word
167	0xA7	Restart delay	R/W	1.0-60.0s	word
168	0xA8	Restart function	R/W	0=OFF、1=Restart on start1, 2= Restart on start2	word
169	0xA9	First channel communication parity	R/W	0-No check, 1-2stop bit, 3-Odd, 4-Even	word

		bits			
170	0xAA	First channel communication baud rate	R/W	0-38400,1-19200,2-9600,3-4800,4-2400,5-1200	word
171	0xAB	First channel communication address	R/W	1-247	word
172	0xAC	reserve	R/W		word
173	0xAD	First channel communication parity bits	R/W	0-No check, 1-2stop bit, 3-Odd, 4-Even	word
174	0xAE	First channel communication baud rate	R/W	0-38400,1-19200,2-9600,3-4800,4-2400,5-1200, 6-Profibus	word
175	0xAF	First channel communication address	R/W	1-247	word
176-177	0XB0-0xB1	reserve	R/W		word
178	0xB2	Start mode	R/W	0-Protection mode, 1-manual mode, 2-two-step mode, 3-two-speed mode, 4-star-triangle mode, 5-auto-step-down	word
179	0xB3	Control access	R/W	0-panel ; 1-in place ; 2-communication ; 3-remote ; 4-three choice one;5-two choice one;6-all control	word
180	0xB4	Start 1 delay	R/W	0.1-60.0s	word
181-189	0xB5-0xBD	reserve	R/W		word
190	0xBE	DO type	R/W	0:Open 1:Closed, bit0-4: relay output1-5	word
191	0xBF	DO1 action setting	R/W	0-Level; (3-250) -pulse time, unit:0.1S	word
192	0xC0	DO2 action setting	R/W	0-Level; (3-250) -pulse time, unit:0.1S	word
193	0xC1	DO3 action setting	R/W	0-Level; (3-250) -pulse time, unit:0.1S	word
194	0xC2	DO4 action setting	R/W	0-Level; (3-250) -pulse time, unit:0.1S	word
195	0xC3	DO5 action setting	R/W	0-Level; (3-250) -pulse time, unit:0.1S	word
196	0xC4	DO2 programmable setting	R/W	Alarm: correspond to alarm allowed bit 1	word
197	0xC5		R/W	Trip: correspond to trip allowed bit 1	word
198	0xC6		R/W	0-No input, 1-star 1, 2-start 2,3-start3, 4-parking,5-starting jumped contactor,6-circuit breakers,7-fault Alarm output,8-tripping fault	word

					output,9-the output state stopped,10-the starting state output,11-the output operation state,12-the communication control output,13-the output device self-checking,14-the device output power,15-nowhere electric process output chain,16-electric reset signal output,17-protected mode have nowhere electricity output 1,18-protected mode electricity output 2,19-logic diagram output 1,20-logic diagram output 2, 21-logic diagram output 3, 22-30 corresponding DI1-9 control the DO output	
199	0xC7			R/W	Alarm: correspond to alarm allowed bit 1	word
200	0xC8			R/W	Trip: correspond to trip allowed bit 1	word
201	0xC9		DO2 programmable setting	R/W	0-No input, 1-star 1, 2-start 2,3-start3, 4-parking,5-starting jumped contactor,6-circuit breakers,7-fault Alarm output,8-tripping fault output,9-the output state stopped,10-the starting state output,11-the output operation state,12-the communication control output,13-the output device self-checking,14-the device output power,15-nowhere electric process output chain,16-electric reset signal output,17-protected mode have nowhere electricity output 1,18-protected mode electricity output 2,19-logic diagram output 1,20-logic diagram output 2, 21-logic diagram output 3, 22-30 corresponding DI1-9 control the DO output	word
202	0xCA			R/W	Alarm: correspond to alarm allowed bit 1	word
203	0xCB		DO3 programmable setting	R/W	Trip: correspond to trip allowed bit 1	word
204	0xCC			R/W	0-No input, 1-star 1, 2-start 2,3-start3,	word

					4-parking,5-starting jumped contactor,6-circuit breakers,7-fault Alarm output,8-tripping fault output,9-the output state stopped,10-the starting state output,11-the output operation state,12-the communication control output,13-the output device self-checking,14-the device output power,15-nowhere electric process output chain,16-electric reset signal output,17-protected mode have nowhere electricity output 1,18-protected mode electricity output 2,19-logic diagram output 1,20-logic diagram output 2, 21-logic diagram output 3, 22-30 corresponding DI1-9 control the DO output	
205	0xCD	DI1 programmable setting	R/W	1-Ordinary DI, 2-starting 1(in situ), 3-starting 1(remote), 4-starting 2(in situ), 5-starting 2(remote), 6-parking (in situ), 7-parking (remote), 8-reset, 9-emergency stop, 10-external fault, 11-single point 1 (in situ) start-stop, 12-single point 1 (remote) start-stop, 13-single point 2 (in situ) start-stop, 14-single point 2 (remote) start-stop, 15-single point 1 start/stop, 16-single point 2 start/stop, 17-control permission 1, 18-control permission 2	word	
206	0xCE	DI2 programmable setting	R/W	ditto	word	
207	0xCF	DI3 programmable setting	R/W	ditto	word	
208	0xD0	DI4 programmable setting	R/W	ditto	word	
209	0xD1	DI5 programmable setting	R/W	ditto	word	
210	0xD2	DI6 programmable setting	R/W	ditto	word	
211	0xD3	DI7 programmable setting	R/W	ditto	word	

	212	0xD4	DI8 programmable setting	R/W	ditto	word
	213	0xD5	DI9 programmable setting	R/W	ditto	word
	214-399	0xD6-0x18F	reserve	R/W		word

Table 15

	Address	Address	Parameter	Read write attr.	Value range	Type
Measure parameters	400	07D0	A Phase effective value current percentage	R	0-1200%	word
	401	07D1	B Phase effective value current percentage	R		word
	402	07D2	C Phase effective value current percentage	R		word
	403	07D3	Average effective value current percentage	R		word
	404	07D4	Maximum RMS current Percentage	R		word
	405	07D5	A Phase fundamental current percentage	R		word
	406	07D6	B Phase fundamental current percentage	R		word
	407	07D7	C Phase fundamental current percentage	R		word
	408	07D8	Average fundamental current percentage	R		word
	409	07D9	Maximum fundamental current percentage	R		word
	410	07DA	Ground current percent	R		word
	411	07DB	positive sequence current percentage	R		word
	412	07DC	Negative sequence current percentage	R	word	
	413	07DD	A Phase fundamental current	R	0-65535/Current scaling factor is the actual value	word
	414	07DE	B Phase fundamental current	R		word
	415	07DF	C Phase fundamental current	R		word
416	07E0	Uab Fundamental line voltage	R	0~1999.9V	word	

417	07E1	Ubc Fundamental line voltage	R	0~1999.9V	word
418	07E2	Uca Fundamental line voltage	R	0~1999.9V	
419	07E3	leakage current	R	30-3000mA	
420	07E4	A Phase effective current	R	0-65535/current scaling factor is the actual value	word
421	07E5	B Phase effective current	R		word
422	07E6	C Phase effective current	R		word
423	07E7	Uab RMS line voltage	R	0~1999.9V	word
424	07E8	Ubc RMS line voltage	R	0~1999.9V	word
425	07E9	Uca RMS line voltage	R	0~1999.9V	word
426	07EA	frequency	R	45.00-70.00Hz	word
427	07EB	Degree of current imbalance	R	0-100%	
428	07EC	Percentage of cumulative heat capacity	R	0-100%	word
429	07ED	Temperature resistance	R	0-65535 Ω	word
430	07EE	Zero sequence voltage percent	R	0-999%	High byte word
431	07EF	Percentage of positive sequence voltage	R	0-999%	Low byte word
432	07F0	Percentage of Negative sequence voltage	R	0-999%	signed short int
433	07F1	Voltage imbalance	R	0-999%	
434	07F2	AB Phase voltage phase Angle difference	R	0-359.9°	word
435	07F3	BC Phase voltage phase Angle difference	R	0-359.9°	word
436	07F4	CA Phase voltage phase Angle difference	R	0-359.9°	word
437-439	07F5-07F8	Reserved	R		
440	07FC	fundamental wave Total active power	R	32 bit signed number, High byte before, low byte after	high byte word
441	07FD		R	Unit: W	Low

						byte word
442	07FE	fundamental wave Total reactive power	R	32 bit signed number, High byte before, low byte after Unit: var	high byte word	
443	07FF		R		Low byte word	
444	0800	fundamental wave Total apparent power	R	32 bit unsigned number, High byte before, low byte after Unit: VA	high byte word	
445	0801		R		Low byte word	
446	0802	Fundamental wave total active energy	R	32 bit unsigned number, High byte before, low byte after Unit: Wh	high byte word	
447	0803		R		Low byte word	
448	0804	Fundamental wave total reactive energy	R	32 bit unsigned number, High byte before, low byte after Unit: varh	high byte word	
449	0805		R		Low byte word	
450	0806	fundamental wave A phase active	R	32 bit signed number, High byte before, low byte after Unit: W	high byte word	
451	0807		R		Low byte word	
452	0808	fundamental wave B phase active	R	32 bit signed number, High byte before, low byte after Unit: W	high byte word	
453	0809		R		Low byte word	
454	080A	fundamental wave C phase active	R	32 bit signed number, High byte before, low byte after Unit: W	high byte word	
455	080B		R		Low byte word	

