Smart Molded Case Circuit Breaker MT88M

Instruction Manual

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FOREWORD

Overview

This manual includes: parts introduction, panel and interface introduction, installation and operation, module replacement, and introduction to the operation of the host computer software. The manual describes the complete functions of the MT88M.

The pictures of the device on the following pages are provided for reference only. Actual device features and specifications may vary.

Target Persons

This manual is mainly applicable to the following:

- Sales Engineer
- Technical Support Engineer
- Maintenance Engineer

Precautions

The following symbols may appear in this manual, and the meanings they represent are as follows.

Symbols	Meanings
DANGER	A hazard which, if not avoided, will result in a high risk of death or serious injury.
WARNING	A hazard with medium risk which, if not avoided, could result in death or serious injury.
ATTENTION	A hazard with a low risk which, if not avoided, could result in minor or moderate injury.
NOTICE	Transmit device or environmental safety warning information. Failure to avoid it may result in device damage, data loss, reduced device performance or other unpredictable results. "Notice" does not involve personal injury.

Reversion Record

The revision record accumulates the description of each document update. The

latest version of the documentation contains updates from all previous versions.

Document Version 1.1(2021-05-19)

This is the first official release.

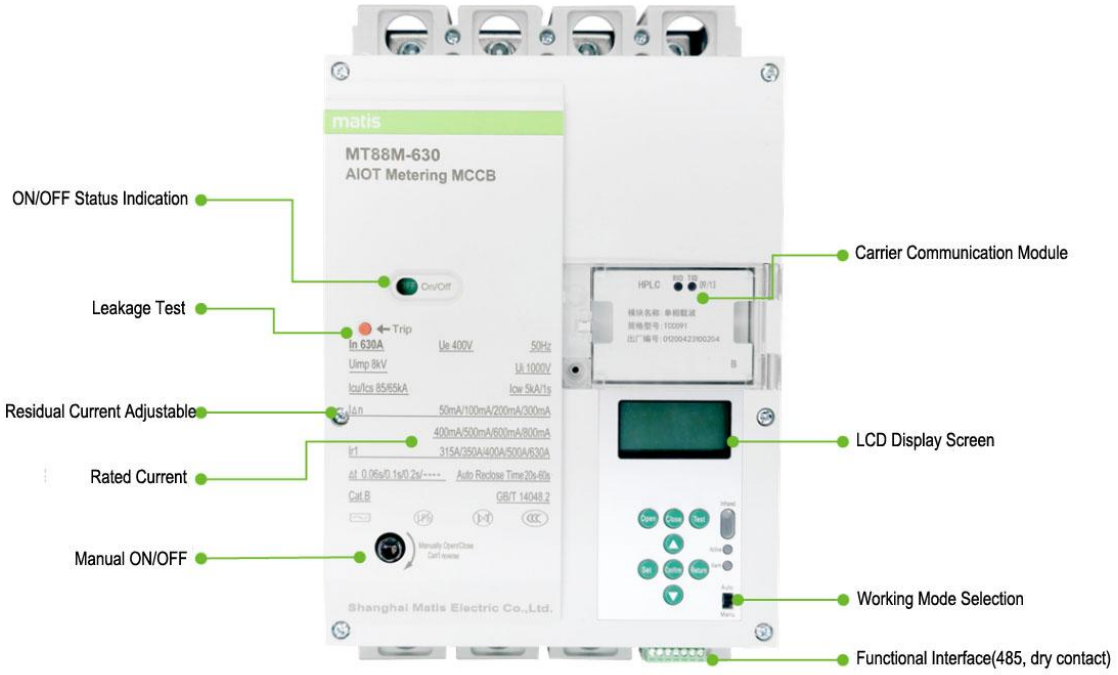
CONTENTS

1 PRODUCT INTRODUCTION

1.1 Introduction

The rated insulation voltage of RCCB MT88M is 1000V, suitable for three-phase four-wire neutral point direct grounding (TT) distribution network with AC 50Hz, rated voltage 400V and rated current up to 630A. It is used to provide indirect contact protection against fire hazards caused by damage to device insulation and ground faults; and it can be used to distribute electric energy and protect the line from overload, short circuit, overvoltage, undervoltage and phase loss.

