027

ARD2 系列

智能电动机保护器

（包含 ARD2/ARD2L/ARD2F）

Smart Motor Protector ARD2 Series

使用说明书 V3.3

User’s Manual V3.3

安科瑞电气股份有限公司

ACREL Co., Ltd

申　　明
Declaration

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Catalogue

ARD2/ARD2L 系列智能电动机保护器

Intelligent Motor Protector ARD2/ARD2L

ARD2F 系列智能电动机保护器

Intelligent Motor Protector ARD2F

警告：用户在使用该保护器之前，请务必按所要保护电动机的实际情况对各项保护功能及保护参数进行设置

Warning: User must set protective functions and parameters in accordance with conditions of your motor before using the protector.

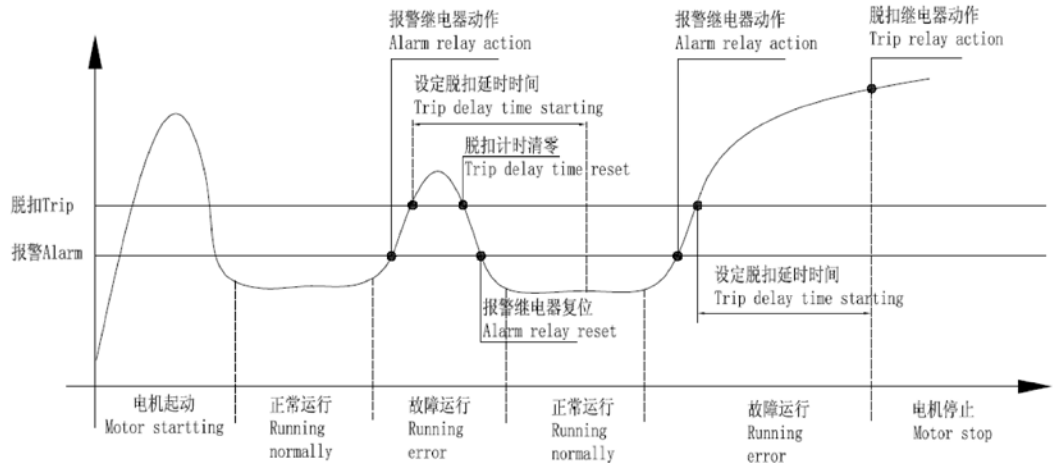
ARD2/ARD2L 系列智能电动机保护器

Intelligent Motor Protector ARD2/ARD2L

1 概述 Overview

ARD2/ARD2L 系列智能电动机保护器（以下简称保护器）能对电动机运行过程中出现的起动超时、过载、断相、不平衡、欠载、接地/漏电、阻塞、短路、外部故障等多种情况进行保护，并设有 SOE 故障事件记录功能，方便现场维护人员查找故障原因。适用于煤矿、石化、冶炼、电力、船舶、以及民用建筑等领域。本保护器具有 RS485 远程通讯接口，DC4～20mA 模拟量输出，方便与 PLC、PC 等控制机组成网络系统。实现电动机运行的远程监控。

Smart Motor Protector ARD2 Series (hereinafter referred to as Protector) can protect the motor from timeout startup, overload, phase failure, unbalance, under-load, earth leakage, blocking,short circuit, external fault and other abnormalities during the running and provide the SOE fault event recorder to help maintenance stuff find causes. It is applicable for coal mines, petrochemical industry, metallurgical industry, power industry,shipping, civil building and other fields. It is equipped with the RS485 remote communication interface and the DC4-20mA analog output, which is convenient to form a network system together with control machines like PLC and PC to realize the remote monitoring of motor.



保护器动作示意图
Schematic diagram

2 产品型号 Product type

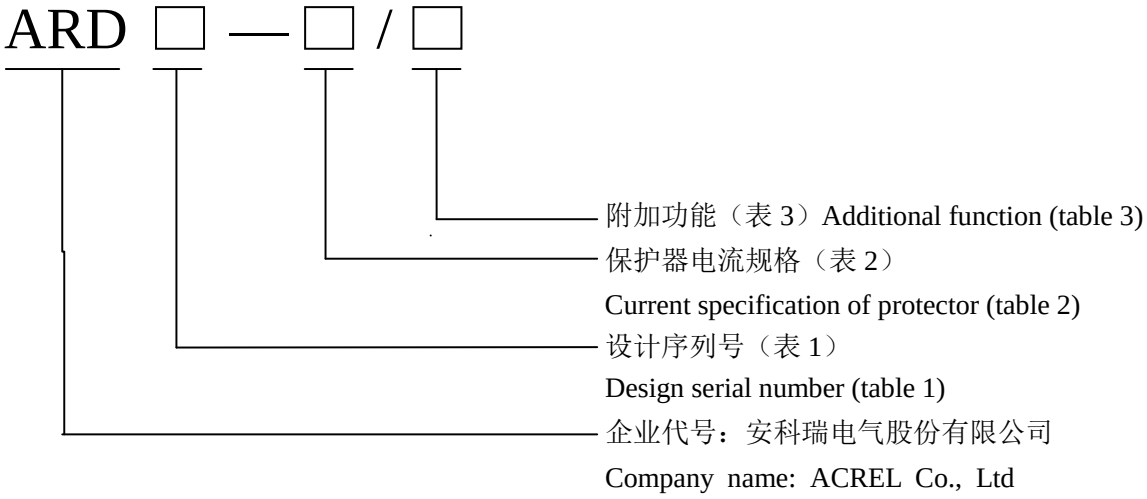


表 1 Table 1

设计序列号 Design serial number	规格 Specification	设计序列号 Design serial number	规格 Specification
2	数码管显示 LED display	2L	液晶显示 LCD display

表 2 Table 2

保护器电流规格 Current specification （A）	变比设置 CT ratio set	互感器一次侧圈数 Number of turns of transformer	适用电动机额定电流 Is 范围 Range of set current Is （A）	适用电动机功率 Power of motor （kW）
1	支持 Yes	5	0.1～9999	0.12～440
5		1	0.1～9999	0.12～440
1.6	不支持 No	1	0.4～1.6	0.12～0.55
6.3		1	1.6～6.3	0.75～2.2
25		1	6.3～25	3～11
100		1	25～100	15～45
250		1	63～250	55～132
800		1	250～800	160～440

注：保护器电流规格为 1、5 时，接收主回路互感器二次侧 1A、5A 信号，主回路互感器客户自备。保护器电流规格为 1.6、6.3、25、100、250、800 时，保护器自配互感器，使用自配互感器测量电机回路电流。

Note: When the current specification of protector is 1and 5, receive 1A and 5A signals from secondary side of main circuit transformer.The main circuit transformer is provided by the customer. When the current specification of protector is 1.6, 6.3, 25, 100, 250, 800, the protector is equipped with transformer which measure motor circuit current.

表 3 Table3

附加功能 Additional functions	代号 Code	附加功能 Additional functions	代号 Code
通讯接口 Communication	C	2 路开关量输入；1 路继电器输出(可编程 3) 2-way switching input, 1-way relay output (programmable 3)	K
漏电保护 Leakage protection	L	SOE 事件记录 SOE event recorder	SR
4～20mA 模拟量输出 Analog output 4-20mA	M	报警输出(可编程 2) Alarm output (programmable 2)	J

注：1、ARD2/ARD2L 标配电流测量功能和两路继电器输出 DO1(95、96)，DO2（97、98）

2、选配 K 功能带 2 路开关量输入 15、16 及 1 路继电器输出 DO4（11、12）；

选配 J 功能多 1 路可编程继电器输出 DO3（9、10）。

Note: 1.ARD2/2L is equipped with current measurement function and two relay outputs: DO1 (95, 96), DO2 (97, 98).

2.Optional K function with two-way switching value input 15,16 and one relay output DO4(11,12);

Optional J function with one programmable relay output DO3 (9, 10).

3 通用技术指标 General technical index

表 4 Table 4

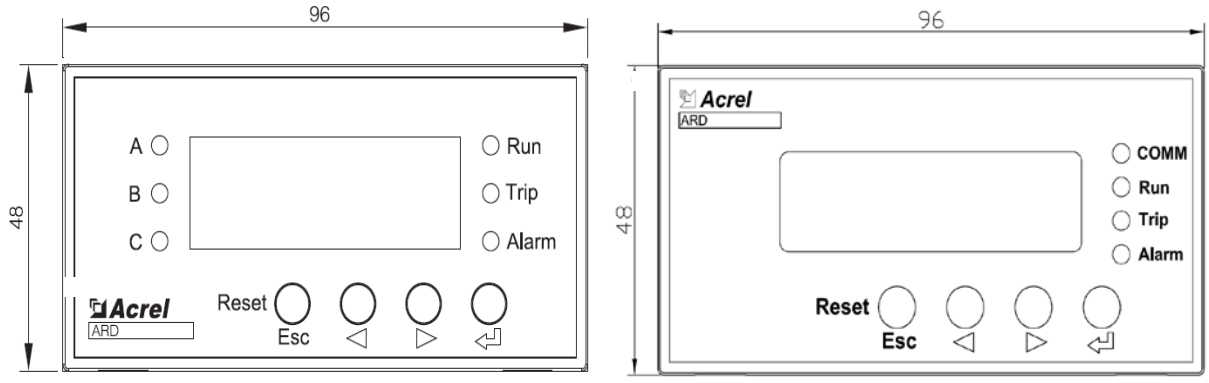
技术参数 Technical parameters	技术指标 Technical specification
保护器辅助电源 Auxiliary power	AC85V~265V/DC100V~350V，功耗≤7VA power consumption≤7VA
电机额定工作电压	AC380V/AC660V，50Hz/60Hz

Rated working voltage of motor		
电动机额定工作电流 Rated working current of motor	1A（0.1～999.9A）	采用小型专用 电流互感器 Small specific current transformer
	5A（0.1～999.9A）	
	1.6A（0.4A～1.6A）	
	6.3A（1.6A～6.3A）	
	25A（6.3A～25A）	
	100A（25A～100A）	
	250A（63A～250A）	采用专用 电流互感器 Specific current transformer
	800A（250A～800A）	
继电器输出触点，额定负载容量 Relay output contactor, rated load capacity	4 路，AC250V, 3A；DC30V, 3A 4-way，AC250V, 3A；DC30V, 3A	
开关量输入 Switching input	2 路，光电隔离 2-way, optical isolation	
通讯 Communication	RS485 Modbus	
SOE 事件记录容量 Volume of SOE event recorder	8 个事件记录 8 events	
环境 Environment	工作温度 Working temperature	-10ºC～55ºC
	贮存温度 Storage temperature	-20ºC～65ºC
	相对湿度 Relative humidity	5％～95％不结露 5%-95%, no dew
	海拔 Altitude	≤2000m
污染等级 Class of pollution	2	
防护等级 Protection level	IP20	

4 外形尺寸及安装 Overall dimensions and installation

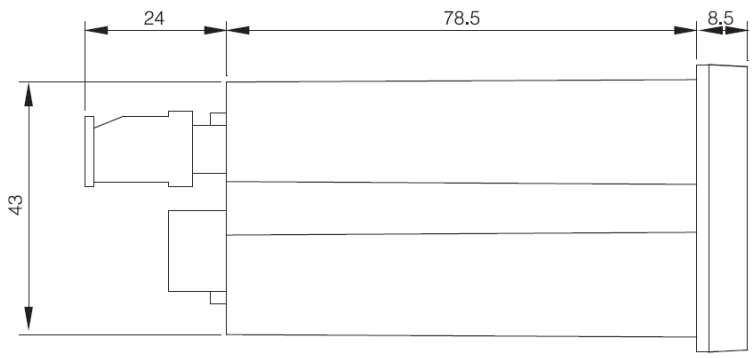
4.1 保护器安装尺寸图 Installation dimensions of protector

单位 Unit：mm

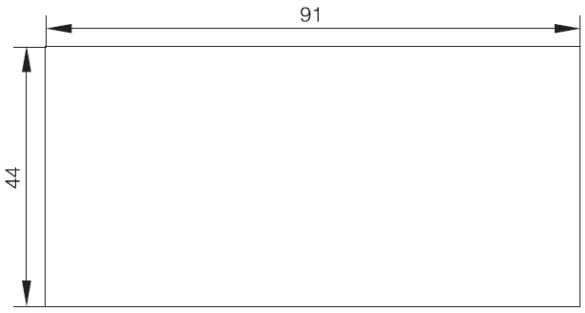


数码管 LED　　液晶 LCD

主视图 Front view



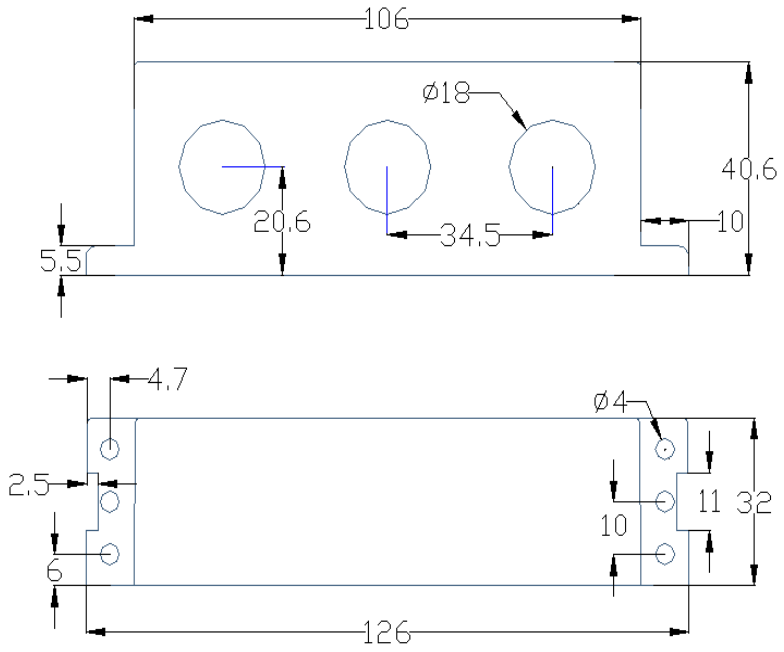
左视图 Left view



盘面开孔 Panel opening

主体部分 Main body

4.2 互感器安装尺寸 Installation dimensions of transformer

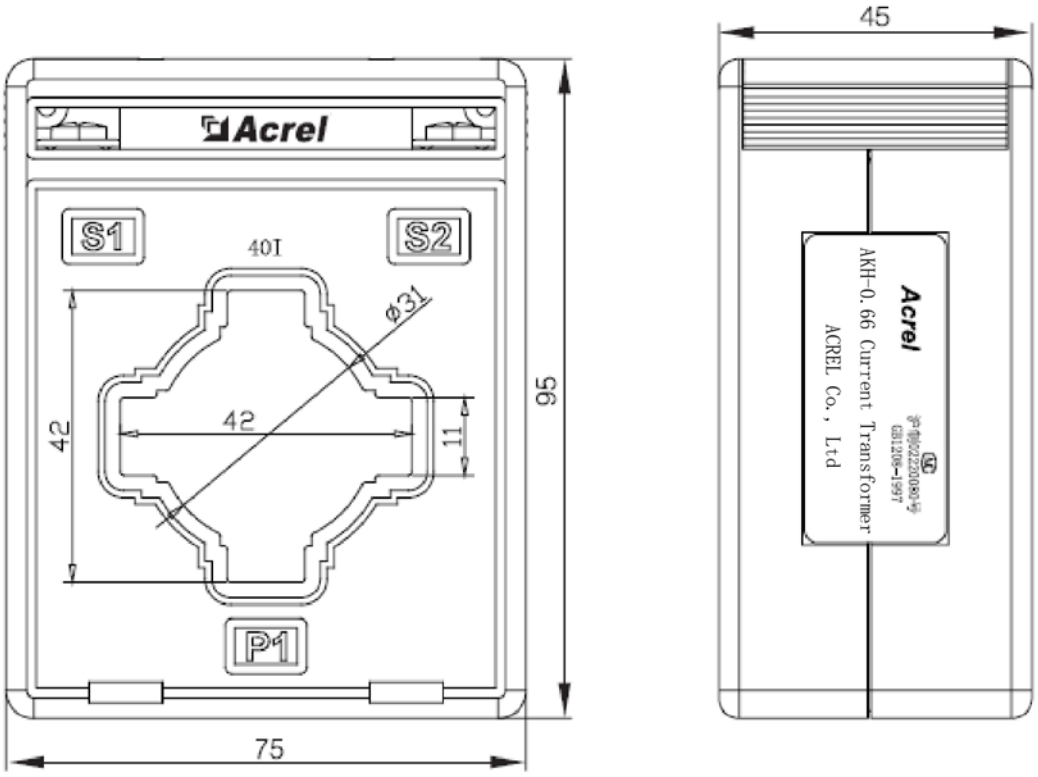


注：引出线黄、蓝、红、黑对应A、B、C、公共端。

Note：Yellow,blue,red,black correspond to A,B,C and COM3.

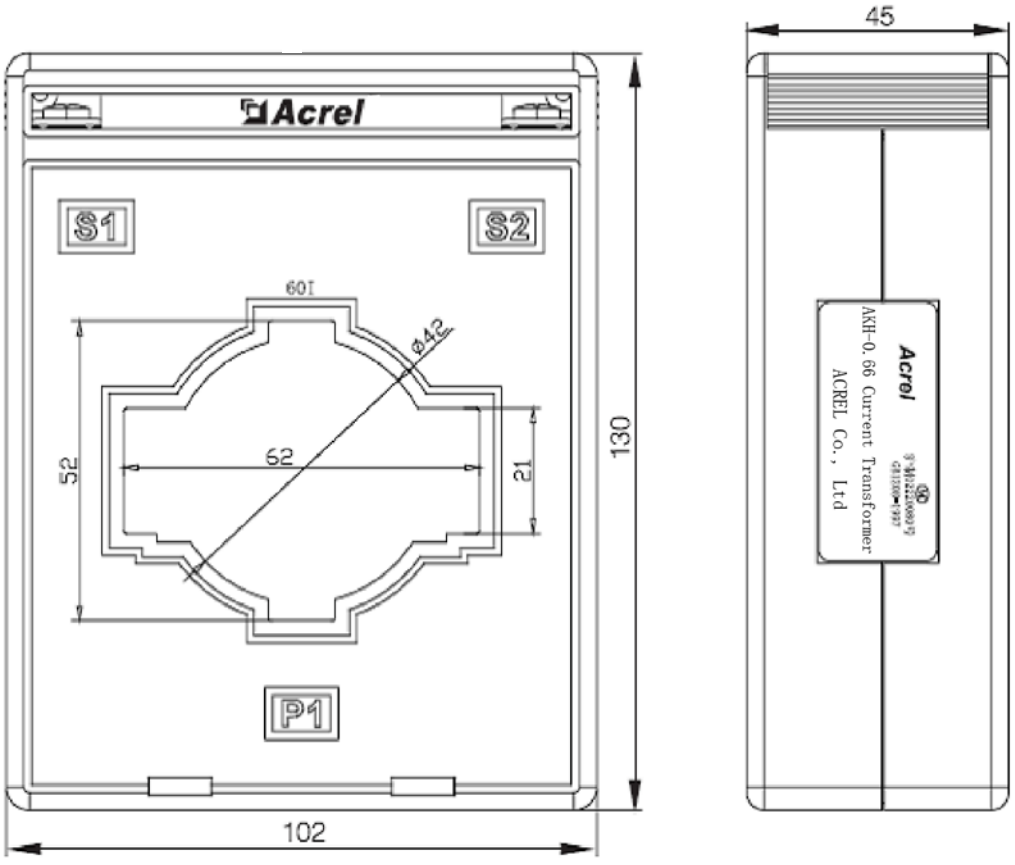
互感器部分（保护器电流规格为 1、5、1.6、6.3、25、100A 时所配电流互感器）

Current Transformer (0.1A-100A)



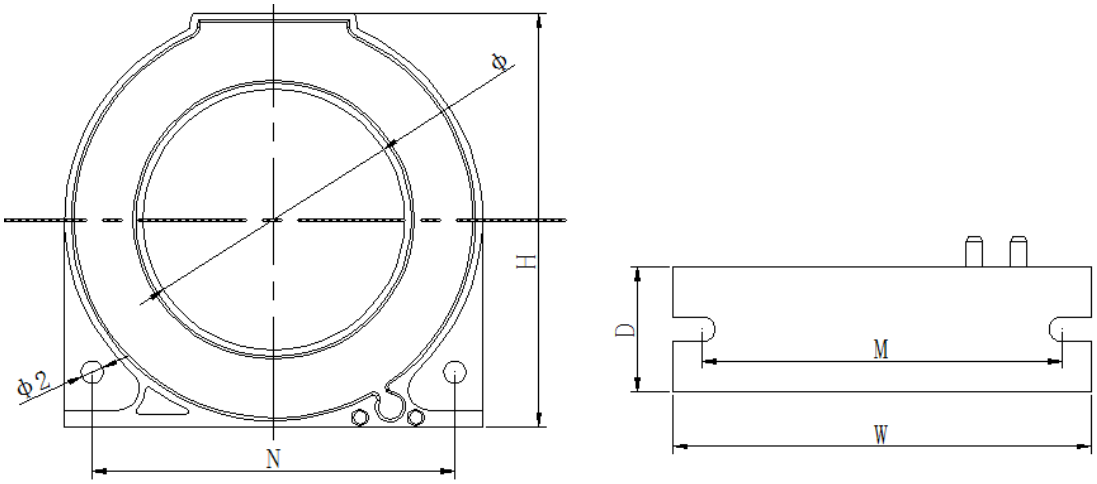
互感器部分（保护器电流规格为 250A 时所配电流互感器）

Current Transformer (63A-250A)



互感器部分（保护器电流规格为 800A 时所配电流互感器）

Current Transformer (250A-800A)



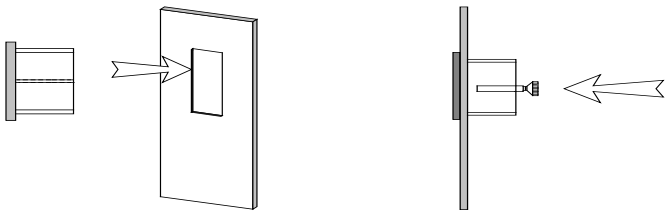
漏电互感器 Leakage current transformer

尺寸 Size / 规格 Standard	额定电流 Current specification (A)	外形尺寸(mm) Outline dimension			穿孔尺寸 Perforation Size(mm)	安装尺寸 Installation size(mm)			公差 Tolerance (mm)	重量 Weight（g）
		W	H	D	Φ	M	N	Φ2		
L-45	16-100	75	75	22	46	65	65	4	±1	200±10
L-80	100-250	120	120	23	81	105	105	4		380±20
L-150	400-800	196	205	24	150	175	180	6		850±50

注：引出线为双芯屏蔽线，标配长度为 1m±10cm，客户可根据需要定制。L-45 规格的漏电互感器适用于 100A 及以下电流规格的保护器，L-80 规格的漏电互感器适用于 250A 电流规格的保护器，L-150 规格的漏电互感器适用于 800A 电流规格的保护器。

Note: The outgoing line is double core shielded wire, and the standard length is 1m ± 10cm. Customers can customize it according to their needs. The leakage transformer of L-45 specification is applicable to the protector of 100A and below current specification, the leakage transformer of L-80 specification is applicable to the protector of 250A current specification, and the leakage transformer of L-150 specification is applicable to the protector of 800A current specification.

4.3 安装方法 Installation method



主体部分安装 Installation of main body

5 显示与用户编程 Display and user programming

5.1 数码管显示说明 Description of LED display

表 5 Table 5

序号	名称 Name	状态	功能说明 Function Description

No.		Status	
1	A 相 LED 指示灯 A phase indicator	亮 On	该指示灯亮则表明表明显示的为 A 相电流 When it is on, the LED shows the current of phase A
2	B 相 LED 指示灯 B phase indicator	亮 On	该指示灯亮则表明表明显示的为 B 相电流 When it is on, the LED shows the current of phase A
3	C 相 LED 指示灯 C phase indicator	亮 On	该指示灯亮则表明表明显示的为 C 相电流 When it is on, the LED shows the current of phase A
4	Run LED 指示灯 Running indicator	亮 On	该指示灯亮则表明电动机正在运行 When it is on， it indicates that the motor is running
5	Trip LED 指示灯 Trip indicator	亮 On	该指示灯亮则表明保护器脱扣继电器已动作 When it is on, it indicates that the trip relay is enabled
6	Alarm LED 指示灯 Alarm indicator	亮 On	该指示灯亮则表明保护器已报警 When it is on, it indicates that the protector has sent an alarm
7	↵ 按键 ↵key	按下 Press	选择操作功能或返回上级菜单 Select the operating function or return to the last menu
8	左方向键 ◀key (left)	按下 Press	查看事件或数字量减或移位 Review events, reduce the digital value or shift
9	右方向键 ▶key (right)	按下 Press	查看显示数据或数字量增 Review the data or increase the digital value
10	Esc/Reset	按下 Press	退出菜单或取消操作或将保护器复位或测试继电器 Exit from the menu, cancel the operation, reset the protector or test the relay
11	4 位 LED 数码管 4-bit LED	0000	显示测量数值 Show the measured value
注 Note	A、B、C 相指示灯 A、B、C phase indicator	On	指示灯全亮则表明 11 显示的为三相平均电流 When all light are on, it indicates that 11 shows the average current of three phases

5.1.1 用户编程 **User programming**

按保护器上的“↵”键，至显示“P001”，按“◀”键和“▶”键用于菜单的选择，到相应的菜单序号后，按“↵”键，进入值域的设置，按“◀”键进行数据位的选择，按“▶”键用于数字的增加，所需参数设置完毕后，按“↵”键进行保存，再按“ESC”键退出菜单。其中，保护器的各种保护功能的打开与否用“ON”“OFF”表示。参数设置见下表：

Press the ↵key on the protector until “P001” is indicated. Press the ◀key (left) and the ▶key (right) to select options on the menu. When the cursor moves to the desired option, press the ↵key to set the value field. Press the ◀key to select data bits and the ▶key (right) to increase the value. After set, press the ↵key to save the parameter. Then press the ESC key to exit from the menu. Indicate the enabling state of protective functions with ON and disabling state with OFF. Refer to the following table for parameter set:

表 6 Table 6

面板参数 Parameter	设定类别 Type of set	默认值 Default value	设定范围 Set range	单位 Unit
P001	过载满载电流设定 Overload/ full-load rated current set	1 5 1.6 6.3 25 100	0.1~999 0.1~999 0.4~1.6 1.6~6.3 6.3~25 25-100	安培 A

		250 800	63~250 250~800	
P002	脱扣等级设定 Trip level set	5	1、2、3、5、10、15、 20、25、30、35、40	级 Level
P003	起动时间 Starting time	10	0.1~999.9	秒 Second
P004	过载报警域值设定 Overload alarm threshold set	85	1~99%	%
P005	断相脱扣延时 Phase failure trip delay	1	0.1~600.0	秒 Second
P006	漏电故障电流设定 Leakage fault current set	300	30~1000	毫安 mA
	接地百分比设定 Earthing percentage set	50	1~100%	%
P007	接地/漏电故障脱扣延时设定 Earthing/ leakage fault trip delay set	0.5	0.1~600.0	秒 Second
P008	欠载脱扣域值设定 Under-load threshold set	50	10~99%	%
P009	欠载脱扣延时设定 Under-load trip	5.0	0.1~600.0	秒 Second
P010	不平衡脱扣域值设定 Unbalance threshold set	30	10~80%	%
P011	不平衡脱扣延时设定 Unbalance trip delay set	5.0	0.1~600.0	秒 Second
P012	不平衡报警设定 Unbalance alarm threshold set	20	10~80%	%
P013	报警允许位开/关 Alarm enabling On/Off	OFF	OFF/ON	过载报警 Overload alarm
P014		OFF	OFF/ON	不平衡报警 Unbalance alarm
P015	脱扣允许位开/关 Trip enabling On/off	ON	OFF/ON	过载脱扣 Overload trip
P016		ON	OFF/ON	接地/漏电脱扣 Earthing/leakage trip
P017		OFF	OFF/ON	欠载脱扣 Under-load trip
P018		ON	OFF/ON	断相脱扣 Phase failure trip
P019		ON	OFF/ON	起动超时脱扣 Starting time-out trip
P020		ON	OFF/ON	短路脱扣 Short-circuit trip
P021		ON	OFF/ON	阻塞脱扣 Blocking trip
P022		OFF	OFF/ON	不平衡脱扣

				Unbalance trip
P023		OFF	OFF/ON	外部故障脱扣 External fault trip
P024	外部故障脱扣延时设定 External fault trip delay set	5.0	0.1~600.0	秒 Second
P025	可编程 1 输出 DO2 设定 Programmable 1 output set set	11	1 报警 2 脱扣 3 过载 4 短路 5 接地/漏电脱扣 6 断相 7 外部故障 8 远程起动 9 漏电报警 10 短路、接地保护 11 短路、漏电/接地 12 短路、漏电/接地(脉冲 1S) 13 停止状态 14 运行状态 1.alarm;2.trip;3.overload; 4.short circuit; 5.earthing/leakage trip; 6.phase failure; 7.external fault; 8.remote starting; 9.leakage alarm; 10.short circuit and earthing protection;11.short circuit, leakage/earthing;12.short circuit,leakage/earthing (pulse: 1s)13.stop14.run	
P026	过载冷却时间 Overload cooling time	0	0 手动复位； 1~30min 自动复位 Manual reset; Automatic reset	秒 Second
P027	阻塞域值设定 Blocking value set	250	100~700	%
P028	阻塞脱扣延时设定 Delay of blocking trip set	5.0	0.1~600.0	秒 Second
P029	MODBUS 波特率设定 Baud rate of MODBUS set	9600	2400、4800、9600、19200、38400	bps
P030	MODBUS 地址设定 MODBUS address set	1	1~247	
P031	堵转脱扣域值设定 Locked-rotor threshold set	600	100~700	%
P032	堵转脱扣延时设定 Locked-rotor trip delay set	5.0	0.1-600.0	秒Second
P033	堵转脱扣允许位开/关 Locked-rotor release On/off	ON	OFF/ON	
P034	短路脱扣域值设定 Short-circuit threshold set	400	400-720	%
P035	短路脱扣延时	0.1	0.1-600.0	秒 Second

	Short-circuit trip delay			
P036	剩余电流互感器投入 Enabling of residual current transformer	OFF	OFF/ON	
P037	可编程 2 输出 DO3 设定 Programmable 2 output set	1	同可编程 1 输出设定 Same as output set of programmable 1	
P038	可编程 3 输出 DO4 设定 Programmable 3 output set	2	同可编程 1 输出设定 Same as output set of programmable 1	
P039	CT 变比 CT transformation ratio	1	1-999	

注：CT 变比在 1A、5A 电流规格时设置，数值为主回路互感器变比。例如主回路互感器为 500/5，则 CT 变比设置为 100，其他电流规格不要设置，使用默认变比 1。

Note: CT transformation ratio is set when the current specification of current Transformer is 1A and 5A, the value is the transformation ratio of main circuit transformer.For example, if the transformation ratio of the main circuit transformer is 500/5,then the CT transformation ratio is set 100.Don't set other current specification, use default ratio1.