456	080C	Fundamental wave A phase reactive	R	32 bit signed number, High byte before, low byte after Unit: var	high byte word
457	080D		R		Low byte word
458	080E	Fundamental wave B phase reactive	R	32 bit signed number, High byte before, low byte after Unit: var	high byte word
459	080F		R		Low byte word
460	0810	Fundamental wave C phase reactive	R	32 bit signed number, High byte before, low byte after Unit: var	high byte word
461	0811		R		Low byte word
462	0812	fundamental wave A phase apparent	R	32 bit unsigned number, High byte before, low byte after Unit: VA	high byte word
463	0813		R		Low byte word
464	0814	fundamental wave B phase apparent	R	32 bit unsigned number, High byte before, low byte after Unit: VA	high byte word
465	0815		R		Low byte word
466	0816	fundamental wave C phase apparent	R	32 bit unsigned number, High byte before, low byte after Unit: VA	high byte word
467	0817		R		Low byte word
468	0818	Total fundamental wave active power	R	32 bit signed number, High byte before, low byte after Unit: W	high byte word
469	0819		R		Low byte word
470	081A	Total fundamental wave	R	32 bit signed number, High byte before, low byte	high byte

		reactive power		after	word
471	081B		R	Unit: VA	Low byte word
472	081C	Total fundamental wave apparent power	R	32 bit signed number, High byte before, low byte after	high byte word
473	081D		R	Unit: VA	Low byte word
474	081E	Fundamental wave total active energy	R	32 bit unsigned number, High byte before, low byte after	high byte word
475	081F		R	Unit: Wh	Low byte word
476	0820	Fundamental wave total reactive energy	R	32 bit unsigned number, High byte before, low byte after	high byte word
477	0821		R	Unit: varh	Low byte word
478	0822	Full wave A phase active	R	32 bit unsigned number, High byte before, low byte after	high byte word
479	0823		R	Unit: W	Low byte word
480	0824	Full wave B phase active	R	32 bit unsigned number, High byte before, low byte after	high byte word
481	0825		R	Unit: W	Low byte word
482	0826	Full wave C phase active	R	32 bit unsigned number, High byte before, low byte after	high byte word
483	0827		R	Unit: W	Low byte word
484	0828	Full wave A phase reactive	R	32 bit unsigned number, High byte before, low byte after	high byte word
485	0829		R	Unit: var	Low

						byte word
486	082A	Full wave B phase reactive	R	32 bit unsigned number, High byte before, low byte after Unit: var	high byte word	
487	082B		R		Low byte word	
488	082C	Full wave C phase reactive	R	32 bit unsigned number, High byte before, low byte after Unit: var	high byte word	
489	082D		R		Low byte word	
490	082E	Full wave A phase apparent	R	32 bit unsigned number, High byte before, low byte after Unit: VA	high byte word	
491	082F		R		Low byte word	
492	0830	Full wave B phase apparent	R	32 bit unsigned number, High byte before, low byte after Unit: VA	高字 word	
493	0831		R		低字 word	
494	0832	Full wave C phase apparent	R	32 bit unsigned number, High byte before, low byte after Unit: VA	高字 word	
495	0833		R		低字 word	
496	0834	Fundamental wave power factor		-1.000~1.000	word	
497	0835	Fundamental wave A phase power factor		-1.000~1.000	word	
498	0836	Fundamental wave B phase power factor		-1.000~1.000	word	
499	0837	Fundamental wave C phase power factor		-1.000~1.000	word	
500	0838	Full wave power factor		-1.000~1.000	word	
501	0839	Full wave A phase power factor		-1.000~1.000	word	
502	083A	Full wave B phase power factor		-1.000~1.000	word	
503	083B	Full wave C phase power factor		-1.000~1.000	word	

	504	083C	Year,month	R/W	High byte:00-99,low byte:0-12	word
	505	083D	Day,hour	R/W	High byte:0-31, low byte:0-23	word
	506	083E	Minute,second	R/W	High byte:0-59, low byte:0-59	word
	507-549	083F-0843	reserve	R		
Motor running information	550	08FC	Motor running time by now	R	0-65535 h	word
	551	08FD	Total motor stopping times	R	0-65535 h	word
	552	08FE	Total running times	R	0-65535 h	word
	553	08FF	Total Stopping times	R	0-65535 h	word
	554	0900	Total starting times	R	0-65535	word
	555	0901	Total tripping times	R	0-65535	word
	556	0902	DI STATE	R	Bit0-bit8 To Switch Input DI1-DI9	word
	557	0903	DO STATE	R/W	Bit0 relay 1, Bit1 relay 2, Bit2 relay 3, Bit3 relay 4, Bit4 relay 5, Bit5 relay 6	
	558	0904	DI/DO TYPE	R	0-DC type; 1-AC type	
	559	0905	MOTOR STATE	R	bit0 readiness; bit1 Stopping; bit2 start; bit3 operation; bit4 alarm; bit5 tripping; bit7 0- Low speed 1- High speed	word
	560	0906	Trip Breakdown fault indication 1	R	Bit0 reverse time limit overload tripping; Bit1 grounding tripping; Bit2 underload tripping Bit3 disconnection; Bit4 underpressure release; Bit5 overpressure release; Bit6 blocking and tripping; Bit7 blocking tripping; Bit8 current imbalance tripping; Bit9 PTC temperature tripping; Bit10 external failure tripping; Bit11 start timeout release; Bit12 power tripping;	word

					Bit13 underpower tripping; Bit14 phase sequence tripping; Bit15 short circuit tripping. (0- No tripping, (1)	
561	0907	Trip Breakdown fault indication 2	R	Bit0 fixed time limit overload tripping; Bit1 voltage unbalanced tripping; Bit2 overflow protection tripping; Bit3 starting times tripping.	word	
562	0908	Alarm fault indication 1	R	Bit0 anti-time overload alarm; Bit1 ground alarm; Bit2 underload alarm; Bit3 fault phase alarm; Bit4 undervoltage alarm; Bit5 overvoltage alarm; Bit6 blocking alarm; Bit7 blocking alarm; Bit8 current imbalance alarm; Bit9 PTC temperature alarm; Bit10 external fault alarm; Bit11 start timeout alarm; Bit12 power alarm; Bit13 underpower alarm; Bit14 phase sequence alarm; Bit15 short circuit alarm. (0- No alarm, 1- Alarm)	word	
563	0909	Alarm fault indication 2	R	Bit0 fixed time limit overload alarm; Bit1 voltage imbalance alarm; Bit2 overflow protection alarm; Bit3 starting times alarm; Bit4 running time alarm; Bit5 fault times alarm	word	
564	090A	Overload remaining cooling time	R	0-30min	word	

