A JOINT VENTURE

EATON | 辉能



HNM3-5 Series
Molded Case
Circuit Breaker

HNM3GDC-5 Series
Molded Case
DC Disconnector

HNM3-5
系列塑壳式断路器
HNM3GDC-5
系列塑壳直流隔离开关

伊顿辉能低压电器（江苏）有限公司
Eaton Huineng Low-Voltage Electrical (Jiangsu) Co., Ltd.

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公司简介

伊顿辉能低压电器（江苏）有限公司坐落于江苏省镇江新区，是美国伊顿公司和江苏辉能电气有限公司成立的合资公司，专业从事低压电器产品的研发、制造和销售。公司现有员工 400 余人，其中各类专业技术人员约占 30%，中高级职称 40 余人，累计申请产品专利 120 余项。

公司主要产品为万能式断路器、塑料外壳式断路器、隔离电器、小型断路器、自动转换开关电器、接触器等。产品广泛应用于光伏、风电、工业、电网、楼宇等多个领域。

2009 年推出 HNW3 风电、光伏专用智能型万能式断路器，市场占有率稳居行业前列，产品广受用户好评。

2017 年，HNM3TL 系列塑壳漏电断路器推向市场，高度模块化的设计使其与 HNM3 系列热磁、电子系列产品保持了相同的尺寸，满足客户对产品小型化和可替换性的需求。

2018 年，HNM3DC 系列直流塑壳断路器推向市场，产品凭借优异的性能，迅速在多个江苏储能示范项目中得到了大量应用，并获得了客户的一致好评。

2019 年，HNW3GDC 系列直流框架隔离开关，HNM3-5 系列交流电子式框塑产品推向市场，产品适用于储能系统。

2020 年，HNM3-HU 系列高电压塑壳断路器、HNW3-HU 系列高电压框架断路器、HNM3GDC 系列直流塑壳隔离开关、HNW2GDC 系列直流框架隔离开关等一大批应用于光伏、风电、储能等系统的性能优异的产品推向市场。产品一经推出，便获得了众多客户的高度关注，并迅速在新能源市场中得到了大量应用。

2021 年，行业内首个通过 AC1500V 50kA 短路分断试验的框架断路器诞生！ HNW3-HV 系列高电压框架断路器推向市场，产品完美适用于风电、光伏等新能源系统。

历时多年发展，伊顿辉能低压电器（江苏）有限公司产品累计装机容量不断提升。目前，风电和光伏装机量累计突破 500GW。并通过众多的运行实践，在新能源领域积累了大量的研发、生产与服务经验，通过持续地技术革新，新能源专用断路器的产品性能、指标、可靠性、环境适应性不断提升，成为新能源行业断路器的领导品牌。

25,000 m^2 企业生产研发经营面积

120+ 项 累计申请专利

18Yrs 风电光伏研究及应用经验

400+ 企业员工

250+ GW 累计风电装机

ACB **100,000** 台 年产能

30% 研发人员

250+ GW 累计光伏装机

MCCB **1,000,000** 台 年产能

Company Brief

Eaton Huineng Low-Voltage Electrical (Jiangsu) Co., Ltd., located in Zhenjiang New District, Jiangsu, is a joint venture established by Eaton and Jiangsu PHONO Electric Co., Ltd., specializing in the R&D, manufacturing and sales of low-voltage electrical products. The company has more than 400 employees, among which all kinds of specialized technical personnel account for about 30%, including more than 40 employees with intermediate or senior professional titles. Totally more than 120 product patents have been applied.

Our company's main products include air circuit breaker (ACB), molded case circuit breaker (MCCB), isolator, miniature circuit breaker (MCB), automatic transfer switching equipment (ATSE), contactor, etc., which are widely used in photovoltaic, wind power, industry, power grid, building and other fields.

In 2009, our company launched the HNW3 intelligent air circuit breaker exclusively for photovoltaic and wind power equipment, with its market share ranking the forefront of the industry, receiving a good reputation from customers.

In 2017, the HNM3TL series molded case leakage circuit breaker was introduced to the market. The highly modular design enables it to maintain the same size as the HNM3 series thermomagnetic and electronic products, thereby meeting the customers' demand for product miniaturization and replaceability.

In 2018, the HNM3DC series DC molded case circuit breaker was unveiled. With its excellent performance, the product was quickly applied in many energy storage demonstration projects of Jiangsu, winning unanimous praise from customers.

In 2019, the HNW3GDC series DC frame disconnector and the HNM3-5 series AC electronic frame plastic products came out, being applicable to energy storage systems.

In 2020, a large number of products with excellent performance used in photovoltaic, wind power, energy storage and other systems became available on the market, including HNM3-HU series high-voltage molded case circuit breaker, HNW3-HU series high-voltage frame circuit breaker, HNM3GDC series DC molded case disconnector, HNW2GDC series DC frame disconnector, etc. The products, once launched, have come under the spotlight among customers, and have quickly been widely applied in the new energy market.

In 2021, the industry's first frame circuit breaker that passed the AC1500V 50kA short-circuit breaking test was born! Moreover, the HNW3-HV series high-voltage frame circuit breakers were also introduced to the market, being perfectly suitable for new energy systems such as wind power and photovoltaic ones.

With the development over the years, Eaton Huineng Low-Voltage Electrical (Jiangsu) Co., Ltd. continues to refresh the record in its cumulative installed capacity. At present, the installed capacity of wind power and photovoltaic power has exceeded 500GW. Through a large number of operational practices, we have accumulated abundant R&D, production and service experience in the new energy field. Thanks to continuous technical innovation, Eaton Huineng, as one of the leading brands in circuit breakers for the new energy industry, is committed to improving the performance, indicators, reliability and environmental adaptability of circuit breakers for new energy application.



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HNM3-5 系列塑壳断路器
HNM3-5 Series Molded Case Circuit Breaker

HNM3GDC-5 系列塑壳直流隔离开关
HNM3GDC-5 Series Molded Case DC Disconnector

HNM3-5塑壳断路器适用于交流50/60Hz，额定工作电压690V及以下，额定工作电流1600A及以下的配电网络，用来分配电能和保护线路及电源设备免受过载、欠电压、短路、接地等故障危害。保护功能齐全，可带有通讯接口，便于与现场总线连接，可实现四遥功能，满足控制自动化的需要。

HNM3-5塑壳断路器也可用于逆变器交流侧及分布式光伏并网系统，该断路器集塑壳断路器限流技术、磁保护、智能保护及全选择性保护于一体。具有分断速度快、温升低的特点。

适用于干热、湿热、交变、高原、盐雾各种应用环境。

断路器具有隔离功能，符号为“ ”。

HNM3-5 molded case circuit breaker is suitable for distribution of electrical energy and protection of circuits and electric power equipment from overload, underload, short circuit, grounding, and other failures in the power distribution networks of 50/60HZ, rated voltage 690V and below, rated working current 1600A and below. It is provided with intact protection functions and can be installed with communication interface that is convenient for connection with the field bus, moreover, it can realize the four-remote function to meet the needs of control automation.

HNM3-5 molded case circuit breaker can also be used in the AC side of inverter and distributed photovoltaic grid connected system. The circuit breaker integrates the current limiting technology, magnetic protection, intelligent protection and all selective protection of molded case circuit breaker. It is characterized by fast breaking speed and low temperature rise.

It is suitable for various application environments such as dry heat, damp heat, alternating, plateau and salt fog.

The circuit breaker has the isolation function, with the symbol of " "



型号及含义
Model and meaning

HNM3 - 5 M / 3P 1000 T11 AL

产品代号 Product code	壳架等级 Frame level
HNM3	1600A

分断能力 Breaking capacity	
S	50kA
M	70kA

极数 Pole number
3P
3P+N

额定电流 Rated current
800A
1000A
1250A
1600A

智能控制器 Intelligent controller	
T1	AC230V
T2	AC400V
T3	DC24V
T4	DC110V
T5	DC220V
1	PTU4.3X
2	PTU6.3X

附件 Accessories	
AX11	1常开1常闭 1 normally open 1 normally closed
AX22	2常开2常闭 2 normally open 2 normally closed
AX33	3常开3常闭 3 normally open 3 normally closed
AL	报警触头 Alarm contact
SHT	分励脱扣器 Shunt release
UVT	欠压脱扣器 Undervoltage release
A5	电源模块 Power module
A6	外接N互感器 External N transformer
CS2-5	转动手柄操作机构 Rotating handle operating mechanism
标准配置 Standard configuration A7	隔板（板后出线） Partition (panel rear outgoing line)
A8	端子罩 Terminal cover
K2	二次端子连接插头 Secondary terminal connection plug
K6	相间隔板 Inter-phase partition
K8	加长手柄 Extended handle

举例：HNM3-5 M/3P 1000 T11 AX22/AL

表示：智能型塑壳断路器；壳架电流1600A；分断能力70kA；3极；额定电流1000A；智能控制器PTU4.3X，需配AC230辅助电源模块；辅助触头2常开2常闭 / 1组报警触头 。

E.g.: HNM3-5 M/3P 1000 T11 AX22/AL

Indication: intelligent molded case circuit breaker; Shell frame current 1600A; Breaking capacity 70kA; 3 poles; Rated current 1000A; Intelligent controller PTU4.3X, needing to be equipped with AC230 auxiliary power module; Auxiliary contact 2 normally open 2 normally closed/Group I alarm contact.

注：客户提供给控制器电源为DC24可直接接至二次端子，电源为AC230V/AC400V/DC110V/DC220V需配置辅助电源模块。

Note: The power supply provided by the customer for the controller is DC24, which can be directly connected to the secondary terminal. The power supply is AC230V/AC400V/DC110V/DC220V, and the auxiliary power module needs to be configured.

断路器符合以下标准

- IEC 60947-1及GB/T 14048.1 低压开关设备和控制设备总则；
- IEC 60947-2及GB/T 14048.2 低压开关设备和控制设备低压断路器；

The circuit breaker shall comply with the following standards

- General of Low-voltage Switchgear and Controlgear Assemblies (IEC60947-1 and GB/T14048.1);
- Low-voltage Circuit Breaker of Low-voltage Switchgear and Controlgear Assemblies (IEC60947-2 and GB/T14048.2);

HNM3 - G DC 5 / 3

产品代号 Product code	隔离开关 Isolating switch	直流 DC	壳架等级 Frame level	极数 Pole number
			1600A	3P

举例：HNM3GDC-5/3

表示：塑壳式直流隔离开关：壳架电流1600A，3级

E.g.: HNM3GDC-5/3

Indication: molded case DC disconnector: Shell frame current 1600A, level 3

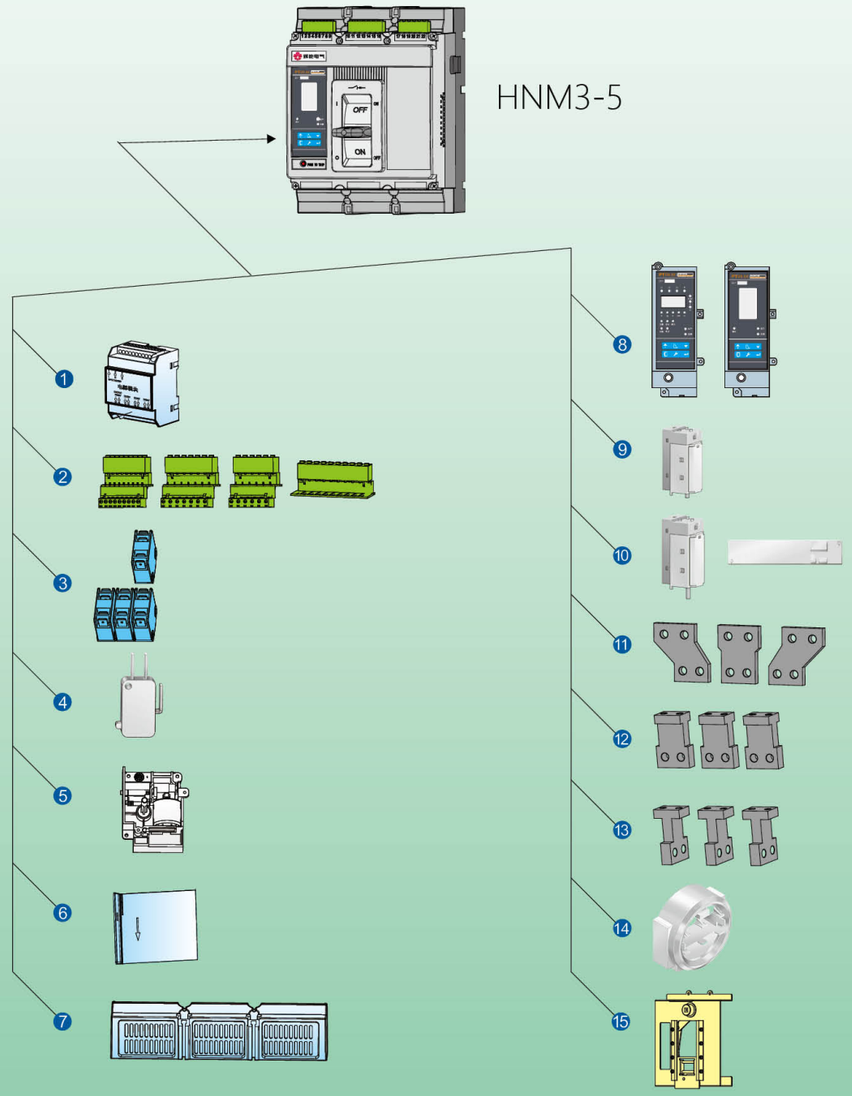
隔离开关符合以下标准

- IEC 60947-1：GB/T 14048.1　低压开关设备和控制设备　总则；
- IEC 60947-3：GB/T 14048.3　开关、隔离器、隔离开关及熔断器组合电器；