液晶参数设置如下 LCD parameters are set as follows:

序号 No.	功能 Function		设定类别 Type of set	设定范围 Set range	默认值 Default value	单位 Unit
一 I	报警信息 Alarm text					
二 II	脱扣信息 Trip text					
三 III	运行信息 Running text	1 本次运行 Running of current cycle				h
		2 本次停车 Stop of current cycle				h
		3 运行时间 Running time				h
		4 停车时间 Stopping time				h
		5 起动次数 Number of starts				
		6 脱扣次数 Number of trip				
四 IV	系统参数 System parameters		波特率 Baud rate	2400、4800、9600、19200、38400	9600	bps
			通讯地址 Communication address	1~247	1	
			背光常亮 Bright backlight	ON/OFF	OFF	
			CT 变比 CT transformation ratio	1-999	1	
			基波开关	ON/OFF	OFF	

			Fundamental wave			
			软件版本 Version of software			
五 V	保护参数 Protection parameters	起动保护 Starting protection	起动时间 Starting time	0.1~999.9	10.0	秒 S
			脱扣 Trip	ON/OFF	ON	
		过载保护 Overload protection	电动机额定电流 Rated current of moto	0.1~999 0.1~999 0.4~1.6 1.6~6.3 6.3~25 25-100 63~250 250~800	1 5 1.6 6.3 25 100 250 800	安培 A
			脱扣等级 Trip level	1、2、3、5、10、15、20、25、30、35、40	5	级 Level
			报警域值 Alarm threshold	1~99%	85	%
			报警 Alarm	ON/OFF	OFF	
			脱扣 Trip	ON/OFF	ON	
			冷却时间 Cooling time	0 手动复位; 1~30min 自动复位 0: manual reset; 1-30min: automatic reset	30	秒 S
		欠载保护 Under-load protection	脱扣域值 Trip threshold	10~99%	50	%
			脱扣延时 Trip delay	0.1~600.0	5.0	秒 S
			脱扣 Trip	ON/OFF	OFF	
		断相保护 Phase failure protection	脱扣延时 Trip delay	0.1~600.0	1.0	秒 S
			脱扣 Trip	ON/OFF	ON	
		不平衡保护 Unbalance protection	报警域值 Alarm threshold	10~80%	20	%
			脱扣域值 Trip threshold	10~80%	30	%
			脱扣延时 Trip delay	0.1~600.0	5.0	秒 S
			报警 Alarm	ON/OFF	OFF	
			脱扣 Trip	ON/OFF	OFF	
		接地/漏电保护 Earthing/leakage protection	互感器投入 Enabling of transformer	ON/OFF	OFF	
			接地脱扣域值 earthing trip	1~100	50	%

			threshold			
			漏电脱扣电流 leakage trip threshold	100~1000	300	毫安 mA
			脱扣延时 Trip delay	0.1~600.0	0.5	秒 S
			脱扣 Trip	ON/OFF	ON	
		短路保护 Short circuit protection	脱扣域值 Trip threshold	400%-700%最大可测过载倍数 Max. measurable overload	500	
			脱扣延时 Trip delay	0.1~600.0	0.1	
			脱扣 Trip	ON/OFF	ON	
		堵转保护 Locked-rotor protection	堵转脱扣域值设定 Locked-rotor threshold	100~700	600	%
			堵转脱扣延时设定 Locked-rotor trip delay	0.1~600.0	5.0	秒 S
			堵转脱扣 Locked-rotor trip	OFF/ON	ON	
		阻塞保护 Blocking protection	阻塞脱扣域值 Blocking threshold	100%~700%	250	%
			脱扣延时 Trip delay	0.1~600.0	5.0	秒 S
			脱扣 Trip	ON/OFF	ON	
		外部故障保护 External fault protection	外部故障脱扣延时 External fault trip delay	0.1~600.0	5.0	秒 S
			脱扣 Trip	ON/OFF	OFF	
六 VI	控制参数 Control parameters	可编程 1 设定 Set of programmable 1		1 报警 2 脱扣 3 过载 4 短路 5 接地/漏电脱扣 6 断相 7 外部故障 8 远程起动 9 漏电报警 10 短路、接地保护 11 短路、漏电/接地 12 短路、漏电/接地(脉冲 1S) 1.alarm;2.trip; 3. overload; 4.short circuit; 5.earthing/ leakage trip; 6.phase failure; 7.external fault; 8.remote starting; 9.leakage alarm; 10.short circuit and earthing	11	

				protection;11.short circuit, leakage/ earthing;12.short circuit, leakage/earthing (pulse: 1s)		
		可编程 2 设定 Set of programmable 2		同可编程 1 输出设定 Same as output set of programmable 1	2	
		可编程 3 设定 Set of programmable 3		同可编程 1 输出设定 Same as output set of programmable 1	2	
		test*	DO1	ON/OFF	OFF	
			DO2	ON/OFF	OFF	
			DO3	ON/OFF	OFF	
			DO4	ON/OFF	OFF	

注：test*作用为测试继电器是否能正常动作，具体操作见 5.1.2。

Note: test* is used to test whether the relay can operate normally,see 5.1.2 for specific operation.

5.1.2 查看数据 Data view

测量数据查看：用户可按动“▶”键，切换显示三相平均电流、A 相电流、B 相电流、C 相电流、漏电流或接地百分比、开关量输入。

事件记录查看：用户可按动“◀”键，至 4 位 LED 数码显示“Eut1”，表示事件 1（此为最近一次保护器脱扣的事件记录），可按动“↵”键，数码管显示为“CAuS”，按动“↵”键，查看脱扣原因。按动“Esc”返回上一层菜单，按动“▶”键可依次查看脱扣动作的“onth”月、“day”日、“hour”时、“Inut”分、“sEc”秒。或用户在“Eut1”时，按动“◀”键或 “▶”键，查看其他的事件。本保护器记录最近 8 次发生的脱扣事件，事件记录定义如表 7 所示。

View the measurement data. User can press the ▶ key (right) to view the average current of three phases, the current of individual phase (phase A, B or C), the leakage current or earthing percentage and switch input.

View the event record. User can press the ◀ key. When the LED shows EUt 1, it indicates the event 1 (for the last trip of protector). Press the ↵ key. Then LED shows CAUS. Press the ↵ key again to view the cause. Press the Esc to return to the last menu. User can view the onth (month), dAy (day), hour (hour), Inut (minute) and SEc (second) of trip action with ▶ key. User can also view other events with ◀ key or ▶ key when the LED shows EUt 1. The protector records the latest eight trip events. The meaning of event record is given in the table 7.

表 7　事件记录说明 Table 7 Meaning of Event Record

通讯故障代码 Code of communication fault	显示 Message	故障原因 Fault cause
1	hEAt	过载 Overload
2	oUdF	接地/漏电 Earthing/Leakage
3	UdCU	欠载 Underload
4	LoPh	断相 Phase failure
7	Stal	堵转 Locked-rotor
8	JA	阻塞 Blocking
9	CUIb	电流不平衡 Current unbalance
11	oUtE	外部故障 External fault
12	Stot	起动超时 Starting time-out
16	shor	短路 Short circuit

测试继电器是否正常：

方法一：长按“ESC”键 8 秒（数码和液晶显示操作方法一致），看所有继电器是否动作。

方法二：此方法仅在液晶显示时有效，在测试前需先将三个可编程继电器设置为“远程起动”（按“↵”后按“▶”键切换至“控制参数”中设置可编程设定为 0008 远程起动），然后按“↵”后按“▶”键切换至“控制参数”中“test”进行测试。

注：方法一：测试完成后按“ESC”键恢复继电器初始状态。

方法二：测试完成后继电器必须恢复初始状态，同时可编程设定重新设定。

Test if the relay works normally.

Method1: Press and hold the ESC for 8s and check if the relay is enabled. (The operation is available for both LED tube and LCD designs.)

Method2: It is only available for LCD design. Set the Remote Starting (0008 by pressing the ↵key and the ▶key to enter the Control Program) for three programmable relay. Then press the ↵key and the ▶key to enter the Control Program and start the test.

Note: For method 1, press the ESC to restore to the original state of relay after test.

For method 2, it is necessary to restore to the original state of relay and reset the programmable set after test.

5.2 液晶显示说明 Description of LCD

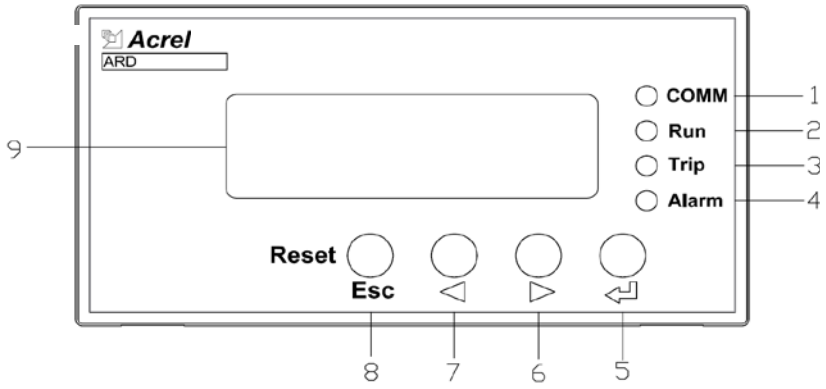


表 8 Table8

序号 NO.	名称 Name	状态 Status	功能说明 Function
1	COMM LED	亮 ON	该指示灯亮则表明通讯总线上数据 When it is on, it indicates that the communication bus is loading data
2	Run LED	亮 ON	该指示灯亮则表明电动机正在运行 When it is on， it indicates that the motor is running
3	Trip LED	亮 ON	该指示灯亮则表明保护器脱扣继电器已动作 When it is on, it indicates that the trip relay is enabled
4	Alarm LED	亮 ON	该指示灯亮则表明保护器已报警 When it is on, it indicates that the protector has sent the alarm
5	↵ 按键 key	按下 Press	选择操作功能或返回上级菜单 Select the operating function or return to the last menu
6	左方向键 left key	按下 Press	查看事件或数字量减或移位 Review events, reduce the digital value or shift
7	右方向键 right key	按下 Press	查看显示数据或数字量增 Review the data or increase the digital value
8	Esc/Reset 键 Esc/Reset key	按下 Press	退出菜单或取消操作或将保护器复位或测试继电器 Exit from the menu, cancel the operation, reset the

			protector or test the relay
9	液晶显示 LCD display		显示测量数值 Show the measured value

5.2.1 用户编程 User programming

按保护器上的“↵”键，至信息查询与参数设定界面，按键操作参考数码管的操作方法，参数的设定参考表 6。

Press the ↵key on the protector to enter the request and set screen. Refer to the operation of LED tube for operations of LCD. Set parameters in accordance with the table 6.

5.2.2 查看数据 Data view

用户可按动“▶”键，切换显示菜单，显示菜单内容如下：

1、A、B、C 三相电流，Iuf 不平衡度百分比；

2、工作电流与设定额定电流的百分比；

3、Iav 三相平均电流，Heat 热容量百分比，Iav/In 三相平均电流与设定额定电流的百分比，Id/In 接地百分比/Id 漏电流；

4、2 路 DI 状态；

5、4 路继电器输出：DO1—脱扣、DO2—短路/接地脱扣（可编程 1）、DO3—报警（可编程 2）、DO4—可编程 3。

User can press the ▶key (right) to see different display menus. Display menus contain following information:

1. current of phases (phase A, B and C) and percentage of unbalance (Iuf)

2. ratio of working current to rated current in percent

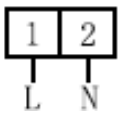
3. average current of three phases (phase A, B and C) (Iav), percentage of thermal capacity (Heat), ratio of average three current of phases (phase A, B and C) to rated current (Iav/In) and earthing ratio (Id/In) or leakage current (Id)

4. 2-way DI state

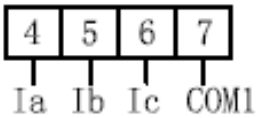
5. 4-way relay output: DO1-trip; DO2-short-circuit/earthing trip (programmable 1);DO3-alarm (programmable 2);DO 4-programmable 3

6 接线方式 Wiring mode

6.1 电源、电流信号接线 Power and current signal



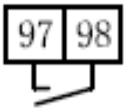
辅助电源 Auxiliary power



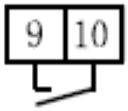
电流信号输入 Input of current

6.2 继电器输出 Relay output

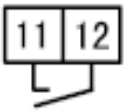
(DO1)
脱扣
Trip



(DO2)
短路/接地脱扣（可编程 1）
Short-circuit/ earthing trip (programmable 1)

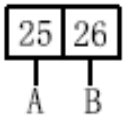


(DO3)
报警（可编程 2）
Alarm(programmable 2)



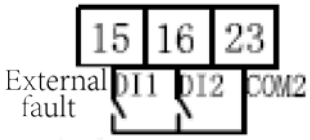
(DO4)
可编程 3
programmable 3

6.3 RS485 通讯 RS485 Communication

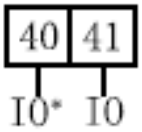


6.4 DC 4～20mA 模拟量输出 Analog output

6.5 开关量输入 Switching input



6.6 漏电流输入 Input of leakage current



注：

1、95、96 及 97、98 是标配 2 路继电器输出，95、96 默认常闭，有故障断开，97、98 默认常开，有故障闭合，选配 J 功能时，多 1 路继电器输出 9、10；

2、选配通讯功能时，25、26 起作用；

3、选配模拟量输出功能时，35、36 起作用；

4、选配开关量输入功能 K 时，控制器带 15、16 两路开关量输入及 1 路可编程继电器输出 11、12，15 默认为外部故障输入；

5、选配漏电流输入功能时，漏电互感器二次线接入 40、41。

Note:1. 95, 96, 97 and 98 are standard two-way relay outputs. 95 and 96 are normally closed by default and disconnected by fault. 97 and 98 are normally open by default and closed by fault. When J function is selected, one more relay outputs 9 and 10;

2. When the communication function is selected, 25 and 26 work;

3. When the analog output function is selected, 35 and 36 work;

4. When the switching value input function K is selected, the controller has 15 and 16 switching value inputs and 1 programmable relay output 11 and 12. 15 is the external fault input by default;

5. When the leakage current input function is selected, the secondary line of leakage transformer is connected to 40 and 41.

7 通讯协议 Communication protocol

7.1 通讯协议概述 Overview of communication protocol

ARD2 系列电动机保护器使用 MODBUS-RTU 通讯协议，MODBUS 协议详细定义了校验码、数据序列等，这些都是特定数据交换的必要内容。MODBUS 协议在一根通讯线上使用主从应答式连接（半双工），这意味着在一根单独的通讯线上信号沿着相反的两个方向传输。首先，主计算机的信号寻址到一台唯一的终端设备（从机），然后，终端设备发出的应答信号以相反的方向传输给主机。

MODBUS 协议只允许在主机（PC，PLC 等）和终端设备之间通讯，而不允许独立的终端设备之间的数据交换，这样各终端设备不会在它们初始化时占据通讯线路，而仅限于响应到达本机的查询信号。

The motor protector ARD2 series applies the communication protocol MODBUS-RTU. The MODBUS defines the check code, data sequence and others necessary for specific data exchange in details. By adopting the master-slave responder connection (half-duplex) in one communication line, it transmits signals in two opposite directions in one

same communication line. The signal of master unit addresses the unique terminal unit (slave unit). Then the terminal unit sends the acknowledgment signal to the master unit in the opposite direction.

The MODBUS just allows the communication between the master unit (PC, PLC, etc.) and the terminal unit other than data exchange between independent terminal units. In this way, terminal units do not occupy the communication line upon initialization. They merely respond to the request signal received from the master unit.

7.1.1 传输方式 Transmission mode

信息传输为异步方式，并以字节为单位，在主机和从机之间传递的通讯信息是 11 位字格式，包含 1 个起始位、8 个数据位（最小的有效位先发送）、无奇偶校验位、1 个停止位。

Adopt the asynchronous signal transmission in byte. The communication information between the master unit and the slave unit is an 11-bit format including one start bit, eight data bits (send the minimum significant bit first), non-parity check bit and one stop bit.

7.1.2 信息帧格式 Format of information frame

地址码 Address code	功能码 Function code	数据区 Data field	CRC 校验码 CRC check code
1 字节 1 byte	1 字节 1 byte	n 字节 n bytes	2 字节 2 bytes

地址码：地址码在帧的开始部分，由一个字节（8 位二进制码）组成，十进制为 0～255，在 ARD2 系列电动机保护器中只使用 1-247,其它地址保留。这些位标明了用户指定的终端设备的地址，该设备将接收来自与之相连的主机数据。每个终端设备的地址必须是唯一的，仅仅被寻址到的终端会响应包含了该地址的查询。当终端发送回一个响应，响应中的从机地址数据便告诉了主机哪台终端正与之进行通信。

功能码：功能码告诉了被寻址到的终端执行何种功能。下表列出了该系列仪表用到的功能码，以及它们的意义和功能。

Address code. It is in the front of frame and consists of one byte (8-bit binary code). The decimal system ranges from 0 to 255. The protector just uses the range from 1 to 247 and others are reserved. These bits identify the address of the terminal unit that user designates to receive the data from connected master unit. The address of each terminal unit is exclusive. Except for addressed terminal unit, no terminal unit will respond to the request including the address. When a terminal unit sends back a response, the response address data enables the master unit to identify the terminal unit communicating with it.

Function code: The function code identifies the function being executed by the addressed terminal unit. The following table lists function codes of this series, their meanings and functions.

功能 Function	定义 Definition	操作 Operation
03H/04H	读数据寄存器 Read the data register	获得一个或多个寄存器的当前二进制值 Obtain the current binary value of one or more registers
10H	预置多寄存器 Preset multiple registers	设定二进制值到一系列多寄存器中 Set the binary value in multiple registers
06H	预置单个寄存器 Preset the single register	设定二进制值到单个寄存器中 Set the binary value in the single register

数据区：数据区包含了终端执行特定功能所需要的数据或者终端响应查询时采集到的数据。这些数据的内容可能是数值、参考地址或者设置值。例如：功能码告诉终端读取一个寄存器，数据区则需要指明从哪个寄存器开始及读取多少个数据，内嵌的地址和数据依照类型和从机之间的不同内容而有所不同。

CRC 校验码：错误校验(CRC)域占用两个字节，包含了一个 16 位的二进制值。CRC 值由传输设备计算出来，然后附加到数据帧上，接收设备在接收数据时重新计算 CRC 值，然后与接收到的 CRC 域中的值进行比较，如果这两个值不相等，就发生了错误。

生成一个 CRC 的流程为：

1、预置一个 16 位寄存器为 0FFFFH（全 1），称之为 CRC 寄存器。

2、把数据帧中的第一个字节的 8 位与 CRC 寄存器中的低字节进行异或运算，结果存回 CRC 寄存器。

3、将 CRC 寄存器向右移一位，最高位填以 0，最低位移出并检测。

4、如果最低位为 0，重复第三步（下一次移位）；如果最低位为 1，将 CRC 寄存器与一个预设的固定值（0A001H）进行异或运算。
5、重复第三步和第四步直到 8 次移位，这样处理完了一个完整的八位。
6、重复第 2 步到第 5 步来处理下一个八位，直到所有的字节处理结束。
7、最终 CRC 寄存器的值就是 CRC 的值。

此外还有一种利用预设的表格计算 CRC 的方法，它的主要特点是计算速度快，但是表格需要较大的存储空间，该方法此处不再赘述，请参阅相关资料。

Data field: It contains data that the terminal unit requires for specific function or data acquired when the terminal unit responds to the request. These data may be the numerical value, the reference address or set. For example, the function code identifies a register and the data field must identify the first register and number of data read out. The embedded address and data vary with the type and slave unit.

CRC check code. The error-checking (CRC) field occupies two bytes including one 16-bit binary value. CRC value is calculated in the transmission unit and attached to the data frame. The receiving unit will re-calculate the CRC value upon receipt and compare the calculated CRC value with that in the CRC field. An error is recognized if two values are different.

A CRC is generated in the following process:

1. Preset 0FFFFH in a 16-bit register (all in 1) and identify such register as CRC register.
2. Perform the XOR operation for 8 bits in the first byte of data frame and low byte in the CRC register and save the result in the CRC register.
3. Shift the CRC register one bit to the right, fill 0 in the most significant bit, move the least significant bit out and conduct the test.
4. If the least significant bit is 0, repeat the step 3 (next shift). If the least significant bit is 1, perform the XOR operation for the register and a preset (0A001H).
5. Repeat the step 3 and step 4 eight times until eight bits are processed completely.
6. Repeat the step 2 to 5 to process the next eight bits until all bytes are processed.
7. The final value in the CRC register is the CRC value.

Alternatively, calculate the CRC with a preset table. The alternative method features the fast calculation. However, it requires a large memory. For more details, please refer to relevant data.

7.2 功能码简介 Brief description of function code

7.2.1 功能码 03H 或 04H：读寄存器 Function code 03H or 04H: read the register

此功能允许用户获得设备采集与记录的数据及系统参数。主机一次请求的数据个数没有限制，但不能超出定义的地址范围。

下面的例子是从 01 号从机读 3 个采集到的基本数据 （数据帧中每个地址占用 2 个字节）L1、L2、L3，其中 L1 的地址为 0000H, L2 的地址为 0001H, L3 的地址为 0002H。

It enables the user to obtain the data and system parameters acquired and recorded by unit. Though there is no restriction on the number of data requested by master unit, the number of data cannot exceed the defined address range.

In the following example, the slave unit 01 reads basic data L1, L2 and L3 acquired (each address occupies two bytes in the data frame). The addresses of L1, L2 and L3 are 0000H, 0001H and 0002H respectively.

主机发送 Information sent by the master unit	发送信息 Code	从机返回 Information sent by the slave unit	返回信息 Code
地址码 Address code	01H	地址码 Address code	01H
功能码 Function code	03H	功能码 Function code	03H

起始地址 Start address	高字节 High byte	00H	字节数 Number of bytes		06H
	低字节 Low byte	00H	寄存器数据 Data in the register	高字节 High byte	00H
寄存器数量 Number of registers	高字节 High byte	00H		低字节 Low byte	00H
	低字节 Low byte	03H	寄存器数据 Data in the register	高字节 High byte	00H
CRC 校验码 CRC check code	低字节 Low byte	CBH		低字节 Low byte	00H
	高字节 High byte	05H	寄存器数据 Data in the register	高字节 High byte	00H
				低字节 Low byte	00H
			CRC 校验码 CRC check code	低字节 Low byte	75H
				高字节 High byte	21H

7.2.2 功能码 10H：写寄存器 Function code 10H: preset the register

功能码 10H 允许用户改变多个寄存器的内容，该仪表中系统参数、继电器输出状态等可用此功能号写入。主机一次最多可以写入 8 个(16 字节)数据。

下面的例子是预置地址为01的仪表输出开关量DO2。开关量输入/输出状态指示寄存器地址为0003H，第0-1位对应DI1-DI2，第8-11位分别对应DO1-DO4。

The code allows user to change the data in multiple registers. With the code, user can preset the system parameter, output state of relay and other data in the protector. The master unit permits the preset of eight data (16 bytes) once at most.

In the following example, the switch output DO3 is preset for the instrument at the address 01. The switch input/output state indicates that the address of register is 0003H, bits 0 and 1 correspond to DI1 and DI2 and bits 8 to 11 correspond to DO1 to DO4.

主机发送 Information sent by the master unit		发送信息 Code	从机返回 Information sent by the slave unit		返回信息 Code
地址码 Address code		01H	地址码 Address code		01H
功能码 Function code		10H	功能码 Function code		10H
起始地址 Start address	高字节 High byte	00H	起始地址 Start address	高字节 High byte	00H
	低字节 Low byte	03H		低字节 Low byte	03H
寄存器数量 Number of registers	高字节 High byte	00H	寄存器数量 Number of registers	高字节 High byte	00H
	低字节 Low byte	01H		低字节 Low byte	01H
字节数 Number of bytes		02H	CRC 校验码 CRC check code	低字节 Low byte	C9H
0003H 待写入数据 Data to be preset in 0003H	高字节 High byte	04H		高字节 High byte	F1H
	低字节 Low byte	00H			

CRC 校验码 CRC check code	低字节 Low byte	A3H			
	高字节 High byte	A4H			

7.2.3 功能码 06H：写单个寄存器 Function code 06H: preset the single register

功能码 06H 允许用户改变单个寄存器的内容，该仪表中系统参数、开关量输出状态等可用此功能号写入。

下面的例子是预置地址为01的仪表输出开关量DO2。开关量输入/输出状态指示寄存器地址为0003H，第0-1位对应DI1-DI2，第8-11位分别对应DO1-DO4。

The function code 06H allows the user to change the information in the single register. Preset the system parameters, switch output state and others relating to the system with 06H.