1	e	H	565	090B	Maximum starting current by now	R	0-65535	word
			566	090C	Maximum Historical starting current	R	0-65535	word
			567	090D	Maximum current in operation by now	R	0-65535	word
			568	090E	Maximum Historical operation current	R	0-65535	word
			569	090F	Latest Fault Record Communication Address	R	2100、2150、2200、2250、2300、2350、2400、2450	word
			570	0910	Latest DI Change Record Communication Address	R	1100、1108、1116、1124、1132、1140、1148、1156	word
			571	0911	Latest Starting Record Communication Address	R	1300、1308、1316、1324、1332、1340、1348、1356	word
			572	0912	Latest Stopping Record Communication Address	R	1500、1508、1516、1524、1532、1540、1548、1556	word
			573	0913	Latest Restart Record Communication Address	R	1700、1708、1716、1724、1732、1740、1748、1756	word
			574	0915	Latest Parameter setting Communication Address	R	1900、1906、1912、1918、1924、1930、1936、1942	word
			575	0916	Latest installation to record correspondence communication address	R	2020、2024、2028、2032、2036、2040、2044、2048	word
			576	0917	Latest device power off record communication address	R	2052、2056、2060、2064、2068、2072、2076、2080	word
			577	0918	Current recorded times of power on	R	0-60000	word
			578	0919	Current recorded times of power off	R	0-60000	word
			579	091A	Waiting time for next start	R	0-30min	word
			580	091F	Current Motor Control Authority	R	0-panel ;1-in-place ;2-communication ;3-remote ;4-stop ;5-All	word
			581-596	0920-0924	reserve	R		word
					597	0925	Energy clear	W

	598	0926	Clear motor operation information	W	Write data 0xa5b5	word
	599	0927	Event record clear	W	Write data 0xa5b5	word
	600	092E	Current	R	1.6、6.3、25.0、100.0、250.0、800.0、1.0、5.0	word
	601	092F	Current proportional factor	R	1、10、100	
	602	0930	Operational control bits	R/W	1-Stop、2-Start 1、3- Start 2、4-Emergency stop、5-resei	word
	603	0931	Restore factory setting	R/W	Write data 0xFFFF	word
	604	0933	Input Mark of Residual Current Transformer	R/W	0 not input, 1 input	word
	605	0934	Base Wave Switch	R/W	0 Rms, 1 Fundament	word
	606	0935	Motor type	R/W	0 Common motor, 1 Increased safety motor	word
	607	0936	CT Ratio	R/W	1A: 1-5000 5A: 1-1000 other specifications can not set CT ratio	word
	608	0937	Rated Frequency	R/W	45-70Hz	word
	609	0938	Motor rated current	R/W	1A:0.1-5000.0A 5A:0.5-5000.0A 1.6A:0.4-1.6A 6.3A:1.6-6.3A 25A:6.3-25.0A 100A:25.0-100.0A 250A:63.0-250.0A 800A:250.0-800.0A	word
	610	0939	Motor rated voltage	R/W	57-1200	word
	611	093A	Motor rated Power	R/W	High byte	word
	612	093B		R/W	Low byte	word
	613	093C	Wiring	R/W	0:1P,1:3P4L, 2:3P3L	word
System parameter	614	093D	Back light	R/W	1-30s, 0:Normally on	word
	615	093E	Liquid crystal contrast	R/W	0~100	word
	616	093F	Main interface index	R/W	1-7 (0-20 can write)	word
	617	0940	Language	R/W	0-Chinese, 1-English	word
	618	0941	Current mask value	R/W	0-30	word
	619	0942	Password	R/W	0000-9999	
	620	0945	Analog output setting	R/W	Type:0-Ia,1-Ib,2-Ic,3-Iav,4-Uab,5-Ubc,6-Uca,7-Uav,8-PTC,9-Heat capacity,10-P,11-F	word

	621	0946	Full value	R/W	2 times rated current	word
	622	0947		R/W		
	623-645	094B-0959	reserve	R		word
	646	095A	LCD version	R		word
	647	095B	LCD NO.	R		word
	648	095C	Main body version	R		word
	649	095D	Main body NO.	R		word
Low speed protection	650	0960	Trip allowed/forbidden 1	R	Bit0 reverse time limit overload tripping; Bit1 grounding tripping; Bit2 underload tripping Bit3 disconnection; Bit4 underpressure release; Bit5 overpressure release; Bit6 blocking and tripping; Bit7 blocking tripping; Bit8 current imbalance tripping; Bit9 PTC temperature tripping; Bit10 external failure tripping; Bit11 start timeout release; Bit12 power tripping; Bit13 underpower tripping; Bit14 phase sequence tripping; Bit15 short circuit tripping. (0- No tripping, 1-trippng)	word
	651	0961	Trip allowed/forbidden 2	R/W	Bit0 fixed time limit overload tripping; Bit1 voltage unbalanced tripping; Bit2 overflow protection tripping; Bit3 starting times tripping.	word
	652	0962	Alarm allowed/forbidden 1	R/W	Bit0 anti-time overload alarm; Bit1 ground alarm; Bit2 underload alarm; Bit3 fault phase alarm; Bit4 undervoltage alarm; Bit5 overvoltage alarm;	word

					Bit6 blocking alarm; Bit7 blocking alarm; Bit8 current imbalance alarm; Bit9 PTC temperature alarm; Bit10 external fault alarm; Bit11 start timeout alarm; Bit12 power alarm; Bit13 underpower alarm; Bit14 phase sequence alarm; Bit15 short circuit alarm. (0- No alarm, 1- Alarm)	
653	0963	Alarm allowed/forbidden 2	R/W	Bit0 fixed time limit overload alarm; Bit1 voltage imbalance alarm; Bit2 overflow protection alarm; Bit3 starting times alarm; Bit4 running time alarm; Bit5 fault times alarm	word	
654	0964	Trip level	R/W	1、 2、 3、 5、 10、 15、 20、 25、 30、 35、 40	word	
655	0965	tE Trip level	R/W	2、 3、 4、 5、 6、 8、 10、 12、 15	word	
656	0966	Start setting	R/W	100-800%	word	
657	0967	Reset method	R/W	0-Off; 1-On	word	
658	0968	Overload cooling time	R/W	0-30min	word	
659	0969	Overload alarm threshold	R/W	1-99%	word	
660	096B	Overload starting protection screen time	R/W	0-25.0	word	
661	096C	Ground fault alarm threshold	R/W	20%-100%		
662	096D	Ground fault trip threshold	R/W	20%-100%		
663	096F	Ground fault protection delay	R/W	0.1~600.0s	word	
664	0970	Trip mode	R/W	Bit (0- circuit breaker 1- contactor)	word	
665	0971	Ground fault starting	R/W	0-25.0	word	

		screen time			
666	0972	Leakage alarm threshold	R/W	(100~1000) mA	word
667	0973	Leakage trip threshold	R/W	(100~1000) mA	word
668	0975	Leakage trip delay	R/W	0.1~600.0s	
669	0976	Leakage action choice	R/W	Bit0:Action choice (0-Circuit breaker 1-contactor)	
670	0977	Leakage fault starting screen time	R/W	0-25.0	
671	0978	Under power alarm threshold	R/W	10~99%	
672	0979	Under power trip threshold	R/W	10~99%	
673	097B	Under power trip delay	R/W	0.1~600.0s	word
674	0981	Phase loss trip delay	R/W	0.1~600.0s	word
675	0984	Under voltage alarm threshold	R/W	50~90%	
676	0985	Under voltage trip threshold	R/W	50~90%	word
677	0987	Under voltage trip delay	R/W	0.1~600.0s	word
678	098A	Over voltage alarm threshold	R/W	110~150%	
679	098B	Over voltage trip threshold	R/W	110~150%	
680	098D	Over voltage trip delay	R/W	0.1~600.0s	word
681	0990	Locked-rotor alarm threshold	R/W	100~700%	
682	0991	Locked-rotor trip threshold	R/W	100~700%	
683	0993	Locked-rotor trip delay	R/W	0.1~600.0s	word
684	0996	Blocking alarm threshold	R/W	100~700%	
685	0997	Blocking trip threshold	R/W	100~700%	
686	0999	Blocking trip delay	R/W	0.1~600.0s	word
687	099C	Current unbalance alarm threshold	R/W	10~99%	
688	099D	Current unbalance trip threshold	R/W	10~99%	
689	099F	Current unbalance trip delay	R/W	0.1~600.0s	word
690	09A2	NTC /PTC	R/W	0 NTC, 1PTC	
691	09A3	Temperature alarm threshold	R/W	100~30000	
692	09A4	Temperature trip threshold	R/W	100~30000	word
693	09A6	Temperature trip delay	R/W	0.1~600.0s	
694	09A8	Temperature fault reset mode	R/W	0-Manual; 1-Automatic	
695	09A9	Temperature return	R/W	0-Off,Can be set between	