1.2 Appearance



1.3Features

- Real-time signal processing and intelligent control with high-performance 32-bit ARM microprocessor;
- LCD display in Chinese/English and friendly man-machine interface for easy operation;
- Residual current (earth leakage) protection, setting residual current gear online and reclosing function;
- Real-time monitoring the residual current of the line and automatic adjustment of gears to ensure the commissioning rate and reliability of the device;
- Long-time delay, short-time delay and instantaneous protection with electronic tripping;
- High breaking capacity to ensure the reliability short-circuit protection;
- Overvoltage protection, undervoltage protection, phase loss protection, and neutral loss protection;
- Real-time display of residual current, three-phase supply voltage and load current;
- Protection functions and parameters can be set and modified online;
- Trip types (residual current, lock, overload, undervoltage, overvoltage, phase loss, neutral loss, etc.) are identified and displayed, and can be stored, inquired, and deleted;
- Support remote signaling, remote measuring, remote control and remote regulation;
- HPLC pluggable modules and micro-power Bluetooth wireless communication;
- 0.05In-1.2In metering up to grade 1.0;
- Real-time measurement of active power, reactive power, apparent power, power factor, etc.;
- Three-phase active power accumulation;
- Time control, cost control and other modes are optional, and the application

is more flexible;

- Support DL/T645 protocol and Modbus protocol, and automatically identify;
- Real-time monitor the temperature of terminal block in incoming terminal (option);
- Support online remote upgrade for convenience.

2 DEVICE INSTALLATION

2.1 Installation Precautions

- Before the installation, please check whether the device specifications and models are correct and whether the accessories are complete.
- Please read this instruction manual carefully to ensure correct installation and routine maintenance.
- Device must be installed vertically.
- According to the rated current of the device and relevant standards to select the appropriate wire and wire it in strict accordance with the regulations. The top is the power terminal, 1, 3, and 5 are connected to A, B, and C phases respectively, and N to the neutral line. The bottom is the load side, 2, 4, and 6 are respectively connected to A, B, and C phases, and N to the neutral line.
- The cross-sectional area of the inlet and outlet wires should meet the construction requirements specified in the standard, and the conductive part should not be exposed beyond the shell.
- After wiring, please install the flash barrier correctly.
- Install the device in places where non-electricians and minors can't reach, prevent electric shock or changing the correct configuration and wiring of the device.

2.2 Product Operation

The circuit breaker has a power-on test function (can be turned off), which can effectively protect the device.

2.3 Product Trial Operation

Turn on the circuit breaker after wiring and check that it is correct. The circuit breaker is in the breaking status, and the parameters should be set according to the operation instructions. Close the device after setting, then press the [Test Trip] button to perform a residual current test trip, and the reclosing can be performed within 20s–60s.

2.4Close Operation of the Circuit Breaker

- Automatic close

Press the [ON] button for 2 seconds, and the LCD will display the words ”close..”. After the successful close, the LCD screen will display ”close operation” and the circuit breaker will enter the normal operation status.

- Manual close

Press the trip button to ensure that the circuit breaker is in OFF status, then press the green [ON] button until ”close..” displays, and insert the manual wrench in the accessory into the hole and turn clockwise about 360°. After the successful close, the LCD screen is automatically updated to the words ”close operation”, and the circuit breaker enters the normal operation status.