In the following example, the switch output DO3 is preset for the instrument at the address 01. The switch input/output state indicates that the address of register is 0003H, bits 0 and 1 correspond to DI1 and DI2 and bits 8 to 11 correspond to DO1 to DO4.

主机发送 Information sent by the master unit		发送信息 Code	从机返回 Information sent by the slave unit		返回信息 Code
地址码 Address code		01H	地址码 Address code		01H
功能码 Function code		06H	功能码 Function code		06H
起始地址 Start address	高字节 High byte	00H	起始地址 Start address	高字节	00H
	低字节 Low byte	03H		低字节 Low byte	03H
0003H 待写入数据 Data to be preset in 0003H	高字节 High byte	04H	写入数据 Data to be preset	高字节 High byte	04H
	低字节 Low byte	00H		低字节 Low byte	00H
CRC 校验码 CRC check code	低字节 Low byte	0AH	CRC 校验码 CRC check code	低字节 Low byte	0AH
	高字节 High byte	7BH		高字节 High byte	7BH

7.3 数据读取换算 Date reading conversion

类型 Type		单位 Unit	小数点位数 Decimal places
电流 Current	电流规格 Current specification： 25、100、250、800	0.1A	1 位小数点 1 decimal point
	电流规格 Current specification： 1.6、6.3	0.01A	2 位小数点 2 decimal points

举例：

1、以电流读取为例：从地址 0x00-0x02 读取电流值分别为 1000、1000、1000，保护器电流规格为 ARD2-100x/xx 时，要得到实际电流值，需要对读取的数据加一位小数点才是实际数据，处理后得到：100.0、100.0、100.0。如不好获取电流规格，还可以采取下面的方法获得电流数据：通过通讯读取三相电流时，同步读取“电流比例因子”地址中的数据，“电流比例因子”中的数据“10”代表 1 位小数点，“100”代表 2 位小数点。如读取三相电流分别为 999、998、1000，“电流比例因子”为“10”，按照上述转化关系进行转化，实际电流为 99.9、99.8、100.0。

2、几种不同电流规格的电流值小数点位数如上表所示。

Examples:

1. Take current reading as an example: when the current values read from address 0x00-0x02 are 1000, 1000 and 1000 respectively, and the current specification of protector is ard2-100x / XX, in order to obtain the actual current value, it is necessary to add one decimal point to the read data to obtain the actual data. After processing, it is obtained: 100.0, 100.0 and 100.0. If it is difficult to obtain the current specification, the following methods can also be adopted to obtain the current data: when reading the three-phase current through communication, synchronously read the data in the address of "current scale factor", the data "10" in "current scale factor" represents 1 decimal point, and "100" represents 2 decimal points. If the read three-phase currents are 999, 998 and 1000 respectively, "current scale factor" is "10", the conversion is carried out according to the above conversion relationship, and the actual current is 99.9, 99.8 and 100.0.

2. The decimal places of current values of several different current specifications are shown in the table above.

7.4 地址参量 Address parameter

表 9 Table 9

地址 Add.	地址 Add.	参数 Parameter	读写属性 Property (R/W)	数值范围 Range of value	类型 Type
1	0x00	L1 相实际电流 Actual current of phase L1	R	0~65535	word
		L1 相基波电流 Fundamental current of phase L1	R	0-65535	word
2	0x01	L2 相实际电流 Actual current of phase L2	R	0~65535	word
		L2 相基波电流 Fundamental current of phase L2	R	0-65535	word
3	0x02	L3 相实际电流 Actual current of phase L3	R	0~65535	word
		L3 相基波电流 Fundamental current of phase L3	R	0-65535	word
4	0x03	开关量输出 Switch output	R/W	Bit0 继电器 1(95 ,96) Bit1 继电器 2(97 ,98) Bit2 继电器 3(9 ,10) Bit3 继电器 4(11,12) Bits 0 to 3 correspond to relays DO1 to DO4	高字节 High byte
		开关量输入 Switch input	R	Bit0、Bit 1 对应开关量输入 DI1、DI2 Bits 0 and 1 correspond to the switch input DI1 and DI2	低字节 Low byte
5	0x04	保留 Hold	R		word
6	0x05	电流不平衡度 Current unbalance	R	0-100%	word
7	0x06	累计热容量百分比 Accumulative percentage of thermal	R	0-100%	word

		capacity			
8	0x07	断相脱扣延时设定 Phase failure trip delay	R/W	0.1~600.0	word
9	0x08	电流规格 Current specification	R	0-1．6、1-6.3、2-25、3-100、4-250、5-800、6-1、7-5	word
		电流比例因子 Current scaling factor	R	10、100	
10	0x09	平均电流 Average current	R	0-65535	word
		平均基波电流 Average fundamental current	R	0-65535	word
11	0x0A	漏电电流 Leakage current	R	30~1000mA	word
		接地电流百分比 Percentage of earthing current		1-100%	
12	0x0B	电机状态 State of motor	R	电机过载剩余冷却时间 Residual overload cooling time	高字节 High byte
				Bit0 保留 hold; Bit1 停车 stop; Bit2 起动 start; Bit3 运行 run; Bit4 报警 alarm; Bit5 脱扣 trip	低字节 Low byte
13	0x0C	脱扣故障指示 Indication of trip fault	R	Bit0 过载脱扣 overload trip; Bit1 接地/漏电脱扣 earthing/ leakage trip Bit2 欠载脱扣 under-load trip;; Bit3 断相脱扣 phase failure trip Bit7 阻塞脱扣; blocking trip Bit8 不平衡脱扣 unbalance trip Bit10 外部故障脱扣; external fault trip Bit11 起动超时脱扣; start time-out trip Bit15 短路脱扣 short circuit trip	word
14	0x0D	过载满载电流设定 Overload/ full-load current	R/W	0.4~800.0	word

15	0x0E	脱扣等级设定 Trip level	R/W	1、2、3、5、10、15、 20、25、30、35、40	word
16	0x0F	起动时间 Starting time	R/W	0.1~999.9	word
17	0x10	过载报警域值设定 Overload alarm threshold	R/W	1-99%	word
18	0x11	保留 Hold	R		word
19	0x12	漏电故障电流设定 Leakage current	R/W	30~1000mA	word
		接地脱扣百分比设定 Earthing trip percentage	R/W	20~100%	word
20	0x13	接地/漏电脱扣延时设定 Earthing/leakage trip delay	R/W	0.1~600.0	word
21	0x14	剩余电流互感器投入 Enabling of residual current transformer	R/W	0 未有投入；1 投入 0: disabled;1:enabled	word
22	0x15	欠载脱扣域值设定 Under-load threshold	R/W	10~99%	word
23	0x16	欠载脱扣延时设定 Under-load trip delay	R/W	0.1~600.0	word
24	0x17	保留 Hold	R	0	word
25	0x18	不平衡脱扣域值设定 Unbalance threshold	R/W	10~80%	word
26	0x19	不平衡脱扣延时设定 Unbalance trip delay	R/W	0.1~600.0	word
27	0x1A	不平衡报警域值设定 Unbalance alarm threshold	R/W	10~80%	word
28	0x1B	报警允许位开/关 Alarm enabling on/off	R/W	Bit0 过载报警 overload alarm Bit8 不平衡报警 unbalance alarm	word
29	0x1C	脱扣允许位开/关 Trip enabling on/off	R/W	Bit0 过载脱扣 overload trip Bit1 接地/漏电脱扣 earthing/ leakage trip Bit2 欠载脱扣 under-load trip Bit3 断相脱扣 phase failure trip Bit6 堵转脱扣 Bit7 阻塞脱扣 blocking trip Bit8 不平衡脱扣 unbalance trip	word

				Bit10 外部故障脱扣 external fault trip Bit11 起动超时脱扣 start time-out trip Bit15 短路脱扣 short circuit trip	
30	0x1D	系统频率 System frequency	R	50、60	word
31	0x1E	MODBUS 波特率设定 MODBUS baud rate: 2400、4800、9600、19200、38400	R/W	2400、4800、9600、 19200、38400	word
32	0x1F	MODBUS 地址设定 MODBUS address	R/W	1~247	word
33	0x20	CT 变比 CT ratio	R/W	1-999	word
34	0x21	基波开关 Fundamental wave on/off	R/W	0 有效值；1 基波 0: effective value; 1: fundamental wave	高字节 High byte
		电机类型保留 Hold type of motor	R/W	0 单相；1 三相四线 0: single-phase; 1: 3-phase 4-wire	低字节 Low byte
35	0x22	短路脱扣域值设定 Short circuit threshold	R/W	400%-700%最大可测过载倍数 400%-700% max. measurable overload multiple	word
36	0x23	短路脱扣延时 Short-circuit trip delay	R/W	0.1-600.0	word
37	0x24	阻塞域值设定 Blocking value	R/W	100-700	word
38	0x25	阻塞脱扣延时设定 Blocking trip delay	R/W	0.1-600.0	word
39	0x26	远程复位 Remote reset	R/W	正常 0 远程复位 1 0: normal; 1: remote reset	word
40	0x27	外部故障脱扣延时 External fault trip delay	R/W	0.1-600.0	word
41	0x28	可编程 1 继电器设定 Programmable 1 relay set	R/W	1 报警 2 脱扣 3 过载 4 短路 5 接地/漏电脱扣 6 断相 7 外部故障 8 远程起动 9 漏电报警 10 短路、接地保护 11 短路、接地/漏电 12 短路、接地/漏电(脉冲 1S) 1.alarm; 2. trip; 3. overload; 4. short circuit;	word

					5. earthing/ leakage trip; 6. phase failure; 7. external fault; 8. remote start; 9. leakage alarm; 10. short-circuit and earthing protection; 11. short circuit, earthing/ leakage; 12. short circuit, earthing/ leakage (pulse 1s)	
42	0x29	过载冷却时间 Overload cooling time		R/W	0 手动复位； 自动复位 1~30min 0: manual reset; automatic reset: 1-30min	word
43	0x2A	可编程 2 继电器设定 Programmable 2 relay set		R/W	同可编程 1 继电器设定 Same as the relay set of programmable 1	word
44	0x2B	可编程 3 继电器设定 Programmable 3 relay set		R/W	同可编程 1 继电器设定 Same as the relay set of programmable 1	word
45	0x2C	继电器初始状态设定 Initial relay state		R/W	0 开 1 合，bit0-3： 继电器 1-4 0: open; 1: closed; bits 0 to 3: relays 1 to 4	word
46	0x2D	堵转脱扣阈值设定 Locked-rotor trip threshold		R/W	100-700	word
47	0x2E	堵转脱扣延时设定 Locked-rotor trip delay		R/W	0.1-600.0	word
48	0x2F	事件控制参数 Event control parameter		R	0 off 1 on	word
49	事件记录 Event record1	0x30	STA1	R	保护 1 动作方式 1 过载脱扣; 2 接地/漏电脱扣 3 欠载脱扣;4 断相脱扣 7 堵转脱扣;8 阻塞脱扣 9 不平衡脱扣;11 外部故障脱扣 12 起动超时脱扣;16 短路脱扣 Actuation of protection 1 1: overload trip; 2:earthing/leakage trip; 3: under-load trip; 4:phase failure trip; 7:locked-rotor trip;	高字节 High byte

					8: blocking trip; 9: imbalance trip; 11: external fault trip; 12: start time-out trip; 16: short-circuit trip	
			Month1	R	动作 1 时间的-月 Actuation month of protection 1	低字节 Low byte
50		0x31	Day1	R	动作 1 时间的-日 Actuation day of protection 1	高字节 High byte
			Hour1	R	动作 1 时间的-时 Actuation hour of protection 1	低字节 Low byte
51		0x32	Minute1	R	动作 1 时间的-分 Actuation minute of protection 1	高字节 High byte
			Second1	R	动作 1 时间的-秒 Actuation second of protection 1	低字节 Low byte
52	事件记录 Event record2	0x33	STA2	R	保护 2 动作方式 Actuation of protection 2	高字节 High byte
			Month2	R	动作 2 时间的-月 Actuation month of protection 2	低字节 Low byte
53		0x34	Day2	R	动作 2 时间的-日 Actuation day of protection 2	高字节 High byte
			Hour2	R	动作 2 时间的-时 Actuation hour of protection 2	低字节 Low byte
54		0x35	Minute2	R	动作 2 时间的-分 Actuation minute of protection 2	高字节 High byte
			Second2	R	动作 2 时间的-秒 Actuation second of protection 2	低字节 Low byte
55	事件记录 Event record3	0x36	STA3	R	保护 3 动作方式 Actuation of protection 3	高字节 High byte
			Month3	R	动作 3 时间的-月 Actuation month of	低字节 Low byte

					protection 3	
56		0x37	Day3	R	动作 3 时间的-日 Actuation day of protection 3	高字节 High byte
			Hour3	R	动作 3 时间的-时 Actuation hour of protection 3	低字节 Low byte
57		0x38	Minute3	R	动作 3 时间的-分 Actuation minute of protection 3	高字节 High byte
			Second3	R	动作 3 时间的-秒 Actuation second of protection 3	低字节 Low byte
58	事件记录 Event record4	0x39	STA4	R	保护 4 动作方式 Actuation of protection 4	高字节 High byte
			Month4	R	动作 4 时间的-月 Actuation month of protection 4	低字节 Low byte
59		0x3A	Day4	R	动作 4 时间的-日 Actuation day of protection 4	高字节 High byte
			Hour4	R	动作 4 时间的-时 Actuation hour of protection 4	低字节 Low byte
60		0x3B	Minute4	R	动作 4 时间的-分 Actuation minute of protection 4	高字节 High byte
			Second4	R	动作 4 时间的-秒 Actuation second of protection 4	低字节 Low byte
61	事件记录 Event record5	0x3C	STA5	R	保护 5 动作方式 Actuation of protection 5	高字节 High byte
			Month5	R	动作 5 时间的-月 Actuation month of protection 5	低字节 Low byte
62		0x3D	Day5	R	动作 5 时间的-日 Actuation day of protection 5	高字节 High byte
			Hour5	R	动作 5 时间的-时 Actuation hour of protection 5	低字节 Low byte

63		0x3E	Minute5	R	动作 5 时间的-分 Actuation minute of protection 5	高字节 High byte
			Second5	R	动作 5 时间的-秒 Actuation second of protection 5	低字节 Low byte
64	事件记录 Event record6	0x3F	STA6	R	保护 6 动作方式 Actuation of protection 6	高字节 High byte
			Month6	R	动作 6 时间的-月 Actuation month of protection 6	低字节 Low byte
65		0x40	Day6	R	动作 6 时间的-日 Actuation day of protection 6	高字节 High byte
			Hour6	R	动作 6 时间的-时 Actuation hour of protection 6	低字节 Low byte
66		0x41	Minute6	R	动作 6 时间的-分 Actuation minute of protection 6	高字节 High byte
			Second6	R	动作 6 时间的-秒 Actuation second of protection 6	低字节 Low byte
67	事件记录 Event record7	0x42	STA7	R	保护 7 动作方式 Actuation of protection 7	高字节 High byte
			Month7	R	动作 7 时间的-月 Actuation month of protection 7	低字节 Low byte
68		0x43	Day7	R	动作 7 时间的-日 Actuation day of protection 7	高字节 High byte
			Hour7	R	动作 7 时间的-时 Actuation hour of protection 7	低字节 Low byte
69		0x44	Minute7	R	动作 7 时间的-分 Actuation minute of protection 7	高字节 High byte
			Second7	R	动作 7 时间的-秒 Actuation second of protection 7	低字节 Low byte

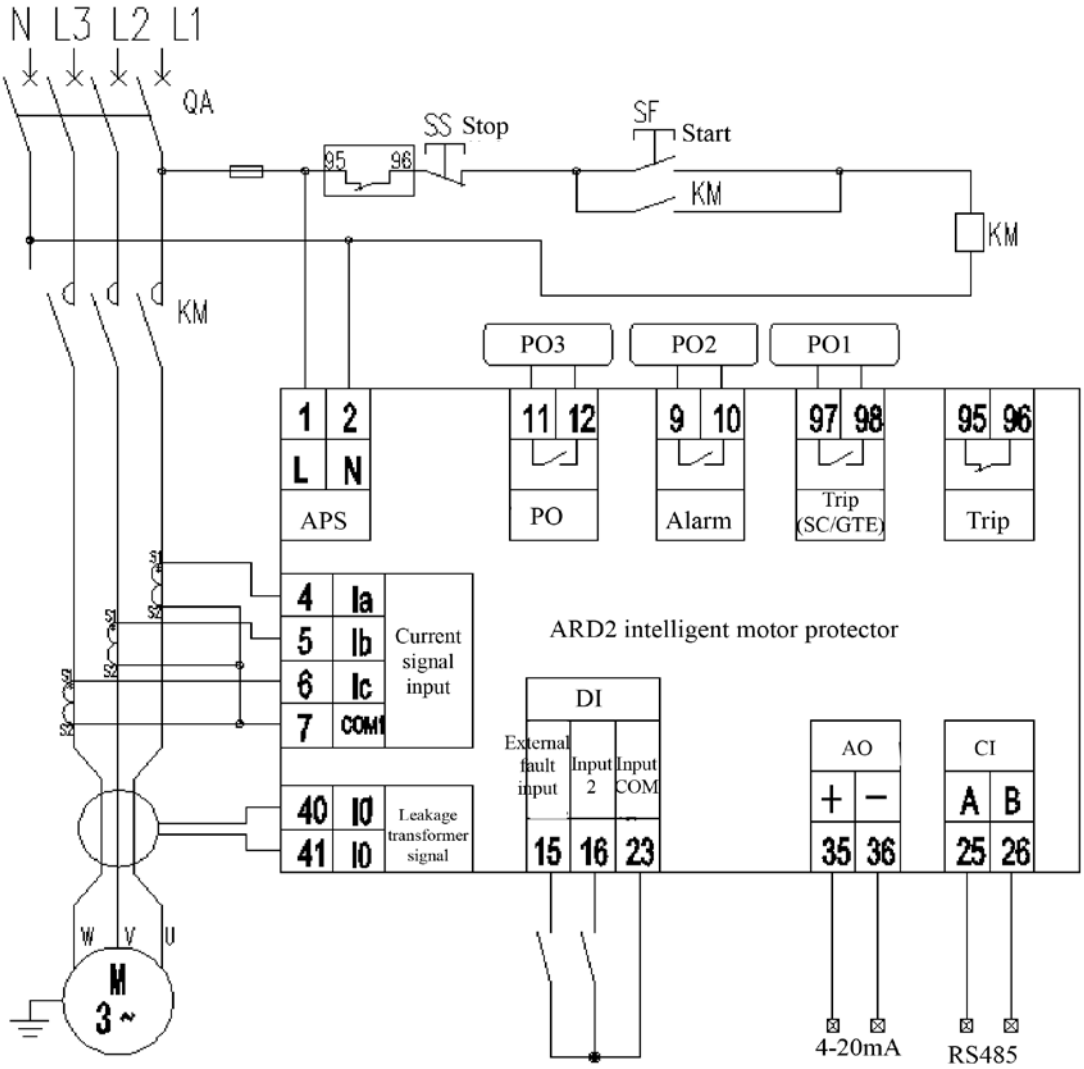
70	事件记录 Event record8	0x45	STA8	R	保护 8 动作方式 Actuation of protection 8	高字节 High byte
			Month8	R	动作 8 时间的-月 Actuation month of protection 8	低字节 Low byte
71		0x46	Day8	R	动作 8 时间的-日 Actuation day of protection 8	高字节 High byte
			Hour8	R	动作 8 时间的-时 Actuation hour of protection 8	低字节 Low byte
72		0x47	Minute8	R	动作 8 时间的-分 Actuation minute of protection 8	高字节 High byte
			Second8	R	动作 8 时间的-秒 Actuation second of protection 8	低字节 Low byte
73	0x48	保留 Hold		R/W		word
74	0x49	软件版本号 Version of software		R	0.1~100.0	word
75	0x4A	年 Year		R/W	2012-2099	
76	0x4B	月 Month		R/W	1-12	
77	0x4C	日 Day		R/W	1-31	
78	0x4D	时 Hour		R/W	0-24	
79	0x4E	分 Minute		R/W	0-59	
80	0x4F	秒 Minute		R/W	0-59	
81	0x50	本次电机运行时间 Running time of current cycle		R	0-65535 hour	word
82	0x51	本次电机停车时间 Stopping time of current cycle		R	0-65535 hour	word
83	0x52	总运行时间 Total running time		R/W	0-65535 hour	word
84	0x53	总停车时间 Total stopping time		R/W	0-65535 hour	word
85	0x54	总起动次数 Total number of starts		R/W	0-65535	word
86	0x55	总脱扣次数 Total number of trips		R/W	0-65535	word

8 典型应用方案 Typical application solutions

8.1 直接起动模式 Direct start mode

图中电动机的起动、停车是通过现场按钮来控制的(保护器本身不控制电动机起、停）,接触器 KM 的吸引线圈串进脱扣继电器的常闭触点中.通电后，按下 SF （起动按钮）时，KM 吸引线圈得电，使 KM 的主触头闭合，电动机开始工作；当按下 SS（停车按钮）时，KM 吸引线圈失电，使 KM 主触点释放，电动机停止工作。

The local button controls the start and stop of motor in the drawing. The protector cannot start or stop the motor independently. The sucking coil of contactor KM is engaged in the NC contact of trip relay. When the electricity is supplied and the start button SF is pressed, the sucking coil of KM is energized to close the main contact of KM and activate the motor. If the stop button SS is pressed, the sucking coil of KM is de-energized to release the main contact of KM and deactivate the motor.

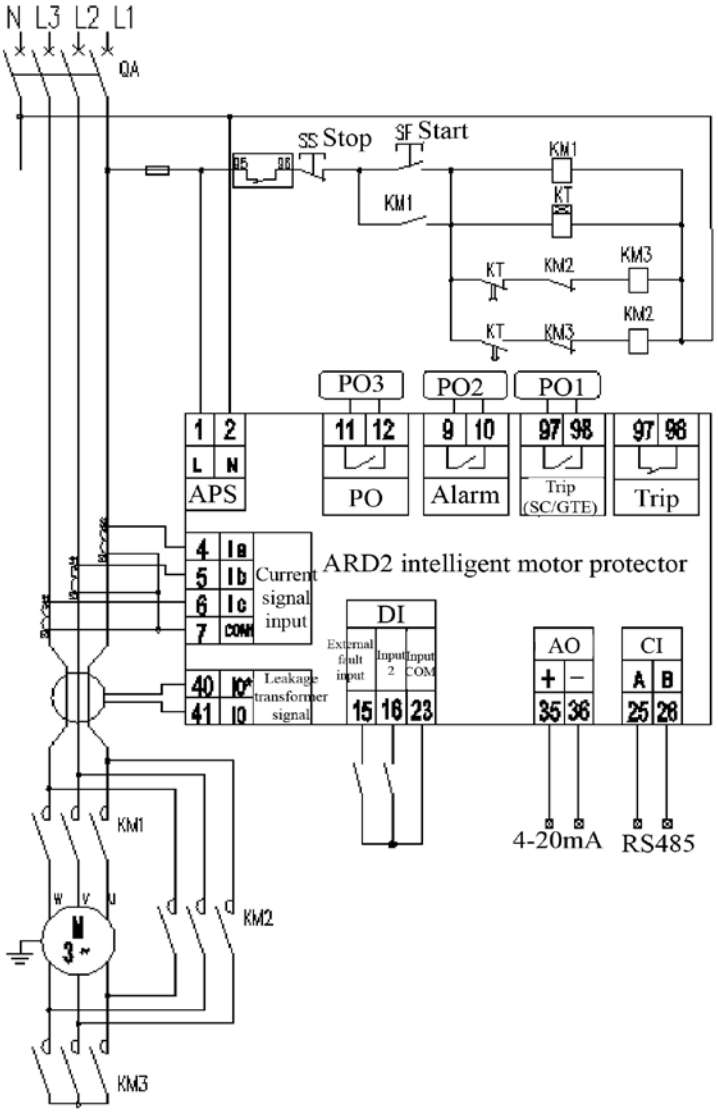


ARD2 电动机保护器直接起动模式接线图
(适用于 1.6、6.3、25、100、250、800A 电流规格)
Direct Start Wiring of Motor Protector ARD2
(Apply to 1.6,6.3,25,100,250,800A current specification)

8.2 Y-△起动模式 Y-Δ start mode

图中电动机的起动、停车是通过现场按钮来控制的（保护器本身不控制电动机起、停），接触器 KM1 的吸引线圈串进脱扣继电器的常闭触点中.通电后，按下 SF（起动按钮）时，KM1、KM3 吸引线圈得电，使 KM1、KM3 的主触点闭合，电动机进行 Y 型起动；延时时间一到则时间继电器 KT 动作，使 KM3 吸引线圈失电，KM3 主触点断开，KM2 吸引线圈得电，KM2 的主触点闭合，使电动机转入△正常运行模式。当按下 SS（停车按钮）时，KM1 吸引线圈失电，使 KM1 主触点释放，电动机停车。

The local button controls the start and stop of motor in the drawing. The protector cannot start or stop the motor independently. The sucking coil of contactor KM1 is engaged in the NC contact of trip relay. When the electricity is supplied and the start button SF is pressed, the sucking coils of KM1 and KM3 are energized to close the main contacts of KM1 and KM3 and activate the motor in the Y mode. When the delay time is reached, the time relay KT is enabled. The sucking coil of KM3 is de-energized and the main contact of KM3 is open while the sucking coil of KM2 is energized and the main contact of KM2 is closed. The motor starts in the normal Δ mode. If the stop button SS is pressed, the sucking coil of KM1 is de-energized to release the main contact of KM1 and deactivate the motor.