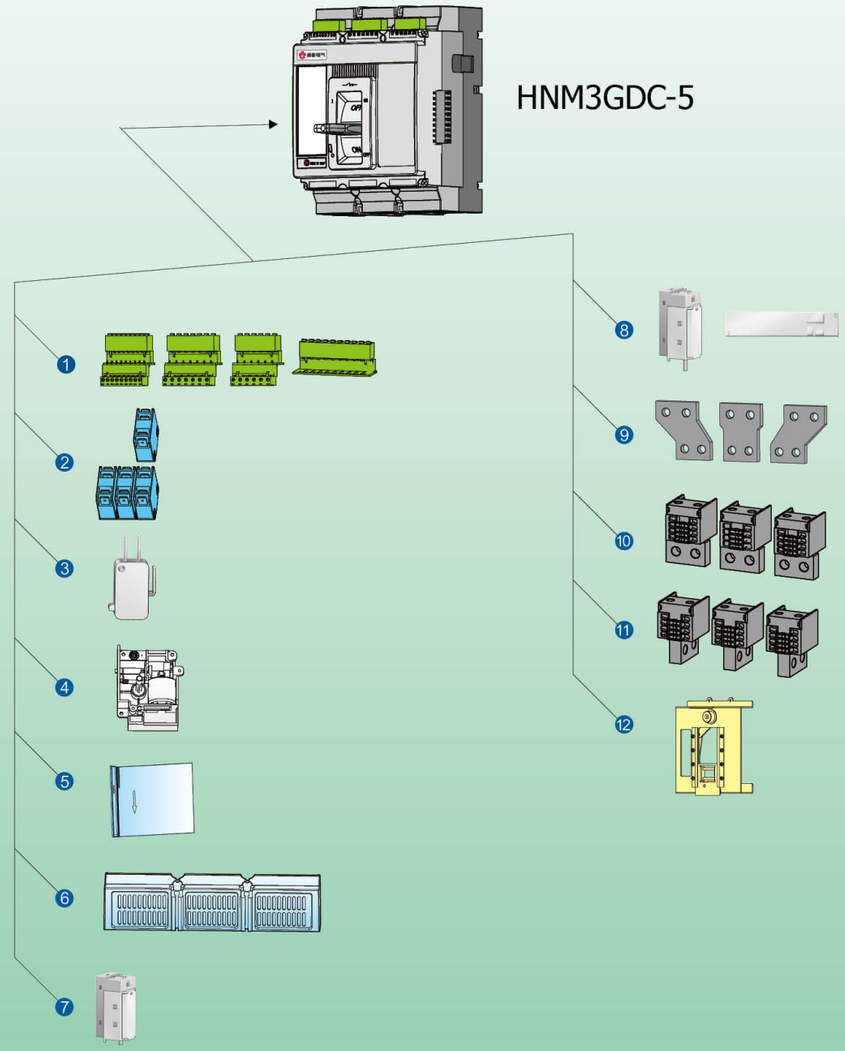
The circuit breaker shall comply with the following standards

- General of Low-voltage Switchgear and Controlgear Assemblies (IEC60947-1 and GB/T14048.1);
- Low-voltage Circuit Breaker of Low-voltage Switchgear and Controlgear Assemblies (IEC60947-2 and GB/T14048.2);

结构
Structure

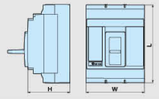


1 电源模块
Power module
2 二次端子
Secondary terminal
3 辅助触头
Auxiliary contact
4 报警触头
Alarm contact
5 控制器执行机构
Controller actuator
6 相间隔板
Inter-phase partition
7 端子罩
Terminal cover
8 控制器
Controller
9 分励脱扣器
Shunt release
10 欠压脱扣器
Undervoltage release
11 板前出线扩展排
Panel front outgoing extension bar
12 板后水平出线扩展排
Panel rear horizontal outgoing extension bar
13 板后垂直出线扩展排
Panel rear vertical outgoing extension bar
14 外接N相互感器
External N-phase transformer
15 转动手柄操作机构
Rotating handle operating mechanism



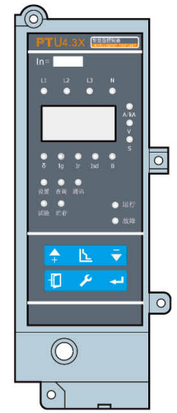
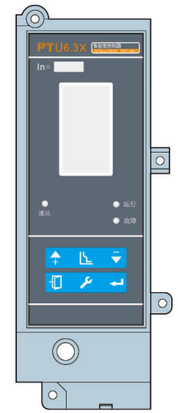
1 二次端子
Secondary terminal
2 辅助触头
Auxiliary contact
3 报警触头
Alarm contact
4 执行机构
Actuator
5 相间隔板
Inter-phase partition
6 端子罩
Terminal cover
7 分励脱扣器
Shunt release
8 欠压脱扣器
Undervoltage release
9 板前出线扩展排
Panel front outgoing extension bar
10 板后水平出线扩展排
Panel rear horizontal outgoing extension bar
11 板后垂直出线扩展排
Panel rear vertical outgoing extension bar
12 转动手柄操作机构
Rotating handle operating mechanism

主要技术数据及性能指标
Main technical data and performance indicators

性能指标 Performance indicators			HNM3-5	
额定工作电流 In(A) Rated working current			800、1000、1250、1600	
额定工作电压 Ue(V) Rated working voltage			AC400/415	AC690
额定绝缘电压 Ui(V) Rated insulation voltage			AC1000	
额定冲击耐受电压 Uimp(kV) Rated impact withstand voltage			12	
工频耐受电压 U(V) 1min Power frequency withstand voltage			AC3500 50/60Hz	
极数 Pole number			3P 3P+N	
额定极限短路分断能力（有效值）Icu(kA) Rated ultimate short-circuit breaking capacity (effective value)		S	50	
		M	70	25
额定运行短路分断能力（有效值）Ics(kA) Rated operating short-circuit breaking capacity (effective value)		S	50	
		M	70	25
额定短路接通能力（峰值）Icm(kA) Rated short-circuit making capacity (peak value)		S	105	
		M	154	52.5
额定短时耐受电流（有效值）Icw(kA)1s Rated short-time withstand current (effective value)			20	
全分断时间 (ms) Full breaking time			≤20ms	
操作性能 Operational performance	电气寿命 Electrical life	AC400/415V	3000（In≤1250A），2000（In=1600A）	
		AC690V	2000（In≤1250A），1000（In=1600A）	
	机械寿命免维护 Maintenance-free mechanical life		10000	
正常工作条件 Normal working condition	使用类别 Service class		B	
	污染等级 Pollution grade		3级 Level 3	
	防护等级 Protection level		IP40	
	环境温度 Ambient temperature		-40℃~+70℃	
	海拔 Altitude		≤5000m	
外形尺寸 (mm) Overall dimension 		长 L Length	288	
		宽 W Width	216	
		高 H Height	155	
重量 kg Weight			14	

性能指标 Performance indicators		HNM3GDC-5
极数 Performance indicators		3
额定工作电压 Ue(V) Rated working voltage		DC750/1000
额定工作电流 In(A) Rated working current		800、1000、1250、1600A
额定绝缘电压 Ui(V) Rated insulation voltage		DC1500
额定冲击耐受电压 Uimp(kV) Rated impact withstand voltage Uimp		12
飞弧距离 (mm) Flashover distance		≤50
短时耐受 Icw(kA 1s) Short time tolerance lew		20
额定短路接通 Icm(kA) Rated short-circuit making		40
使用类别 Service class		DC21B、DC-22B
电寿命（次） Electrical life (times)		1000（800A、1000A、1250A、1600A）
机械寿命（次） Mechanical life (times)		10000（免维护 maintenance-free）
外形尺寸 (mm) Overall dimension	宽 Width（mm）	216
	长 Length（mm）	288
	高 Height（mm）	155

控制器功能概况
Brief introduction of controller

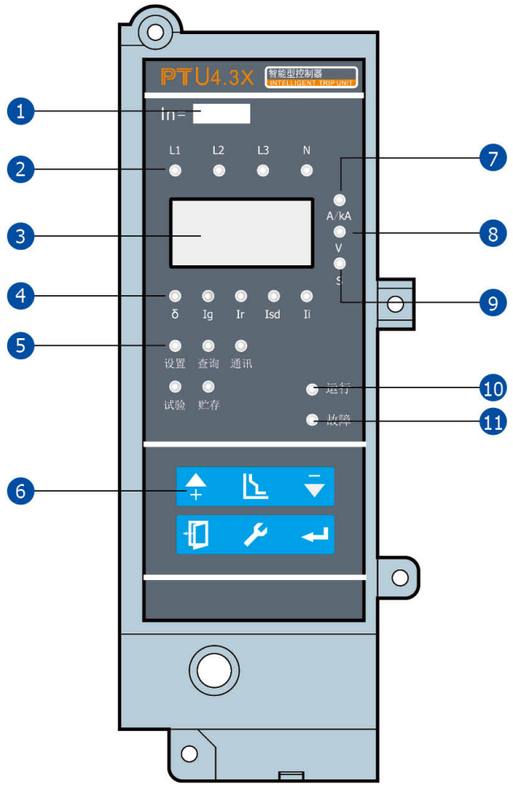
控制器型号 Controller model	PTU4.3X	PTU6.3X
外观 Appearance		
显示方式 Display mode	数码型 Digital type	液晶型 Liquid crystal type
基本功能 Basic functions	- 过载长延时 Overload long delay - 短路短延时 Short-circuit short delay - 短路瞬时 Short-circuit instantaneous - 故障指示 Fault indication - 故障记忆 Fault memory - 功能试验 Functional test - 热记忆 Thermal memory - 自诊断 Self-diagnosis	- 过载长延时 Overload long delay - 短路短延时 Short-circuit short delay - 短路瞬时 Short-circuit instantaneous - 故障指示 Fault indication - 故障记忆 Fault memory - 功能试验 Functional test - 热记忆 Thermal memory - 自诊断 Self-diagnosis
增选功能 Optional function	☐ 接地故障保护 Grounding fault protection ☐ 电流不平衡 Current imbalance ☐ 剩余电流保护 Residual current protection ☐ 电压测量 Voltage measurement ☐ 频率测量 Frequency measurement ☐ MCR&HSISC 保护 MCR&HSISC protection ☐ 信号触点输出 Signal contact output ☐ 通讯功能 Communication function	☐ 接地故障保护 Grounding fault protection ☐ 电流不平衡保护 Current unbalance protection ☐ 剩余电流保护 Residual current protection ☐ 电压保护 Voltage protection ☐ 相序保护 Phase sequence protection ☐ 频率保护 Frequency protection ☐ MCR&HSISC 保护 MCR&HSISC protection ☐ 电压测量 Voltage measurement ☐ 频率测量 Frequency measurement ☐ 功率测量 Power measurement ☐ 功率因数测量 Power factor measurement ☐ 电能测量 Electric energy measurement ☐ 信号触点输出 Signal contact output ☐ 变位记录 Displacement record ☐ 操作次数记录 Operation times record ☐ 通讯功能 Communication function

注：若订购“剩余电流保护”功能，需与我司技术人员沟通。

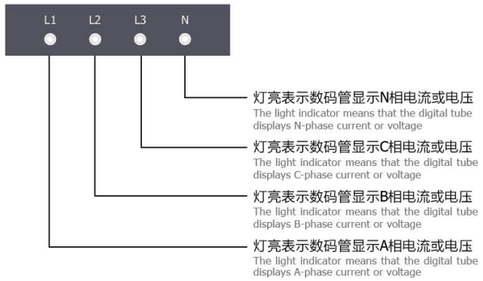
Note: If you order the "Residual current protection" function, you need to communicate with our technical personnel.