			resistance		100-30000	
	696	09AC	External fault trip delay	R/W	0.1~600.0s	word
	697	09AE	Start timeout trip threshold	R/W	100%~200%	word
	698	09AF	Start time	R/W	0.1~600.0s	
	699	09B0	Over power alarm threshold	R/W	100~700%	
	700	09B1	Over power trip threshold	R/W	100~700%	word
	701	09B3	Over power trip delay	R/W	0.1~600.0s	
	702	09B6	Under power alarm threshold	R/W	0~100%	
	703	09B7	Under power trip threshold	R/W	0~100%	word
	704	09B9	Under power trip delay	R/W	0.1~600.0s	
	705	09BF	Phase sequence trip delay	R/W	0.1~600.0s	
	706	09C2	Short-circuit alarm threshold when starting	R/W	400%~800%	
	707	09C3	Short-circuit trip threshold when starting	R/W	400%~800%	word
	708	09C4	Short-circuit alarm threshold when running	R/W	400%~800%	
	709	09C5	Short-circuit trip threshold when running	R/W	400%~800%	
	710	09C7	Short-circuit trip delay	R/W	0.1~600.0s	word
	711	09CA	Fixed time limit overload alarm threshold	R/W	100-800%	word
	712	09CB	Fixed time limit overload trip threshold	R/W	100-800%	
	713	09CD	Fixed time limit overload trip delay	R/W	0.1~600.0s	word
	714	09D0	Voltage unbalance alarm threshold	R/W	10~99%	
	715	09D1	Voltage unbalance trip threshold	R/W	10~99%	
	716	09D3	Voltage unbalance trip delay	R/W	0.1~600.0s	
	717	09D6	overflow protection threshold	R/W	400%~800%	
Other alarm	718	09DF	Start times alarm threshold	R/W	1-10 unti :time	
	719	09E0	Start times protection delay	R/W	10-300min	
	720	09E1	Running time alarm threshold	R/W	1000-60000 unit:hour	
	721	09E3	Fault times alarm	R/W	20-10000 unti:time	

			threshold			
	722-799	09E5-0 A27	Reserve	R		
High speed prote ction	800	0A28	High speed trip allowed/forbidden 1	R/W	Content is consistent with low speed,but the default value is different	
	801	0A29	High speed trip allowed/forbidden 2	R/W		
	802	0A2A	High speed alarm allowed/forbidden 1	R/W		
	803	0A2B	High speed alarm allowed/forbidden 2	R/W		
	804	0A2C	High speed rated current	R/W		
	805	0A2D	High speed rated power	R/W		
	806	0A2E		R/W		
	807	0A2F	High speed trip level	R/W		
	808	0A30	High speed tE trip level	R/W		
	809	0A31	High speed inverse time protectin start setting	R/W		
	810	0A32	High speed inverse time protectin seset method	R/W		
	811	0A33	High speed inverse time protectin cooling time	R/W		
	812	0A34	High speed inverse time protectin alarm threshold	R/W		
	813	0A36	High speed starting screen time	R/W		
	814	0A37	High speed underload alarm threshold	R/W		
	815	0A38	High speed underload trip threshold	R/W		
	816	0A3A	High speed underload trip delay	R/W		
	817	0A43	High speed locked-rotor alarm threshold	R/W		
	818	0A44	High speed locked-rotor trip threshold	R/W		
	819	0A46	High speed locked-rotor trip delay	R/W		
	820	0A49	High speed blocking alarm threshold	R/W		
	821	0A4A	High speed blocking trip threshold	R/W		
	822	0A4C	High speed blocking trip delay	R/W		
823	0A4F	High speed current unbalance alarm threshold	R/W			

	824	0A50	High speed current unbalance trip threshold	R/W		
	825	0A52	High speed current unbalance trip delay	R/W		
	826	0A55	High speed start timeout threshold	R/W		
	827	0A56	High speed start timeout time	R/W		
	828	0A57	High speed over power alarm threshold	R/W		
	829	0A58	High speed over power trip threshold	R/W		
	830	0A5A	High speed over power trip delay	R/W		
	831	0A5D	High speed under power alarm threshold	R/W		
	832	0A5E	High speed under power trip threshold	R/W		
	833	0A60	High speed under power trip delay	R/W		
	834	0A63	High speed short-circuit alarm threshold when starting	R/W		
	835	0A64	High speed short-circuit trip threshold when starting	R/W		
	836	0A65	High speed short-circuit alarm threshold when running	R/W		
	837	0A66	High speed short-circuit trip threshold when running	R/W		
	838	0A68	Short-circuit trip delay	R/W		
	839	0A6B	High speed fixed time limit overload alarm threshold	R/W		
	840	0A6C	High speed fixed time limit overload trip threshold	R/W		
	841	0A6E	High speed fixed time limit overload trip delay	R/W		
	842	0A6F	High speed phase loss trip delay	R/W		
	843-899	0A71-0 ABD	Reserve	R		
Start control	900	0ABE	Self-start mode	R/W	0-start, 1-restore	word
	901	0ABF	Self-start delay	R/W	0.1~60.0s	word
	902	0AC0	Self-start control	R/W	0-Off、1-ON	word
	903	0AC1	Control access	R/W	0-Panel; 1-In place; 2-Comm; 3-Remote;	word

					4-Three choice one; 5- Two choice one; 6-all control	
	904	0AC2	Three choice one permission output1	R/W	0- Comm; 1- In place; 2- Panel; 3-Stop; 4-Remote the default is 0	word
	905	0AC3	Three choice one permission output2	R/W	0- Comm; 1- In place; 2- Panel; 3-Stop; 4-Remote the default is 1	word
	906	0AC4	Three choice one permission output3	R/W	0- Comm; 1- In place; 2- Panel; 3-Stop; 4-Remote the default is 2	word
	907	0AC5	Three choice one permission output4	R/W	0- Comm; 1- In place; 2- Panel; 3-Stop; 4-Remote the default is 3	word
	908	0AC6	Start method	R/W	0-Protection mode,1-manual mode,2-two-step mode, 3-two-speed mode, 4-star triangle, 5-auto-step-down	word
	909	0AC7	Start1delay	R/W	0.1~60.0s	word
	910	0AC8	Recovery voltage	R/W	70~95%	word
	911	0AC9	Immediate restart time	R/W	0.1~10.0s	word
	912	0ACA	Restart delay	R/W	1.0~60.0s	word
	913	0ACB	Restart control	R/W	0=Off, 1=operates on start 1, 2= operates on start 2	word
	914	0ACC	Sway electric time	R/W	0.5~300.0s	word
	915	0ACD	Voltage drop		50-90% ≤Recovery voltage	
	916-949	0ACE-0 AEA	Reserve	R		word
Programmable setting	950	0AF0	DO initial state setting	R/W	0-Normally on, 1- Normally off; bit0-bit4 correspond DO1-DO5	word
	951	0AF1	DO1 Definition	R/W	0-No input, 1-start 1, 2-start 2, 3-start 3, 4-parking, 5-starting jumped contactor, 6-circuit breakers, 7-fault Alarm output, 8-tripping fault output,9-the output state stopped, 10-the starting state output, 11-the output operation state, 12-the communication control output,13-the output	

					device self-checking, 14-the device output power, 15-nowhere electric process output chain, 16-electric reset signal output, 17-protected mode have nowhere electricity output 1, 18-protected mode electricity output 2,19-logic diagram output 1 output logic diagram,20-logic diagram output 2, 21-logic diagram output 3, 22-30 corresponding DI1-19 control the DO output	
952	0AF2	DO1 action setting(time)	R/W	0-Level; (3-250) -pulse time, unit:0.1S	word	
953	0AF3	DO1 trip setting1	R/W	As same as 650	word	
954	0AF4	DO1 trip setting2	R/W	As same as 651	word	
955	0AF5	DO1 alarm setting1	R/W	As same as 651	word	
956	0AF6	DO1 alarm setting2	R/W	As same as 651	word	
957	0AF7	DO2 progamable	R/W	As same as DO1 (951-956)	word	
958	0AF8	DO2 action setting(time)	R/W		word	
959	0AF9	DO2 trip setting1	R/W		word	
960	0AFA	DO2 trip setting2	R/W		word	
961	0AFB	DO2 alarm setting1	R/W		word	
962	0AFC	DO2 alarm setting2	R/W		word	
963	0AFD	DO3 progamable	R/W	As same as DO1 (951-956)	word	
964	0AFE	DO3 action setting(time)	R/W		word	
965	0AFF	DO3 trip setting1	R/W		word	
966	0B00	DO3 trip setting2	R/W		word	
967	0B01	DO3 alarm setting1	R/W		word	
968	0B02	DO3 alarm setting2	R/W		word	
969	0B03	DO4 progamable	R/W	As same as DO1 (951-956)	word	
970	0B04	DO4 action setting(time)	R/W		word	
971	0B05	DO4 trip setting1	R/W		word	
972	0B06	DO4 trip setting2	R/W		word	
973	0B07	DO4 alarm setting1	R/W		word	
974	0B08	DO4 alarm setting2	R/W		word	