ARD2 电动机保护器 Y-△起动模式接线图

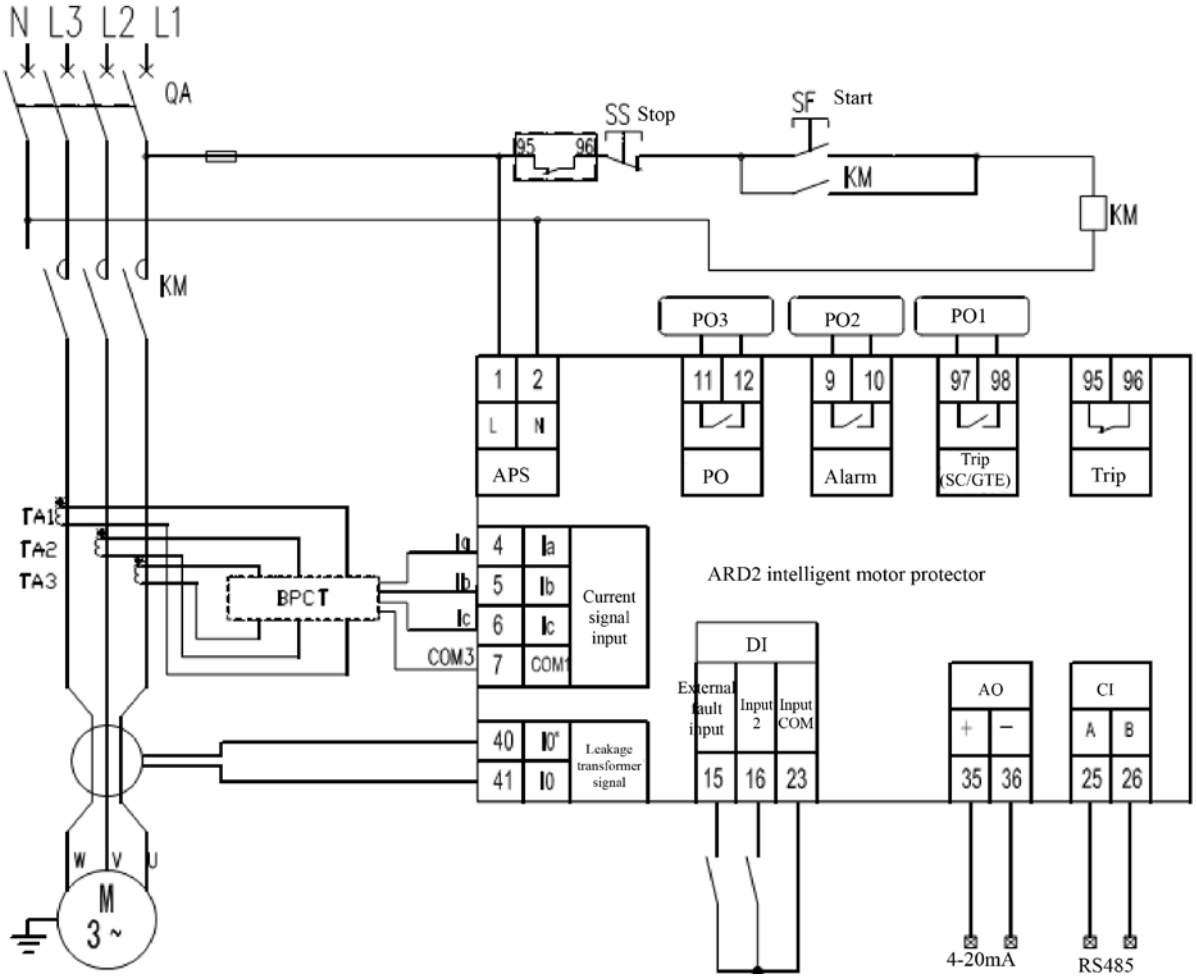
（适用于 1.6、6.3、25、100、250、800A 电流规格）

Y-Δ Start Wiring of Motor Protector ARD2

(Apply to 1.6,6.3,25,100,250,800A current specification)

8.3 1A、5A 规格的 ARD2 的接线如下

The wiring of ARD2 of 1A and 5A specifications is as follows:



注：选用 1A、5A 规格的 ARD2 保护器时，需要先通过/1、/5 的互感器将一次侧电流转换成 1A、5A 的电流，然后再通过标配的 100A/20mA 电流互感器输入到保护器使用。图中 TA1、TA2、TA3 为/1、/5 互感器，需要客户自行购买，BPCT 为我司标配的 100A/20mA 电流互感器。

Note: when selecting the ARD2 protector of 1A and 5A specifications, it is necessary to convert the primary side current into 1A and 5A current through the transformer of /1 and /5, and then input it to the protector through the standard 100A/20mA current transformer. TA1, TA2 and TA3 in the figure are /1 and /5 transformers, which need to be purchased by customers. BPCT is our standard 100A/20mA current transformer.

9 保护功能设置及说明 Set and instructions of protection functions

9.1 保护功能参数设置 Parameter set：

表 10 Table 10

功能 Function	项目 Item	内容 Content
起动超时保护 Start time-out protection	起动时间范围 Range of starting time	0.1s～999.9s
	动作时间 Actuation time	瞬动 Instant
	保护动作方式 Actuation method	脱扣 Trip

过载保护 Overload protection	不动作特性 Non-operating characteristic	<105%Ie, 2h 内不动作 no operation in 2h
	动作特性 Operating characteristic	>120%Ie, 1h 内延时动作 delay in 1h
	脱扣级别 Trip level	1，2，3，5，10，15，20，25，30，35，40
	报警值域 Alarm threshold	1%～99%
	过载保护方式 Overload protection method	报警、脱扣 Alarm,Trip
堵转保护 Locked-rotor protection	动作值整定范围 Set range of operating value	(100%～700%)Ie
	延时时间整定范围 Set range of delay time	0.1s～600.0s，级差 0.1s graduation in 0.1s
	保护动作方式 Actuation method	脱扣 Trip
阻塞保护 Blocking protection	动作值整定范围 Set range of operating value	(100%～700%)Ie
	延时时间整定范围 Set range of delay time	0.1s～600.0s，级差 0.1s graduation in 0.1s
	保护动作方式 Actuation method	脱扣 Trip
欠载保护 Under-load protection	动作值整定范围 Set range of operating value	（10%～99%）Ie
	延时时间整定范围 Set range of delay time	0.1s～600.0s，级差 0.1s graduation in 0.1s
	保护动作方式 Actuation method	脱扣 Trip
不平衡保护 Unbalance protection	动作值整定范围 Set range of operating value	10%～80%
	动作时间 Actuation time	0.1s～600.0s，级差 0.1s graduation in 0.1s
	保护动作方式 Actuation method	报警、脱扣 Alarm,Trip
接地/漏电保护 Earthing/leakage protection	整定值范围 Set range	30～1000mA
	延时时间 Delay time	0.1s～600.0s，级差 0.1s graduation in 0.1s
	保护动作方式 Actuation method	脱扣 Trip
短路保护 Short-circuit protection	短路整定值 Short-circuit set	（400% ~700%）Ie
	动作时间 Actuation time	0.1s～600.0s，级差 0.1s graduation in 0.1s

	保护动作方式 Actuation method	脱扣 Trip
外部故障保护 External fault protection	动作时间 Actuation time	0.1s～600.0s，级差 0.1s graduation in 0.1s
	保护动作方式 Actuation method	脱扣 Trip
断相保护 Phase failure protection	动作时间 Actuation time	0.1s～600.0s，级差 0.1s graduation in 0.1s
	保护动作方式 Actuation method	脱扣 Trip

9.2 保护功能说明 Description of protective functions

各保护类型起作用时间段 Enabling time of protective functions:

表 11 Table 11

保护类型 Type of protection	起作用时段 Working periods
外部故障 External fault	停车 Stop
外部故障、断相、堵转、漏电/接地、起动超时 External fault, phase failure, leakage/ earthing, locked-rotor and start time-out	起动 Start
外部故障、断相、漏电/接地、过载、不平衡、阻塞、欠载、短路 External fault, phase failure, leakage/ earthing, overload, unbalance, blocking, under-load, short circuit	运行 Running

■ 起动超时保护 Starting overtime protection

当电动机起 动时间达到用户设定的起动时间，电动机的三相平均电流还大于设定的额定电流 1.1（增安电机为 1.7）倍时，保护器按照内部设定的要求保护，发出脱扣命令，停止电机运行。

When the starting time reaches the set value and the average current of phases exceeds 1.1 times (1.7 for Exmotor) than the rated current, the protection is activated according to the set and a trip command is sent to stop the motor.

■ 过载保护 Overload protection

当电动机在过负载情况下，长时间超过其额定电流运行时，会导致电动机过热，绝缘降低而烧毁，保护器根据电动机的发热特性，计算电动机的热容量，模拟电动机发热特性对电动机进行保护。

过载保护电流-时间对照表 9，过载特征曲线图（K 曲线图）如下图所示。

过载保护电流—时间对照表:

When the motor runs under overload conditions (actual current above the rated value) for a long time, the overheating will occur and the insulation will be reduced and burnt. The protector calculates the thermal capacity of motor according to the heating characteristic and then protects the motor by simulating the heating characteristic.

Refer to the table 9 for relationship between the overload current and the time. The following diagram illustrates the overload characteristic curve (curve K).

Relationship between the overload current and time

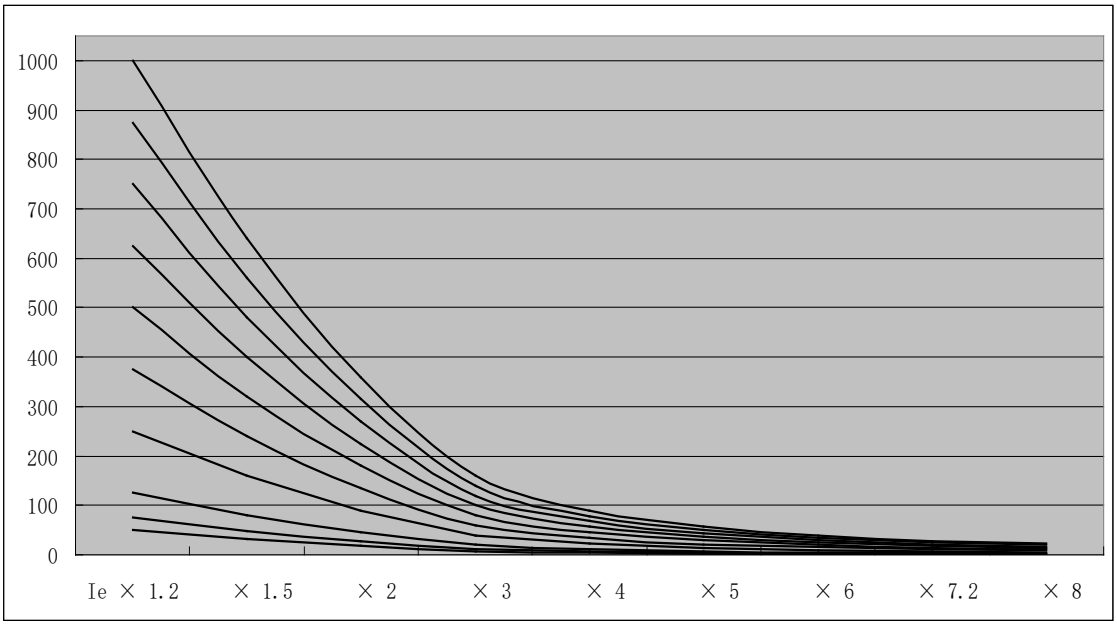
表 12 Table 12

可选择的脱扣曲线等级 K Selectable trip curve level, K	1	2	3	5	10	15	20	25	30	35	40
脱扣延时 Trip delay(S) 误差 error±10%	三相平衡的负载，自冷态始 Balanced three-phase load, starting from the cold state										

额定值 Rated value Ie×1.2	25	50	75	125	250	375	500	625	750	875	1000
×1.5	16	32	48	80	160	240	320	400	480	560	640
×2	9	18	27	45	90	135	180	225	270	315	360
×3	4	8	12	20	40	60	80	100	120	140	160
×4	2.26	4.52	6.78	11.3	22.5	33.8	45	56.3	67.5	78.8	90
×5	1.44	2.88	4.32	7.2	14.4	21.6	28.8	36	43.2	50.4	57.6
×6	1	2	3	5	10	15	20	25	30	35	40
×7.2	0.7	1.4	2.1	3.5	6.9	10.4	13.9	17.4	20.8	24.3	27.8

当保护器监测到电动机过载运行了，保护器应在报警或脱扣（延时）设定时间内发出报警或脱扣信号。

When the protector detects the overload running of motor, it shall send the alarm or trip signal within the alarm or trip (delay) set time.



过载特征曲线图（K 曲线图）Overload characteristic curve (curve K)

■ 堵转保护（起动过流保护）Locked-rotor protection (over-current protection upon start)

电动机在起动过程中，如果由于负荷过大或自身机械原因，造成电动机轴被卡住，而未及时解除故障，将造成电机过热，绝缘降低而烧毁电机，堵转保护适用于电动机起动发生此类故障时进行保护。

If the motor shaft is caught due to the great load or mechanical troubles upon start or during running and the problem is not resolved promptly, the overheating will occur and the insulation will be reduced and burnt. The locked-rotor protection is available when the motor shaft is caught upon start. The blocking protection is available when the motor shaft is caught during running. After the current reaches the actuation set, the protector performs the trip within the trip (delay) time set to prevent the motor from burning.

■ 阻塞保护 Block protection

电动机在运行过程中，如果由于负荷过大或自身机械原因，造成电动机轴被卡住，而未及时解除故障，将造成电机过热，绝缘降低而烧毁电机，堵转保护适用于电动机起动发生此类故障时进行保护，阻塞保护适用于电动机运行过程中发生此类故障时进行保护；当电流达到动作设定电流时，保护器及时在脱扣（延时）设定时间内脱扣，避免电机烧毁。

During the operation of the motor, if the motor shaft is stuck due to excessive load or its own mechanical reasons

and the fault is not removed in time, it will cause the motor to overheat and reduce the insulation and burn the motor. The locked rotor protection is applicable to the protection in case of such fault during motor starting, and the blocking protection is applicable to the protection in case of such fault during motor operation; When the current reaches the action set current, the protector trips in time within the tripping (delay) set time to avoid motor burning.

■ 欠载保护 Under-load protection

当电动机所带负载为泵式负载时，电动机空载或欠载运转会产生危害，保护器提供欠载保护，当三相的平均电流与额定电流的百分比低于设定值时，保护器应在脱扣（延时）设定时间内脱扣。

The no-load or under-load operation of motor is hazardous for connected pump load, if any. In such case, the protector provides the under-load protection. When the ratio of average current of phases to rated current is lower than the set, the protector performs the trip within the trip (delay) time set.

■ 不平衡保护Unbalance protection

电动机运行时，三相电流不平衡率达到保护设定值时，保护器按照设定的要求保护，发出报警或脱扣信号，使电动机的运行更加安全。三相不平衡率表示三相电流与平均电流的最大差值/额定电流与平均电流的最大值的比值。

动作时间误差：在动作时间定值±10%范围内。

保护动作特性：当不平衡率>设定值时动作。

When the motor is running and the three-phase unbalance rate reaches the set, the protector provides the protection by sending the alarm or trip signal. It increases the running safety of motor.Maximum difference between three-phase current and average current/maximum difference between rated current and average current

■ 接地/漏电保护Earthing/ leakage protection

保护器具备接地保护和漏电保护功能（用户只能选择其中的一种）。接地电流采用三相电流矢量和叠加而成，漏电电流通过增加零序互感器，检测到漏电电流大于设定的故障电流值，则保护器在脱扣（延时）设定时间内脱扣，以保证人身安全。

The protector is provided with the earthing protection and leakage protection (user can just select one protective function).The earthing current is the vector sum of three-phase current. When the zero sequence transformer detects that the leakage current is above the set, the protector trips within the trip (delay) set time for human safety.

■ 短路保护Short-circuit protection

当电动机运行电流超过设定的保护电流时保护器按设定的要求进行保护，在脱扣（延时）设定时间内脱扣。

When the running current of motor exceeds the current set, the protector provides the protection and trips within the trip (delay) set time.

■外部故障保护 External fault protection

当有外部故障出现时，外部故障开关量闭合，则保护器检测到有外部故障信号输入，在脱扣（延时）设定时间内脱扣。

When any external fault occurs, the external fault switching value is closed. Then the protector detects the input of external fault signal and trips within the trip (delay) set time.

■ 断相保护Phase failure protection

断相故障运行时对电动机的危害很大，当电动机发生断相时，保护器按照设定的要求保护，发出脱扣指令，使电动机的运行更加安全。

The phase failure operation is hazardous for motor. In case of phase failure, the protector provides the protection and sends the trip command to guarantee the running safety of motor.

10 注意事项 Cautions

1、4～20mA模拟量输出中20mA对应2倍电动机额定电流。
2、一次回路，三相电流穿线方向需一致，否则将导致接地保护出错。
3、当保护器配有接地/漏电保护功能时，从漏电流互感器引入保护器的导线建议采用屏蔽导线，否则可能导致测量数据不准确。
4、电机的额定电流，按照电机实际额定电流设置，不需放大或缩小。
5、保护器一旦发生脱扣动作，在故障排除后，重新起动电动机前，需对保护器进行复位，否则将无法起动电动机。
6、电机冷却时间：电机过载保护动作后（故障显示为hEAt）由于热累积，冷却后方可复位。
7、修改完参数后必须复位操作，使当前设置参数有效。
8、在现场实际使用中，由于保护器的参数设置不合理，可能会导致电动机一起动就保护或无保护作用，此时，可将所有保护功能都关闭，根据保护器在电动机正常运行时测量得到的各种参数对保护器的各种保护参数进行重新设定。
9、若保护器设定的各种保护参数是合适的，但电动机一起动保护器就动作，根据保护器显示的动作代码来查找故障原因。
10、保护器在出厂时的各种设置参数采用默认设置（用户特别要求除外），用户在实际使用中可根据实际需要将各种保护功能打开，并对各种参数进行设置。
11、如用户无特别注明，互感器与保护器的连接线默认 1m。
12、如用户有特殊要求的（如单相电动机保护器、连接线长度等）需在订单中注明。

1. To improve the anti-interference capacity, the protector ARD2L may select the fundamental current for display and protection. Select the true RMS or fundamental mode with the fundamental switch option in the menu of system parameter.
2. The direction of primary circuit must be identical to that of three-phase current. Otherwise, the earthing protection may fail.
3. If the protector is provided with the earthing/leakage protection, recommend the shielded conductor to lead the zero sequence current transformer into the protector. Otherwise, the measured data may be inaccurate.
4. Set the rated current of protector (P001) properly. If the set is below the normal rated current of motor, the motor may not start normally. If the set is above the normal rated current of motor, the protector may not provide the normal protection for failed motor.
5. After the protector trips, resolve the fault and reset the protector before restarting the motor. Otherwise, the motor cannot start.
6. Cooling time of motor: 30min. After the overload protection is enabled (fault code: hEAt), cool the motor and then reset it because of heat accumulation.
7. It is necessary to reset the protector after changing any parameter. Then the current set becomes valid.
8. If the protector is enabled as soon as the motor starts or is always disabled because the parameter set of protector is improper for the intended application, turn off all protective functions. Then reset the protector according to parameters measured during normal running of motor.
9. If the protector is enabled as soon as the motor starts and protective parameter sets are proven suitable, find out causes according to the displayed code.
10. The set of protector is default when the protector is delivered (unless otherwise specified by user). User can turn on all protective functions and set them to actual demands.
11. Unless otherwise specified the length of connecting line is 1m between the transformer and protector.
12.User must specify the special requirements (e.g. single-phase motor protector and length of connect line) in the order.

11 订货范例 Ordering example

例：型号：ARD2-25/CLMKSR
辅助电源：AC 220V
显示方式：数码管
电机额定电流：6.3～25A
应用场合：三相电机
测量参数：三相电流、三相平均电流
附加功能：RS485 Modbus 通讯、漏电流测量、DC4～20mA 模拟量输出、2路开关量输入1路继电器输出、8个事件记录

Example: Model: ARD2-25/CLMKSR
Auxiliary power supply: AC220V
Display mode: nixie tube
Rated current of motor: 6.3-25A
Application: three-phase motor
Measurement: three-phase current and average current of phases
Additional functions: RS485 Modbus, zero sequence current measurement, DC analog output 4-20mA, 2-way switch input,1-way relay output and 8 event records

ARD2F 系列智能电动机保护器

Intelligent Motor Protector ARD2F

1 概述 Overview

ARD2F 系列智能电动机保护器（以下简称保护器）能对电动机运行过程中出现的起动超时、过载、堵转/阻塞、断相、不平衡、欠载、接地/漏电、过压、欠压、相序、过功率、欠功率、温度、外部故障等多种情况进行保护，设有SOE故障事件记录功能，方便现场维护人员查找故障原因，并通过LCD四行中文液晶显示屏、状态指示灯等各种方式，将电机的运行状态清晰、直观地显示出来。适用于煤矿、石化、冶炼、电力、船舶、以及民用建筑等领域。该保护器具有RS485远程通讯接口，DC4～20mA模拟量输出，方便与PLC、PC等控制机组成网络系统，实现电动机运行的远程监控。

Smart motor protectors ARD2F series (hereinafter referred to as the protector) can protect motors from many faults during the motor running such as timeout startup, overload,locked rotor/block, phase failure, unbalance, under-load, earthing, earth leakage, over voltage, under voltage, phase sequence, overpower, under power, temperature, external faults, etc. and is equipped with SOE fault event log function which is convenient for maintenance stuff to find the causes of the problems, and display the running state clearly and intuitively through LCD in Chinese in four lines, status indicators and other ways. It is suitable for coal mine, petrochemical industry, metallurgy industry, power industry, shipbuilding, civil buildings and other fields. The protector has RS485 remote communication interface and DC4-20mA analog output, which is convenient to form a network system together with control machines like PLC and PC to realize the remote monitoring of motor.

2 产品型号 Product type

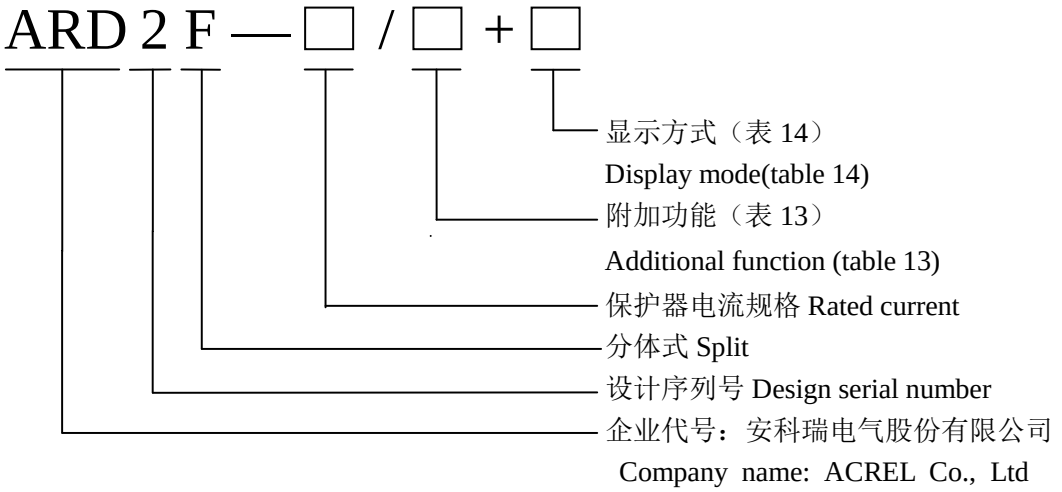


表 13 Table 13

附加功能 Additional function	代号 Code	附加功能 Additional function	代号 Code
起动控制（包含 K 功能） Starting control (including K function)	Q	漏电保护 Leakage protection	L
开关量输入 Switching input	K	4～20mA 模拟量输出 analog output	M
温度保护 Temperature protection	T	失压重起（抗晃电，包含 U、SR） Loss voltage restart (anti shake	SU

			electricity,including U,SR)		
报警（可编程输出） Alarm (Programmable output)		J	SOE 事件记录 event record		SR
单通讯 Single communication	Modbus_RTU	C	双通讯 Dual communication	2 路 MODBUS 2-way MODBUS	2C
电压功能(相序、功率、功率因数) Voltage function (phase sequence, power, power factor)		U	t_E时间保护 tE time protection		tE
电能 Electric energy		Ep			

注：

1、ARD2F 标配电流测量和两路继电器输出 DO4(97、98)、DO5（95、96）；

2、带有起动控制时，保护器最多提供2个起动继电器用于顺序控制外部2个接触器的闭合/断开，从而实现电动机的不同起动方式（如 Y-Δ**转换起动、正反转控制，自耦降压起动等**）；

3、温度保护的测量范围：热电阻 100Ω～30kΩ；

4、对于无显示要求的客户，必须在一批订单中订购一个 90L 显示单元，作为调试使用；

5、附加功能温度保护（T）和双通讯（2C）不能同时选配，使用双通讯时，不能带有温度保护功能；

6、附加功能选配 SU 时必须同时选配 Q，失压重起(抗晃电)是需要起动控制功能配合实现的。附加功能 SU 包括 U（电压）、SR（故障记录）功能。

Note:

1. Ard2f is equipped with current measurement and two relay outputs do4 (97, 98) and do5 (95, 96) as standard;

2.When equipped with starting control, the protector provides no more than 2 starting relay for the sequence controlof 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 measurement range of temperature protection: thermal resistance 100Ω-30KΩ¸:

4. For the customer with no display requirements, a 90L display unit must be ordered together in a batch of orders for commissioning;

5. Additional functions temperature protection (T) and dual communication (2C) cannot be selected at the same time. When dual communication is used, it cannot have temperature protection function;

6. When selecting Su for additional functions, Q must be selected at the same time. The voltage loss restart (anti shake) needs to be realized with the help of the start control function. Additional functions Su include U (voltage) and Sr (fault recording) functions.