智能控制器 *Intelligent controller*

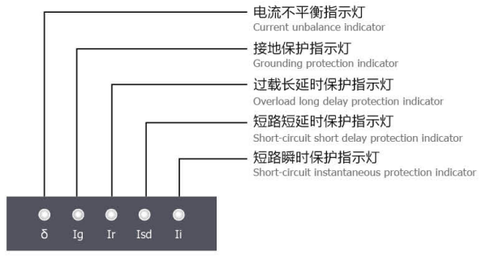
PTU4.3X型控制器
PTU4.3X controller



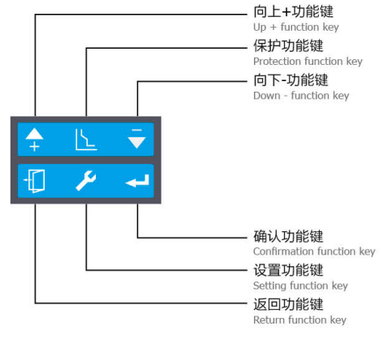
1 额定工作电流 Rated operational current
2 电流相序指示灯 Current phase sequence indicator



3 参数显示窗口 Parameter display window
4 参数调整/故障指示灯 Parameter adjustment/fault indicator



5 状态指示灯 Status indicator
6 功能按键 Functional key



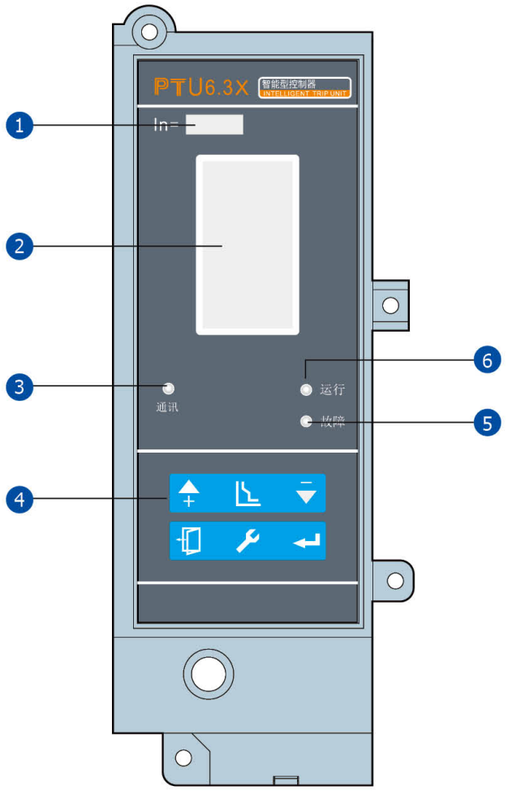
7 单位指示灯-“安培/千安” Unit Indicator - "Amp/Dry Amp"
8 单位指示灯-“伏特” Unit indicator - "Volt"
9 单位指示灯-“秒” Unit indicator - "s"
10 运行指示灯 Running indicator
11 故障指示灯 Fault indicator

PTU4.3X智能控制器保护特性
Protective characteristics of PTU4.3X intelligent controller

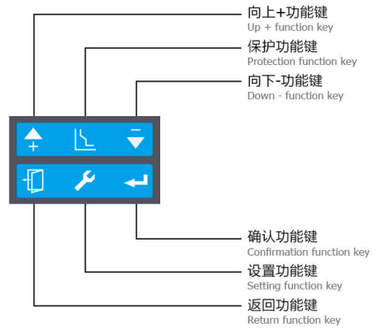
过载长延时 Overload long delay		
动作电流设定值I_r （允差±10%） Action current setting value Ir (tolerance ±10%)		（0.4~1.0）× In +OFF（步长1A） (0.4~1.0)×In+OFF (in steps of 1A)
动作时间t_r 允差±15% Action time tr tolerance ±15%	电流 Current	动作时间 Operating time
动作特性 Action characteristics	≤1.05I_r	2小时之内不动作 Not acting within 2h
	＞1.2I_r	1小时之内动作 Acting within 1h
动作时间t_r（允差±15%） Action time t_r (tolerance ±15%)	曲线类型 I^2t Curve type I^2t	15 / 30 / 60 / 120 / 240 / 360 / 480 / 600
	设定时间@1.5I_r Setting time @1.5Ir	720 / 840 / 960
热记忆时间 Thermal memory time		30min+OFF（断电可消除） 30min+OFF (available to be eliminated via power outage)
短路短延时 Short-circuit short delay		
动作电流设定值I_{sd} （允差±10%） Action current setting value Isd (tolerance ±10%)		（1.5~15）× I_r +OFF（步长1A） (1.5~15)×Ir+OFF (in steps of 1A)
动作时间t_{sd}（允差±15%） Action time t_{sd} (tolerance±15%)	定时限延时整定值 Definite time limit delay setting value	0.1~1s（步长0.1s） 0.1~1s (in steps of 0.1s)
热记忆保护 Thermal memory protection		15min+OFF（断电可消除） 15min+OFF (available to be eliminated via power outage)
短路瞬时 Short-circuit instantaneous		
动作电流设定值I_i（允差±15%） Action current setting value I_i (tolerance ±15%)		（1~20）× I_n +OFF（步长1A） (1~20)×In+OFF (in steps of 1A)
动作特性 Action characteristics		≤0.85Ii 不动作 ≤0.85Ii Not acting
		＞1.15Ii 动作 >1.15Ii Acting
接地故障 Grounding fault		
动作电流设定值I_g （允差±10%） Action current setting value I_g (tolerance ±10%)		（0.2~1.0）× I_n +OFF（步长1A）（最小100A） (0.2~1.0)×In+OFF (in steps of 1A)
动作特性 Action characteristics		＜0.9I_g 不动作 < 0.9Ig Not acting
		≥1.1 I_g 延时动作 ≥1.1Ig Delayed action
动作时间t_g（允差±15%） Action time t_g (tolerance ±15%)	定时限延时整定值 Definite time limit delay setting value	0.1~100s（0.1~1s，步长0.1s，1s~100s，步长1s） 0.1~100s (0.1~1s, in steps of 0.1s, 1s~100s, in steps of 1s)
电流不平衡保护 Current unbalance protection		
不平衡率δ调整范围 Unbalance rate δ adjustment range		40%~100%（步长1%）+OFF 40%~100% (in steps of 1%) +OFF
动作特性或报警特性 Action characteristics or alarm characteristics		≤0.9 δ，不动作 ≤0.9 5, Not acting
		＞1.1 δ，延时动作或报警 >1.1δ, delayed action or alarm
动作时间（s）（允差±10%） Action time (s) (tolerance ±10%)		0.1~100s+OFF（0.1~1s，步长0.1s，1s~100s，步长1s） 0.1~100s+OFF (0.1~ls, in steps of 0.1s, 1s~100s, in steps of 1s)

智能控制器 *Intelligent controller*

PTU6.3X型控制器
PTU6.3X controller



1. 额定工作电流 Rated operational current
2. 液晶显示屏 LCD
3. 通讯指示灯 Communication indicator
4. 功能按键 Functional key



5. 故障指示灯 Fault indicator
6. 运行指示灯 Running indicator

PTU6.3X智能控制器保护特性
Protective characteristics of PTU6.3X intelligent controller

过载长延时 Overload long delay									
动作电流设定值I_r（允差±10%） Action current setting value Ir (tolerance ±10%)		(0.4～1.0)×I_n+OFF（步长1A） (0.4～1.0)×I_n+OFF (in steps of 1A)							
动作特性 Action characteristics	电流 Current	动作时间 Operating time							
	≤1.05Ir	2小时之内不动作 Not acting within 2h							
	＞1.20Ir	1小时之内动作 Acting within 1h							
动作时间tr（允差±15%） Action time tr (tolerance ±15%)	曲线类型（默认I^2t） Curve type (I^2t by default)	整定时间tr（括号内为系数K） Setting time tr (in the bracket is the factor K)							
	标准反时限 Standard inverse time limit $t=K/(N^{0.02}-1)$	0.61(0.005)	0.98(1.0)	1.47(0.012)	2.46(0.02)	3.68(0.03)	4.91(0.04)	6.14(0.05)	9.21(0.075)
		11.1(0.09)	17.2(0.14)	24.6(0.2)	36.8(0.3)	49.1(0.4)	61.4(0.5)	73.7(0.6)	86(0.6)
	快速反时限 Quick inverse time limit $t=K/(N-1)$	2(1)	3.2(1.6)	4.8(2.4)	8(4)	12(6)	16(8)	20(10)	27(13.5)
		36(18)	56(28)	80(40)	120(60)	160(80)	200(100)	240(120)	280(140)
	特快反时限 Express inverse time limit $t=K/(N^2-1)$	8(10)	12.8(16)	19.2(24)	32(40)	48(60)	64(80)	80(100)	108(135)
		144(180)	224(280)	320(400)	480(600)	640(800)	800(1000)	960(1200)	1040(1300)
	特快反时限 Express inverse time limit $t=(K/1.15)\times\log_e[N^2/N^2-1.15]$	6.22(10)	9.96(16)	14.9(24)	24.9(40)	37.3(60)	49.8(80)	62.2(100)	84(135)
		112(180)	174(280)	249(400)	373(600)	498(800)	622(1000)	747(1200)	809(1300)
	高压熔丝兼容 High-voltage fuse compatible $t=K/(N^4-1)$	2.46(10)	3.94(16)	5.9(24)	9.85(40)	14.8(60)	19.7(80)	24.6(100)	33.2(135)
		44.3(180)	68.9(280)	98.5(400)	147(600)	197(800)	246(1000)	295(1200)	320(1300)
	曲线类型I^2t Curve type I^2t $t=(1.5/N)^2\times K$	15(15)	30(30)	60(60)	120(120)	240(240)	360(360)	480(480)	600(600)
		720(720)	840(840)	960(960)					
热记忆时间 Thermal memory time		瞬时、10min、20min、30min、45min、1h、2h、3h（断电可消除） Instantaneous, 10min, 20min, 30min, 45min, 1h, 2h, 3h (available to be eliminated via power outage)							
短路短延时 Short-circuit short delay									
动作电流设定值I_{sd}（允差±10%） Action current setting value I_{sd} (tolerance ±10%)		(1.5～15)×I_r+OFF（步长1A） (1.5～15)×I_r+OFF (in steps of 1A)							
动作时间t_{sd} （允差±15%） Action time t_{sd} (tolerance ±15%)	定时限延时整定值 Definite time limit delay setting value	0.1～1s（步长0.1s） 0.1～1s (in steps of 0.1s)							
	反时限延时 Delay of inverse time limit	曲线同过载长延时曲线，曲线速度比过载长延时快10倍（按过载延时曲线公式计算得出的时间除以10即为短延时反时限延时时间） The curve is the same as the overload long delay curve, and the curve speed is 10 times faster than the overload long delay curve (the time calculated according to the overload delay curve formula divided by 10 is the short delay inverse time limit delay time)							
热记忆保护 Thermal memory protection		15min+OFF（断电可消除） 15min+OFF (available to be eliminated via power outage)							
短路瞬时 Short-circuit instantaneous									
动作电流设定值I_i（允差±10%） Action current setting value I_i (tolerance ±10%)		(1~20)×In +OFF（步长1A） (1~20)×In +OFF (in steps of 1A)							
动作特性 Action characteristics		≤0.85I_i 不动作 Not acting							
		>1.15 I_i 动作 acting							
接地保护									
动作电流设定值I_g（允差±10%） Action current setting value I_g (tolerance ±10%)		(0.2～1.0)×I_n+OFF（步长1A）（最小100A） (0.2~1.0)×I_n+OFF (in steps of 1A) (Min. 100A)							
动作特性 Action characteristics		< 0.9I_g 不动作 Not acting							
		≥1.1I_g 延时动作 Delayed action							
动作时间t_g（允差±10%） Action time t_g (tolerance ±15%)	定时限延时整定值 Definite time limit delay setting value	0.1~100s（步长0.1s） 0.1~100s (in steps of 0.1s)							
	反时限剪切系数C_r Inverse time limit shearing factor C_r	1.5~6+OFF（步长0.5，OFF表示反时限关闭） 1.5~6+OFF (in steps of 0.5, OFF represents that it is off with inverse time limit)							
	反时限公式 Inverse time limit formula	公式 Formula $t=t_g\times C_r\times I_g/I$ t—延时时间 t_g—设定延时时间 C_r—剪切系数 I_g—设定动作电流 I—接地电流 t- delay time tg- setting delay time C_r- shearing coefficient I_g- setting action current I- grounding current 当故障电流的倍数（I/C_r）<K时，动作特性为反时限特性 When the multiple of fault current (I/C_r) <K, the action characteristic is inverse time limit 当故障电流的倍数（I/C_r）≥K时，动作特性为定时限 When the multiple of fault current (I/C_r) ≥K, the action characteristic is definite time limit							

智能控制器 *Intelligent controller*

接地报警 False grounding alarm		
接地报警启动值 Grounding alarm starting value	(0.2～1.0)×I_n+OFF（步长1A） (0.2～1.0)×I_n+OFF (in steps of 1A)	
接地报警延时时间 Grounding alarm delay time	0.1~1s（步长0.1s） 0.1~1s (in steps of 0.1s)	
接地报警返回值 Grounding alarm return value	0.2×I_n启动值（步长1A） 0.2×I_n starting value (in steps of 1A)	
接地报警返回延时时间 Grounding alarm return delay time	0.1~1s（步长0.1s） 0.1~1s (in steps of 0.1s)	
剩余电流保护 Residual current protection		
动作电流设定值$I_{\triangle n}$（允差±10%） Action current setting value $I_{\triangle n}$ (tolerance ± 10%)	（0.5~30）A +OFF（步长0.1A） 建议（0.1～30） (0.5~30)A+OFF (in steps of 0.1A) suggested to be (0.1~30)	
动作特性 Action characteristics	＜0.9$I_{\triangle n}$ 不动作 ＜0.9$I_{\triangle n}$ Not acting	
	≥1.1$I_{\triangle n}$ 延时动作 ≥1.1$I_{\triangle n}$ Delayed action	
动作时间$t_{\triangle n}$（允差±15%） Action time $t_{\triangle n}$ (tolerance ±15%)	定时限延时整定值 Definite time limit delay setting value	瞬时，0.06, 0.08, 0.17, 0.25, 0.33, 0.42, 0.5, 0.58, 0.67, 0.75, 0.83s Instantaneous, 0.06, 0.08, 0.17, 0.25, 0.33, 0.42, 0.5, 0.58, 0.67, 0.75, 0.83s
电流不平衡保护 Current unbalance protection		
不平衡率δ调整范围 Unbalance rate δ adjustment range	5%~60%（步长1%） 5%~60% (in steps of 1%)	
动作特性或报警特性 Action characteristics or alarm characteristics	≤0.9δ，不动作 ≤0.9 δ, not acting	
	＞1.1δ，延时动作或报警 ＞1.1δ, delayed action or alarm	
动作时间（s） Action time (s)	0.1~100s（步长0.1s） 0.1~100s (in steps of 0.1s)	
保护返回设定值 Protection return setting value	5%~启动值（步长1%） 5%~starting value (in steps of 1%)	当输出为报警不脱扣时的返回参数 Return parameter when the output is alarm without tripping
返时间 Return time	10s~200s（步长1s） 10s~200s (in steps of 1s)	

注：“接地保护”和“剩余电流保护”不可同时选择，如需“剩余电流保护”请先与我司技术人员沟通。
Note: "Grounding protection" and "Residual current protection" cannot be selected at the same time. If "Residual current protection" is required, please communicate with our technicians first.