975	0B09	DO5 progamable	R/W	As same as DO1 (951-956)	word
976	0B0A	DO5 action setting(time)	R/W		word
977	0B0B	DO5 trip setting1	R/W		word
978	0B0C	DO5 trip setting2	R/W		word
979	0B0D	DO5 alarm setting1	R/W		word
980	0B0E	DO5 alarm setting2	R/W		word
981-986	0B15-0B2C	Reserve	R		
987	0B2D	DI type	R/W	Bit0-Bit8 correspond DI1-9, 0-Normally on; 1-Normally off	
988	0B2E	DI1 programmable setting	R/W	1-Ordinary DI, 2-starting 1(in situ), 3-starting 1(remote), 4-starting 2(in situ), 5-starting 2(remote), 6-parking (in situ), 7-parking (remote), 8-reset, 9-emergency stop, 10-external fault, 11-single point 1 (in situ) start-stop, 12-single point 1 (remote) start-stop, 13-single point 2 (in situ) start-stop, 14-single point 2 (remote) start-stop, 15-single point 1 start/stop, 16-single point 2 start/stop, 17-control over 1, 18-control over 2	word
989	0B2F	DI2 programmable setting	R/W	ditto	word
990	0B30	DI3 programmable setting	R/W		word
991	0B31	DI4 programmable setting	R/W		word
992	0B32	DI5 programmable setting	R/W		word
993	0B33	DI6 programmable setting	R/W		word
994	0B34	DI7 programmable setting	R/W		word
995	0B35	DI8 programmable setting	R/W		word
996	0B36	DI9 programmable	R/W		word

			setting			
997-1002	0B38-0B3D		Reserve	R		
1003	0B3E		Logic diagram1	R/W	0-close;1-A;2-A*B;3-A+B;4-A*B*C;5-(A+B)*C;6-(A*B)+C;7-A+B+C;8-A*B*C*D;9-(A+B)*C*D;10-(A*B+C)*D;11-(A+B+C)*D;12-A*B*C+D;13-(A+B)*C+D;14-A*B+C+D;15-A+B+C+D;16-A*B*C*D+E;17-(A+B)*C*D+E;18-(A*B+C)*D+E;19-(A+B+C)*D+E;20-(A*B*C+D)*E;21-((A+B)*C+D)*E;22-(A*B+C+D)*E;23-(A+B+C+D)*E;24-A*B*C*D+E;25-(A+B)*C*D+E;26-(A*B+C)*D+E;27-(A+B+C)*D+E;28-A*B*C+D+E;29-(A+B)*C+D+E;30-A*B+C+D+E;31-A+B+C+D+E	word
1004	0B3F		Input A	R/W	Low-byte:0-Close;1-9 correspond to DI1-19;17-21 correspond to DO1 - DO6;27-Starting 1;28-Starting 2;29-Starting 3;30-Stop,31-Emergency shutdown;32-Stop state;33-Starting state;34-Running state;35-Alarm status;36-Trip status;49-80 correspond to trip typ;81-112 correspond to alarm types High byte:0-Logical,1-illogical	word
1005	0B40		Input B	R/W	As same as 1004	word
1006	0B41		Input C	R/W		word
1007	0B42		Input D	R/W		word
1008	0B43		Input E	R/W		word
1009	0B44		Input A relay	R/W		0.0-60.0s

	1010	0B45	Input B relay	R/W	0.0-60.0s	word	
	1011	0B46	Input C relay	R/W	0.0-60.0s	word	
	1012	0B47	Input D relay	R/W	0.0-60.0s	word	
	1013	0B48	Input E relay	R/W	0.0-60.0s	word	
	1014	0B49	Logic diagram 2	R/W	As same as logic diagram 1 (data:1003~1013)	word	
	1015	0B4A	Input A	R/W		word	
	1016	0B4B	Input B	R/W		word	
	1017	0B4C	Input C	R/W		word	
	1018	0B4D	Input D	R/W		word	
	1019	0B4E	Input E	R/W		word	
	1020	0B4F	Input A relay	R/W		word	
	1021	0B50	Input B relay	R/W		word	
	1022	0B51	Input C relay	R/W		word	
	1023	0B52	Input D relay	R/W		word	
	1024	0B53	Input E relay	R/W		word	
	1025	0B54	Logic diagram 2	R/W		As same as logic diagram 1 (data:1003~1013)	word
	1026	0B55	Input A	R/W			word
	1027	0B56	Input B	R/W			word
	1028	0B57	Input C	R/W	word		
	1029	0B58	Input D	R/W	word		
	1030	0B59	Input E	R/W	word		
	1031	0B5A	Input A relay	R/W	word		
	1032	0B5B	Input B relay	R/W	word		
	1033	0B5C	Input C relay	R/W	word		
	1034	0B5D	Input D relay	R/W	word		
	1035	0B5E	Input E relay	R/W	word		
	1036-1039	0B5F-0B67	Reserve	R		word	
	Communication setting	1040	0B68	ADD 1	R/W	1~247	word
		1041	0B69	Baud rate1	R/W	0-38400,1-19200,2-9600,3-4800,4-2400,5-1200	word
		1042	0B6A	Check digit 1	R/W	0-No check, 1-2stop bit, 3-Odd, 4-Even	word
		1043	0B6B	ADD 2		1~247	word
		1044	0B6C	Baud rate2	R/W	0-38400,1-19200,2-9600,3-4800,4-2400,5-1200,6-Profi bus	word
		1045	0B6D	Check digit 2	R/W	0-No check, 1-2stop bit, 3-Odd, 4-Even	word
		1047-1099	0BAC-0BB5	Reserve	R/W		

DI displacement record 1	1100	0BB8	DI NO.	R	1-9 correspond to DI1-9	
	1101	0BB9	DI status	R	0-open 1-closed	
	1102	0BBA	Action 1time-year month	R	High byt:year,low byte:month	
	1103	0BBB	Action 1time-day hour	R	High byt:day,low byte:hour	
	1104	0BBC	Action 1time-minute second	R	High byt:minute,low byte:second	
	1105-11 07	0BBD-0 BBF	Reserve	R		
DI displacement record 2-8	1108-11 15	0BC0-0 BC6	ditto	R	ditto	
	1116-11 23	0BC7-0 BCD		R		
	1124-11 31	0BCE-0 BD4		R		
	1132-11 39	0BD5-0 BDB		R		
	1140-11 47	0BDC-0 BE2		R		
	1148-11 55	0BE3-0 BE9		R		
	1156-11 63	0BEA-0 BF0		R		
	1164-12 59	0BF8-0 C57	Reserve	R		
Start record 1	1300	0C80	Start position	R	0-External start 1-Comm 2-In place 3-Panel 4-Remote 5-Self-start 6-Restart	
	1301	0C81	Maximum current when starting	R	Unit:1%	
	1302	0C82	Minimum voltage when starting	R	Unit:1%	
	1303	0C83	Result of starting	R	1-stop when starting 2-go into running status 3-go into trip status	
	1304	0C84	Action 1time-year month	R	High byt:year,low byte:month	
	1305	0C85	Action 1time-day hour	R	High byt:day,low byte:hour	
	1306	0C86	Action 1time-minute second	R	High byt:minute,low byte:second	
	1307	0C87	Starting time	R	Unit:0.1S	

Start record 2-8	1308-13 15	0C88-0 C8F	ditto	R	ditto	
	1316-13 23	0C90-0 C97		R		
	1324-13 31	0C98-0 C9F		R		
	1332-13 39	0CA0-0 CA7		R		
	1340-13 47	0CA8-0 CAF		R		
	1348-13 55	0CB0-0 CB7		R		
	1356-13 63	0CB8-0 CBF		R		
	1364-14 99	0CC0-0 D47	reserve	R		
Stop record 1	1500	0D48	Stop position	R	0-External stop 1-Comm 2-In place 3-Panel 4-Remote 5-Emergency stop 6-Voltage loss stop	
	1501	0D49	Action 1time-year month	R	High byt:year,low byte:month	
	1502	0D4A	Action 1time-day hour	R	High byt:day,low byte:hour	
	1503	0D4B	Action 1time-minute second	R	High byt:minute,low byte:second	
	1504-15 07	0D4C-0 D4F	reserve	R		
Stop record 2-8	1508-15 15	0D50-0 D57	ditto	R	ditto	
	1516-15 23	0D58-0 D5F		R		
	1524-15 31	0D60-0 D67		R		
	1532-15 39	0D68-0 D6F		R		
	1540-15 47	0D70-0 D77		R		
	1548-15 55	0D78-0 D7F		R		
	1556-15 63	0D80-0 D87		R		
	1564-16 99	0D88-0 E0F	reserve	R		