表 14 Table 14

代号 Code	规格 Specification
90L	LCD 液晶显示模块尺寸为 90×70，开孔 86×66（单位 mm） The size of LCD liquid display module is 90*70, hole of 86*66 (unit: mm)

3 通用技术指标 General technical index

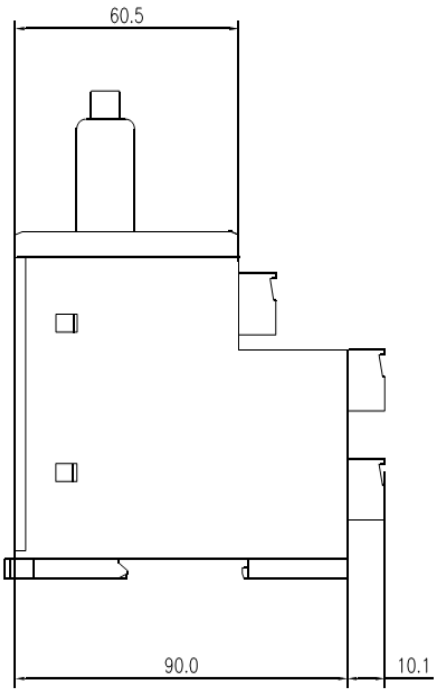
表 15 Table 15

技术参数 Technical parameters	技术指标 Technical specification
保护器辅助电源 Auxiliary power supply of protector	AC85V～265V/DC100～350V， 功耗 power consumption 15VA

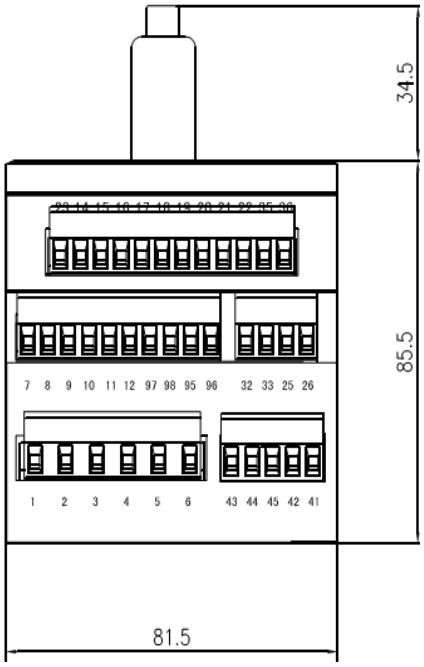
<table>
<tr><td>电机额定工作电压
Rated working voltage of motor</td><td colspan="2">AC380V/AC660V，50Hz/60Hz</td></tr>
<tr><td rowspan="8">电动机额定工作电流
Rated working current of motor</td><td>1A(0.1A-999A)</td><td rowspan="6">采用小型专用电流互感器
Small special current transformers</td></tr>
<tr><td>5A(0.1A-999A)</td></tr>
<tr><td>1.6A(0.4A-1.6A)</td></tr>
<tr><td>6.3A(1.6A-6.3A)</td></tr>
<tr><td>25A(6.3A-25A)</td></tr>
<tr><td>100A(25A-100A)</td></tr>
<tr><td>250A(63A-250A)</td><td rowspan="2">采用专用电流互感器
Special current transformers</td></tr>
<tr><td>800A(250A-800A)</td></tr>
<tr><td>继电器输出触点，
额定负载容量
Relay output contactor,
rated negative capacity</td><td colspan="2">5 路，AC250V、6A
5way，AC250V、6A</td></tr>
<tr><td>开关量输入 Switching input</td><td colspan="2">9 路，光耦隔离 9way,opto-coupler insolation</td></tr>
<tr><td>通讯 Communication</td><td colspan="2">RS485 Modbus_RTU</td></tr>
<tr><td rowspan="4">环境 Environment</td><td>工作温度
Working Temperature</td><td>-10ºC～55ºC</td></tr>
<tr><td>贮存温度
Storage temperature</td><td>-20ºC～65ºC</td></tr>
<tr><td>相对湿度
Relative humidity</td><td>5％～95％不结露
no condensation</td></tr>
<tr><td>海拔 Altitude</td><td>≤2000m</td></tr>
<tr><td>污染等级 Classes of pollution</td><td colspan="2">2 级 Level 2</td></tr>
<tr><td>防护等级 Protection level</td><td colspan="2">主体 IP20，安装在柜体中；显示外露部分可达 IP54
Main part IP20, installed in the cabinet;
display unit IP54</td></tr>
<tr><td>安装类别 Installation category</td><td colspan="2">III 级 Class III</td></tr>
</table>

4 外形尺寸及安装 Overall dimensions and installation

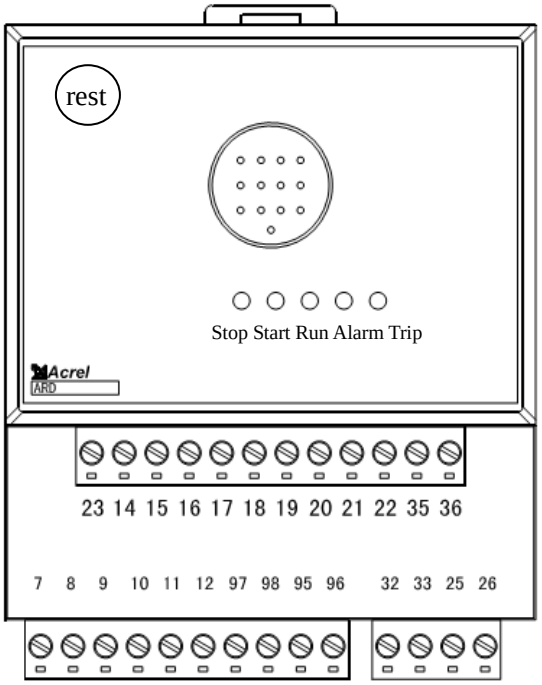
4. 1 外形及安装开孔尺寸 Overall and installation opening dimensions
单位 Unit:mm



主视图 Front View

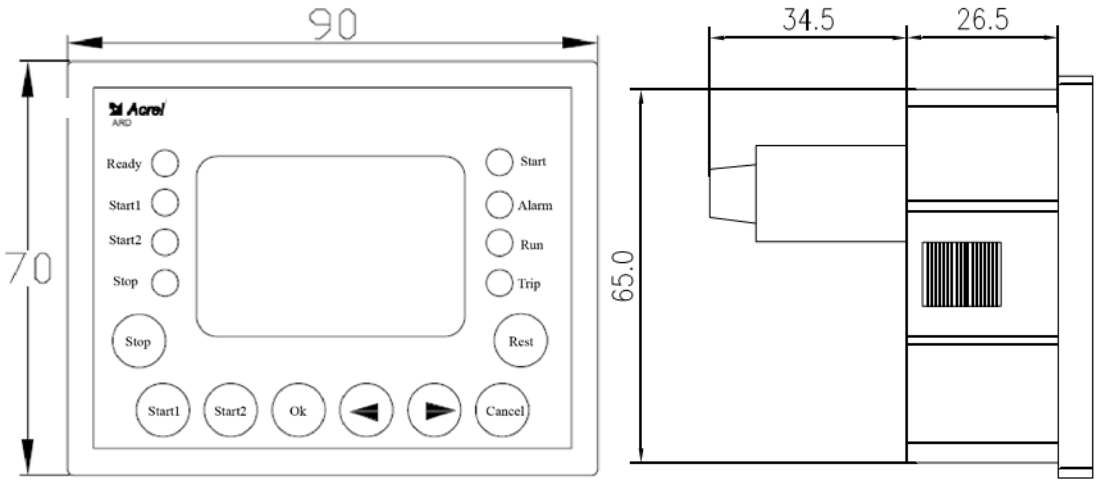


左视图 Left view

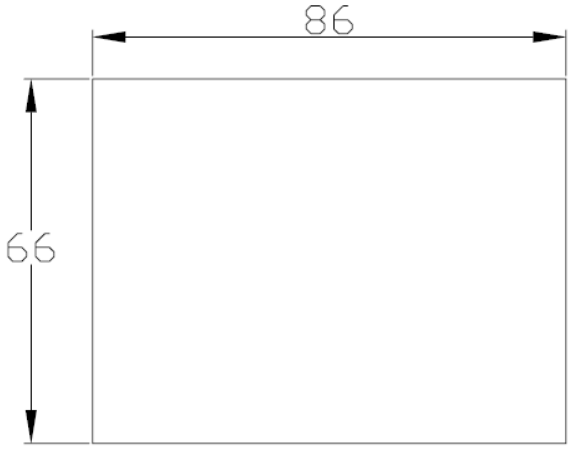


俯视图 Top view

4.2 保护器显示单元安装尺寸 Installation dimension of protector display unit



主视图 Front View　　左视图 Left view

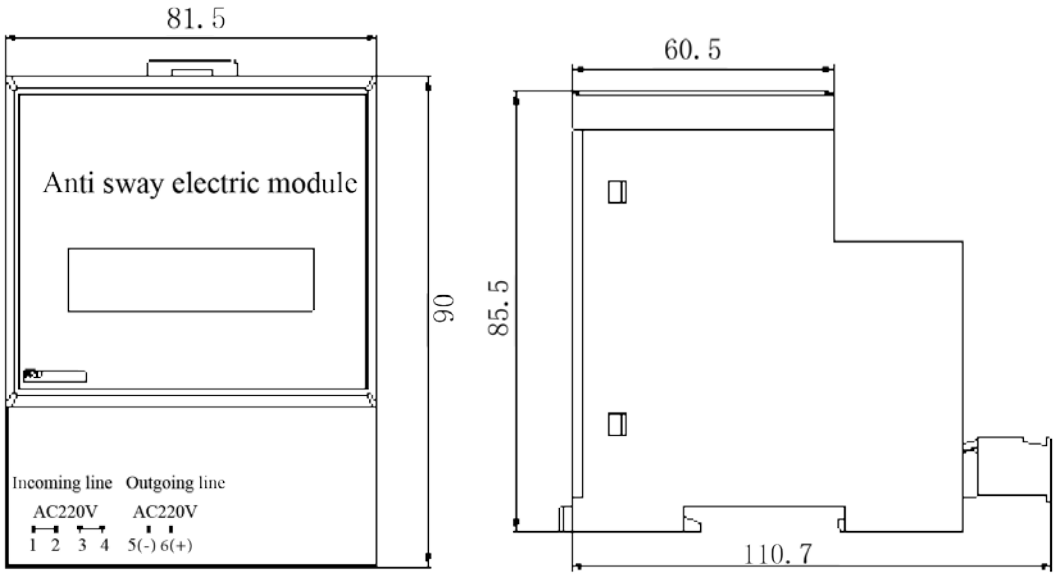


盘面开孔 Panel opening

4.3 互感器安装尺寸 Installation dimensions of transformer

参见 ARD2 互感器安装尺寸 Refer to installation dimensions of ARD2 transformer

4.4 抗晃电模块 Anti sway electric module



5 显示与参数设置 Display and parameters set

5.1 操作面板说明 Operation panel instruction

用户可以通过显示单元上的 LED 指示灯和中文液晶显示屏观察电动机的运行状态，并可通过按键来控制电动机起动、停车、复位、设置参数等。

The user Control

Authority1 can observe the running state of the motor through the LED indicator on the display unit and the Chinese LCD screen, and can control the starting, stopping, reset and set parameters of the motor through the keys.

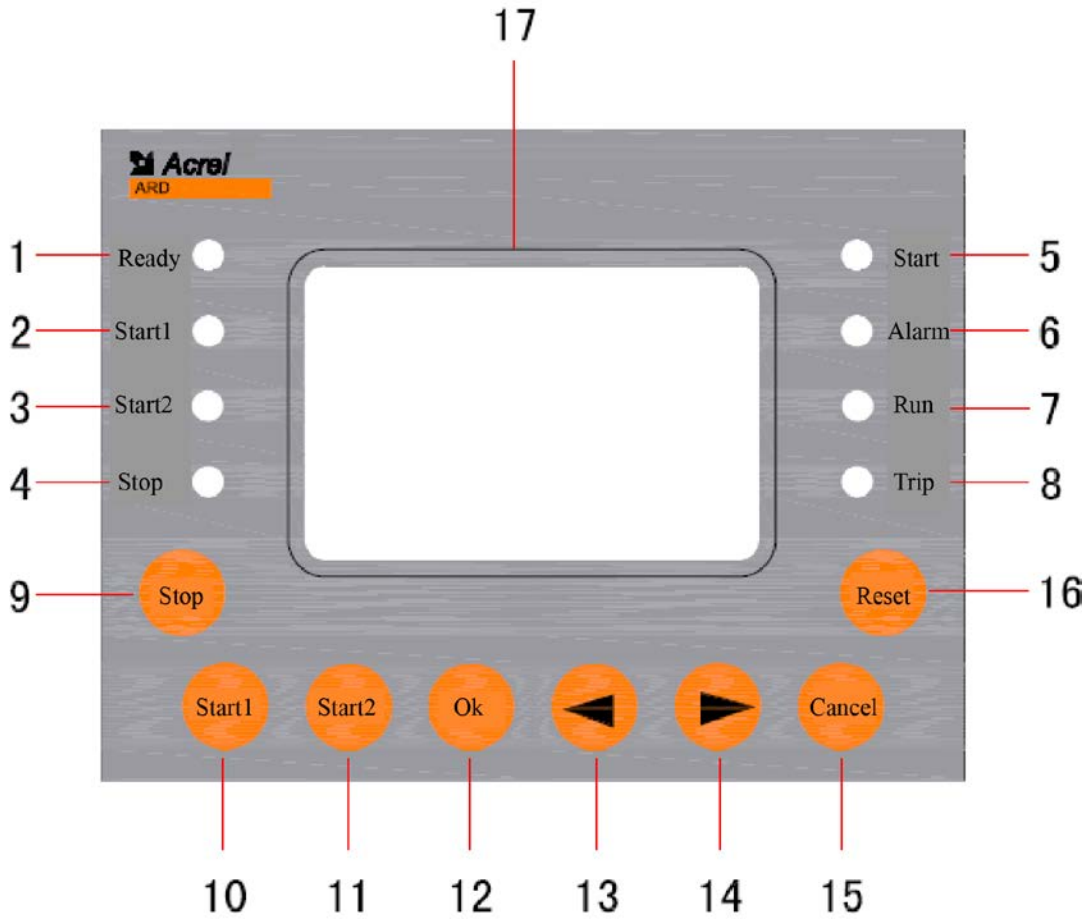


表 16 Table 16

序号 No.	名称 Name	状态 Status	功能说明 Function Description
1	就绪 LED 指示灯 Ready LED	亮 On	该指示灯亮则表明保护器处于正常状态，可以起动电动机 When it is on, it indicates that the protector is in normal state and the motor can be started.
2	起动 1 LED 指示灯 Starting 1 LED	亮 On	该指示灯亮则保护器起动 1 继电器闭合 When it is on, it indicates that the protector starting 1 relay closed
3	起动 2 LED 指示灯 Starting 2 LED	亮 On	该指示灯亮则保护器起动 2 继电器闭合 When it is on, it indicates that the protector starting 2 relay closed
4	停车 LED 指示灯 Stopping LED	亮 On	该指示灯亮则表明电动机处于停车状态 When it is on, it indicates that the motor is in stopping status.

5	起动 LED 指示灯 Starting LED	亮 On	该指示灯亮则表明电动机处于起动阶段 When it is on, it indicates that the motor is in starting status.
6	运行 LED 指示灯 Running LED	亮 On	该指示灯亮则表明电动机处于运行状态 When it is on, it indicates that the motor is in running status.
7	报警 LED 指示灯 Alarm LED	亮 On	该指示灯亮则表明保护器报警继电器已动作 When it is on, it indicates that the protector alarm relay has taken action.
8	脱扣 LED 指示灯 Trip LED	亮 On	该指示灯亮则表明保护器脱扣继电器已动作 When it is on, it indicates that the protector trip relay has taken action.
9	停车按键 Stop button	按下 Press	释放起动 1、起动 2 继电器 Trip starting 1, starting 2 relays
10	起动 1 按键 Starting 1 button	按下 Press	操作起动 1 继电器，使其闭合 Operate starting 1 relay to make it closed
11	起动 2 按键 Starting 2 button	按下 Press	操作起动 2 继电器，使其闭合 Operate starting 2 relay to make it closed
12	确定按键 Confirm button	按下 Press	进入菜单，修改参数 Enter the menu and modify the parameters
13	方向键 arrow key	按下 Press	上翻菜单；数据移位；查看事件记录 Turn on the menu; data transfer; view event log
14	方向键 arrow key	按下 Press	下翻菜单；修改数据 Turn down menu; modify data;
15	取消按键 cancel button	按下 Press	退出菜单；取消操作；点亮背光 Exit the menu; cancel operation; lighten backlight
16	复位按键 reset button	按下 Press	将保护器复位 Reset the protector
17	LCD 显示屏 LCD display screen		显示各种测量参数和设置参数 Display various measured parameters and set parameters

注：起动及运行指示灯根据电流点亮。

Note: the start and operation indicator lights up according to the current.

5.2 参数设置 Parameter set

5.2.1 显示菜单内容：Display menu contents:

1、A、B、C 三相电流及不平衡度百分比；
2、三相电流以及三相平均电流与设定额定电流的百分比；
3、Uab、Ubc、Uca 线电压；
4、有功功率 P、视在功率 S、功率因数 PF、有功电能 E；
5、Iav 三相平均电流、Uav 三相平均电压、Id 漏电流、频率 F；
6、热容量百分比；
7、热电阻阻值（带温度保护功能时才显示）；
8、5 路继电器输出：DO1—起动 1、DO2—起动 2、DO3—报警（可编程）
DO4—脱扣（可编程）、DO5—脱扣；
9、9 路 DI 状态。

1. A,B,C three-phase current and unbalance percentage
2. Three-phase current and the percentage of three-phase average current to the set rated current
3. Uab, Ubc, Uca line voltage
4. Active power P, apparent power S, power factor PF;
5. lav three-phase average current, Uav three-phase average voltage, ld earth leakage current, frequency F;
6. Heat capacity percentage
7.Thermal resistance value:
8 Route 5 relay input: 1-Starting 1, 2-Starting, 2, 3-Alarm (programmable)
4- Trip (Programmable), 5- Trip
9. Route 9 DI status.

用户可通过按动显示单元上的“”键用于显示菜单界面的选择。

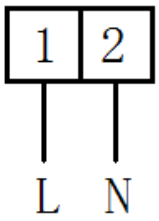
用户需要进入参数设置菜单，可在显示菜单界面时，按动“确定”按键，此时会出现密码输入界面，要求用户输入密码才能进入参数设置菜单（初始密码为 0001，万能密码为 0008），用户可按动“”和“”键输入正确的密码，按动“确定”按键进入参数设置菜单，此时可按动“”和“”键选择所需设置的项目，选定后按动“确定”按键进入该项目的设置界面，再次按动“”和“”键选择所需设置的子项目，按动“确定”按键进入值设定界面，按动“”和“”键进行值的设定，设定完毕后可按动“确定”按键进行保存，保存后按动“取消”按键退出，也可按动“取消”按键不保存退出。

Users can press the “” button on the display unit to display the selection of menu interface.

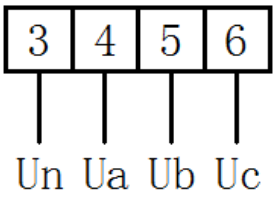
If users want to enter parameter set menu, they can press the “Confirm” button when displaying the menu interface and then password input interface comes out, and users can enter the parameter set menu after inputting the password (initial password is 0001, universal password is 0008), and users can press “”and “” button to input the correct password and then press “Confirm” button to enter parameter set menu; and at this moment users can press “”and “” buttons to select the needed items and then press “Confirm” button to enter the set interface and again press “”and “” buttons to select the needed sub-items , press “Confirm” key to enter the value set interface, and then press “”and “” to set the value, after finishing set, press “Confirm” key for save, after that, press “Cancel” button to exit or press “Cancel” button to exit without saving.

6 接线方式 Wiring mode

6. 1 辅助电源 Auxiliary power suply

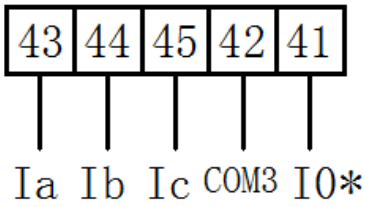


6. 2 电压、电流、漏电流信号输入 Voltage, Current, Leakage current input



电压信号输入

Voltage signal input



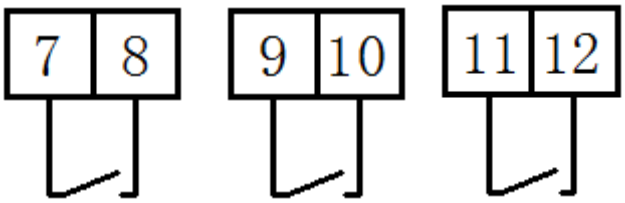
电流信号输入

Current signal input

漏电流输入

Leakage current input

6. 3 继电器输出 Relay output



起动 1(DO1)　　起动 2(DO2)　　报警（DO3 可编程）

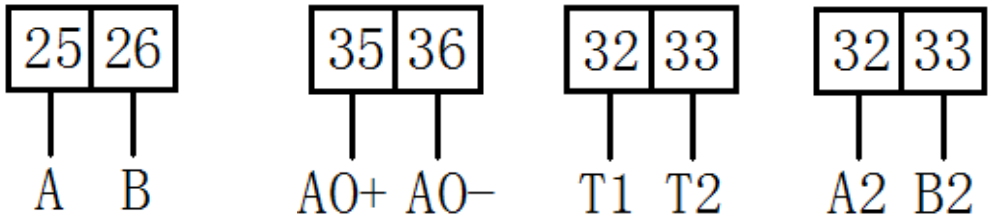
Starting 1　　Starting 2　　Alarm(DO3 programmable)

脱扣（DO4 可编程）　　脱扣(DO5)

Trip (DO4 programmable)　　Trip9(DO5)

6.4 RS485 通讯、DC4～20mA 模拟量输出、热电阻输入

RS485 communication, DC4-20mA analog output, thermal resistance input



RS485(通讯 1)　　模拟量输出　　PTC/NTC 电阻输入　　RS485(通讯 2)

RS485(communication1) Analog output　PTC/NTC resistance input　RS485(communication2)

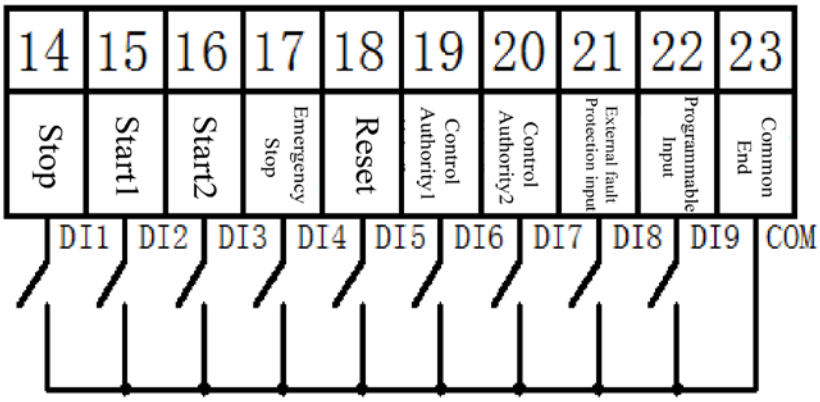
注：1、附加功能选配温度保护 T 时，（32,33）为 PTC/NTC 电阻输入接口；

2、附加功能选配双通讯 2C 时，（32,33）为 RS485(通讯 2)接口，二者不能同时选配，使用双通讯时，不能带有温度保护功能。

Note: 1. When temperature protection t is selected for additional functions, (32,33) is PTC/NTC resistance input interface;

2.When dual communication 2C is selected for additional functions, (32,33) is RS485 (Communication 2) interface, which cannot be selected at the same time. When dual communication is used, it cannot have temperature protection function.

6.5 开关量输入 DI



7 通讯协议 Communication protocol

7.1 通讯协议概述 Overview of communication protocol

参照 ARD2 通讯协议概述 Refer to the overview of ard2 communication protocol

7.2 数据读取换算 Date reading conversion

表 17 Table17

类型 Type		单位 Unit	小数点位数 Decimal places
电流 Current	电流规格 Current specification: 25、100、250、800	0.1A	1 位小数点 1 decimal point
	电流规格 Current specification: 1.6、6.3	0.01A	2 位小数点 2 decimal points
电压 voltage		V	无小数点 No decimal point
功率 Power		W	无小数点 No decimal point
功率因数 power factor		0.001	3 位小数点 3 decimal points
电能 Electric energy		kWh	无小数点 No decimal point
频率 Frequency		0.01Hz	2 位小数点 3 decimal points

举例：

1、以电流读取为例：从地址 0x00-0x02 读取电流值分别为 1000、1000、1000，保护器电流规格为 ARD2F-100x/xx-90L 时，要得到实际电流值，需要对读取的数据加一位小数点才是实际数据，处理后得到：100.0、100.0、100.0。如不好获取电流规格，还可以采取下面的方法获得电流数据：通过通讯读取三相电流时，同步读取“电流比例因子”地址中的数据，“电流比例因子”中的数据“10”代表 1 位小数点，“100”代表 2 位小数点。如读取三相电流分别为 999、998、1000，“电流比例因子”为“10”，按照上述转化关系进行转化，实际电流为 99.9、99.8、100.0。

2、其它几种电参数的小数点位数是固定见上表，读取相应数据后直接按照上面的关系转换。

Example:

1. Take current reading as an example: when the current values read from address 0x00-0x02 are 1000, 1000 and 1000 respectively, and the current ```specification of protector is ard2f-100x / xx-90l, in order to obtain the actual current value, it is necessary to add a decimal point to the read data to obtain the actual data, and after processing, it is obtained: 100.0, 100.0 and 100.0. If it is difficult to obtain the current specification, the following methods can also be adopted to obtain the current data: when reading the three-phase current through communication, synchronously read the data in the address of "current scale factor", the data "10" in "current scale factor" represents 1 decimal point, and "100" represents 2 decimal points. If the read three-phase currents are 999, 998 and 1000 respectively, "current scale factor" is "10", the conversion is carried out according to the above conversion relationship, and the actual current is 99.9, 99.8 and 100.0.

2. The decimal places of other electrical parameters are fixed, as shown in the table above. After reading the corresponding data, they are directly converted according to the above relationship.

7.3 地址参量 Address parameter

表 18 Table 18

地址 Add.	地址 Add	参数 Parameters	读写属性 Property (R/W)	取值范围 Value range	类型 Type
1	0x00	L1 相实际电流 L1 phase actual current	R	0-65535	word
		L1 相基波电流	R	0-65535	word

		L1 phase fundamental wave current			
2	0x01	L2 相实际电流 L2 phase actual current	R	0-65535	word
		L2 相基波电流 L2 phase fundamental wave current	R	0-65535	word
3	0x02	L3 相实际电流 L3 phase actual current	R	0-65535	word
		L3 相基波电流 L3 phase fundamental wave current	R	0-65535	word
4	0x03	漏电电流 Leakage current	R	30-1000mA	word
		接地电流百分比 Earth current percentage	R	1-100%	
5	0x04	Uab 线电压 Uab line-voltage	R	0~999.9	word
6	0x05	Ubc 线电压 Ubc line-voltage	R	0~999.9	word
7	0x06	Uca 线电压 Uca line-voltage	R	0~999.9	word
8	0x07	视在功率 Apparent power	R	0-65535	高字 High byte
9	0x08		R	0-65535	低字节 Low byte
10	0x09	有功功率 Active power	R	0-65535	高字节 High byte
11	0x0A		R	0-65535	低字节 Low byte
12	0x0B	保留 Hold	R/W		高字节 High byte
13	0x0C		R/W		低字节 Low byte
14	0x0D	功率因数 Power factor	R	0-1 单位 Unit0.001	word
15	0x0E	电流不平衡度 Unbalance degree of current	R	0-100%	word
16	0x0F	累计热容量百分比 Accumulated thermal capacity percentage	R	0-100%	word
17	0x10	温度值 Temperature value	R	100-30000	word
18	0x11	本次电机运行时间 Motor running time of this time	R	0-65535 小时 hours	word
19	0x12	本次电机停车时间 Motor stopping time of this time	R	0-65535 小时 hours	word
20	0x13	开关量输出 DO	R/W	Bit0-bit8 对应开关量输入 DI1-DI9、Bit11 继电器 1(7.8)、Bit12 继电器 2(9.10)、Bit13 继电器 3(11.12)、Bit14 继电器 4(97.98)、Bit15 继电器 5(95.96) Bit0-bit8 corresponding	word

				Switching input DI1-DI9, Bit11 relay1, Bit12 relay2, Bit13 relay3, Bit14 relay4, Bit15 relay5	
21	0x14	脱扣故障指示 Trip fault indicator	R	Bit0 过载脱扣 Bit1 接地/漏电脱扣 Bit2 欠载脱扣 Bit3 断相脱扣 Bit4 欠压脱扣 Bit5 过压脱扣 Bit6 堵转脱扣 Bit7 阻塞脱扣 Bit8 不平衡脱扣 Bit9PTC 温度脱扣 Bit10 外部故障脱扣 Bit11 起动超时脱扣 Bit12 过功率脱扣 Bit13 欠功率脱扣 Bit14 相序脱扣 Bit15 短路脱扣 Bit 0 overload trip Bitl earth/ leakage trip Bit2 under load trip Bit3 phase failure trip Bit4 under voltage trip Bit5 over voltage trip Bit6 locked-rotor trip Bit7 block trip Bit8 imbalance trip Bit9 PTC temperature trip Bit10 external fault trip Bit11 starting overtime trip Bit12 over power trip Bit13 under power trip Bit14 phase sequence trip Bit15 short circuit trip	word
22	0x15	保留 Hold	R/W		word
23	0x16	报警故障指示 Alarm fault indicator	R	Bit0 过载报警 Bit1 接地/漏电报警 Bit2 欠载报警 Bit3 断相报警 Bit4 欠压报警 Bit5 过压报警 Bit6 堵转报警 Bit7 阻塞报警 Bit8 不平衡报警 Bit9PTC 温度报警 Bit10 外部故障报警 Bit11 起动超时报警 Bit12 过功率报警 Bit13 欠功率报警 Bit14 相序报警 Bit15 短路报警	word