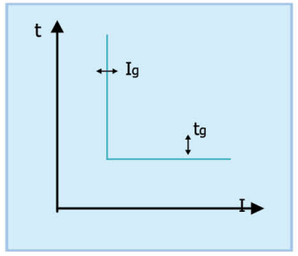
电压不平衡保护 Voltage imbalance protection		
动作阈值 Action threshold value	2%~30%（步长1%） 2%~30% (in steps of 1%)	
动作延时时间（s） Action delay time	0.2~60（步长0.1s） 0.2~60 (in steps of 0.1s)	
返回阈值 Return threshold value	2%~启动值（步长1%） 2%~starting value (in steps of 1%)	当执行方式为“报警”时才有此设定值，返回值需小于或等于启动值。 This set value is available only when the execution mode is "Alarm", and the return value must be less than or equal to the starting value.
返回延时时间（s） Return delay time	0.2~60（步长0.1s） 0.2~60 (in steps of 0.1s)	
动作或报警特性 Action or alarm characteristics	（实际电压不平衡率/设定值）≥1.1 (Actual voltage unbalance rate/setting value) ≥1.1	定时限动作或报警 Definite time limit action or alarm
	（实际电压不平衡率/设定值）＜0.9 (Actual voltage unbalance rate/setting value) <0.9	不动作或报警 No action or alarm
电压不平衡报警返回特性 Voltage imbalance alarm return characteristics	（实际电压不平衡率/设定值）≤0.9 (Actual voltage unbalance rate/setting value) ≤0.9	返回 Return
	（实际电压不平衡率/设定值）＞1.1 (Actual voltage unbalance rate/setting value) >1.1	不返回 Not return
报警触点输出 Alarm contact output	当执行方式为报警时可增选“电压不平衡报警”触点输出 When the execution mode is alarm, the "Voltage unbalance alarm" contact output can be added	
欠压保护 Undervoltage protection		
动作阈值 Action threshold value	100V~返回阈值（步长1V） 100V~return threshold value (in steps of 1V)	
动作延时时间（s） Action delay time	0.2~60s（步长0.1s） 0.2~60s (in steps of 0.1s)	
返回阈值 Return threshold value	动作阈值~1200V（步长1V） Action threshold value~1200V (in steps of 1V)	当执行方式为“报警”时才有此设定值，返回值需大于或等于启动值。 This set value is available only when the execution mode is "Alarm", and the return value must be greater than or equal to the starting value.
返回延时时间（s） Return delay time	0.2~60s（步长0.1s） 0.2~60s (in steps of 0.1s)	
动作或报警特性 Action or alarm characteristics	（Umax/动作阈值）＜0.9 (Umax/action threshold value) <0.9	定时限动作或报警 Definite time limit action or alarm
	（Umax/动作阈值）≥1.1 (Umax/action threshold value) ≥1.1	不动作或报警 No action or alarm

欠压报警返回特性 Undervoltage alarm return characteristics	（Umin/动作阈值）＞1.1 (Umin/action threshold value) >1.1	返回 Return
	（Umin/动作阈值）≤0.9 (Umin/action threshold value) ≤0.9	不返回 Not return
报警触点输出 Alarm contact output	当执行方式为报警时可增选“欠压报警”触点输出 When the execution mode is alarm, the "Undervoltage alarm" contact output can be added	
过压保护 Overvoltage protection		
动作阈值 Action threshold value	返回阈值~1200V（步长1V） Return threshold value~1200V (in steps of 1V)	
动作延时时间（s） Action delay time	0.2~60s（步长0.1s） 0.2~60s (in steps of 0.1s)	
返回阈值 Return threshold value	100V~动作阈值（步长1V） 100V~action threshold value (in steps of 1V)	当执行方式为“报警”时才有此设定值，返回值需大于或等于启动值。 This set value is available only when the execution mode is "Alarm", and the return value must be greater than or equal to the starting value.
返回延时时间（s） Return delay time	0.2~60s（步长0.1s） 0.2~60s (in steps of 0.1s)	
动作或报警特性 Action or alarm characteristics	（Umin/动作阈值）≥1.1 (Umin/action threshold value) ≥1.1	定时限动作或报警 Definite time limit action or alarm
	（Umin/动作阈值）＜0.9 (Umin/action threshold value) <0.9	不动作或报警 No action or alarm
过压报警返回特性 Overvoltage alarm return characteristics	（Umax/动作阈值）≤0.9 (Umax/action threshold value) ≤0.9	返回 Return
	（Umax/动作阈值）＞1.1 (Umax/action threshold value) >1.1	不返回 Not return
报警触点输出 Alarm contact output	当执行方式为报警时可增选“过压报警”触点输出 When the execution mode is alarm, the "Overvoltage alarm" contact output can be added	
频率保护 Frequency protection		
动作阈值 Action threshold value	欠频 Underfrequency	45~返回值（步长0.5Hz） 45~return value (in steps of 0.5Hz)
	过频 Overfrequency	返回值~65（步长0.5Hz） Return value~65 (in steps of 0.5Hz)
动作延时时间（s） Action delay time	0.2~5.0s（步长0.1s） 0.2~5.0s (in steps of 0.1s)	
返回阈值 Return threshold value	欠频 Underfrequency	启动值~65Hz （步长0.5Hz） Starting value~65Hz (in steps of 0.5Hz)
	过频 Overfrequency	45Hz~启动值 （步长0.5Hz） 45Hz~starting value (in steps of 0.5Hz)
		当执行方式为“报警”时才有此设定值 This set value is available only when the execution mode is "Alarm"
返回延时时间（s） Return delay time	0.2~36.0s（步长0.1s） 0.2~36.0s (in steps of 0.1s)	
报警触点输出 Alarm contact output	当执行方式为报警时可增选“欠频报警”“过频报警”触点输出 When the execution mode is alarm, the "Under frequency alarm" and "Over frequency alarm" contact output can be added	
保护执行方式 Protection execution mode	报警 / 跳闸 / 关闭 Alarm / Trip / Close	

智能控制器 *Intelligent controller*

控制器功能描述
Description of controller

接地故障保护特性
Grounding fault protection characteristics

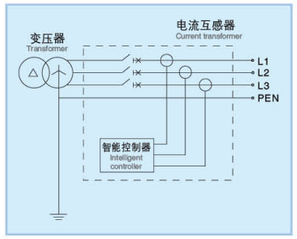


接地故障保护
Earth fault protection

- ■ 接地故障定时限或反时限保护，整定电流I_g可调；
- ■ 延时时间t_g可调；
- ■ 关断（OFF）后只报警，不分断。
- ■ 接地故障保护方式：
- □ 方式一
- □ 方式二
- □ 方式三

- ■ Definite time limit or inverse time limit protection for grounding fault, and the setting current Ig is adjustable;
- ■ Delay time tg is adjustable;
- ■ After turning off (OFF), only the alarm will be given without breaking.
- ■ Grounding fault protection mode:
- □ Mode I
- □ Mode II
- □ Mode III

方式一
Method I



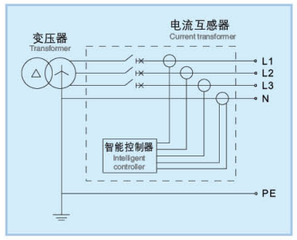
方式一：TN-C、TN-C-S配电系统选用三极断路器，仅适用于PEN中性保护线中流过的三相不平衡电流与谐波电流很小的时候。

- □ 接地故障保护信号取三相电流的矢量和。
- □ 保护特性为定时限或反时限保护。

Mode I: TN-C and TN-C-S power distribution systems is equipped with three-pole circuit breakers, which are only applicable when the three-phase unbalanced current and harmonic current flowing through the PEN neutral protection line are very small.

- □ The vector sum of three-phase current is taken as the grounding fault protection signal.
- □ The protection characteristic is definite time limit or inverse time limit protection.

方式二
Method II



方式二：TN-S配电系统选用三极断路器，外置中性线电流互感器。

- □ 接地故障保护信号取三相电流及N相电流矢量和。
- □ 保护特性为定时限或反时限保护。

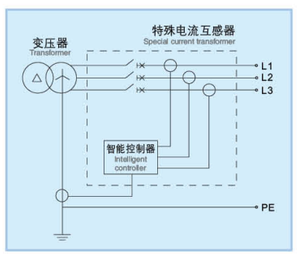
注：互感器导线长度不大于2m

Mode II: TN-S power distribution system uses three-pole circuit breaker, and the neutral line current transformer is installed externally.

- □ The sum of three-phase current and N-phase current vector is taken as the grounding fault protection signal.
- □ The protection characteristic is definite time limit or inverse time limit protection.

Note: The length of transformer conductor is not more than 2m

方式三
Method III



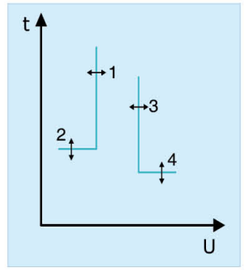
方式三：TN系统选用三极断路器，变压器中性线上外置W型电流互感器。

- □ 接地保护信号取自变压器中心接地线上的电流
- □ 保护特性为定时限或反时限保护

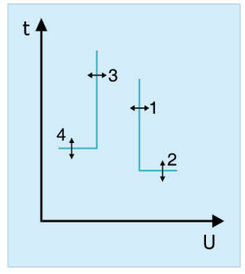
Mode III: TN system is equipped with three-pole circuit breaker, and the neutral line of transformer is externally installed with W-type current transformer.

- □ The grounding protection signal is taken from the current on the central grounding wire of the transformer
- □ The protection characteristic is definite time limit or inverse time limit protection.

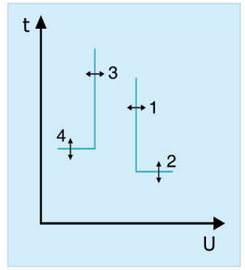
欠压保护动作原则
Undervoltage protection action principle

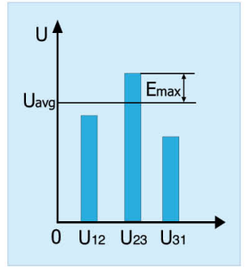


过压保护动作原则
Overvoltage protection action principle



电压不平衡
Voltage imbalance





1：动作阈值
Action threshold value
2：动作延时时间
Action delay time
3：返回阈值
Return threshold value
4：返回延时时间
Return threshold value

电压保护
Drawable connection

欠压保护
Undervoltage protection

智能控制器测量一次回路电压的真有效值,当三个线电压都小于设定值时,即三个线电压的最大值小于欠压保护设定值时欠压保护动作;当三个线电压的最大值大于返回值时报警动作返回。

动作特性：

① 当电压最大值小于动作阈值1时启动报警或跳闸延时；

② 当动作延时时间2到达时发出报警或跳闸信号，欠压故障动作；

③ 当电压最大值大于返回阈值3时启动返回延时；

④ 当返回延时时间4到达时撤除报警，欠压故障返回。

The intelligent controller measures the true RMS value of the primary circuit voltage. When the three line voltages are less than the set value, that is, when the maximum value of the three line voltages is less than the set value of the undervoltage protection, the undervoltage protection acts; When the maximum value of the three line voltages is greater than the return value, the alarm action returns.

Action characteristics:

① When the maximum voltage is less than the action threshold 1, start the alarm or trip delay;

② Upon the action delay time 2, an alarm or trip signal will be sent, and the undervoltage fault will act;

③ When the maximum voltage is greater than the return threshold value 3, start the return delay;

④ Upon the return delay time, the alarm will be removed and the undervoltage fault will return.

过压保护
Overvoltage protection

智能控制器测量一次回路电压的真有效值，当三个线电压都大于设定值时，即三个线电压的最小值大于过压保护设定值过压保护动作；当三个线电压小于返回值时报警动作返回。

动作特性：

① 当最小线电压大于动作阈值 1时启动报警或跳闸延时；

② 当动作延时时间2到达时发出报警或跳闸信号，过压故障动作；

③ 当执行方式为报警时，在报警动作后，当最小线电压小于返回阈值3时启动返回延时；

④ 当返回延时时间4到达时撤除报警，过压故障返回。

The intelligent controller measures the true RMS value of the primary circuit voltage. When the three line voltages are larger than the set value, that is, when the minimum value of the three line voltages is larger than the set value of the overvoltage protection, the overvoltage protection acts; When the three line voltages are less than the return values, the alarm action returns.

Action characteristics:

① When the minimum line voltage is less than the action threshold 1, start the alarm or trip delay;

② Upon the action delay time 2, an alarm or trip signal will be sent, and the overvoltage fault will act;

③ When the execution mode is alarm, after the alarm, the return delay is started when the minimum line voltage is less than the return threshold value 3;

④ Upon the return delay time, the alarm will be removed and the overvoltage fault will return.