Restart record 1	1700	0E10	Cause of voltage shock	R	0-All three phase lost power 1-A phase 2-B phase 3-C phase	
	1701	0E11	Minimum voltage	R	Unit :1%	
	1702	0E12	Time of voltage shock		Unit :0.1S	
	1703	0E13	Action after voltage shock		1-keep 2-restart 1 3-restart 2	
	1704	0E14	Action 1time-year month	R	High byt:year,low byte:month	
	1705	0E15	Action 1time-day hour	R	High byt:day,low byte:hour	
	1706	0E16	Action 1time-minute second	R	High byt:minute,low byte:second	
	1707	0E17	reserve	R		
Restart record2-8	1708-1715	0E18-0E1F	ditto	R	ditto	
	1716-1723	0E20-0E27		R		
	1724-1731	0E28-0E2F		R		
	1732-1739	0E30-0E37		R		
	1740-1747	0E38-0E3F		R		
	1748-1755	0E40-0E47		R		
	1756-1763	0E48-0E4F		R		
	1804-1899	0E78-0ED7	reserve	R		
Parameter change record 1	1900	0ED8	Change time-year month	R	High byt:year,low byte:month	
	1901	0ED9	Change time-day hour	R	High byt:day,low byte:hour	
	1902	0EDA	Change time-minute second	R	High byt:minute,low byte:second	
	1903	0EDB	First data	R		
	1904	0EDC	Length of comm data	R		
	1905	0EDD	Set position	R	0=lcd,1=rs485-1,2=rs485-2,	
Parameter change record 2-8	1906-1911	0EDE-0EE3	ditto	R	ditto	
	1912-1917	0EE4-0EE9		R		
	1918-1923	0EEA-0EEF		R		

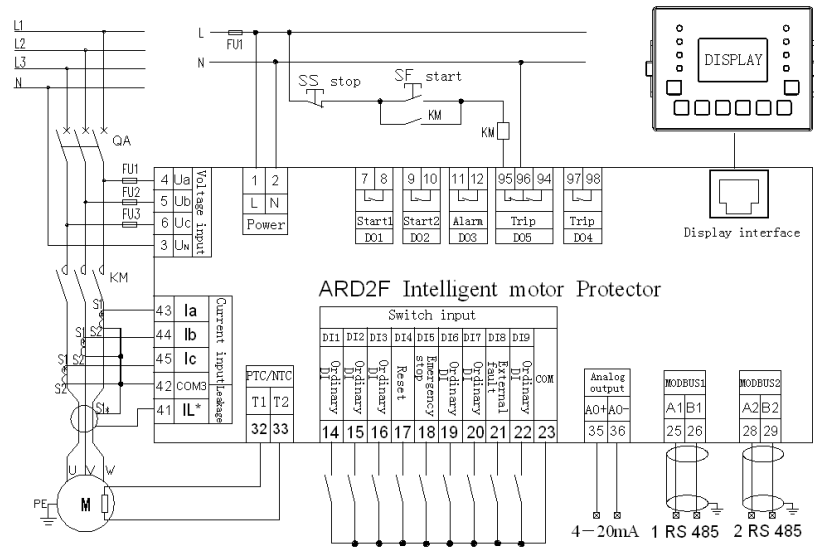
	1924-19 29	0EF0-0 EF5		R		
	1930-19 35	0EF6-0 EFB		R		
	1936-19 41	0EFC-0 F01		R		
	1942-19 47	0F02-0F 07		R		
	1948-20 19	0F08-0F 4F	reserve	R		
Power on record1	2020	0F50	Power on index	R	Record the number of power on	
	2021	0F51	Power on time-year month	R	High byt:year,low byte:month	
	2022	0F52	Power on time-day hour	R	High byt:day,low byte:hour	
	2023	0F53	Power on time-minute second	R	High byt:minute,low byte:second	
Power on record2-8	2024-20 27	0F54-0F 57				
	2028-20 31	0F58-0F 5B				
	2032-20 35	0F5C-0 F5F				
	2036-20 39	0F60-0F 63	ditto		ditto	
	2040-20 43	0F64-0F 67				
	2044-20 47	0F68-0F 6B				
	2048-20 51	0F6C-0 66F				
Power off 1	2052	0F70	Power off index	R	Record the number of power off	
	2053	0F71	Power off time-year month	R	High byt:year,low byte:month	
	2054	0F72	Power off time-day hour	R	High byt:day,low byte:hour	
	2055	0F73	Power off time-minute second	R	High byt:minute,low byte:second	
Power off 2-8	2056-20 59	0F74-0F 77				
	2060-20 63	0F78-0F 7B	ditto		ditto	
	2064-20	0F7C-0 F7F				

	67					
	2068-2071	0F80-0F83				
	2072-2075	0F84-0F87				
	2076-2079	0F88-0F8B				
	2080-2083	0F8C-0F8F				
	2084-2089	0F90-0F95	reserve	R		
	2090-2095	0F96-0F9B	ditto	R		
Fault record 1	2100	0FA0	Trip status 1	R		
	2101	0FA1	Trip status 2	R		
	2102	0FA2	Alarm status 1	R		
	2103	0FA3	Alarm status 2	R		
	2104	0FA4	Action 1time-year month	R	High byte:year,low byte:month	
	2105	0FA5	Action 1time-day hour	R	High byte:day,low byte:hour	
	2106	0FA6	Action 1time-minute second	R	High byte:minute,low byte:second	
	2107	0FA7	Fundamental wave switch、 sensor type	R	bit0: fundamental wave switch; bit1:PTC/NTC type	
	2108	0FA8	A phase current	R		
	2109	0FA9	B phase current	R		
	4010	0FAA	C phase current	R		
	2111	0FAB	A phase voltage	R		
	2112	0FAC	B phase voltage	R		
	2113	0FAD	C phase voltage	R		
	2114	0FB4	Total apparent power	R		
	2115	0FB5		R		
	2116	0FB6	Total active power	R		
	2117	0FB7		R		
	2118	0FB8	Total reactive power	R		
	2119	0FB9		R		
2120	0FBA	Total power factor	R			
2121	0FBB	Frequence	R			
2122	0FBC	Zero sequence current	R			

	2123	0FBD	Zero sequence voltage	R		
	2124	0FBE	PTC/NTC resistance	R		
	2125	0FBF	Leakage current	R		
	2126	0FC0	DI status	R		
	2127	0FC1	DO status	R		
	2128	0FC2	Motor status	R	Bit1 stop; Bit2 start; Bit3 run; Bit4 alarm	
	2129-2149	0FC3-0FD1	Reserve	R		
Fault record 2-8	2150-2199	0FD2-1003	ditto	R	ditto	
	2200-2249	1004-1035		R		
	2250-2299	1036-1067		R		
	2300-2349	1068-1099		R		
	2350-2399	109A-10CB		R		
	2400-2449	10CC-10FD		R		
	2450-2499	10FE-112F		R		
2500-2599	1130-1187	Reserve	R			
Customize mailing address	5000	1388	Correspond value of custom address 1	R	As same as the corresponding mailing address	
	5001	1389	Correspond value of custom address 2	R		
	~	~	~	R		
	5119	144F	Correspond value of custom address 120	R		
	5120-5299	1450-14B3	reserve	R		
	5300	14B4	Correspond address of custom address 1	R/W		
	~	~	~	R/W		
	5419	157B	Correspond address of custom address 120	R/W		