				Bit 0 overload alarm Bit1 earth /leakage alarm Bit2 under load alarm Bit3 phase failure alarm Bit4 under voltage alarm Bit5over voltage alarm Bit6 locked-rotor alarm Bit7 block alarm Bit8 unbalance alarm Bit9 PTC temperature alarm Bit10 external fault alarm Bit11 starting overtime alarm Bit12 over power alarm Bit13 under power alarm Bit14 phase sequence alarm Bit15 short circuit alarm	
24	0x17	保留 Hold	R/W		word
25	0x18	电流规格 Current specification	R	0-1.6、1-6.3、2-25、3-100、4-250、5-800、6-1、7-5	word
		电流比例因子 Current scaling factor	R	10、100	
26	0x19	A 相过载百分比 A phase overload percentage	R		word
27	0x1A	B 相过载百分比 B phase overload percentage	R		word
28	0x1B	C 相过载百分比 C phase overload percentage	R		word
29	0x1C	过载百分比 Overload percentage	R		word
30	0x1D	频率 Frequency	R	45.0-70.0	word
31	0x1E	电机状态 Motor status	R	电机热过载冷却剩余时间 Motor thermal overload cooling remaining time	word
				Bit0 就绪；Bit1 停车 Bit2 起动；Bit3 运行；Bit4 报警；Bit5 脱扣 Bit0 ready; Bit1 stop; Bit2 start;Bit3 run; Bit4 alarm; Bit5 trip	
32	0x1F	保留 Hold	R/W		word
33	0x20	保留 Hold	R/W		word
34	0x21	保留 Hold	R/W		word
35	0x22	保留 Hold	R/W		word
36	0x23	保留 Hold	R/W		word
37	0x24	保留 Hold	R/W		word
38	0x25	保留 Hold	R/W		word
39	0x26	保留 Hold	R/W		word
40	0x27	保留 Hold	R/W		word
41	0x28	保留 Hold	R/W		word

42	0x29	运行控制位 Operational control position	R/W	1 停车、2 起动 1、3 起动 2 1 stop,2 start1,3 start 2	word
43	0x2A	保留 Hold	R/W		word
44	0x2B	恢复出厂设置 Factory Reset	R/W	0xFFFF	word
45	0x2C	总运行时间 Total run time	R/W	0-65535 小时 hours	word
46	0x2D	总停车时间 Total stop time	R/W	0-65535 小时 hours	word
47	0x2E	总起动次数 Total number of starts	R/W	0-65535	word
48	0x2F	总脱扣次数 Total trip times	R/W	0-65535	word
49	0x30	年 Year	R/W	2012-2099	word
50	0x31	月 Month	R/W	1-12	word
51	0x32	日 Day	R/W	1-31	
52	0x33	时 Hour	R/W	0-24	word
53	0x34	分 Cent	R/W	0-59	word
54	0x35	秒 Second	R/W	0-59	word
55~ 93	0x36~0x5C	保留 Hold	R/W		word
94	0x5D	高速开关 high-speed switch	R/W	0 低速 1 高速 0 low speed 1 high speed	word
95	0x5E	变送类型设定 Transmission type set	R/W	0-Ia、1-Ib、2-Ic、 3-Iav、4-Uab、5-Ubc、 6-Uca、7-Uav、8-PTC、9- 热容量 thermal capacity、 10-P、11-F	word
		变送变比设定 Transmission ratio set	R/W	1-8	
96	0x5F	剩余电流互感器投入标志 Residual current transformer input symbol	R/W	0 未有投入 1 投入 0 not input 1 input	word
97	0x60	基波开关 Fundamental wave switch	R/W	1 基波；0 有效值 1 fundamental wave; 0 valid value	word
98	0x61	电机类型 Motor type	R/W	0 普通电机；1 增安电机 0 general motor; 1 increased safety motor	word
99	0x62	CT 变比 CT ratio	R/W	1-2000	word
100	0x63	额定频率 Rated frequency	R/W	45-70	word
101	0x64	电机额定电流 Rated current of motor	R/W	1.6~800.0	word
102	0x65	电机额定电压 Rated voltage of motor	R/W	190、380、690	word
103	0x66	电机额定功率 Rated power of motor	R/W	高位 High level	word
104	0x67		R/W	低位 Low level	word
105	0x68	起动时间设定 Start time set	R/W	0.1-999.9	word
106	0x69	接线方式 Connection mode	R/W	0 单相模式 1 三相四线 0 single-phase mode 1 3-phase 4-wire	word

107	0x6A	脱扣等级设定 Trip level set	R/W	1、2、3、5、10、15、20、25、30、35、40	word
		TE 脱扣时间设定 TE trip time set	R/W	2、3、4 、5、6、 8、10、12、15	
108	0x6B	过载自动复位 Overload automatic reset	R/W	1 开 0 关 1 ON 0 OFF	word
		过载冷却时间 Overload cool time		1-255min	
109	0x6C	保留 Hold	R/W		word
110	0x6D	脱扣允许位开/关 Trip allowable bit open/closed	R/W	Bit0 过载脱扣 Bit1 接地/漏电脱扣 Bit2 欠载脱扣 Bit3 断相脱扣 Bit4 欠压脱扣 Bit5 过压脱扣 Bit6 堵转脱扣 Bit7 阻塞脱扣 Bit8 不平衡脱扣 Bit9PTC 温度脱扣 Bit10 外部故障脱扣 Bit11 起动超时脱扣 Bit12 过功率脱扣 Bit13 欠功率脱扣 Bit14 相序脱扣 Bit15 短路脱扣 Bit 0 overload trip Bitl earth/leakage trip Bit2 under load trip Bit3 phase failure trip Bit4 under voltage trip Bit5 over voltage trip Bit6 Stall trip Bit7 block trip Bit8 imbalance trip Bit9 PTC temperature trip Bit10 external fault trip Bit11 starting overtime trip Bit12 over power trip Bit13 under power trip Bit14 phase sequence trip Bit15 short circuit trip	word
111	0x6E	保留 Hold	R/W		word
112	0x6F	保留 Hold	R/W		word
113	0x70	报警允许位开/关 Alarm allowable bit open/closed	R/W	Bit0 过载报警 Bit1 接地/漏电报警 Bit2 欠载报警 Bit3 断相报警 Bit4 欠压报警 Bit5 过压报警 Bit6 堵转报警 Bit7 阻塞报警 Bit8 不平衡报警	word

				Bit9 PTC 温度报警 Bit10 外部故障报警 Bit11 起动超时报警 Bit12 过功率报警 Bit13 欠功率报警 Bit14 相序报警 Bit15 短路 Bit 0 overload alarm Bit1 earth/leakage alarm Bit2 under load alarm Bit3 phase failure alarm Bit4 under voltage alarm Bit 5over voltage alarm Bit6 locked-rotor alarm Bit7 block alarm Bit8 unbalance alarm Bit9 PTC temperature alarm Bit10 external fault alarm Bit11 starting overtime alarm Bit12 over power alarm Bit13 under power alarm Bit14 phase sequence alarm Bit15 short circuit	
114	0x71	保留 Hold	R/W		word
115	0x72	保留 Hold	R/W		word
116	0x73	过载报警域值设定 Overload alarm threshold set	R/W	1-99%	word
117	0x74	断相脱扣延时设定 Phase failure trip delay set	R/W	0.1~600	word
118	0x75	接地/漏电报警电流设定 Earth/leakage alarm current set	R/W	100~1000mA	word
119	0x76	接地/漏电脱扣电流设定 Earth/leakage trip current set	R/W	100~1000mA	word
120	0x77	接地/漏电脱扣延时设定 Earth/leakage trip delay set	R/W	0.1~600	word
121	0x78	堵转报警域值设定 Locked-rotor alarm threshold set	R/W	100~700%	word
122	0x79	堵转脱扣域值设定 Locked-rotor trip threshold set	R/W	100~700%	word
123	0x7A	堵转脱扣延时设定 Locked-rotor trip delay set	R/W	0.1~600	word
124	0x7B	阻塞报警域值设定 Block alarm threshold set	R/W	100~700%	word
125	0x7C	阻塞脱扣域值设定 Block trip threshold set	R/W	100~700%	word
126	0x7D	阻塞脱扣延时设定 Block trip delay set	R/W	0.1~600	word
127	0x7E	欠载报警域值设定 Under load alarm threshold set	R/W	10~99%	word

128	0x7F	欠载脱扣域值设定 Under load trip threshold set	R/W	10~99%	word
129	0x80	欠载脱扣延时设定 Under load trip delay set	R/W	0.1~600	word
130	0x81	不平衡报警域值设定 Unbalance alarm threshold set	R/W	10~80%	word
131	0x82	不平衡脱扣域值设定 Unbalance trip threshold set	R/W	10~80%	word
132	0x83	不平衡脱扣延时设定 Unbalance trip delay set	R/W	0.1~600	word
133	0x84	NTC/PTC 设定 NTC/PTC set	R/W	0 NTC；1PTC	word
134	0x85	温度报警值设定 Temperature alarm threshold set	R/W	100~30000	word
135	0x86	温度脱扣值设定 Temperature trip threshold set	R/W	100~30000	word
136	0x87	温度脱扣延时设定 Temperature trip delay set	R/W	0.1~600	word
137	0x88	温度返回阻值设定 Temperature returning resistance value set	R/W	0 关闭 off 100~30000	word
138	0x89	欠电压报警域值设定 Under voltage alarm threshold set	R/W	50~90%	word
139	0x8A	欠电压脱扣域值设定 Under voltage trip threshold set	R/W	50~90%	word
140	0x8B	欠电压脱扣延时设定 Under voltage trip delay set	R/W	0.1~600	word
141	0x8C	过电压报警域值设定 Over voltage alarm threshold set	R/W	110~150%	word
142	0x8D	过电压脱扣域值设定 Over voltage trip threshold set	R/W	110~150%	word
143	0x8E	过电压脱扣延时设定 Over voltage trip delay set	R/W	0.1~600	word
144	0x8F	过功率报警域值设定 Over voltage alarm threshold set	R/W	100~700%	word
145	0x90	过功率脱扣域值设定 Over voltage trip threshold set	R/W	100~700%	word
146	0x91	过功率脱扣延时 Over voltage trip delay set	R/W	0.1-600	word
147	0x92	欠功率报警域值设定 Under power alarm threshold set	R/W	0~100%	word
148	0x93	欠功率脱扣域值设定 Under power trip threshold set	R/W	0~100%	word

149	0x94	欠功率脱扣延时 Under power trip delay set	R/W	0.1-600	word
150	0x95	短路报警域值设定 Short circuit alarm threshold set	R/W	400%-800%最大可测过载倍数 maximum measurable overload	word
151	0x96	短路脱扣域值设定 Short circuit trip threshold set	R/W	400%-800%最大可测过载倍数 maximum measurable overload	word
152	0x97	短路脱扣延时 Short circuit trip delay set	R/W	0.1-600	word
153	0x98	相序故障延时设定 Phase sequence fault delay set	R/W	0.1-600	word
154	0x99	外部故障脱扣延时设定 External fault trip delay set	R/W	0.1-600	word
155	0x9A	接地报警百分比设定 Earth alarm percentage set	R/W	10~100%	word
156	0x9B	接地脱扣百分比设定 Earth trip percentage set	R/W	10~100%	word
157	0x9C	接地脱扣延时设定 Earth trip delay set	R/W	0.1~600	word
158	0x9D	回流检测延时设定 Reflux detection delay set	R/W	0.1-600	word
159	0x9E	回流检测控制 Reflux detection control	R/W	0 关、1 开 0 OFF 1 ON	word
160	0x9F	远程复位 Remote reset	R/W	正常 0;远程复位 1 Normal 0; remote reset 1	word
161	0xA0	接触器允许分断电流 Contactor allowed break	R/W	0,OFF,600-1000%	word
162	0xA1	自起动模式 Self-start mode	R/W	0 起动;1 恢复 0 start; 1 recover	word
163	0xA2	自起动延时设定 Self-start delay set	R/W	0.1-60.0s	word
164	0xA3	自起动控制 Self-start control	R/W	0 关、1 开 0 OFF 1 ON	word
165	0xA4	重起动电压设定 Restart voltage set	R/W	75-95%	word
166	0xA5	立即重起允许失电时间 Immediate restart allowed power failure time	R/W	0.1-0.5	word
167	0xA6	延时重起允许失电时间 Delay restart allowed power failure time	R/W	0.5-10.0	word
168	0xA7	重起动延时设定 Restart delay set	R/W	1.0-60.0s	word
169	0xA8	失压重起起动控制 Loss voltage restarting control	R/W	0 关、1=重起动后执行起动 1，2=重起动后执行起动 2 0 off,1=start 1 after restart, 2=start 2 after start	word
170	0xA9	奇偶校验位 1 Parity bit1	R/W	0 无校验 1 奇校验 2 偶校验 0 no parity check 1 odd parity check 2 even parity check	word
171	0xAA	MODBUS 波特率设定 1 MODBUS baud rate set1	R/W	1200、2400、4800、9600、19200、38400	word

172	0xAB	MODBUS 地址设定 1 MODBUS address set1	R/W	1-247	word
173	0xAC	保留 Hold	R/W		word
174	0xAD	奇偶校验位 2 Parity bit2	R/W	0 无校验 1 奇校验 2 偶校验 0 no parity check 1 odd parity check 2 even parity check	word
175	0xAE	MODBUS 波特率设定 2 MODBUS baud rate set2	R/W	1200、2400、4800、9600、 19200、38400	word
176	0xAF	MODBUS 地址设定 2 MODBUS address set2	R/W	1-247	word
177-178	0XB0-0xB1	保留 Hold	R/W		word
179	0xB2	起动控制设定 Start control set	R/W	0=保护模式、1=手动模式、 2=两步起动、3=双速模式 0=protection mode, 1=manual mode, 2=two-step start, 3=two-speed mode.	word
180	0xB3	控制权限设定 Control authority set	R/W	0 本地 、1 就地、2 远程、 3 三选一、4 全控 0 local, 1 on-site, 2 remote 3 1 in 3, 4 all control	word
181	0xB4	起动一延时设定 Start-delay set	R/W	0.1-60.0s	word
182	0xB5	保留 Hold	R/W		word
183	0xB6	保留 Hold	R/W		word
184	0xB7	保留 Hold	R/W		word
185	0xB8	保留 Hold	R/W		word
186	0xB9	保留 Hold	R/W		word
187	0xBA	保留 Hold	R/W		word
188	0xBB	保留 Hold	R/W		word
189	0xBC	保留 Hold	R/W		word
190	0xBD	保留 Hold	R/W		word
191	0xBE	继电器初始状态设定 Relay initial status set	R/W	0 开 1 合，bit0-4：继电器 1-5 0 on 1 off, bit0-4: relay 1-5	word
192	0xBF	继电器 1 动作设定 Relay 1 operation set	R/W	0 电平 electrical level 3-250 单位 unit 0.1S	word
193	0xC0	继电器 2 动作设定 Relay 2 operation set	R/W	0 电平 electrical level 3-250 单位 unit 0.1S	word
194	0xC1	继电器 3 动作设定 Relay 3 operation set	R/W	0 电平 electrical level 3-250 单位 unit 0.1S	word
195	0xC2	继电器 4 动作设定 Relay 4 operation set	R/W	0 电平 electrical level 3-250 单位 unit 0.1S	word
196	0xC3	继电器 5 动作设定 Relay 5 operation set	R/W	0 电平 electrical level 3-250 单位 unit 0.1S	word
197	0xC4	可编程输出 1（DO2）定义 Definition of programmable	R/W	报警故障：对应报警允许位 Alarm fault:corresponding to	word

		output 1(DO2)		alarm allowable position	
198	0xC5		R/W	脱扣故障：对应脱扣允许位 Trip fault:corresponding trip allowable position	word
199	0xC6		R/W	其它功能：2-起动 2、3-报警故障输出、4-脱扣故障输出、5-装置自检输出、6-装置电源输出、7-停止状态就绪、8-运行状态输出、9-控制输出、10-总线控制 Other functions: 2-start2,3-alarm fault output output, 4-trip fault output, 5-device self-check output, 6-device power output, 7-stop status ready, 8-run status output, 9-control output, 10-bus control	word
200	0xC7	可编程输出 2(DO3)定义 Definition of programmable output 2(DO3)	R/W	报警故障：对应报警允许位 Alarm fault:corresponding to alarm allowable position	word
201	0xC8		R/W	脱扣故障：对应脱扣允许位 Trip fault:corresponding trip allowable position	word
202	0xC9		R/W	其它功能：1-起动 1、2-起动 2、3-报警故障输出、4-脱扣故障输出、5-装置自检输出、6-装置电源输出、7-停止状态就绪、8-运行状态输出、9-DI 控制输出、10-总线控制 Other functions:1-Start1,2-Star2,3-Alarm fault output, 4-trip fault output, 5-device self-check output, 6-device power output, 7-stop status ready, 8-run status output, 9-DI control output, 10-bus control	word
203	0xCA	可编程输出 3(DO4)定义 Definition of programmable output 3(DO4)	R/W	报警故障：对应报警允许位 Alarm fault:corresponding to alarm allowable position	word
204	0xCB		R/W	脱扣故障：对应脱扣允许位 Trip fault:corresponding trip allowable position	word
205	0xCC		R/W	其它功能：1-起动 1、2-起动 2、3-报警故障输出、4-脱扣故障输出、5-装置自检输出、6-装置电源输出、7-停止状态就绪、8-运行状态输出、9-DI 控制输出、10-总线控制	word

				Other functions:1-start 1,2-start2,3-alarm fault output, 4-trip fault output, 5-device self-check output, 6-device power output, 7-stop status ready, 8-run status output, 9-DI control output, 10-bus control	
206	0xCD	DI1 可编程定义 DI1 programmable definition	R/W	1 普通 DI 2 起动 1(直接起动、左转、低速)、3 起动 2(右转、高速)、4 停车、5 复位、6 紧急停车、7 外部故障、8 起/停、9 控制权限 1、10 控制权限 2、11 两线制起停、12 起停使能 1 normal D1 2 start 1 (direct start, turn left, low speed), 3 Start 2 (turn right, high speed), 4 stop, 5 reset, 6 emergency stop, 7 external fault, 8 start/stop, 9 control authority 1, 10 control authority 11 D0 control	word
207	0xCE	DI2 可编程定义 DI2 programmable definition	R/W	同上 Ditto	word
208	0xCF	DI3 可编程定义 DI3 programmable definition	R/W	同上 Ditto	word
209	0xD0	DI4 可编程定义 DI4 programmable definition	R/W	同上 Ditto	word
210	0xD1	DI5 可编程定义 DI5 programmable definition	R/W	同上 Ditto	word
211	0xD2	DI6 可编程定义 DI6 programmable definition	R/W	同上 Ditto	word
212	0xD3	DI7 可编程定义 DI7 programmable definition	R/W	同上 Ditto	word
213	0xD4	DI8 可编程定义 DI8 programmable definition	R/W	同上 Ditto	word
214	0xD5	DI9 可编程定义 DI9 programmable definition	R/W	同上 Ditto	word
215-253	0xD6-0XFC	保留 Hold	R/W		word
254	0xFD	软件版本号 Software version number	R/W	1.0-9.9	word
255	0xFE	保留 Hold			word
256	0xFF	保留 Hold			word
257	0x0100	事件控制参数 Event control parameter	R	事件开关 0 关 1 开 Event switch 0 closed 1 open	word
258	事件记录 1 Event record 1	0x0101 STA1	R	保护 1 动作方式 1 过载脱扣 2 接地/漏电脱扣 3 欠载脱扣 4 断相脱扣	高字节 High byte

					5 欠压脱扣 6 过压脱扣 7 堵转脱扣 8 阻塞脱扣 9 不平衡脱扣 10 温度脱扣 11 外部故障脱扣 12 起动超时脱扣 13 过功率脱扣 14 欠功率脱扣 15 相序脱扣 16 短路脱扣 Protection 1 action pattern 1 overload trip 2 earth/leakage trip 3 under load trip 4 phase failure trip 5 under voltage trip 6 over voltage trip 7 locked-rotor trip 8 blocking trip 9 unbalance trip 10 temperature trip 11 external fault trip 12 starting overtime trip 13 over power trip 14 under power trip 15 phase sequence trip 16 short circuit trip	
			Month1	R	动作 1 时间-月 Operation 1 time-month	低字节 Low byte
259		0x0102	Day1	R	动作 1 时间-日 Operation 1 time-day	高字节 High byte
			Hour1	R	动作 1 时间-时 Operation 1 time-hour	低字节 Low byte
260		0x0103	Minute1	R	动作 1 时间-分 Operation 1 time-minute	高字节 High byte
			Second1	R	动作 1 时间-秒 Operation 1 time-second	低字节 Low byte
261-317	事件记录 2-20 Event record 2-20	0x0104-0x013C		R		57Word
	Ua 录波 Ua wave record	0x500-0x63F		R		320Word
	Ub 录波 Ub wave record	0x640-0x77F		R		320Word
	Uc 录波 Uc wave record	0x780-0x8BF		R		320Word
	Ia 录波	0x8C0-0x9FF		R		320Word

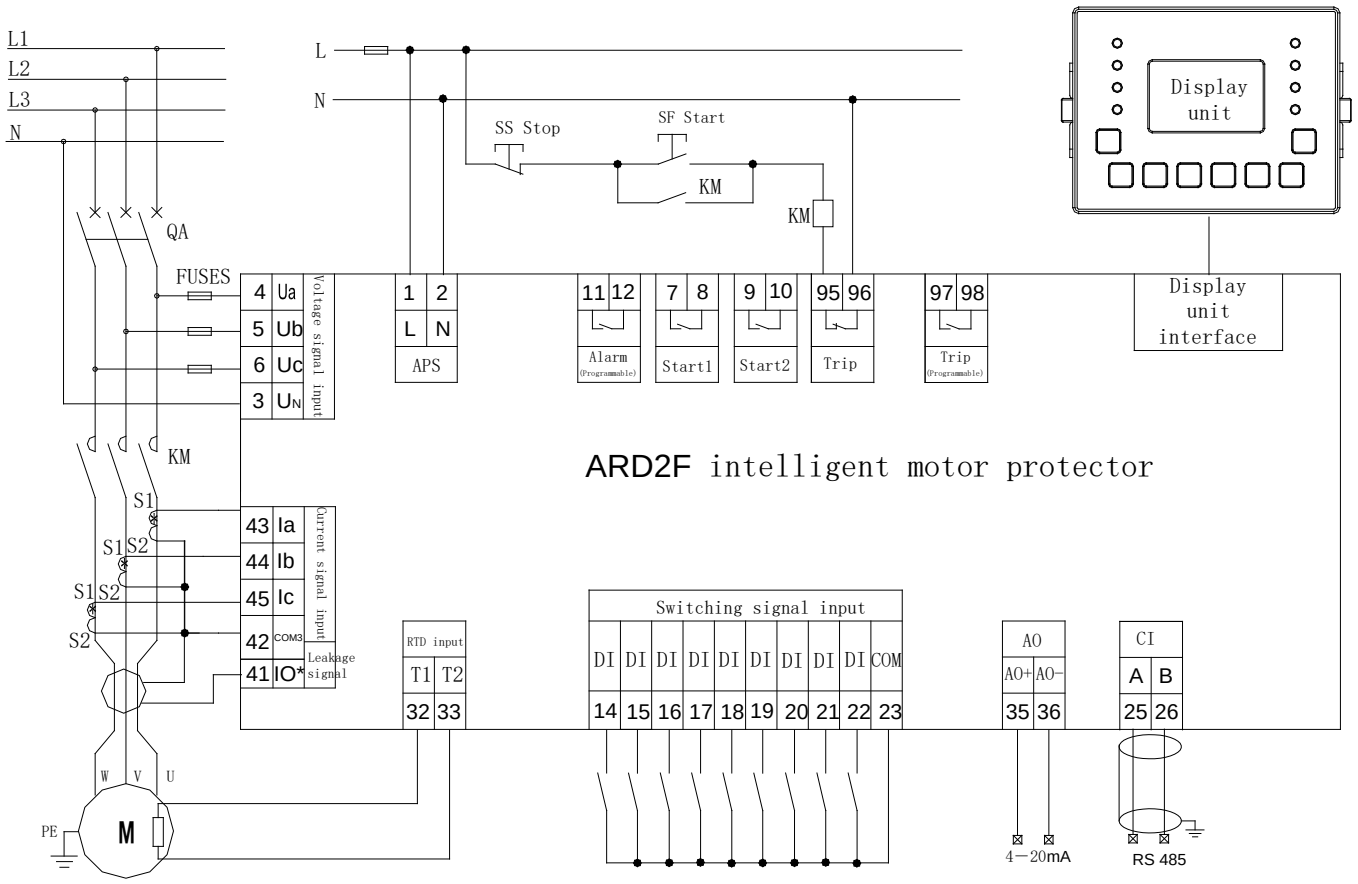
	Ia wave record					
	Ib 录波 Ib wave record	0xA00-0xB3F		R		320Word
	Ic 录波 Ic wave record	0xB40-0xC7F		R		320Word

注：故障录波功能——当保护器发生故障脱扣时，能记录脱扣前后各 5 个周期的三相电压、三线电流 AD 采样数据，每个周期 32 个采样数据。可通过通讯读取记录的数据。

Note: fault wave recording function - when the protector trips due to fault, it can record the three-phase voltage and three-wire current AD sampling data of 5 cycles before and after tripping, with 32 sampling data in each cycle. The recorded data can be read through communication.

8 典型应用方案 Typical application solutions

8.1 ARD2F 电动机保护器保护模式接线图（适用于 1.6、6.3、25、100、250、800A 电流规格）：
Wiring diagram of protection mode of ARD2F motor protector (applicable to 1.6, 6.3, 25, 100, 250 and 800A current specifications):



保护模式：

电动机的起动、停车由外部按钮实现，接触器 KM 的吸引线圈串进脱扣继电器的常闭触点中。闭合 QA，按下起动按钮 SF，KM 吸引线圈得电，使 KM 的主触头闭合，电动机开始工作，当按下停车按钮 SS 时，KM 的吸引线圈失电，使 KM 的主触点释放，电动机停止工作。

Protection mode:

The start and stop of the motor are realized by external buttons, and the suction coil of contactor km is connected

in series into the normally closed contact of tripping relay. Close QA, press the start button SF, the KM suction coil is powered on, so that the main contact of KM is closed, and the motor starts to work. When the stop button SS is pressed, the KM suction coil is powered off, so that the main contact of KM is released, and the motor stops working.