电压不平衡保护

Voltage imbalance protection

电压不平衡率保护根据三个线电压之间的不平衡率进行保护动作。智能控制器测量电压不平衡率，当电压不平衡率大于动作阈值保护动作；当电压不平衡率小于返回阈值时报警动作返回。

动作特性：

① 当电压不平衡大于动作阈值1时启动报警或跳闸延时；

② 当动作延时时间2到达时发出报警或跳闸信号，电压不平衡故障动作；

③ 当执行方式为报警时，在报警动作后，当电压不平衡率小于返回阈值3时启动返回延时，

④ 当返回延时时间4到达时撤除报警，电压不平衡故障返回。

The voltage unbalance rate protection acts according to the unbalance rate among the three line voltages. The intelligent controller measures the voltage imbalance rate, and when the voltage imbalance rate is greater than the action threshold, the protection acts; When the voltage unbalance rate is less than the return threshold, the alarm action returns.

Action characteristics:

① When the voltage imbalance is less than the action threshold 1, start the alarm or trip delay;

② Upon the action delay time 2, an alarm or trip signal will be sent, and the voltage imbalance fault will act;

③ When the execution mode is alarm, after the alarm, the return delay is started when the voltage imbalance rate is less than the return threshold value 3;

④ Upon the return delay time, the alarm will be removed and the voltage imbalance fault will return.

电压不平衡率计算方法：

Calculation method of voltage unbalance rate:

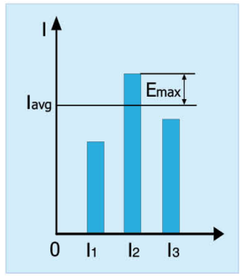
$$U_{unbal} = \frac{|E_{max}|}{U_{avg}} \times 100\%$$

$$U_{avg} = \frac{(U_{12}+U_{23}+U_{31})}{3}$$

E_{max}：每相线电压和Uavg之间的最大差值。
Maximum difference between each phase line voltage and U_{avg}.

U_{avg}：三相线电压有效值和的平均值。
Average value of the effective value sum of three-phase line voltage.

电流不平衡
Current imbalance



电流不平衡保护

Current unbalance protection

电流不平衡保护依据三相电流之间的不平衡率对断相、缺相和三相的电流不平衡进行保护：

Current unbalance protection refers that the unbalance rate between three-phase current protects open phase, missing phase and three-phase current unbalance:

不平衡率计算方法：

Calculation method of unbalance rate:

电流不平衡
Current imbalance

$$I_{unbal} = \frac{|E_{max}|}{I_{avg}} \times 100\%$$

$$I_{avg} = \frac{I_{12}+I_{23}+I_{31}}{3}$$

E_{max}：每相电流与I_{avg}之间的最大差值。
Maximum difference between each phase current and I_{avg}.

I_{avg}：三相电流有效值和的平均值。
Average value of the effective value sum of three-phase current.

过频保护

Over-frequency protection

用于发电机保护。当电路频率大于动作阈值整定值，并超过动作延时（定时限动作），断路器跳闸或发出报警信号。如此后电路中的频率小于返回阈值整定值，并超过返回延时（定时限动作），断路器解除报警信号。

过频保护功能可设定开启或关闭，开启包括发出报警信号或跳闸。

It is used for generator protection. When the circuit frequency is greater than the setting value of the action threshold and exceeds the action delay (definite time limit action), the circuit breaker trips or sends an alarm signal. If the frequency in the circuit is less than the return threshold setting value and exceeds the return delay (definite time limit action), the circuit breaker will release the alarm signal.

The over frequency protection function can be set to be open or closed, including sending alarm signal or tripping.

欠频保护

Under-frequency protection

用于发电机保护。当电路频率低于动作阈值整定值、并超过动作延时（定时限动作），断路器跳闸或发出报警信号。如此后电路中的频率大于返回阈值整定值，并超过返回延时（定时限动作），断路器解除报警信号。

欠频保护功能可设定开启或关闭，开启包括发出报警信号或跳闸。

It is used for generator protection. When the circuit frequency is less than the setting value of the action threshold and exceeds the action delay (definite time limit action), the circuit breaker trips or sends an alarm signal. If the frequency in the circuit is larger than the return threshold setting value and exceeds the return delay (definite time limit action), the circuit breaker will release the alarm signal.

The under frequency protection function can be set to be open or closed, including sending alarm signal or tripping.

相序保护
Phase-sequence protection

用于对相序有要求场合。当检测到相序与动作阈值不同，超过动作延时（定时限动作），断路器跳闸或发出报警信号。如果一相或多相电压不存在时，此功能自动退出。

相序保护功能可设定开启或关闭，开启包括发出报警信号或跳闸。

It is used where phase sequence is required. When it is detected that the phase sequence is different from the action threshold and it exceeds the action delay (definite time limit action), the circuit breaker trips or sends an alarm signal. If one or more phase voltages do not exist, this function will exit automatically.

The phase sequence protection function can be set to be open or closed, including sending alarm signal or tripping.

自诊断
Self-diagnosis

智能控制器能够对自身出现的故障进行诊断，故障包括：环境温度超温E^2PROM数据出错、A/D采样出错、断路器拒动作。

The intelligent controller can diagnose its own faults, including: E2PROM data error due to excessive ambient temperature, A/D sampling error, and circuit breaker rejecting to act.

MCR及HSISC
MCR or HSISC

接通分断功能（MCR）：断路器在合闸过程中或控制器在通电初始化时，遇到短路故障立即分断。默认动作阈值20kA。

越限跳闸功能（HSISC）：断路器在正常运行时，当短路电流超过设定值后瞬间分断。默认动作阈值25kA。

Switch on/off function (MCR): The circuit breaker will switch off immediately in case of short circuit fault during switching-on process or when the controller is powered on for initialization. Default action threshold value 20kA.

Over limit tripping function (HSISC): When the circuit breaker is in normal operation, it will break instantly when the short-circuit current exceeds the setting value. Default action threshold value 25kA.

信号触点（DI/DO）功能
Signal contact (DI/DO) function

智能控制器提供1组信号触点输出。无源触点容量：AC250V 3A，DC30V 3A

The intelligent controller provides 1 set of signal contact output. Passive contact capacity: AC250V 3A, DC30V 3A

控制器种类 Controller type	PTU4.3X			
功能设置 Function setting	见DO功能设置表 See DO function setting table			
执行方式 Execution mode	常开电平（默认） Normally open level (default)		常闭脉冲 Normally closed pulse	
控制器种类 Controller type	PTU6.3X			
功能设置 Function setting	见DO功能设置表 See DO function setting table			
执行方式 Execution mode	常开电平（默认） Normally open level (default)	常闭电平 Normally closed level	常开脉冲 Normally open pulse	常闭脉冲 Normally closed pulse
脉冲时间 Pulse time	无 None		1～360s（步长1s） 1~360s (in steps of 1s)	

Do功能设置表
Do function setting table

控制器种类 Controller type	PTU4.3X			
通用 General	故障跳闸 Faulty tripping	过载故障 Overload fault	短延时故障 Short delay fault	瞬时故障 Transient fault
接地故障 Grounding fault	电流不平衡故障 Current unbalance fault	过载预报警 Overload pre-alarm	远程分闸 Remote opening	远程合闸 Remote closing
控制器种类 Controller type	PTU6.3X			
通用 General	故障跳闸 Faulty tripping	过载故障 Overload fault	短延时故障 Short delay fault	瞬时故障 Transient fault
接地故障 Grounding fault	电流不平衡故障 Current unbalance fault	过载预报警 Overload pre-alarm	过频故障 Over frequency fault	欠频故障 Under frequency fault
电压不平衡故障 Voltage unbalance fault	故障跳闸 Faulty tripping	欠压跳闸 Undervoltage trip	自诊断故障 Self-diagnostic failure	相序故障 Phase-sequence fault

通讯
Communication

可通过通信口对短路器实现远距离的“四遥”功能。即“遥控”、“遥信”、“遥调”、“遥测”。

The "four-remote" functions can be realized for the short circuit breaker through the communication port. That is, "remote control", "remote signaling", "remote adjustment" and "telemetering".

Modbus通讯接口 Modbus communication interface		
网络特性 Network characteristics	通信方式 Communication mode	RS485（具有光电隔离） RS485 (with photoelectric isolation)
	通信协议 Communication protocol	Modbus-RTU
	通信介质 Communication media	屏蔽双绞线 Shielded twisted-pairs
	传输速度（Kb/S） Transmission speed (Kb/S)	9.6, 19.2, 38.4, 57.6可选 9.6, 19.2, 38.4, 57.6 (optional)
	最多可接用户数 Maximum number of users to be received	255（理论值） 255 (theoretical value)
	通信距离 Communication distance	1200m
网络功能 Network functions	遥测 Telemetering	监控组网电器运行参数 Operation parameters of monitoring networking appliances
	遥控 Remote control	远程控制断路器的分闸 Remote control of circuit breaker opening
	遥调 Remote regulation	远程设定断路器保护特性参数值 Remote setting of circuit breaker protection characteristic parameter value
	遥信 Telecommand	实时监控电网各种工作统计信息 Real time monitoring of various work statistics of power grid

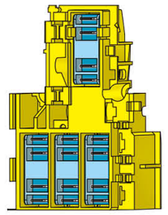
用户无特殊要求，智能控制器出厂默认设置

When the user has no special requirements, the intelligent controller is defaulted by factory setting

过载长延时保护 Overload long delay protection	I_r	I_n
	t_r	60s
短路短延时保护 Short-circuit short delay protection	I_{sd}	$3I_r$
	t_{sd}	0.1s
短路瞬时保护 Short-circuit instantaneous protection	I_i	$5I_r$
接地故障保护 Earth fault protection	I_g	OFF
电流不平衡保护 Current unbalance protection	OFF	
中性及保护（3P+N） Neutral and protection (3P+N)	100% I_r	
电压不平衡保护 Voltage imbalance protection	OFF	
欠压保护 Undervoltage protection	OFF	
过压保护 Overvoltage protection	OFF	
相序保护 Phase-sequence protection	OFF	
频率保护 Frequency protection	OFF	
信号触点输出DO Signal contact output DO	故障跳闸 Faulty tripping	

辅助触头（AX）

Auxiliary contact (AX)



辅助触头标准型式为1常开1常闭；最多可为外部提供3常开3常闭；

The standard type of auxiliary contact is 1 normally open and 1 normally closed; and at most 3 normally open and 3 normally closed can be provided externally;

	额定工作电压 Ue(V) Rated working voltage	额定工作电流（A） Rated working current	约定发热电流 Ith(A) Agreed heating current
辅助触头 Auxiliary contact	AC380	AC-12 16A	16
	AC240	AC-15 1A	
	DC250	DC-12 5A	
	DC220	DC-13 1.2A	
	DC48	DC-13 6A	

报警触头（AL）

Auxiliary contact (AX)

报警触头一组，带公共点。容量AC380V 2A、DC250V 0.3A

A group of alarm contacts with common points. Capacity AC380V 2A, DC250V 0.3A



欠压脱扣器（UVT）

Undervoltage release (UVT)





延时时间说明
Delay time description

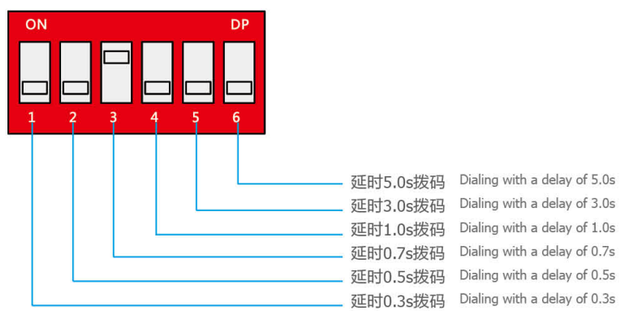
额定工作电压 Ue(V) Rated working voltage	欠压脱扣器 Undervoltage release	
	AC230	AC400
动作类型 Action type	瞬时 Transient	
	延时 Delay（0.3s～10.5s）	
动作电压 (V) Action voltage	（0.35-0.7）Ue	
可靠合闸电压 (V) Reliable closing voltage	（0.85-1.1）Ue	
可靠不能合闸电压 (V) Reliable non-closing voltage	≤ 0.35Ue	
功耗 Power consumption	15VA	

注：在雷雨多发地区或在供电电源电压不稳定的电网中，推荐使用带延时的欠电压脱扣，可防止由于短时的电压降低而使断路器脱扣。如延时时间有特殊要求应与我们联系协商。

Note: In thunderstorm-prone areas or in power grids with unstable power supply voltage, it is recommended to use undervoltage tripping with time delay to prevent circuit breaker tripping due to short-time voltage drop. If there are special requirements for delay time, please contact us for consultation.