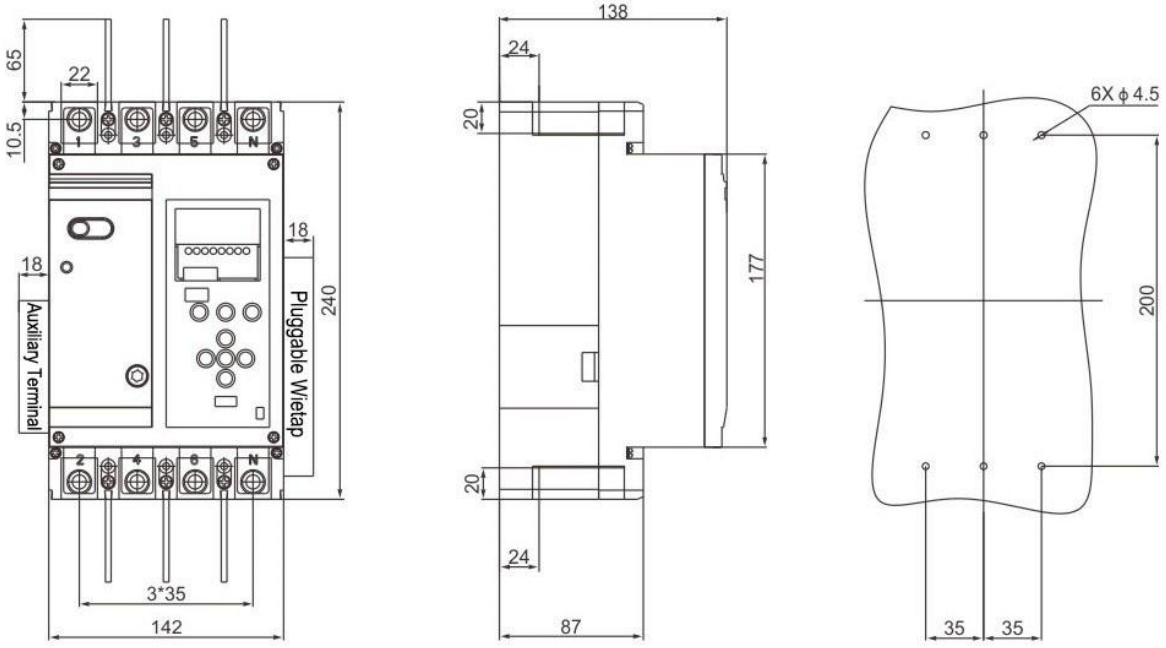
Note: When the power supply terminal of the circuit breaker is not power on and the main contact is disconnected, only manual close can be performed. See method 2 above for close operation.

2.5Open Operation of the Circuit Breaker

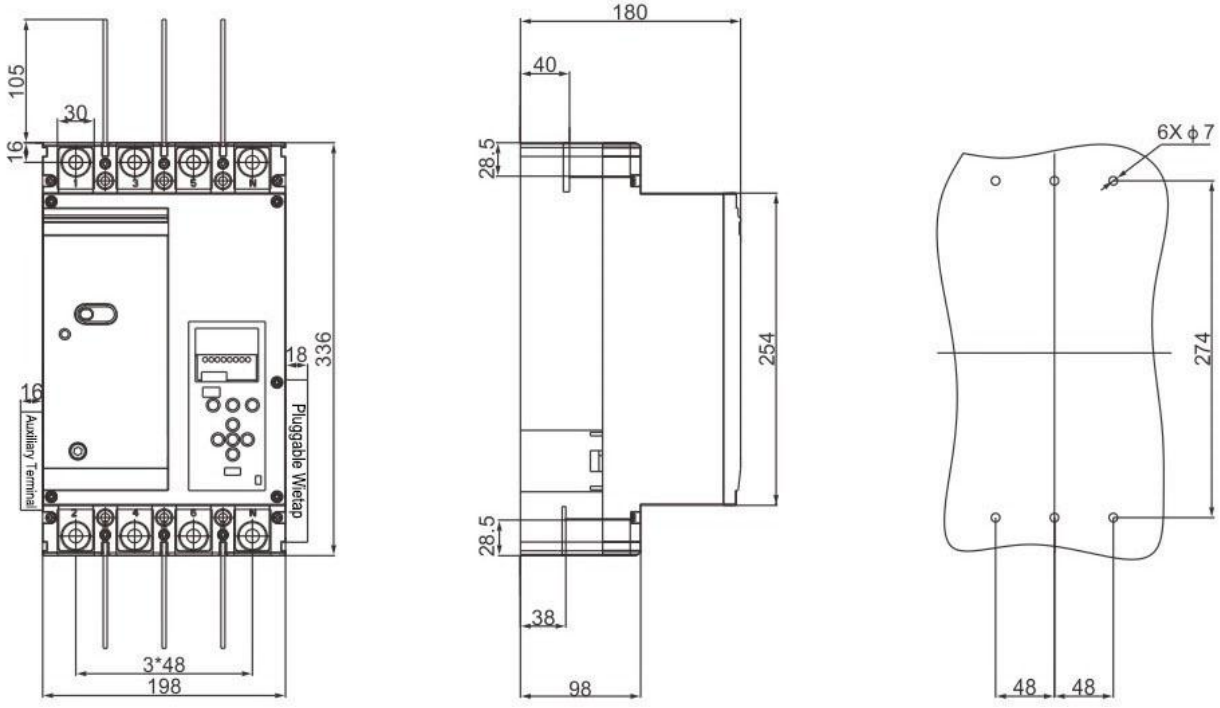
- Insert the wrench into the hole and turn it 180° clockwise. After the successful open, the LCD screen displays ”mechanical lock”.
- Press the red emergency release button on the panel with a specific tool to realize the disconnection, which can be operated without the device being powered on. And the LCD screen will display ”mechanical lock” if the power is on.
- In the running status, press [OFF] key for 2 seconds, and the LCD screen displays ”button lock” after successful open.