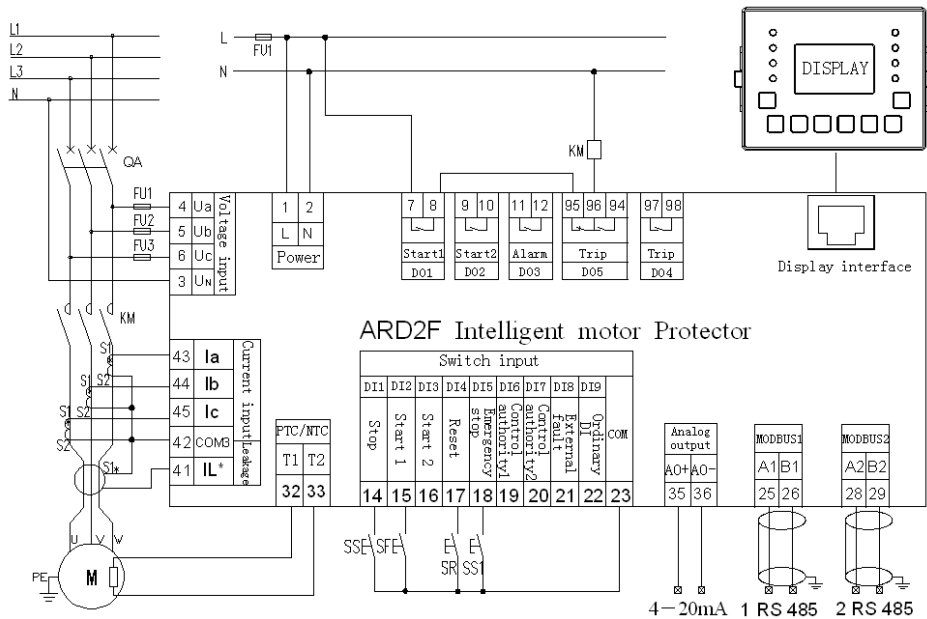
9 Typical applications

9.1 ARD2F Electrical Motor Protection Mode Wiring



Protection mode: the starting and stopping of the motor is realized by the external button. The closing QA, presses the starting button SF, KM attracts the coil to get electricity, makes the main contact of the KM close, and the motor starts to work. When the stop button is pressed, the KM suction coil loses power, so that the main contact of the KM is released and the motor stops working.

9.2 ARD2F Electrical motor protector direct starting wiring diagram

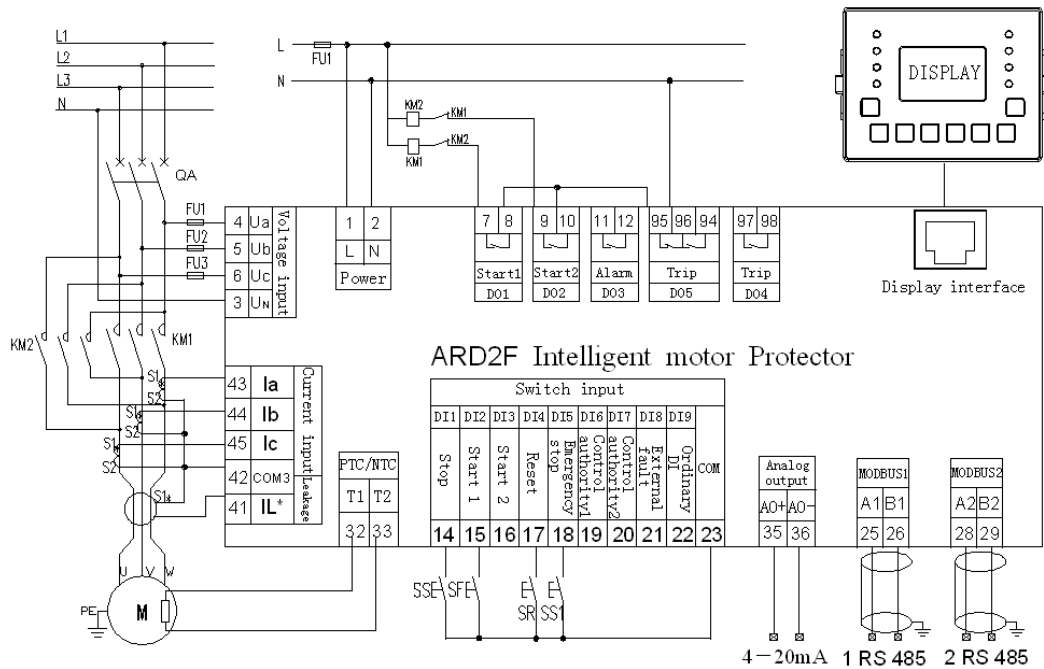


Direct starting: motor starting and stopping is controlled by protector, Press the Start 1 button on the display unit, Display unit control), DO1 relay (default start 1 function) closed, Close the KM's main contacts, The motor began to work. Press the "Stop" button on the panel, Local control), DO1 relay disconnected, with parking in this mode KM coil is out of power, The motor stopped working.

Press switch input DI2(default start 1 function, start control set to manual mode, local control), DO1 relay (default start 1 function) closed, so that the main contact of the KM closed, the motor began to work. Press switch input DI1(default stop function,

start control set to manual mode, local control), DO1 relay disconnected, KM coil power loss, motor stop work.

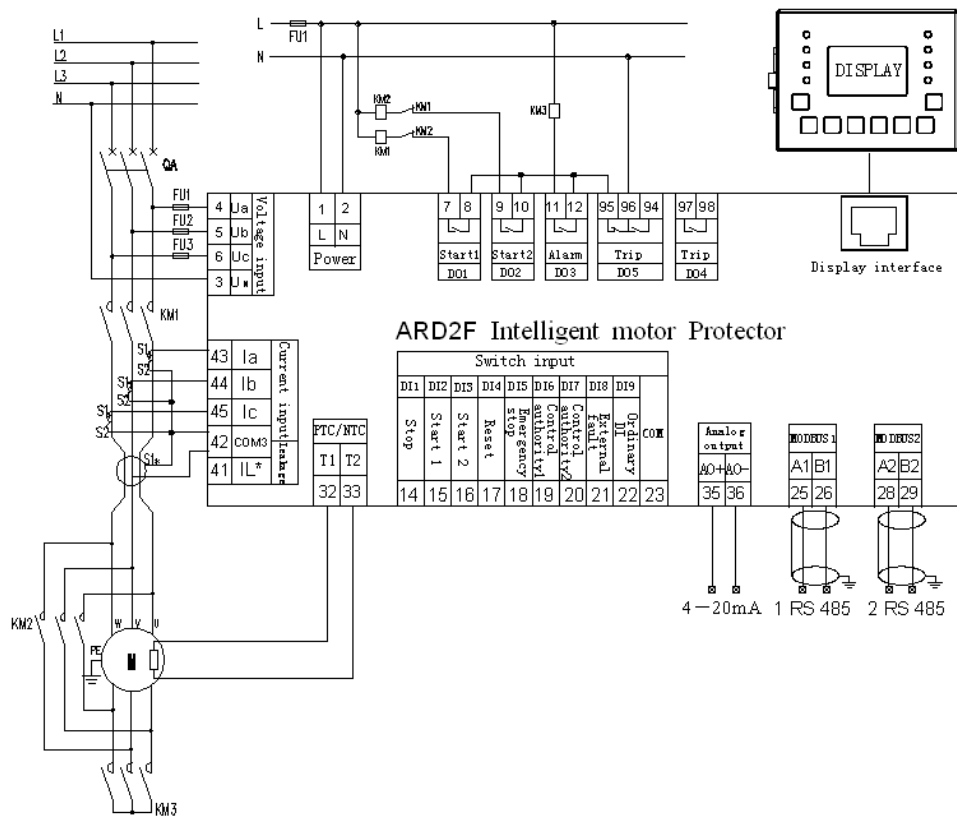
9.3 ARD2F Electrical motor protector forward/reverse wiring diagram



Forward and reverse starting: motor starting and stopping are controlled by protector, Press the Start 1 button on the display unit, Display unit control), DO1 relay (default start 1 function) closed, Close the KM1's main contacts, Motor starting; Press the "start 2" button on the display unit, DO1 relay (default start 1 function) disconnected, DO2 relay (default start 2 function) closed, close the KM2's main contacts, Motor reverse start. Press the stop button on the panel, DO2 relay disconnected 3s, with stop function in pulse output mode KM1、 KM2 coil is out of power, The motor stopped working.

Click switch input DI2(default start 1 function, Start control set to manual mode, Local control), DO1 relay (default start 1 function) closed, Close the KM1's main contacts, Motor starting; Click switch input DI3(default start 2 function), DO1 relay (default start 1 function) disconnected, DO2 relay (default start 2 function) closed, close the KM2's main contacts, Motor reverse start. Click switch input DI1(default stop function), DO2 relay disconnected, KM1、 KM2 coil is out of power, The motor stopped working.