延时拨码时间可累加，延时时间0.3s~10.5s。图示延时时间为0.7s

The delay dialing time can be accumulated, with a delay of 0.3s~10.5s. The delay time shown in the figure is 0.7s

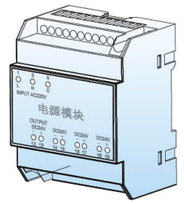


分励脱扣器（SHT）
Shunt release (SHT)



额定控制电源电压 Us(V) Rated control supply voltage	AC230	AC400	DC110	DC220
类型代号 Type code	SHT1	SHT2	SHT3	SHT4
动作电压 Operating voltage	(0.7~1.1) Us			
启动电流 (A) Starting current	<1.2			
闭合时间 (ms) Closing time	≤30			

辅助电源模块（A5）
Auxiliary power module (A5)



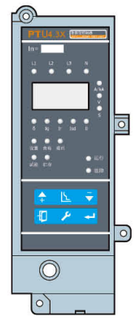
由于控制器额定工作电源为DC24V，当选择所接电源为AC230V/AC400V/DC110V/DC220V时必须通过辅助电源模块转换为DC24V，再提供给智能控制器。

当使用接地保护、通讯、热记忆功能或要求断路器在分闸状态保持输入输出信号时，必须配备辅助电源。其它输入电源请与我司沟通。

As the rated working power supply of the controller is DC24V, when the connected power supply is AC230V/AC400V/DCU0V/DC220V, it must be converted to DC24V through the auxiliary power module and then provided to the intelligent controller.

When grounding protection, communication and thermal memory functions are used or the circuit breaker is required to maintain input and output signals in the opening state, auxiliary power must be provided. Please contact us in case of other input power.

控制器（T）
Controller (T)



两种型号：数码显示 PTU4.3、液晶显示 PTU6.3；

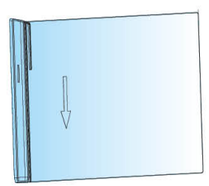
Two models: digital display PTU4.3, LCD display PTU6.3;

两种供电方式：DC24V辅助电源、互感器CT供电；

Two power supply modes: DC24V auxiliary power supply and transformer CT power supply;

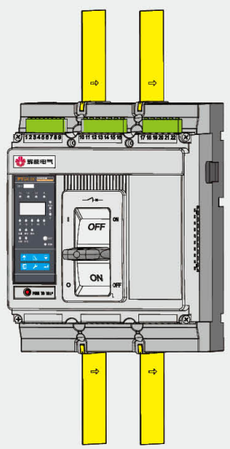
互感器CT供电 Transformer CT power supply	n × In
单相供电 Single-phase power supply	n≥0.8
两相供电 Two-phase power supply	n≥0.6
三相供电 Three-phase power supply	n≥0.4

相间隔板（A1）
Inter-phase partition (A1)



加强母排连接处的绝缘强度。

Strengthen the insulation strength of the busbar connection.



外置中性线电流互感器（A6）

External neutral line current transformer (A6)



TN-S配电系统选用三极断路器，需配备外置中性线电流互感器。

TN不配出中性线系统选用三极断路器，需配备外置W型电流互感器。

TN-S power distribution system uses three-pole circuit breaker, and the neutral line current transformer must be installed externally.
TN system without neutral line is equipped with three-pole circuit breaker, and external W-type current transformer shall be equipped.

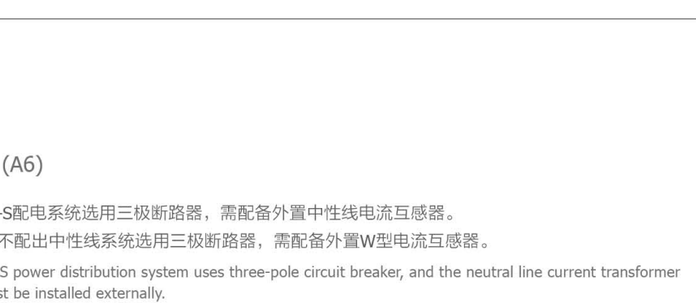
安装注意事项如下：

1. 外接中性线电流互感器有上双绞导线，导线上有相应接二次端子的编码3、4，只要按导线上的编码连接到二次端子上即可。
2. 外置中性线电流互感器的安装方向视断路器接线方式而定：

若断路器进线为上进线时，外置中性线电流互感器的圆凸面面向中性接地点侧；

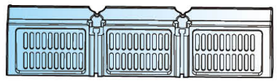
若断路器进线为下进线时，外置中性线电流互感器的平面面向中性接地点侧。

Installation precautions are shown as follow:
1. The external neutral current transformer has upper twisted-pair wires, and the wires have codes 3 and 4 corresponding to the secondary terminals. The transformer only needs to be connected to the secondary terminals according to the codes on the wires.
2. The installation direction of the external neutral line current transformer depends on the wiring mode of the circuit breaker:
If the incoming line of the circuit breaker is the upper incoming line, the round convex surface of the external neutral line current transformer faces the neutral grounding point side;
If the incoming line of the circuit breaker is the lower incoming line, the plane of the external neutral line current transformer faces the neutral grounding point side.



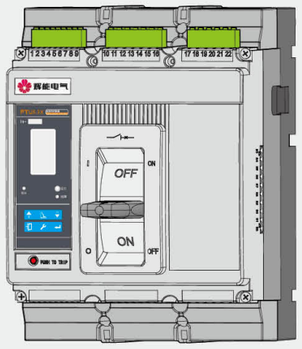
端子罩（A8）

Terminal cover (A8)



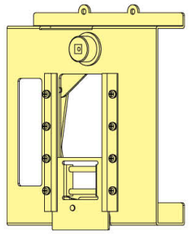
产品固定后，卸下端子罩，连接导电铜排，再装上端子罩

After the product is fixed, remove the terminal cover, connect the conductive copper bar, and then install the terminal cover



转动手柄操作机构

Rotating handle operating mechanism



转动手柄操作机构采用独特的设计和传动机构，通过旋转手柄实现塑壳断路器的合闸、分闸和再扣；

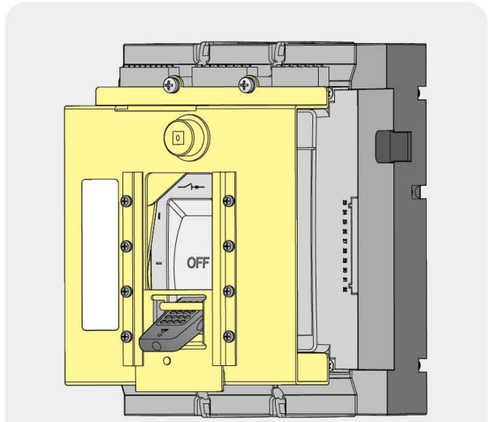
旋转操作手柄有两种：R型——圆形手柄、F型——方形手柄；

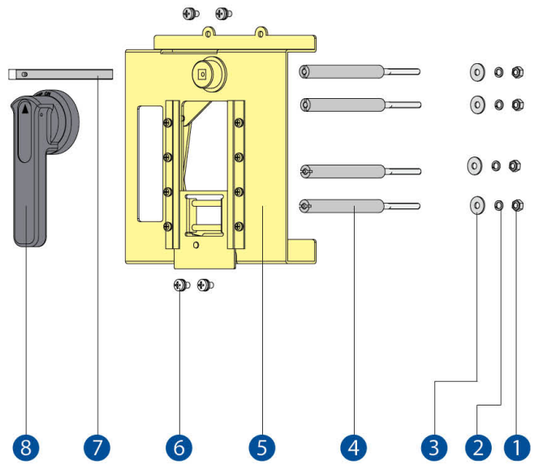
断路器处在合闸状态后柜门不能打开，即具有门联锁的功能。若转动手柄操作机构在合闸状态时有故障，可通过操作手柄上的紧急解锁装置开启柜门；

The operating mechanism of the rotary handle uses a unique design and transmission mechanism, which realizes the closing, opening and re-tripping of the molded case circuit breaker through the rotary handle;

There are two types of rotary operating handles: R type - round handle and F type - square handle;

The cabinet door cannot be opened after the circuit breaker is in the closing state, that is, it has the function of door interlocking. If the operating mechanism of the rotary handle fails in the closing state, the cabinet door can be opened through the emergency unlocking device on the operating handle;





1. 平垫圈 Flat washer
2. 弹性垫圈 Elastic washer
3. 螺母 Nut
4. 螺杆 Screw
5. 转动手柄操作机构 Rotating handle operating mechanism
6. 组合螺钉 Combination screw
7. 方轴 Square shaft
8. 旋转操作手柄 Rotary operating handle

降容表、功耗表、铜排规格
Derating meter, power consumption meter, copper bar specification

断路器功耗（环境温度+40℃）
Power consumption of circuit breaker (ambient temperature + 40℃)

壳架等级额定电流 I_{nm}（A） Frame level rated current	1600
功耗（W） Power consumption	100W

环境温度降容系数
Derating factor of ambient temperature

下表表示断路器板前水平接线在所处周围工作环境温度且满足GB/T14048.2种约定发热条件下持续承载电流的能力。

The following table shows the continuous current carrying capacity of the horizontal wiring in front of the circuit breaker board under the ambient temperature and the agreed heating conditions in GB/T14048.2.

环境温度 Ambient temperature		+40℃	+45℃	+50℃	+55℃	+60℃	+65℃	+70℃
允许持续工作电流 Allowable continuous operational current	In=1600A	1In	0.97In	0.94In	0.91In	0.84In	0.82In	0.80In
	In=1250A	1In	1In	1In	0.97In	0.91In	0.86In	0.83In
	In=1000A	1In	1In	1In	0.97In	0.95In	0.90In	0.85In
	In=800A	1In	1In	1In	1In	1In	1In	1In

注：周围空气温度允许持续工作电流关系。

Note: The ambient air temperature allows continuous working current relationship.

高海拔降容
High-altitude derating

海拔超过使用工作环境的2000m，断路器电气性能可参照下表修正：

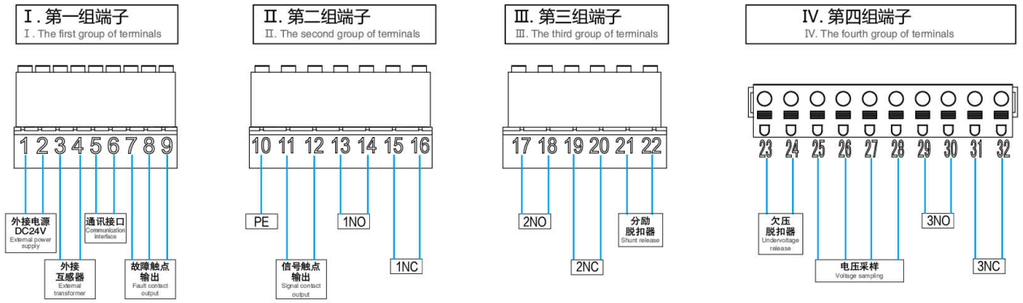
If the altitude exceeds 2000m of the working environment, the electrical performance of the circuit breaker can be corrected according to the following table:

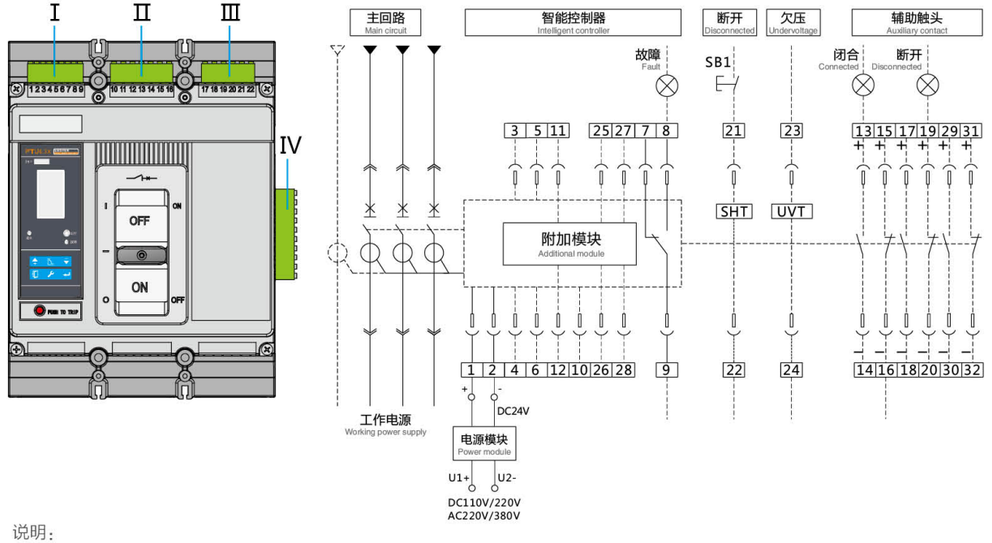
海拔 Altitude（m）	2000	3000	4000	4500	5000
工频耐压（V） Power-frequency withstand voltage	3500	3500	3000	2500	2200
绝缘电压（V） Insulation voltage	1000	900	800	720	700
工作电流修正系数 Modification coefficient of operational current	1	0.98	0.95	0.94	0.93

主回路接线铜排规格参数表
Specifications and Parameters of Main Circuit Wiring Copper Bar

壳架等级额定电流 Frame level rated current I_{nm}(A)	额定电流 Rated current I_n(A)	铜排规格 Specification of copper bar	
		根数 Qty.	尺寸 Dimension（mm×mm）
1600	800	1	50×10
	1000	1	50×10
	1250	2	50×10
	1600	2	60×10

电气图 (HNM3-5)
Electrical diagram (HNM3-5)