- When the device is in ON status, press the test key to trip, and the LCD screen will display ”leakage trip” after successful open.

2.6Overall and Installation Dimensions



MT88M-250



MT88M 630

2.7The Cross-sectional Area of the Connecting Wire and the Rated Current of the Trip Unit

2.7.1 The Cross-sectional Area of the Connecting Wire Matches the Rated Current of the Trip Unit

Rated Current (A)	63	80	100	125, 140	160	180, 200, 225	250	315, 350	400
Cross-sectional Area (mm^2)	16	25	35	50	70	95	120	185	240

2.7.2 The Rated Current > 400A and the Corresponding Cross-sectional Area of the Connecting Wire

Rated Current (A)	Cable		Busbar	
	Cross-sectional Area mm^2	Number	Size mm×mm	Number
500	150	2	30×5	2
630	185	2	40×5	2
800	240	2	50×5	2

2.8Working Environment

- The installation site should be free of conductive dust, corrosive gas, inflammable and explosive gas, and free from rain and snow.
- Altitude ≯ 2000m;
- Environment temperature: -5℃～+40℃, average daily maximum temperature≤+35℃;
- Relative humidity≤50% (When the environment temperature is +40° C);
- The external magnetic field of the installation site does not exceed 5 times the strength of the geomagnetic field in any direction;
- The installation location should have good ventilation and heat dissipation conditions
- When HPLC (wideband carrier) communication is required, make sure that all communication devices work under a transformer.

3 DEVICE FEATURES AND USE

Protection Features

3.1 Overload Long-time Delay Protection

Overload protection is a kind of protection that controls the heating of simulated conductor which based on rated current and actual current. The higher the current, the shorter the action time, which can effectively prevent the device from overload. Under this protection, the device will not lock and cannot automatically close, requiring manual operation.

3.1.1 Action Value Setting Range

Table1：Overload long-time delay parameter setting

Specification & Model	Set Value	Factory Set Value
MT88M-250CY	63A, 80A, 100A, 125A, 140A, 160A, 180A, 200A, 225A, 250A	250A
MT88M-400CY	200A, 225A, 250A, 315A, 350A, 400A	400A
MT88M-630CY	400A, 500A, 630A	630A
Set value of delay time Ir1_T	3~18s stepping 1s	12s

3.1.2 Action Characteristics

Table 2：Protective action characteristics

Environment Temperature	Current Name	Setting Current Multiple	Conventional Time
+40℃	Conventional non-tripping current	1.05Ir1	⩾2h
	Conventional tripping current	1.3Ir1	<2h

3.1.3 Delay Characteristics

Overload protection is carried out according to the reverse time characteristic:

$T=(6Ir1/I)^2 Ir1\_T$ Delay accuracy: ±10%

T is the action time value, Ir1 is the long-time delay protection setting value, I is the fault current, Ir1_T is the setting value of long-time delay.

3.2Short Circuit Short-time Delay Protection

Short circuit short-time delay protection prevents resistive short-circuits in the distribution system, and trip delay is for selective protection. Under this protection, the device will not lock and cannot automatically close, requiring manual operation.

3.2.1 Related Parameter Setting of Short Circuit Short-time Delay Protection

Table 3：Short circuit short-time delay parameter setting

Parameter Setting	Setting Range	Factory Set Value
Short-time delay action current setting value (Ir2_N)	2~10Ir1 stepping 1Ir1 for option	6Ir1
Short-time delay setting value Ir2_T	0.1s~1.0s stepping 0.1s	0.4s

3.2.2 Short circuit Short-time Delay Protection Action Characteristics

Table 4：Short circuit and short-time delay action characteristics

Characteristics	Fault Current Multiple	Trip Time	Delay Error
Non-operating characteristics	≤0.85 Ir2	No operating	±40ms
Action characteristics	＞1.15 Ir2	Delay operating	±40ms

3.3Instantaneous Protection

Instantaneous protection, the last stage of the electronic three-stage protection, can effectively prevent short circuit faults. The delay of this protection cannot be adjusted. Under this protection, the device will not lock and cannot automatically close, requiring manual operation.