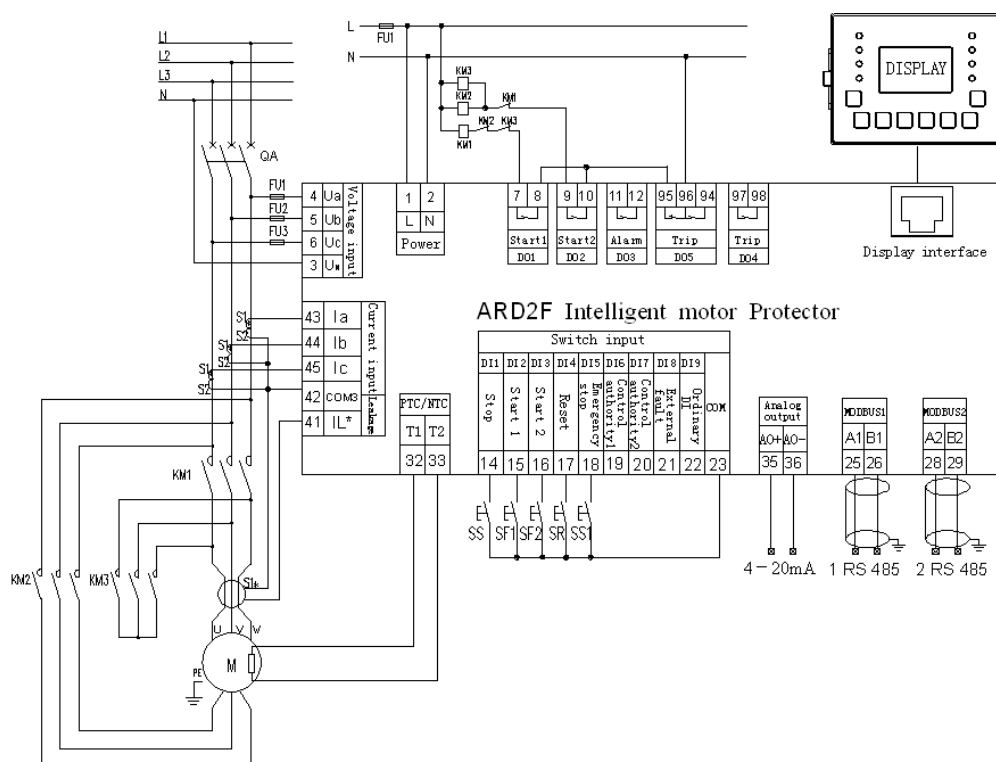
9.4 ARD2F Electrical Protector Y- Δ Starting (Three Relay Mode) Wiring Diagram



Y- Δ start (three relay mode): motor start, stop is controlled by protector, Press the "Start 1" button on the display unit, Display unit control), DO1 relay (default start 1 function), DO3 relay (default start 3 function) closed, close the KM1、KM3's main contacts, Motor Y starting. After the switch time DO1 relay is disconnected, DO2 relay closed (default start 2 function), Close the KM2、KM3's main contacts, Motor into Δ operation. Press the stop button on the panel, DO2 relay (default start 2 function), DO3 relay (default start 3 function) disconnected, KM1、KM2、KM3 coil is out of power, The motor stopped working.

Click switch input DI2(default start 1 function, Starting control is set to two-step mode, enabling local control), DO1 relay (default start 1 function), DO3 relay (default start 3 function) closed, close the KM1、KM3's main contacts, Y motor starts, After the switch time DO1 the relay is disconnected, DO2 relay closed (default start 2 function), Close the KM2、KM3's main contacts, Motor into Δ operation. Press the stop button, DO2 relay (default start 2 function), DO3 relay (default start 3 function) disconnected, KM1、KM2、KM3 coil is out of power, The motor stopped working.

9.5 ARD2F Electrical Motor Protector Double Speed Mode Connection



Double speed starting: motor starting and stopping are controlled by protector, Press the "Start 1" button on the display unit, Display unit control), DO1 relay (default start 1 function) closed, Close the KM1's main contacts, Motor starting at low speed; Press the start 2 button, DO1 relay (default start 1 function) disconnected, DO2 relay (default start 2 function) closed, Close the KM2、KM3's main contacts, Motor starting at high speed. Press the stop button on the panel, DO2 relay (default start 2 function) disconnected, KM2、KM3 coil is out of power, The motor stopped working. Click switch input DI2(default start 1 function, Starting control is set to double speed mode, Local control), DO1 relay (default start 1 function) closed, Close the KM1's main contacts, Motor starting at low speed; Click switch input DI3(default start 2 function), DO1 relay (default start 1 function) disconnected, DO2 relay closed (default start 2 function), close the KM2、KM3's main contacts, Motor starting at high speed. Click switch input DI1(default stop function), DO2 relay (default start 2 function) disconnected, KM2、KM3 coil is out of power, The motor stopped working.

10 Features and Functions

10.1 Permissions programmable

Protector has perfect control authority programmable function, with permission for "two choose one" or "three choose one" use.

when the control permission is " 1 in 2 ", the user can define the control permission output 1 and output 2: either of the panel, communication, remote and native (both definitions are not repeatable).

For example, control permissions are defined as "1 in 2 ", control permission output type output 1

is defined as "communication control", output 2 is defined as "panel control". The DI6 is defined as (control permission 1). When DI6(control permission 1) is disconnected, the control mode corresponding to the control permission output 1 takes effect, and the control mode corresponding to the output 2 takes effect when the DI6(control permission 1) is connected. The control permissions are selected as shown in Table 16 below:

Table 16

Control Permission Type	DI6 Control Permission Input 1 State
Communication control	0
Panel control	1

When the control permissions are set to "1 in 3", The user can define control rights output 1, output 2, output 3, and output 4 as either of the panel, communication, remote, and native, stop (each output definition is not repeatable), The effective output is selected by DI6(control permission 1), DI7(control permission 2) on-off. If control permission output 1 is defined as communication control, Output 2 is defined as panel control, Output 3 is defined as native control, Output 4 is defined as remote control, The control permissions are selected as shown in Table 17 below:

Tale 17

Control permissions	DI Input state	
	DI7 Control permission 1	DI8 Control permission 2
Communication control	0	0
Panel control	0	1
Native control	1	0
Remote control	1	1

Note : "0" means switch input disconnected , "1" means turn on

10.2 Logic programmable

The protector has perfect logic programmable function, and the user can program and define according to the required logic output function. Each logic function consists of five programmable input conditions A、 B、 C、 D、 E, freely combined by "with "," or" relations. The programmable content of each input condition and the combination of input conditions can be seen in Table 11 menu.

Suppose the user needs to output passive signal when any fault occurs in blocking, short circuit, time limit overload, phase break, current imbalance, can set DO3(or other DO) to logic diagram output 1, set the condition of logic output 1 to $A*B*C*D*E$, and set the condition input A、 B、 C、 D、 E to block, short circuit, time limit overload, phase break, current imbalance fault, then block, short circuit, time limit overload, phase break, current imbalance fault any fault occurs, DO3—— logic diagram output 1 action, output passive signal.

Note : "?" representation and logic , " * " representation or logic.

10.3 Custom communication address

The protector has the function of customizing communication address, which makes communication reading more convenient and effective.

There are 120 communication addresses for user customization. Address 5000-5119 and 5300-5419, the corresponding data values can be customized. If the value of 5300 is written as 2010, the address 5000 is the same as the address 2010 data.

Example: Suppose the user needs to read and write the original address 2003,2300,2307,2309,2335,2357,2758,2800 frequently. These addresses are not continuous addresses, each read an address data, need to send a MODBUS read command.

In this case, the efficiency can be improved by customizing the address function: the user can write the address 5300-5307 as 2003,2300,2307,2309,2335,2357,2758,2800 respectively, so that the definition of the address 5000-5007, read and write, value range and so on will correspond to the above address one by one. At this time, the user only needs to send a read command to achieve all data read and write.

11 Examples of ordering

Example: specific model: ARD2F-100/QJMCSU-90L

Technical requirements: motor power 37 KW, 4-20 mA analog output ,alarm output, voltage loss restart

Communication protocol : RS485 protocol, MODBUS RTU protocol

Auxiliary power: AC 220V

Display mode :90L

Note: main body and transformer connection length 1 m; main body and display unit connection length 1.5 m.

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