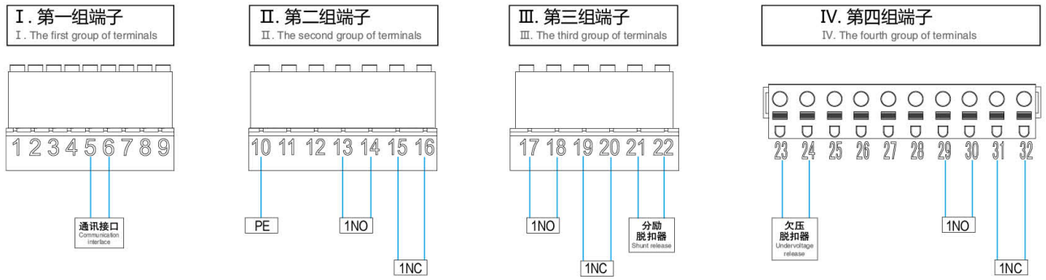
说明：
Description

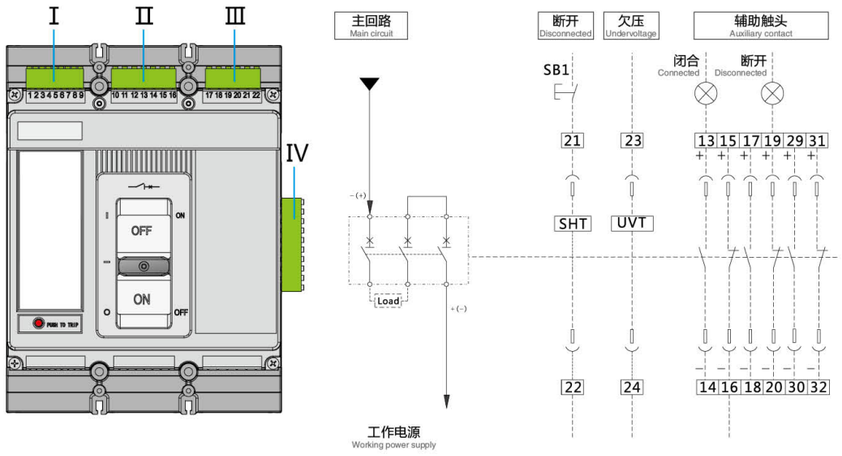
SB1 分励按钮 SB1 shunt button	SHT 分励脱扣器 SHT shunt release	UVT 欠压脱扣器 UVT undervoltage release	按钮、指示灯用户自备 Buttons and indicators are prepared by users

端子号说明如下：
The terminal numbers are described as follows:

HNM3-5			
U1+、U2-	电源模块电源输入 Power module power input	17# ~ 20#	第二组辅助触头（1NO 1NC） The second group of auxiliary contacts (1NO 1NC)
1#、2#	DC24V辅助电源输入 DC24V auxiliary power input	21#、22#	分励脱扣器SHT Shunt release SHT
3#、4#	外接N互感器输入 External N transformer input	23#、24#	欠压脱扣器UVT Undervoltage release UVT
5#、6#	通讯接口5#RS485+，6#RS485- Communication interface 5#RS485+, 6#RS485-	25#	A相电压输入 A-phase voltage input
7#、8#、9#	报警触点输出 Alarm contact output	26#	B相电压输入 B-phase voltage input
10#	PE	27#	C相电压输入 C-phase voltage input
11#、12#	信号触点输出(250V 5A) Signal contact output (250V 5A)	28#	N相电压输入 N-phase voltage input
13# ~ 16#	第一组辅助触头（1NO 1NC） The first group of auxiliary contacts (1NO 1NC)	29#~32#	第三组辅助触头（1NO 1NC） The third group of auxiliary contacts (1NO 1NC)

电气图 (HNM3GDC-5)
Electrical diagram (HNM3GDC-5)





说明：
Description

SB1 分励按钮 SB1 shunt button	SHT 分励脱扣器 SHT shunt release	UVT 欠压脱扣器 UVT undervoltage release

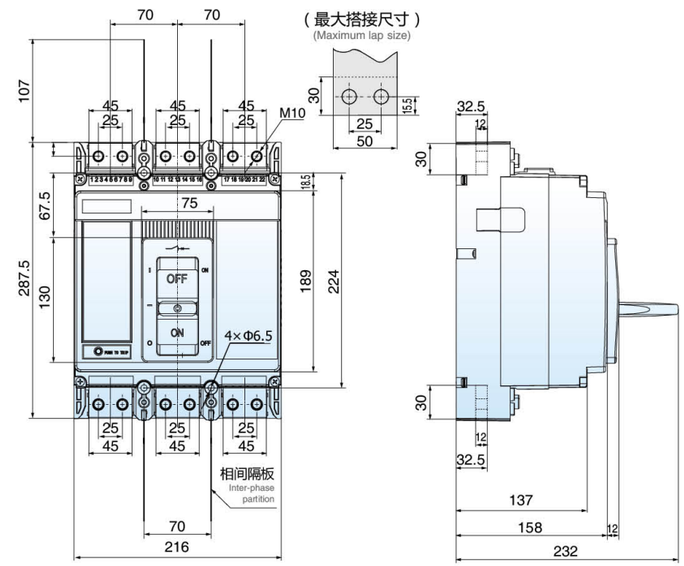
按钮、指示灯用户自备
Buttons and indicators are prepared by users

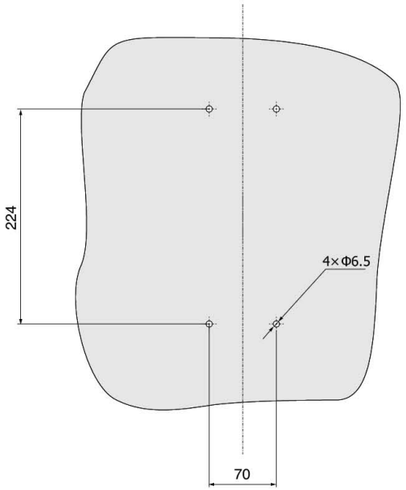
端子号说明如下：
The terminal numbers are described as follows:

HNM3GDCM-5			
5#、6#	通讯接口5#RS485+，6#RS485- Communication interface 5#RS485+, 6#RS485-	21#、22#	分励脱扣器SHT Shunt release SHT
10#	PE	23#、24#	欠压脱扣器UVT Undervoltage release UVT
13# ~ 16#	第一组辅助触头（1NO 1NC） The first group of auxiliary contacts (1NO 1NC)	29#~32#	第三组辅助触头（1NO 1NC） The third group of auxiliary contacts (1NO 1NC)
17# ~ 20#	第二组辅助触头（1NO 1NC） The second group of auxiliary contacts (1NO 1NC)		

外形及安装尺寸
Overall and installation dimensions

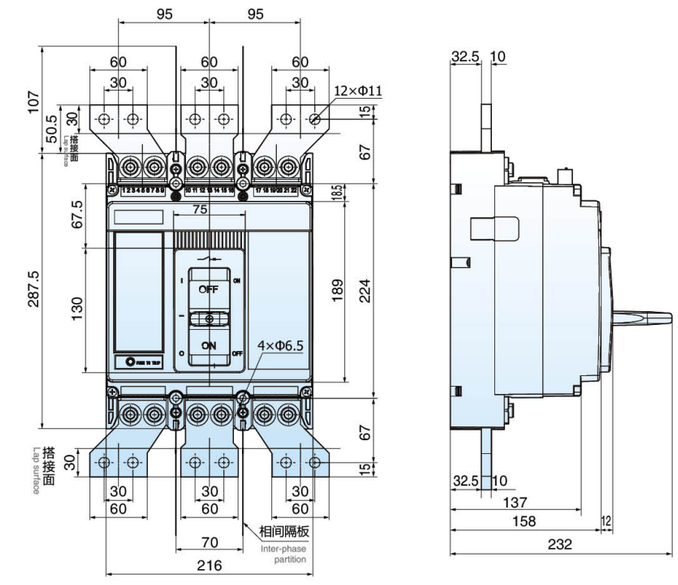
板前接线：In=800-1250A
Panel front wiring: In=800-1250A

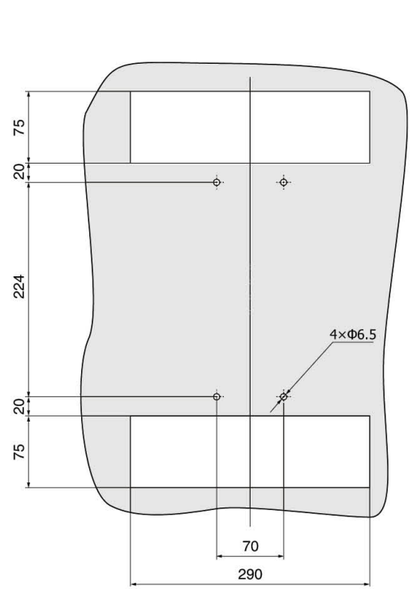




板前接线安装开孔尺寸
Opening size of panel front wiring mounting hole

板前接线：In=1600A＆In=800~1250A扩展方案
Panel front wiring: In=1600A & In=800~ 1250A extension scheme



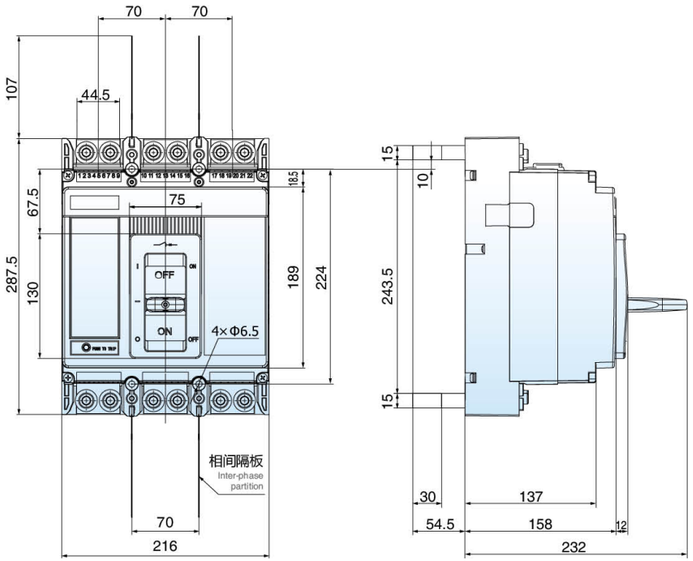


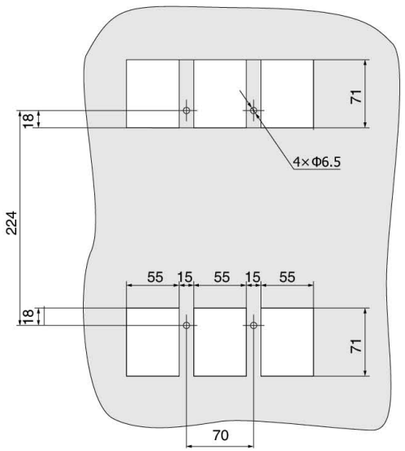
板前扩展排接线安装孔开孔尺寸
Opening size of extension row of panel front wiring mounting hole

外形及安装尺寸 *Overall and installation dimensions*

板后接线一水平出线：In=800-1600A

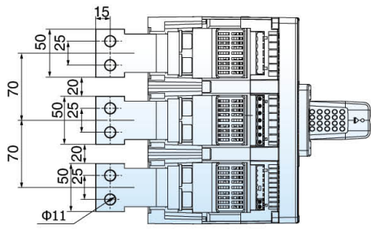
Panel rear wiring - horizontal outgoing: In=800-1600A





板后接线安装孔开孔尺寸

Opening size of panel rear wiring mounting hole

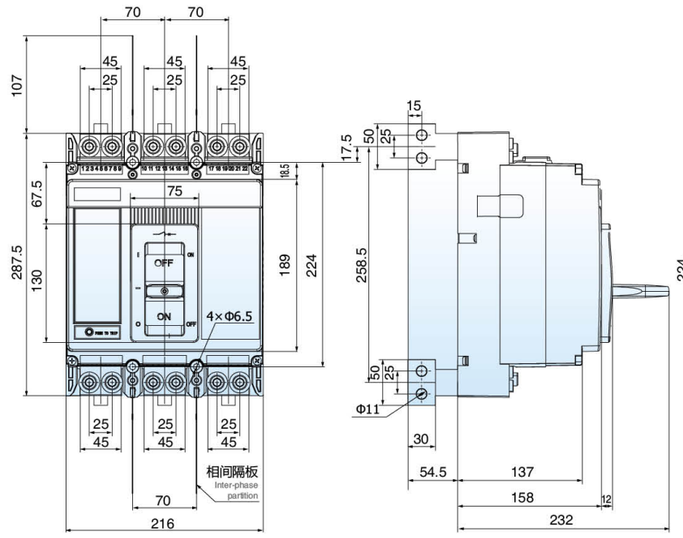


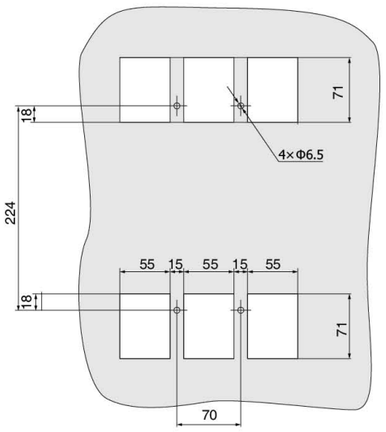
注：板后出线不可导轨安装

Note: The panel rear outgoing line cannot be installed on the guide rail

板后接线一垂直出线：In=800~1600A

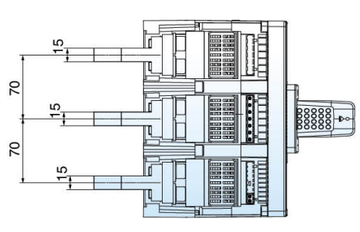
Panel rear wiring - vertical outgoing: In=800~1600A