注：1、可用脱扣（DO4 可编程）继电器输出，实现塑壳断路器的速断功能。

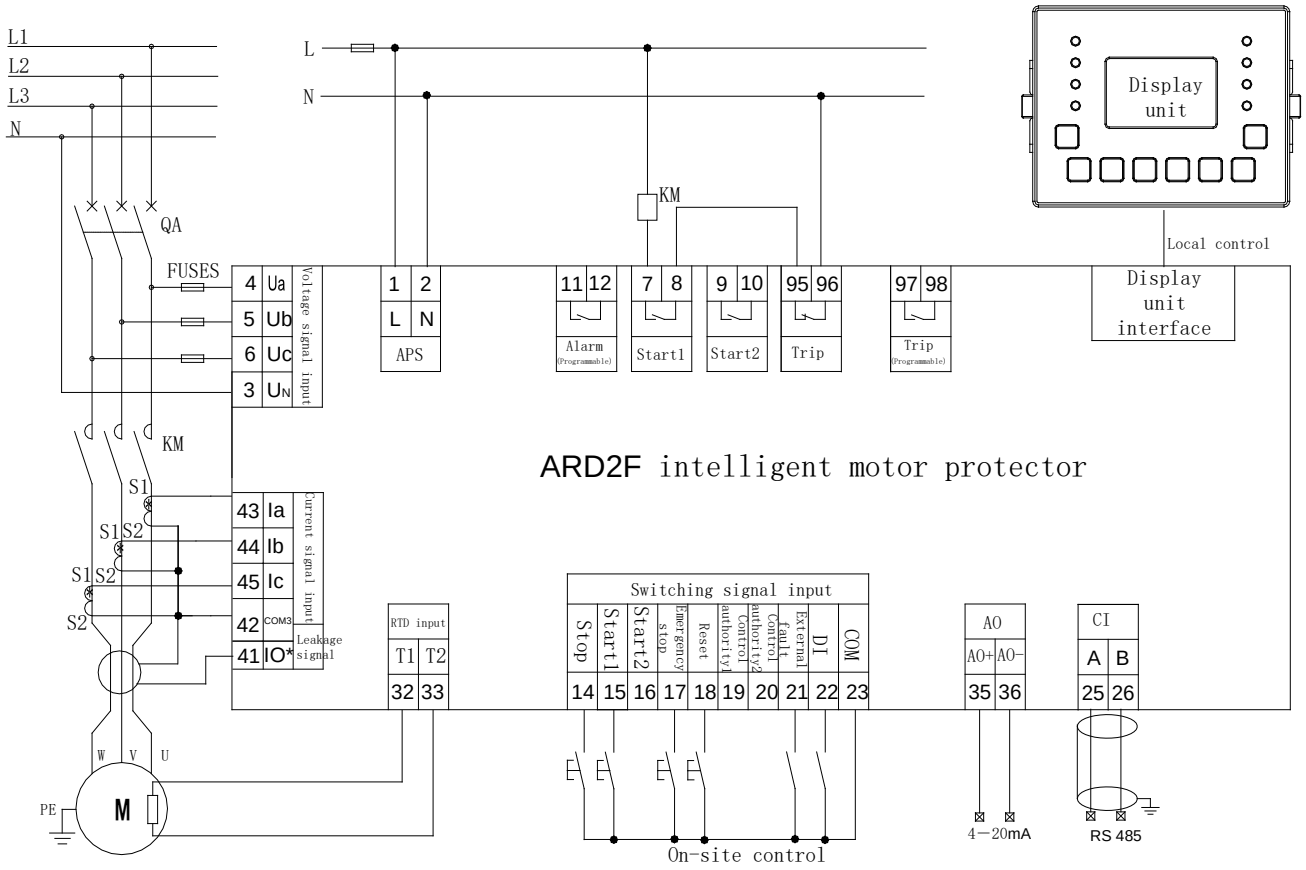
2、可编程继电器可定义为起动 1、起动 2、报警故障输出、脱扣故障输出、装置自检输出、装置电源输出、停止状态就绪、运行状态输出、DI 控制输出、总线控制。

Note: 1. Tripping (do4 programmable) relay output can be used to realize the quick breaking function of molded case circuit breaker.

2. Programmable relay can be defined as start 1, start 2, alarm fault output, tripping fault output, device self-test output, device power output, stop state ready, operation state output, di control output and bus control.

8.2 ARD2F 电动机保护器直接起动模式接线图（适用于 1.6、6.3、25、100、250、800A 电流规格）：

Wiring diagram of direct starting mode of ARD2F motor protector (applicable to 1.6, 6.3, 25, 100, 250 and 800A current specifications):



直接起动：

电动机的起动、停车由保护器控制，接触器 KM 的吸引线圈串进脱扣继电器的常闭触点和起动 1 继电器的常开触点，闭合 QA，按下显示单元上的“起动 1”按键（起动控制设置为手动模式，使能本地控制），则使 KM 的主触头闭合，电动机开始工作，按下“停车”按钮，KM 的吸引线圈失电，使 KM 的主触点释放，电动机停止工作。

Direct starting:

The start and stop of the motor are controlled by the protector. The suction coil of the contactor km is connected in series into the normally closed contact of the tripping relay and the normally open contact of the start 1 relay to close QA. Press the "start 1" button on the display unit (the start control is set to manual mode to enable local control), the main

contact of KM is closed and the motor starts to work, Press the "stop" button, the suction coil of KM loses power, the main contact of KM is released, and the motor stops working.

控制权限选择（除保护模式外）：

90FL 显示单元按键本地控制、DI 端就地控制、上位机通讯远程控制。DI6、DI7 组合实现三位置权限选择。下表中“0”表示开关量输入未接通，“1”表示接通。

Control authority selection (except protection mode):

90FL display unit key local control DI end on-site control, host computer communication remote control. Di6 and di7 are combined to realize three position permission selection. "0" in the following table indicates that the switching value input is not connected, and "1" indicates that it is connected.

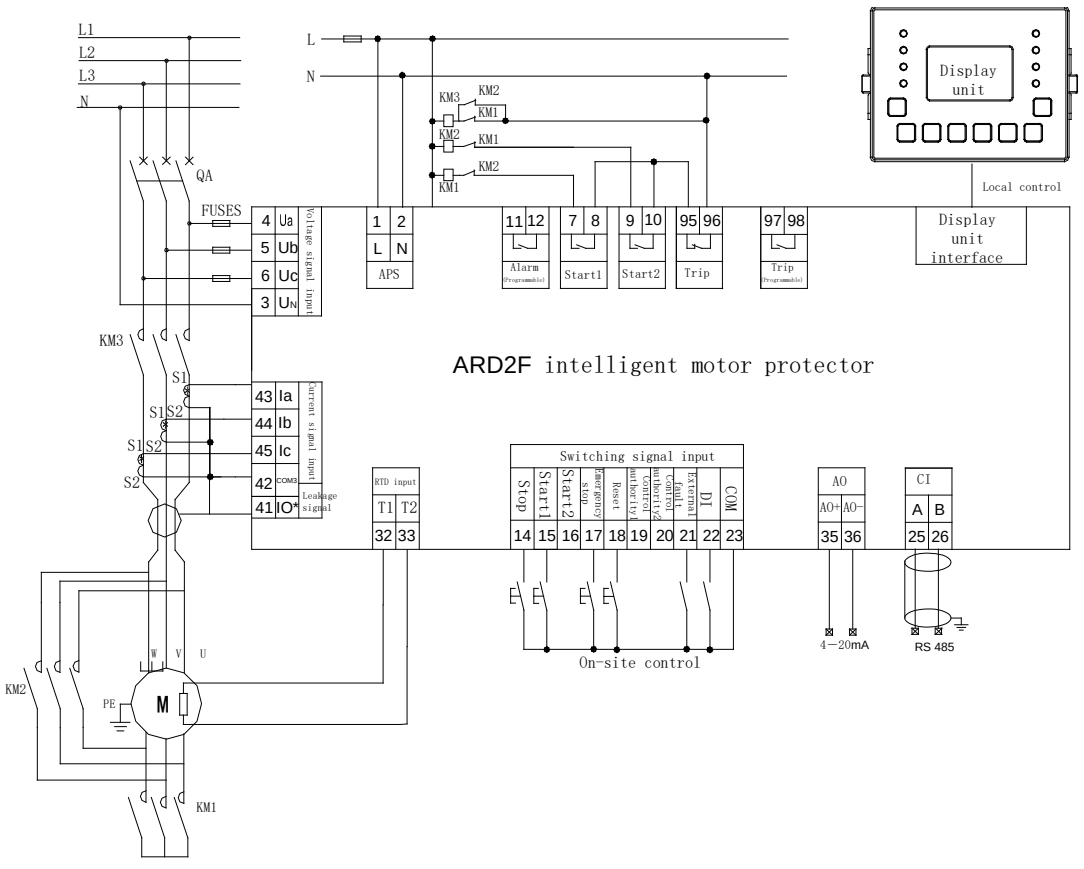
DI 控制权限定义：DI control authority definition:

表 19 Table 19

控制权限 Control authority	DI 输入状态 DI input status	
	DI6 控制权限 1 DI6 control authority 1	DI7 控制权限 2 DI7 control authority 2
本地控制 Local control	1	0
远程控制 Remote control	0	0
就地控制 On-site control	0	1

8.3 ARD2F 电动机保护器 Y-△起动模式接线图（适用于 1.6、6.3、25、100、250、800A 电流规格）：

Wiring diagram of Y-Δ starting mode of ARD2F motor protector (applicable to 1.6, 6.3, 25, 100, 250 and 800A current specifications):



Y-△起动：

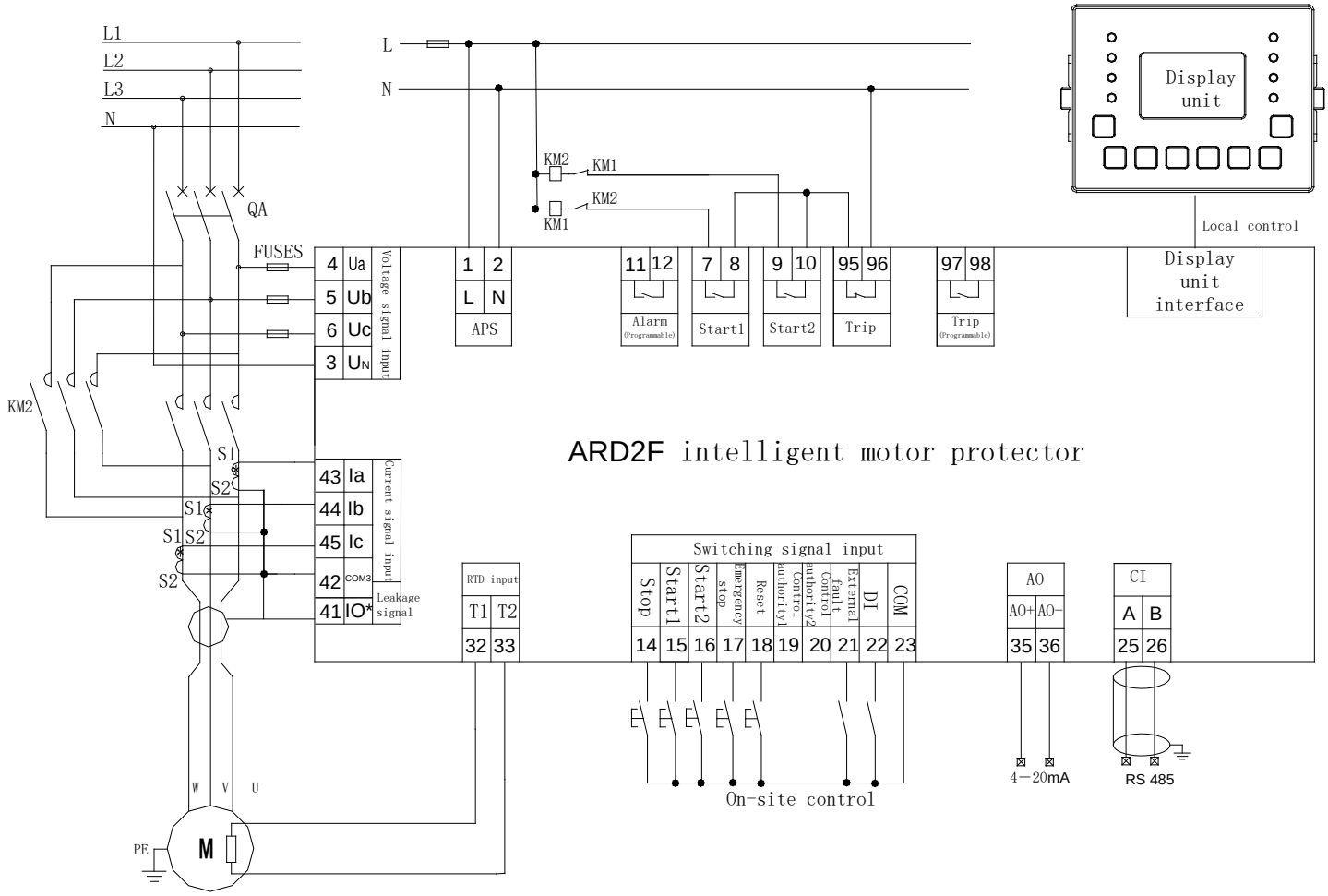
电动机的起动、停车由保护器控制。按图示方法将控制电路接好后，闭合 QA，按下显示单元上的“起动 1”按键（起动控制设置为两步起动，使能本地控制），使起动继电器 1 闭合，KM1、KM3 吸引线圈得电，KM1、KM3 的主触头闭合，电动机以 Y 方式起动，转换时间到保护器自动断开起动继电器 1，同时闭合起动继电器 2，KM2、KM3 吸引线圈得电，KM2、KM3 的主触头闭合，保护器转入Δ运行，按下“停车”按钮，电动机停止工作。

Y-Δstarting:

The starting and stopping of the motor are controlled by the protector. After connecting the control circuit according to the method shown in the figure, close QA, press the "start 1" button on the display unit (the start control is set to two-step start, enabling local control), close the start relay 1, energize the suction coils of KM1 and KM3, close the main contacts of KM1 and KM3, start the electric machine in Y mode, and switch the time to the protector to automatically disconnect the start relay 1, At the same time, close the starting relay 2, the suction coils of km2 and KM3 are powered on, the main contacts of km2 and KM3 are closed, the protector turns into Δ operation, press the "stop" button, and the motor stops working.

8.4 ARD2F 电动机保护器正反转起动模式接线图（适用于 1.6、6.3、25、100、250、800A 电流规格）：

Wiring diagram of forward and reverse start mode of ARD2F motor protector (applicable to 1.6, 6.3, 25, 100, 250 and 800A current specifications):



正反转起动：

电动机的起动、停车由保护器控制。按图示方法将控制电路接好后，闭合 QA，按下显示单元上的“起动

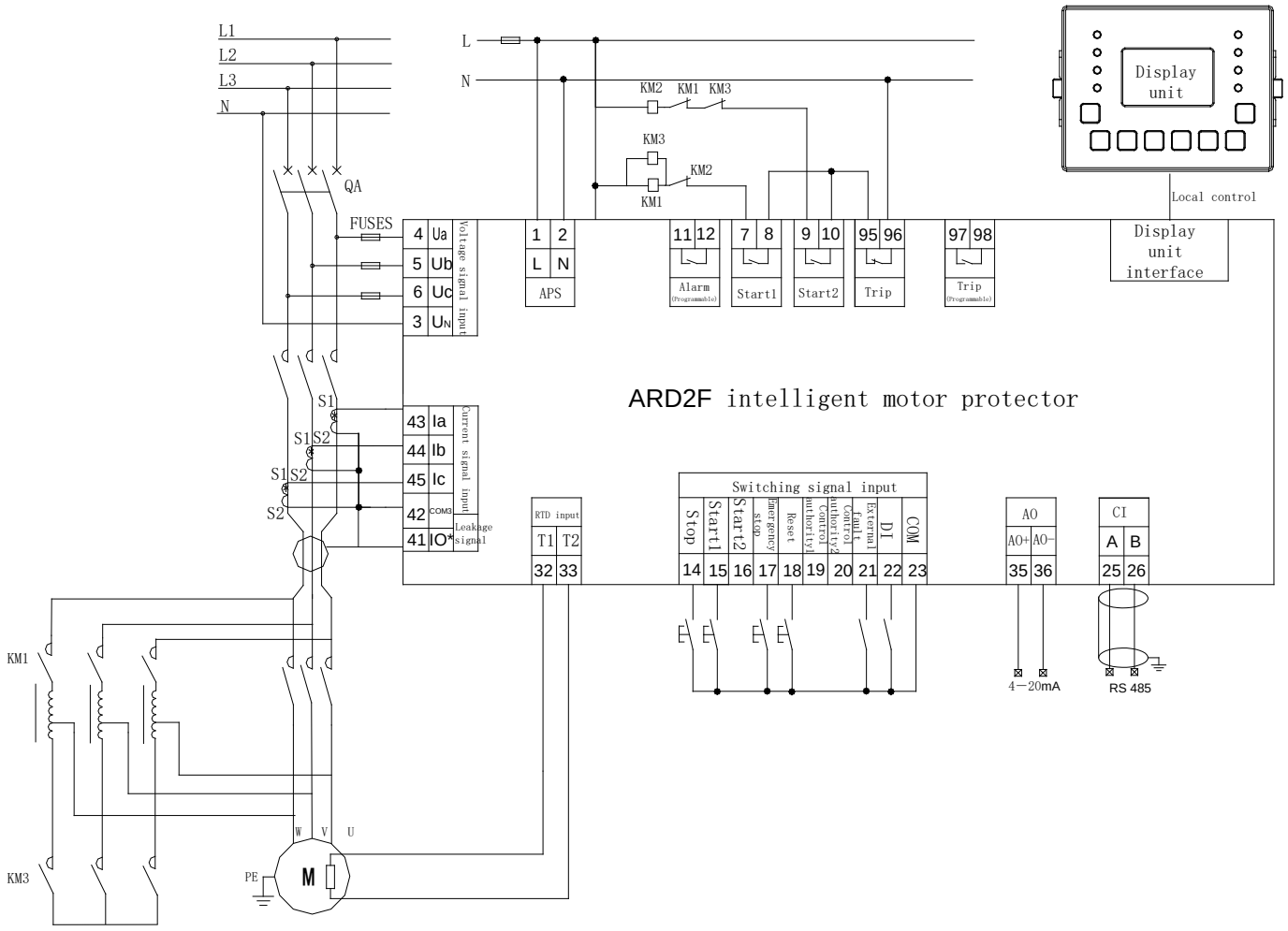
1”按键（起动控制设置为手动模式，使能本地控制），KM1 吸引线圈得电，使 KM1 的主触头闭合，电动机正转起动；按下“起动 2”按键，KM2 吸引线圈得电，使 KM2 的主触头闭合，电动机反转起动，按下“停车”按钮，KM1、KM2 断开，电动机停止工作。

Forward and reverse start:

The starting and stopping of the motor are controlled by the protector. After connecting the control circuit according to the method shown in the figure, close QA, press the "start 1" button on the display unit (the start control is set to manual mode, enabling local control), power on KM1 suction coil, close the main contact of KM1, and start the motor in forward rotation; Press the "start 2" button, the km2 suction coil is powered on, the main contact of km2 is closed, and the motor starts in reverse. Press the "stop" button, KM1 and km2 are disconnected, and the motor stops working.

8.5 ARD2F 电动机保护器自耦降压起动模式接线图（适用于 1.6、6.3、25、100、250、800A 电流规格）：

Wiring diagram of self coupling step-down starting mode of ARD2F motor protector (applicable to 1.6, 6.3, 25, 100, 250 and 800A current specifications):



自耦降压起动：

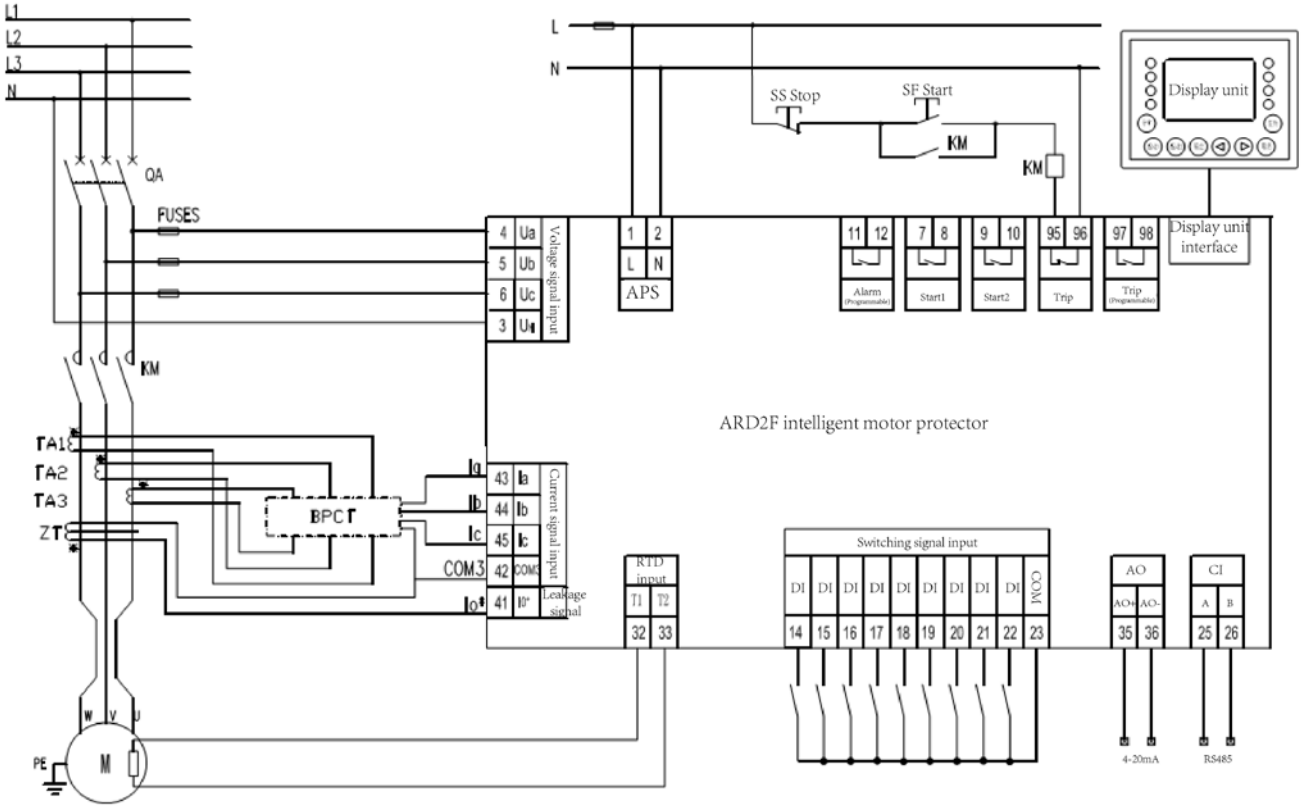
在自耦降压起动模式下，电动机的起动、停车由保护器控制。按图示方法将控制电路接好后，闭合 QA，按下显示单元上的“起动 1”按键（起动控制设置为两步起动，使能本地控制），使起动继电器 1 闭合，KM1 吸引线圈得电，KM1 的主触头闭合，电动机通过自耦变压器降压起动，转换时间到后保护器自动断开起动继电器 1，同时闭合起动继电器 2，KM2 吸引线圈得电，使 KM2 的主触头闭合，电动机转入正常运行，按下“停车”按钮，KM1 的吸引线圈失电，使 KM1 的主触点释放，电动机停止工作。

Self coupling step-down start

In the self coupling step-down starting mode, the starting and stopping of the motor are controlled by the protector. After connecting the control circuit according to the method shown in the figure, close QA, press the "start 1" button on the display unit (the start control is set to two-step start, enabling local control), close the start relay 1, energize the KM1 suction coil, close the main contact of KM1, reduce the voltage and start the motor through the autotransformer, and the protector will automatically disconnect the start relay 1 after the conversion time, At the same time, close the starting relay 2, the km2 suction coil is powered on, so that the main contact of km2 is closed, and the motor turns into normal operation. Press the "stop" button, the suction coil of KM1 is powered off, so that the main contact of KM1 is released and the motor stops working.

8.6 ARD2F 电动机保护器 1A、5A 规格的接线图：

Wiring diagram of 1A and 5A of ARD2F motor protector:



注：选用 1A、5A 规格的 ARD2F 保护器时，需要先通过/1、/5 的互感器将大电流转换成 1A、5A 的电流，然后再通过标配的 100A/20mA 电流互感器输入到保护器使用。图中 TA1、TA2、TA3 为/1、/5 互感器，需要客户自行购买，BPCT 为我司标配的 100A/20mA 电流互感器。

Note: when selecting the ard2f protector of 1a and 5A specifications, it is necessary to convert the large current into 1a and 5A current through the transformer of / 1 and / 5, and then input it to the protector through the standard 100A / 20mA current transformer. TA1, TA2 and TA3 in the figure are / 1 and / 5 transformers, which need to be purchased by customers. Bpct is our standard 100A / 20mA current transformer.