板后接线安装孔开孔尺寸

Opening size of panel rear wiring mounting hole



注：板后出线不可导轨安装

Note: The panel rear outgoing line cannot be installed on the guide rail

螺钉安装扭矩

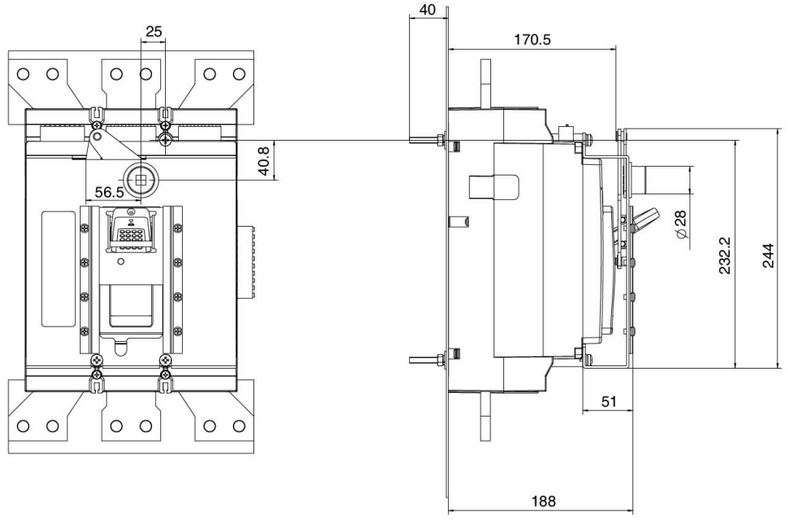
Screw installation torque

螺钉规格 Screw specification	扭矩（N·m） Torque	备注 Remarks
M6十字盘头螺钉 M6 cross recessed pan head screw	9.8	断路器安装螺钉 Circuit breaker mounting screw
M10内六角圆柱头螺钉 M10 hexagon socket cap screw	50	主回路端子连接螺钉 Connecting screw of main circuit terminal

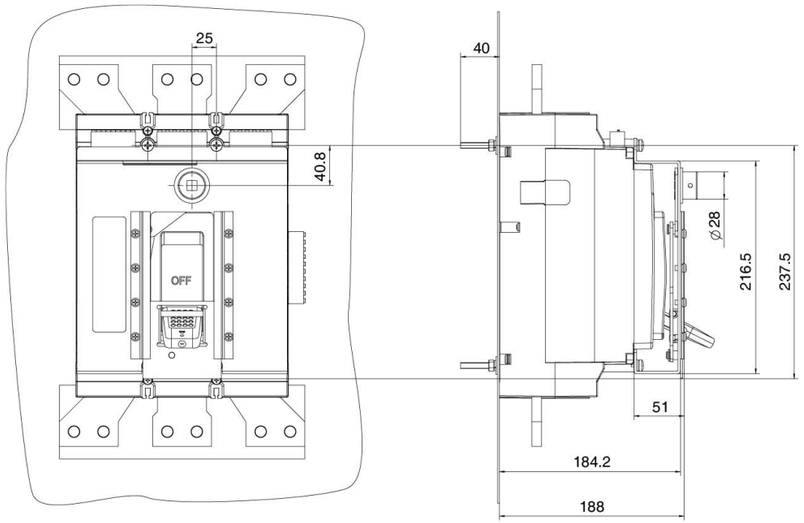
外形及安装尺寸 *Overall and installation dimensions*

CS2-5转动手柄操作机构尺寸图

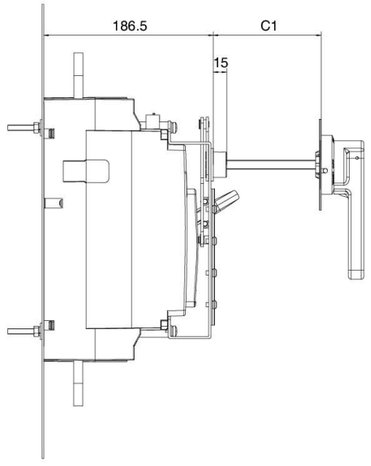
Dimension Drawing of CS2-5 Rotating Handle Operating Mechanism



合闸位置
Closing position



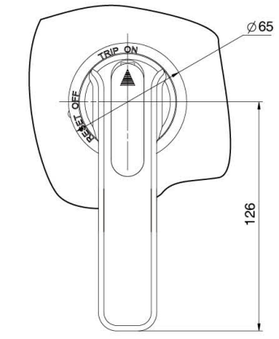
分闸位置
Opening position



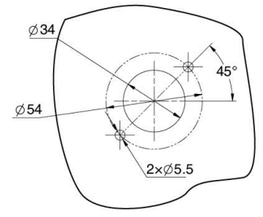
方轴长(mm) Square shaft length	C1 (mm)	备注 Remarks
150	123	默认长度 Default length
200	173	可选 Optional
250	223	可选 Optional
300	273	可选 Optional

注：如需其他尺寸请与我司技术联系；

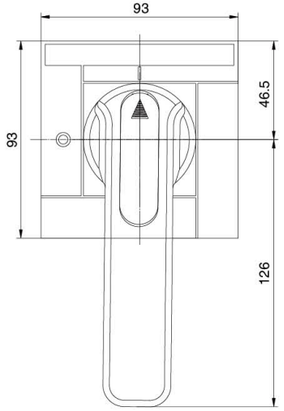
Note: If you need other sizes, please contact our technicians;



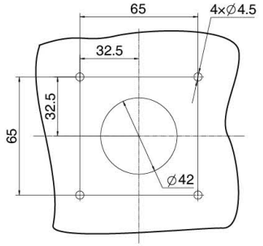
R型手柄
R-type handle



R型手柄安装尺寸
Installation dimension of R-type handle



F型手柄
F-type handle



F型手柄安装尺寸
Installation dimension of F-type handle

订货规范
Ordering specification

HNM3-5塑壳断路器订货规范
Ordering Specification for HNM3-5 Molded Case Circuit Breaker

订货单位 Ordering unit			订货数量 Order Qty.	台 Set	订货日期 Order date
极数 Pole number		☐ - 3P ☐ - 3P+N			
额定工作电流 Rated operational current		☐ - 800A ☐ - 1000A ☐ - 1250A ☐ - 1600A			
额定工作电压及分断能力 Rated working voltage and breaking capacity		☐-S AC400/415V Icu=50kA Ics=50kA Icw=20kA 1s			
		☐-M AC400/415V Icu=70kA Ics=70kA Icw=20kA 1s			
		☐-M AC690V Icu=25kA Ics=25kA Icw=20kA 1s			
控制器 Controller	客户提供电源 The power supply should be provided by the customer	☐ - AC220V ☐ - AC400V ☐ - DC24V ☐ - DC110V ☐ - DC220V	*说明：除DC24V工作电源外，选用其它工作电源均需增加辅助电源模块。* *Note: Except for DC24V working power supply, auxiliary power supply module shall be added for other working power supplies.*		
	区分 Differentiation	基本功能 Basic functions	可选功能 Optional functions		
	☐-PTU4.3X 数码显示 Digital display	过载长延时 Overload long delay I_r = _____ A t_r = _____ s 短路短延时 Short-circuit short delay I_{sd} = _____ A t_{sd}= _____ s 短路瞬时 Short-circuit instantaneous I_i = _____ A	☐-接地保护 Grounding protection Ig= _____ A，t_g = _____ s ☐-电流不平衡保护 Current unbalance protection ☐-信号触点输出 Signal contact output ☐-MCR&HSISC 保护 MCR&HSISC protection ☐-通讯功能 Communication function		
	☐-PTU6.3X 液晶显示 LCD	过载长延时 Overload long delay I_r = _____ A t_r = _____ s 短路短延时 Short-circuit short delay I_{sd} = _____ A t_{sd}= _____ s 短路瞬时 Short-circuit instantaneous I_i = _____ A	☐-接地保护 Grounding protection Ig= _____ A，t_g = _____ s ☐-电流不平衡保护 Current unbalance protection ☐-信号触点输出 Signal contact output ☐-MCR&HSISC 保护 MCR&HSISC protection ☐-通讯功能 Communication function ☐-电压测量、频率测量 Voltage measurement, frequency measurement ☐-功率因数测量、电能测量、功率测量 Power factor measurement, electric energy measurement, power measurement ☐-电压测量、保护 Voltage measurement and protection ☐-相序保护 Phase sequence protection ☐-频率测量保护 Frequency measurement protection ☐-变位记录 Displacement record		
☐-分励脱扣器 Shunt release		☐-AC230V ☐-AC400V ☐-DC110V ☐-DC220V			
☐-欠压脱扣器 Undervoltage release		☐-AC230V ☐-AC400V	☐- 瞬时 Instantaneous ☐- 延时 Delay ☐-0.3s ☐-0.5s ☐-0.7s ☐-1.0s ☐-3.0s ☐-5.0s （延时时间可累加选择 Delay time can be selected cumulatively）		
辅助触头 Auxiliary contact		标准形式 Standard form ☐-1常开1常闭 ☐-1 normally open 1 normally closed			
		增选类型 Optional type ☐-2常开2常闭 ☐-2 normally open 2 normally closed ☐-3常开3常闭 ☐-3 normally open 3 normally closed			
标准配置附件 Standard accessories		■-端子罩 ■-Terminal cover ■-相间隔板 ■-Inter-phase partition ■-二次端子连接插头 ■-Secondary terminal connection plug ■-加长手柄 ■-Extended handle			

HNM3-5塑壳断路器订货规范
Ordering Specification for HNM3-5 Molded Case Circuit Breaker

	可选附件 Optional accessories	增加附件 Added accessories
可选/增加附件 Optional/additional accessories	☐-报警触头（1组，带公共端） Alarm contact (1 set, with common terminal) ☐-板前出线扩展排+塞子（In=1600A必选） Panel front outgoing extension bar + plug (required for In=1600A) ☐-板后水平出线扩展排 Panel rear horizontal outgoing extension bar ☐-板后垂直出线扩展排 Panel rear vertical outgoing extension bar ☐-转动手柄操作机构 Rotating handle operating mechanism ☐-R型旋转手柄 R-type rotary handle ☐-F型旋转手柄 F-type rotary handle	☐-端子罩 Terminal cover ☐-相间隔板 Inter-phase partition ☐-二次端子连接插头 Secondary terminal connection plug ☐-加长手柄 Extended handle
出线方式 Outgoing way	☐-板前出线（标准配置） Panel front outgoing (standard configuration) ☐-板后出线 Panel rear outgoing	
备注 Remarks		

注 Note：

☐-增选配置，如选择，在☐内标注√
optional configuration, if it is selected, mark in ☐√

☐-若订购“剩余电源保护”功能，需与我司技术人员沟通。
Note: If you order the "Residual power supply protection" function, you need to communicate with our technical personnel.

订货规范 *Ordering specification*

HNM3GDC-5直流隔离开关订货规范
Ordering Specification for HNM3GDC-5 DC Disconnector

订货单位 Ordering unit		订货数量 Order Qty.	台 Set	订货日期 Order date	
极数 Pole number	☐ - 3P				
额定工作电流 Rated operational current	☐ - 800A ☐ - 1000A ☐ - 1250A ☐ - 1600A				
额定工作电压及分断能力 Rated working voltage and breaking capacity	☐-DC750/1000V Icm=40kA Icw=20kA 1s				
☐-分励脱扣器 Shunt release	☐-AC230V ☐-AC400V ☐-DC110V ☐-DC220V				
☐-欠压脱扣器 Undervoltage release	☐-AC230V ☐-AC400V	☐- 瞬时 Instantaneous ☐- 延时 Delay ☐-0.3s ☐-0.5s ☐-0.7s ☐-1.0s ☐-3.0s ☐-5.0s （延时时间可累加选择 Delay time can be selected cumulatively）			
辅助触头 Auxiliary contact	标准形式 Standard form	☐-1常开1常闭 ☐-1 normally open 1 normally closed			
	增选类型 Optional type	☐-2常开2常闭 ☐-2 normally open 2 normally closed	☐-3常开3常闭 ☐-3 normally open 3 normally closed		
标准配置附件 Standard accessories	■-端子罩 ■-Terminal cover	■-相间隔板 ■-Inter-phase partition	■-二次端子连接插头 ■-Secondary terminal connection plug	■-加长手柄 ■-Extended handle	
可选/增加附件 Optional/additional accessories	可选附件 Optional accessories		增加附件 Added accessories		
	☐-报警触头（1组，带公共端） Alarm contact (1 set, with common terminal)		☐-端子罩 Terminal cover		
	☐-板前出线扩展排+塞子 Panel front outgoing extension bar + plug		☐-相间隔板 Inter-phase partition		
	☐-板后水平出线扩展排+隔板 Panel rear horizontal outgoing extension bar + partition		☐-二次端子连接插头 Secondary terminal connection plug		
	☐-板后垂直出线扩展排+隔板 Panel rear vertical outgoing extension bar + partition		☐-加长手柄 Extended handle		
出线方式 Outgoing way	☐-板前出线（标准配置） Panel front outgoing line (standard configuration)		☐-板后出线 Panel rear outgoing		
备注 Remarks					

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