9 保护功能设置及说明 Set and instructions of protection functions

9.1 参数设置 Parameter set：

表 20 Table 20

序号 NO.	主菜单 Main menu	功能 Function	类别 Type	设定范围 Set ranges	默认值 Default value	单位 Unit
一 I	报警信息					

	Alarm infromation					
二 II	脱扣信息 Trip infromation					
三 III	运行信息 Operation infromation	1 本次运行 this run				h
		2 本次停车 this sop				h
		3 运行时间 Run time				h
		4 停车时间 Stop time				h
		5 起动次数 Start time				
		6 脱扣次数 Trip imes				
四 IV	系统参数 System parameter	1MODBUS 波特率 Baud rate 1		2400、4800、9600、19200、38400	9600	bps
		2 通讯地址 postal address 1		1~247	1	
		3 校验方式 Check method1		None/Odd/Even	None	
		4MODBUS 波特率 Baud rate2		2400、4800、9600、19200、38400	9600	bps
		5 通讯地址 postal address2		1~247	1	
		6 校验方式 Check method 2		None/Odd/Even	None	
		7 进入密码 Enter the password		0-9999	1	
		8 电机类型 Motor Type		普通电机、增安电机 General motor, safety-increased motor	普通电机 General motor	
		9 变送类型 Transmission type		Ia、Ib、Ic、Iav、Uab、Ubc、Uca、Uav、PTC、热容量 heat Capacity、P、F	Iav	
		10 变送变比 Transmission ratio		1-8	2	
		11 背光常亮 light		开/关 on/off	关 off	
		12 系统电压 System voltage		380、660	380	V
		13 额定频率 Rated frequency		45~65	50	
		14 额定功率 Rated power		0.12-999kW		
		15CT 变比 CT ratio		1-2000	1	
		16 高速开关 High speed switch		开/关 on/off	关 off	
		17 基波开关 fundamental wave switch		开/关 on/off	关 off	
		18 软件版本号 Software version				
		19Dnet 波特率		125k、250k、500k	125k	

		Baud rate				
五 V	保护参数 Protection parameter	1 起动保护 Start protection	起动时间 Start time	0.1~999.9	10.0	S
			报警 alarm	开/关 on/off	开 on	
			脱扣 trip	开/关 on/off	开 on	
		2 过载保护 Overload protection	电动机 额定电流 Rated current of motor	0.4~1.6,1.6~6.3 6.3~25,25-100 63~250,250~800	1.6,6.3 25.0,100 250,800	A
			脱扣等级 Trip level	1、2、3、5、10、15、20、25、30、35、40	5	级 level
			报警域值 Alarm threshold	1~99%	85	%
			报警 alarm	开/关 on/off	开 on	
			脱扣 trip	开/关 on/off	开 on	
			过载自动复位 Overload automatic reset	开/关 on/off	关 off	
			冷却时间 cool time	1~30	30	min
		3 欠载保护 Underload protection	报警域值 Alarm threshold	10~99%	70	%
			脱扣域值 Trip threshold	10~99%	50	%
			脱扣延时 Trip delay	0.1~600	5.0	S
			报警 alarm	开/关 on/off	关 off	
			脱扣 trip	开/关 on/off	关 off	
		4 断相保护 Phase failure protection	脱扣延时 Trip delay	0.1~600	1.0	S
			报警 alarm	开/关 on/off	开 on	
			脱扣 trip	开/关 on/off	开 on	
		5 相序保护 Phase sequence protection	脱扣延时 Trip delay	0.1~600	1.0	S
			报警 alarm	开/关 on/off	开 on	
			脱扣 trip	开/关 on/off	开 on	
		6 不平衡保护 Unbalance protection	报警域值 Alarm threshold	10~80%	20	%
			脱扣域值 Trip threshold	10~80%	30	%
			脱扣延时 Trip delay	0.1~600	5.0	S
			报警 alarm	开/关 on/off	开 on	
			脱扣 trip	开/关 on/off	开 on	
		7 接地/漏电 Earth/leakage	互感器投入 Transformer input	开/关 on/off	开 on	

			接地报警域值 Earth alarm threshold	10~100%	20	%
			接地脱扣域值 Earth trip threshold	10~100%	50	%
			脱扣延时 Trip delay	0.1~600	0.1	S
			漏电报警电流 Leakage alarm circuit	100~1000	200	mA
			漏电脱扣电流 Leakage trip circuit	100~1000	300	mA
			脱扣延时 Trip delay	0.1~600	0.5	S
			报警 alarm	开/关 on/off	开 on	
			脱扣 trip	开/关 on/off	开 on	
		8 短路保护 Short circuit protection	报警域值 Alarm threshold	400-800%最大可测过载倍数 max measurable overload times	400	%
			脱扣域值 Trip threshold	400-800%最大可测过载倍数 max measurable overload times	500	%
			脱扣延时 Trip delay	0.1-600	0.1	S
			报警 alarm	开/关 on/off	关 off	
			脱扣 trip	开/关 on/off	关 off	
		9 过压保护 Over voltage protection	报警域值 Alarm threshold	110~150%	110	%
			脱扣域值 Trip threshold	110~150%	120	%
			脱扣延时 Trip delay	0.1~600	5.0	S
			报警 alarm	开/关 on/off	开 on	
			脱扣 trip	开/关 on/off	开 on	
		10 欠压保护 Under voltage protection	报警域值 Alarm threshold	50~90%	90	%
			脱扣域值 Trip threshold	50~90%	80	%
			脱扣延时 Trip delay	0.1~600	5.0	S
			报警 alarm	开/关 on/off	关 off	
			脱扣 trip	开/关 on/off	关 off	
		11 堵转保护 Locked rotor protection	报警域值 Alarm threshold	100~700%	500	%
			脱扣域值 Trip threshold	100~700%	600	%

			脱扣延时 Trip delay	0.1~600	5.0	S
			报警 alarm	开/关 on/off	开 on	
			脱扣 trip	开/关 on/off	开 on	
		12 阻塞保护 Block protection	报警域值 Alarm threshold	100~700%	150	%
			脱扣域值 Trip threshold	100~700%	250	%
			脱扣延时 Trip delay	0.1~600	5.0	S
			报警 alarm	开/关 on/off	开 on	
			脱扣 trip	开/关 on/off	开 on	
		13 过功率保护 Over power protection	报警域值 Alarm threshold	100~700%	150	%
			脱扣域值 Trip threshold	100~700%	250	%
			脱扣延时 Trip delay	0.1-600	5.0	S
			报警 alarm	开/关 on/off	关 off	
			脱扣 trip	开/关 on/off	关 off	
		14 欠功率保护 Under power protection	报警域值 Alarm threshold	0~100%	80	%
			脱扣域值 Trip threshold	0~100%	50	%
			脱扣延时 Trip delay	0.1-600	5.0	S
			报警 alarm	开/关 on/off	关 off	
			脱扣 trip	开/关 on/off	关 off	
		15 温度保护 Temperature protection	PTC 类型 type	开/关 on/off	开 on	
			返回阻值 Return resistance	0（关闭 off）、 100-30000	0	Ω
			报警阻值 Alarm resistance	100~30000	1600	Ω
			脱扣阻值 Trp resistance	100~30000	3600	Ω
			脱扣延时 Trip delay	0.1~600	5.0	S
			报警 alarm	开/关 on/off	开 on	
			脱扣 trip	开/关 on/off	开 on	
		16 外部故障 External fault	脱扣延时 Trip delay	0.1~600	5.0	S
			报警 alarm	开/关 on/off	关 off	
			脱扣 trip	开/关 on/off	关 off	
六 VI	控制参数 Control parameter	1 控制权限 Control authority	控制权限 Control authority	本地、就地、远程、 三选一、全控 local, on-site, remote,1in3,	全控 Full-controlled	

				Full-controlled		
		2 起动控制 Start control	起动模式 Start mode	保护模式、手动模式、两步模式、双速模式 Protection mode, manual mode, two-step mode, two-speed mode	保护模式 Protection mode	
			起动一延时 Start-delay	0.1-600	3.0	S
		3 自起动 Self-start	自起动模式 Self-start mode	恢复/起动 reset/start	起动 start	
			自起动延时 Self-start delay	0.1~600	5.0	S
			自起动控制 Self-start control	开/关 on/off	关 off	
		4 失压重起动 Loss voltage start	电压设定 voltage set	75-95%	80	%
			立即重起失电时间 Immediately Restart power loss time	0.1-0.5	0.1	S
			允许时间 Allow time	0.5-10.0	5.0	S
			重起动延时 Reset delay	1.0-60.0s	30.0	S
			控制 control	0 关 on、1 起动 start1，2 起动 start2	关 off	
		5 回流检测 Rsflux detection	延时设定 Delay set	0.1-600	5.0	S
			控制 control	开/关 on/off	关 off	
		6 DO3 可编程设定 Programmable set	可编程设定 Programmable set	1-起动 1、 2-起动 2、 3-报警故障输出、 4-脱扣故障输出、 5-装置自检输出、 6-装置电源输出、 7-停止状态就绪、 8-运行状态输出、 9-DI 控制输出、 10-总线控制 1-Start 1, 2-Start2 3-alarm fault output, 4-trip fault output, 5-device self-check output 6-device power output, 7-stop state ready 8-run state output, 9-DI control output,	3	

				10-Bus control		
			动作时间设定 Action time set	0-25	0.0	S
		7 DO4 可编程设定 Programmable set	可编程设定 Programmable set	1-起动 1、 2-起动 2、 3-报警故障输出、 4-脱扣故障输出、 5-装置自检输出、 6-装置电源输出、 7-停止状态就绪、 8-运行状态输出、 9-DI 控制输出、 10-总线控制 1-Start 1, 2-Start2 3-alarm fault output, 4-trip fault output, 5-device self-check output 6-device power output, 7-stop state ready 8-run state output, 9-DI control output, 10-Bus control	4	
			动作时间设定 Action time set	0-25	0.0	S
			脱扣故障设定 Trip fault set	0-65535	65535	
		8 DI9 可编程设定 Programmable set	DI9 可编程设定 Programmable set	1 普通 DI 2 起动 1(直接起动、左转、低速)、 3 起动 2(右转、高速)、 4 停车、 5 复位、 6 紧急停车、 7 外部故障、 8 起/停、 9 控制权限 1、 10 控制权限 2、 11 两线制起停、 12 起停使能 l common DI, 2 Start 1 (direct start, turn left,low speed), 3 Start 2(turn right, high speed), 4 Stop,5 Reset, 6 Emergency stop, 7 external faul,t 8 start / stop, 9 control authority 1,	1	

				10 control authority 2, 11two-wire start-stop, 12 start-stop enable		
		9TEST	DO2	开/关 on/off	关 off	
			DO3	开/关 on/off	关 off	
			DO4	开/关 on/off	关 off	
			DO5	开/关 on/off	开 on	

注：系统参数中的第二路通讯设置只有带 2C 功能时才能使用。

Note: the second communication set in the system parameters can only be used with 2C function.

9.2 功能说明 Function instructions

各保护类型起作用时间段 Each type of protection work periods:：

表 21 Table 21

保护类型 Type of protection	起作用时段 Working periods
相序、外部故障、过压、欠压 Phase sequence, external fault, over voltage, under-voltage	停车 Stop
相序、外部故障、过压、欠压、断相、漏电/接地、堵转、起动超时 Phase sequence, external fault, over voltage, under-voltage, phase failure, earth leakage/earthing, locked- rotor, starting overtime	起动 Start
相序、外部故障、过压、欠压、断相、漏电/接地、过载、不平衡、阻塞、欠载、欠功率、过功率、温度、短路 Phase sequence, external fault, over voltage, under-voltage, phase failure, earth leakage and earthing, overload, unbalance, blocking, under load, under power,over power, temperature, short circuit	运行 Run

■ 起动超时保护 Starting overtime protection

（参照 ARD2 功能说明）(Reference ARD2 function instructions)

■ 过载保护 Overload Protection

（参照 ARD2 功能说明）(Reference ARD2 function instructions)

■ 欠载保护 Underload Protection

（参照 ARD2 功能说明）(Reference ARD2 function instructions)

■ 断相保护 Phase failure protection

（参照 ARD2 功能说明）(Reference ARD2 function instructions)

■ 不平衡保护 Unbalance protection

（参照 ARD2 功能说明）(Reference ARD2 function instructions)

■ t_E时间保护 tE time protection

（适用于增安型电动机）(suitable for safety-increased motor)

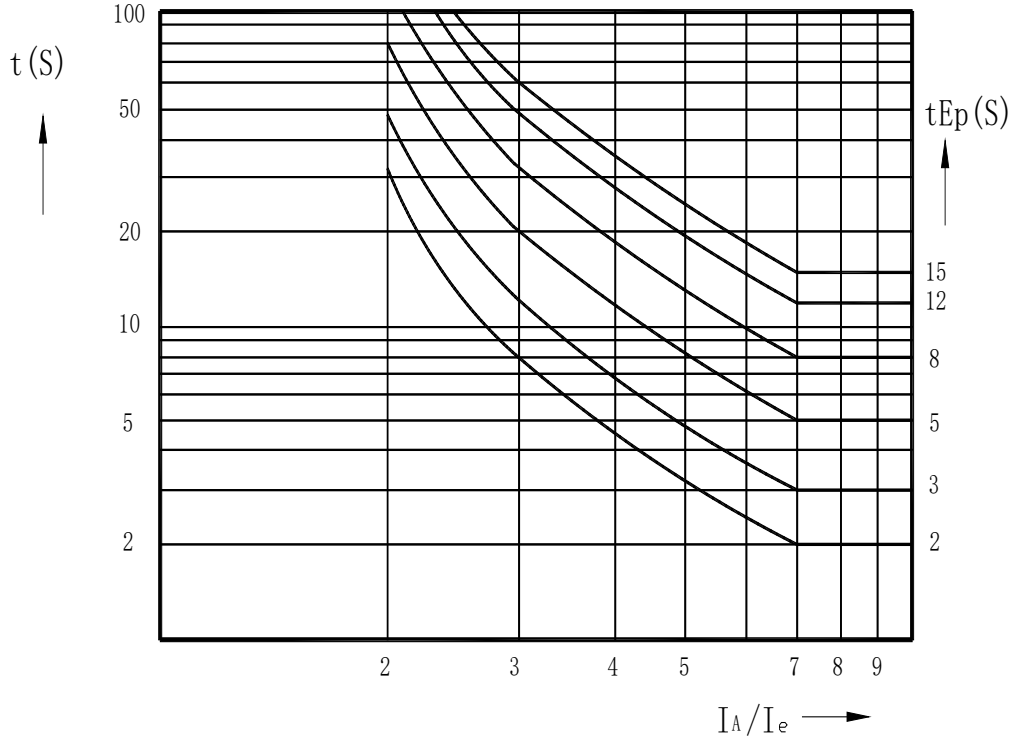
对于增安型电动机，交流绕组在最高环境温度下达到额定运行稳定温度后，从开始通过堵转电流时记起，

直至上升到极限温度所需的时间即为 t_E时间。增安型电机的 t_E时间通常由电机制造商提供，用户可以在电机铭牌上找到该数据。

提供堵转时在 t_E时间内断开电动机电源的热过载保护，仅在电动机起动完成后投入，带有独 立的延时计时器。t_E保护特征曲线动作延时对照表如表 22 所示，曲线图如下图所示。

After the AC winding reaches the rated operation stable temperature at maximum ambient temperature for safety-increased motors, the desired time from the beginning of locked-rotor current to the time rising to limiting temperature is tE. The tE time of safety-increased motors is usually provided by the motor manufacturers, and users can find the data on the motor nameplate.

When providing locked-rotor and within the tE time, disconnect the thermal overload protection of electric motor, only after the motor starting is completed, the independent delay timer can be applied. Delay timer with independence。tE protection characteristic curve action delay table shown in Table 22, and curve diagram as shown below.



t_E保护延时与堵转电流比 IA/I_e的电流—时间特性曲线

说明： t_{Ep}：7 倍额定电流时允许堵转时间；IA：堵转电流；Ie：电动机额定电流。

tE protection delay and locked-rotor current ratio IAII.'s current-time characteristic curve

tEp: Allow locked-rotor time when under 7 times rated current; IA: locked-rotor current; Ie: rated current of motor.

动作延时特性表 Action Delay Characteristics Table:

表 22 Table 22

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

注：（一）t_E保护的动作时间=t_{Ep}为 2（S）时的动作时间/2×t_{Ep}设定值

（二）tE 设定为 5（S）时，按起动电流比 IA/ Ie 确定的 tE 值是按照 IEC79-7、GB3836.3-2000 标准，在用于增安型电动机 tE 保护时，其反时限过载保护可参照该特性曲线设定。为确保电动机堵转时在 tE 时间前断开电源，过载保护装置的反时限曲线宜下移 15%左右。

（三）t_E保护的动作时间是通过设定“电机类型”和“脱扣等级”来实现的，根据表 9 设定 t_{Ep}（脱扣等级）来选择相应的脱扣曲线。（当电机类型选择为“增安电机”时，脱扣等级自动变为 t_{Ep}设定；否则脱扣曲线是普通电机的反时限过载脱扣曲线）

Note: (1) tE protection time = operation time 12xtEp set when Ep is 2 (S) :

(2) when tE is set to 5 (S), tE value by starting current ratio IAI Ie is determined according to IEC79-7, GB3836.3-2000 standard, when apply to safety-increased motor tE protection, its inverse time overload may refer to characteristic curve sets. To ensure that the power is turned off before the time when the motor companying rotating, the inverse time curve of overload protection should be down about 15%.

(3) The action time of "tE protection is achieved by set ""Motor Type"" and "" trip class"" according to Table 9 ". tEp(trip class) selects the appropriate trip curves. "(When the motor type is selected to ""safety-increased motors", the "trip class will automatically become tEp set: Otherwise, the trip curve is inverse time overload trip curve of normal motor."

■ 相序保护 Phase sequence protection

当保护器检测到电动机的电压相序错误时，闭锁电动机起动，保护电动机安全。

When the protector detects the error of voltage phase sequence of the motor, the locking motor will start to protect the motor.

■ 短路保护 Short circuit protection

（参照 ARD2 功能说明）(Refer to ARD2 function instructions)

■ 接地/漏电保护 Earth/ leakage Protection

（参照 ARD2 功能说明）(Refer to ARD2 function instructions)

■ 过压保护 Over voltage protection

电压过高引起电动机绝缘程度损伤，当电动机运行电压超过设定的保护电压时保护器按设定的要求进行保护，在脱扣（延时）设定时间内脱扣。

Too high voltage will result in extent damage of motor insulation, and when the operating voltage of motor exceeds the protection voltage, the protector will protect according to the set requirements, and trip within the trip (delay) set time.

■ 欠压保护 Under voltage protection

电压过低会引起电动机转速降低，甚至停止运行，当电动机运行电压下降至设定的欠电压保护范围时，保护器按设定的要求进行保护，在脱扣（延时）设定时间内脱扣。

Too low voltage will cause the motor speed to reduce, or even stop, when the operating voltage of motor drops to the under voltage protection set, the protector will protect according to the set requirements, and trip within the trip (delay) set time.

■ 堵转保护（起动过流保护）Locked rotor protection (Start overcurrent protection)

（参照 ARD2 功能说明）(Refer to ARD2 function instructions)

■ 阻塞保护 Block protection

（参照 ARD2 功能说明）(Refer to ARD2 function instructions)

■ 过功率保护 Over power protection

当负载功率与额定功率的百分比高于设定动作值时，保护器在动作设定时间内动作或报警。

When the percentage of load power and rated power is higher than the set action value, the protector will act or alarm within the action set time.

■ 欠功率保护 Under power protection

当负载功率与额定功率的百分比低于设定动作值时，保护器在动作设定时间内动作或报警。

When the percentage of load power and rated power is lower than the set action value, the protector will act or alarm within the action set time.

■ 温度保护 Temperature protection

电动机温度保护是以预埋在电动机定子绕组或轴承上的热敏电阻检测器送出的热敏电阻值作为保护条件。当保护器检测到热敏电阻的值大于预设的保护值后，则保护器在脱扣（延时）设定时间内脱扣。

Motor temperature protection regards the thermistor values sent by thermistor detector embedded in the motor’s stator windings or bearings as the protection conditions. When the protector detects that the value of the thermistor is larger than the preset protection value, the protector will trip.

■ 外部故障保护（工艺联锁保护）External fault protection (Process interlock protection)

（参照 ARD2 功能说明）(Refer to ARD2 function instructions)

■ 控制权限 Control authority

保护器具有多种控制权限，用户可根据实际需要，设置不同的控制权限来对电动机进行控制。

全控：当用户将控制权限设置为“全控”时，则用户可以通过显示单元上的按键实现本地控制、上位机实现远程控制、DI 端实现就地控制电动机的起动和停止。

本地：只能通过显示单元上的按键来控制保护器的起动、停止。

就地：只能通过保护器主体上的 DI 输入端来控制保护器的起动、停止。

远程：只能由上位机远程通讯来控制保护器的起动、停止。

三选一：通过 DI 端来选择控制位置（本地、就地、远程选择其一）。

Protector has a variety of control authority, and users can set different control authority to control the motor according to the actual needs.

Full control: when the users set the control authority to "full control", then the users can press a button on the display unit to achieve local control, the host computer realizes remote control, DI termination to achieve on-site control start and stop of motor.

Local: The start and stop of protector can only be controlled by local Z via using the keys on the display unit.

On-site: The start and stop of protector can only be controlled by on-site Z via DI input terminal on the protector.

Remote: The start and stop of protector can only be controlled via remote communication of PC.

1 in 3: By using DI end to select the control position (select one from local, on-site, and remote).

■ 起动控制 Start control

本保护器带有不同的起动控制模式，用户根据实际情况选择不同的起动控制方式。

保护模式：在此模式下，本地、就地均不能对保护器进行控制。

手动模式：在此模式下，需手动单独对 2 个起动继电器进行控制。

两步模式：在此模式下，只需对起动 1 进行手动操作，经设定的延时时间后，起动 1 自动断开，并同时起动 2 动作。若打开了自起动功能，则保护器上电后，自动顺序动作起动 1 和起动 2 继电器。

双速模式：在此模式下，“起动 1”为低速运行，“起动 2”为高速运行。

The protector has different start control mode, and the users can select different start control way according to the actual situation.

Protection mode: Under this mode, the protector can’t be controlled by local and on-site.

Manual mode: Under this mode, it is need to manually control 2 starter relay separately.

Two-step mode: Under this mode, only need to adopt manual operation for start 1, after the set delay time, start 1 will automatically disconnect and simultaneously start 2 action. If the self-start function is opened up, when the protector is power on, it will start 1 and start 2 relays in automatic sequence of actions.

Two-speed mode: Under this mode, "start I" is low-speed operation, and "start 2" is high-speed operation.

■ 自起动 Self-start

在上电过程中或电源恢复后，保护器将根据设置分时起动电动机。

若系统自起动控制为“开”，自起动模式设置为“恢复”，那么保护器将根据掉电前的状态，判断是否需要重新起动，若掉电前系统处于运行状态，则上电后按照设定的自起动延时时间起动运行；若自起动模式为“起动”，那么保护器一上电便可根据自起动延时时间实现电机群分时顺序起动。

During power up or power restoration process, the protector will start the motor according to set sharing.

If the self-start control of system is "open", and self-start mode is set to "restore", then the protector will determine whether there is need to re-start based on the state before power off, if the system is running before power off,then it will start to run according to the set self-start delay time after power on; if the self-start mode is "start", then the protector can achieve motor group delay time sequence starting once power on.

■ 失压重起动 Loss voltage restart

该功能只有在带电压功能时有效，且失压重起动功能需设置为“起动 1”或“起动 2”状态，同时需关闭欠压脱扣功能。

当电动机处于运行状态，检测到电流归零，则开始失压计时，在立即失压时间内，如果电压能够恢复到设定的失压重起动电压设定，则起动继电器不释放，在大于立即失压时间后，起动继电器释放。如果电压能够在失压重起动允许时间内恢复到失压重起动电压设定，则保护器在延时重起动延时后起动电动机。失电时间大于失压重起动允许时间，清除相关信息,不再重起动。

注：1、双速电机起动时间、过载、欠载、堵转、阻塞、过功率、欠功率、短路有两套，在设置时首先需在系统参数中选择低速开关，“关”为设置的低速参数，“开”为设置的高速参数。

2、4～20 模拟量输出：默认 20mA 对应 2 倍额定电流值。用户也可根据需要自行设置模拟量输出对应的参

数和倍率（注意，倍率设置只对电流有效）。见下表。

This function is only valid when with voltage function and loss voltage restart function must be set to "start 1" or "start 2" state, while there is need to close the under voltage trip function.

When the motor is running and zero current is detected, then begin timing under loss of pressure; within immediate time of loss voltage, if the voltage can be restored to voltage set set under the loss of pressure starting, the starter relay is not released; when after the greater immediate time of loss of pressure, the starter relay will be released. If the voltage can be restored to voltage set set under the loss voltage restarting within the time, the protector will start the motor under delay after delay restart. When power failure time is greater than the loss voltage restarting time allowed, this eliminates relevant information, no re-start any more.

Note: 1. Two-speed motor starting time, overload, under load, locked-rotor, blocking, over power, under power, short circuit in two sets, when carry out set, there is need to select low-speed switch in system parameters firstly; "OFF" is the low-speed parameter set"; "ON" is the high-speed parameter set.

2. 4 to 20 analog output: Default 20 mA corresponds to 2 times the rated current value. Users can also set their own required corresponding parameters and magnification of analog output (note: magnification set is only valid for the current). See the below table:

变送设置说明：

Transmission set instructions as flows:

表 23 Table 23

变送类型 Transmission type	变送倍率 Transmission magnification
0、A 相电流 0, A -phase current	Ie 整数倍（1-8）Ie integral multiples (1-8)
1、B 1. B -phase current	
2、C 2. C -phase current	
3、平均电流 mean current	
4、AB 线电压 4. ab line voltage	95-275、330-990、190-570（50%-150%系统电压 system voltage） 对应 corresponds to 4-20Ma
5、BC 线电压 5. bc line voltage	
6、CA 线电压 6. ca line voltage	
7、平均线电压 7. Average line voltage	
8、PTC（100-30K） 8. PTC (l00-30K)	默认 100-30000 对应 4-20Ma Default 100-30000 corresponds to 4-20mA
9、热容量百分比 9.Thermal capacity	默认 0-100%对应 4-20Ma Default 0-100% corresponds to 4-20mA
10、功率 10. Power	额定功率整数倍（1-8） Rated power integral multiple (1-8)

10 注意事项 Cautions

1、脱扣继电器（端子号 95、96）为常开，上电后闭合。

2、保护器不能显示实时“报警信息”，仅能显示进入菜单查询时的报警状态。建议客户当故障报警稳定时再进入查看。

3、保护器最大可测所订购规格 7.2 倍过载电流，即 100A 规格保护器最大可测电流为 720A,在设置短路保护时客

户需根据设定的保护器规格合理设置参数。
4、当保护器起动控制设置为“两步起动”时，“起动一延时”时间应小于起动时间。
5、堵转保护脱扣延时时间应小于起动时间，否则将无法实现堵转保护功能。
6、当保护器配有接地/漏电保护功能时，从漏电流互感器引入保护器的导线建议采用屏蔽导线，否则可能导致测量数据不准确。
7、保护器提供异步半双工 RS485 通讯接口，采用 MODBUS-RTU 协议，各种数据信息均可在通讯线路上传送。通讯连接建议使用屏蔽双绞线，线径不小于 0.5㎜^{2}。布线时应使通讯线远离强电电缆或其他强电场环境。
8、电机的额定电流，按照电机实际额定电流设置，不需放大或缩小。
保护器一旦发生脱扣动作，在故障排除后，重新起动电动机前，需对保护器进行复位，否则将无法起动电动机。
9、电机热过载保护后，由于热累积，冷却后方可复位。
10、在现场实际使用中，由于保护器的参数设置不合理，可能会导致电动机一起动就保护或无保护作用，此时，可将所有保护功能都关闭，根据保护器在电动机正常运行时测量得到的各种参数对保护器的各种保护参数进行重新设定。
11、若保护器设定的各种保护参数是合适的，但电动机一起动保护器就动作，则此时，可根据保护器显示的动作代码来查找故障原因。
12、保护器出厂时的参数均为默认设置（用户特别要求除外），用户在实际使用中必须根据实际需要将各种保护功能打开，并对各种参数进行设置。
13、用户如无特别注明，则互感器与保护器主体的连接线默认 1m，保护器主体与显示单元的连接线默认 1.5m。
14、用户如有特殊要求的（如单相电动机保护器、连接线长度等）需在订单中注明。
15、多台主体同排安装时，产品间要预留散热空间，不能相互贴紧安装。
1.The trip relay (terminal no.95, 96) is normally open, and closed after power on.
2.The protector can not display real-time ""alarm information, which can only display alarm condition when enter the query menu." Customers are advised to view when the fault alarm is stable.
3.The protector can measure 7.2 times overload current of specifications ordered in maximum, namely, 100A protector can measure 720A current in maximum.When set the short-circuit protection, customers need to set reasonable parameters according to specifications set by the protector.
4.when the start control of protector is set to " two-step start", " starting – delay" time should be less than the start time.
5.Pei-rotating protection trip delay time should be less than the starting time, otherwise the locked-rotor protection function will not be achieved.
6.When the protector is equipped with earth/leakage protection, the conducting wire of \ protector introduced from zero sequence current transformer is recommended to use shield wire, otherwise this may lead to inaccurate measurements.
7.Protector provides asynchronous half-duplex RS485 communication interface, adopt MODBUS-RTU protocol, and a variety of data can be transmitted on the communication line. Communication connection is recommended to use shielded twisted pair wire whose diameter should be not less than 0.5mm^2. When wiring, make communication lines away from power cable or other strong electric field environment.
8.The rated current of the motor shall be set according to the actual rated current of the motor without amplification or reduction.
9.Once the protector occurs trip, the protector should be reset after debugging and before re-start the motor, otherwise it will not start the motor.
10.After the thermal overload protection of motor, due to the heat accumulation, it can be reset after cooled.
11.In the actual use on-site, the unreasonable protection parameters sets may cause the motor to has protection action once the motor started or no protection action; at this time, all protection functions can be turned off, various protection parameters can be reset in accordance with various parameters obtained from normal operation of the motor.

12.If the various protection parameters set by protection are appropriate, but the protector has action once the motor started, at this time, the cause of fault can be found according to the action code displayed by protector.
13.The protector's parameters are default sets when made(unless users have special requirements); In actual use, various protection functions must be opened by users based on the actual needs, and various parameters can be set.
14.Unless otherwise specified by users, the connecting line of transformer and protector body is 1m in default, and the connecting line of protector body and display unit is 1.5m in default.
15.Special requirements should be specified in the order if users have special requirements(such as single-phase motor protector, length of connection line, etc.)
16.When multiple main bodies are installed in the same row, heat dissipation space shall be reserved between products and cannot be installed close to each other.

11 订货范例 Ordering example

例：具体型号：ARD2F-100/QCM-90L
技术要求：电动机功率 37KW；模拟量输出 4-20mA；起动控制；
通讯协议：RS485 接口 Modbus/RTU 协议
辅助电源：AC/DC220V
显示方式：90L（中文液晶显示）
备注：主体与互感器连接线长度 1m；主体与显示单元连接线长度 1.5m。

Example:
Type:ARD2F-100/QCM-90L
Technical requirements: motor power 37KW; Analog output 4-20mA;
Start control;
Communication protocol: RS485 interface Modbus /RTU protocol
Auxiliary power supply: AC/DC220V
Display mode: 90L (Chinese LCD)
Remarks: the length of the connecting line between the main body and the transformer is 1m;
The length of the connecting line between the main body and the display unit is 1.5m.

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