3.3.1 Related Parameter Settings of Short-circuit Instantaneous Protection

Table 5：Instantaneous parameter setting

Parameter Setting	Setting Range	Factory Set Value
Instantaneous action current setting value (Ir3)	4~12Ir1 stepping 1Ir1	10 Ir1

3.3.2 Short-circuit Instantaneous Protection Action Characteristics

Table 6：Instantaneous Action Characteristics

Characteristics	Current Multiple (I/Ir3)	Trip Time	Delay Error
Non-operating characteristics	≤0.85	No action	
Action characteristics	＞1.15	Instantaneous action	±40ms

3.4Residual Current Protection Characteristics

This protection, also known as leakage protection, can perform sudden change and slow change protection for leakage, which can effectively reduce the risk of electric shock. Under this protection, the device will try to close once more, if there is still leakage within the safe time (can be set) after close, the device will lock and cannot close automatically, and manual operation is required.

3.4.1 Gear Setting Range

Parameter	Set Value (mA)	Factory Set Value
Residual action current (I∆n)	30\50\75\100\200\300\500\800\1000\ automatic	500

3.4.2 Action Characteristics

Parameter	Characteristics			
Rated non-operating current	0.5 I∆n			
Rated action current	≥0.8I∆n			
Delay characteristics	2 IΔn limiting non-actuating time (∆t)	Breaking time		
		I∆n	2IΔn	5 I∆n
Non-delay	----------	≤0.3s	≤0.15s	≤0.04s
0.3	≥0.30s	≤0.9s	≤0.6s	≤0.3s
0.6	≥0.60s	≤1.8s	≤1.2s	≤0.6s
1.0	≥1.00s	≤3.0s	≤2.0s	≤1.00s
Sudden current	Test cycle			

30-99mA	20-90ms can be set (10ms stepping)

3.4.3 Automatic Gear Mode

In automatic gear mode, each gear value and floating value:

Gear value (mA)	30	50	75	100	200	300	500	800	1000
Floating value (mA)	15	25	37.5	50	100	150	250	400	-

When the residual current is greater than the floating value of the gear but does not reach its action value and remains stable for 60s, the gear will rise by one gear, and so on, until the maximum gear; when the residual current is less than the floating value of the next gear of the gear and remains stable for 120s, the gear shifts down by one gear, and so on, until the minimum gear.

3.4.4 Auto-recloser

When the residual current exceeds the action current value and trips, the device will automatically reclose after 20 to 60 seconds, but the manual close is not limited by time. If the fault current is eliminated within the safety time after close, the close is successful and the circuit breaker operates normally; if the fault current is not eliminated and the circuit breaker trips and locks again, the device cannot reclose automatically and manual reclosing is in need.

3.5 Overvoltage Protection

When phase voltage is higher than the overvoltage protection setting value, the circuit breaker trips for protection. When the voltage returns to normal range, the circuit breaker can automatically close and operate. The setting value range of overvoltage protection ranges from 65V to 350V, and the factory setting is 280V, users can set or turn off the protection by themselves.

3.6Undervoltage Protection

When phase voltage is lower than the under-voltage protection setting value, the circuit breaker trips for protection. When the voltage returns to normal range, the circuit breaker can automatically close and operate. The setting value of undervoltage

protection ranges from 100V to 200V, and the factory setting is 170V. Users can set or turn off the protection by themselves.

3.7Phase Loss Protection

The circuit breaker trips protection when there is a phase loss at the line power supply end. When the line voltage returns to normal range, it can automatically close and operate. The setting value of phase loss protection ranges from 10V to 100V, and the factory setting is 30V. Users can set or close the protection by themselves.

3.8 Multi-machine Protection

When local remote control is required (for example, the switch is in the power distribution cabinet, the remote button on the cabinet door is required to control the switch), the external terminal of the switch can be used for multi-machine protection and control, and users can turn on and off this function by themselves in the function selection menu.

3.9 Cost Control Protection

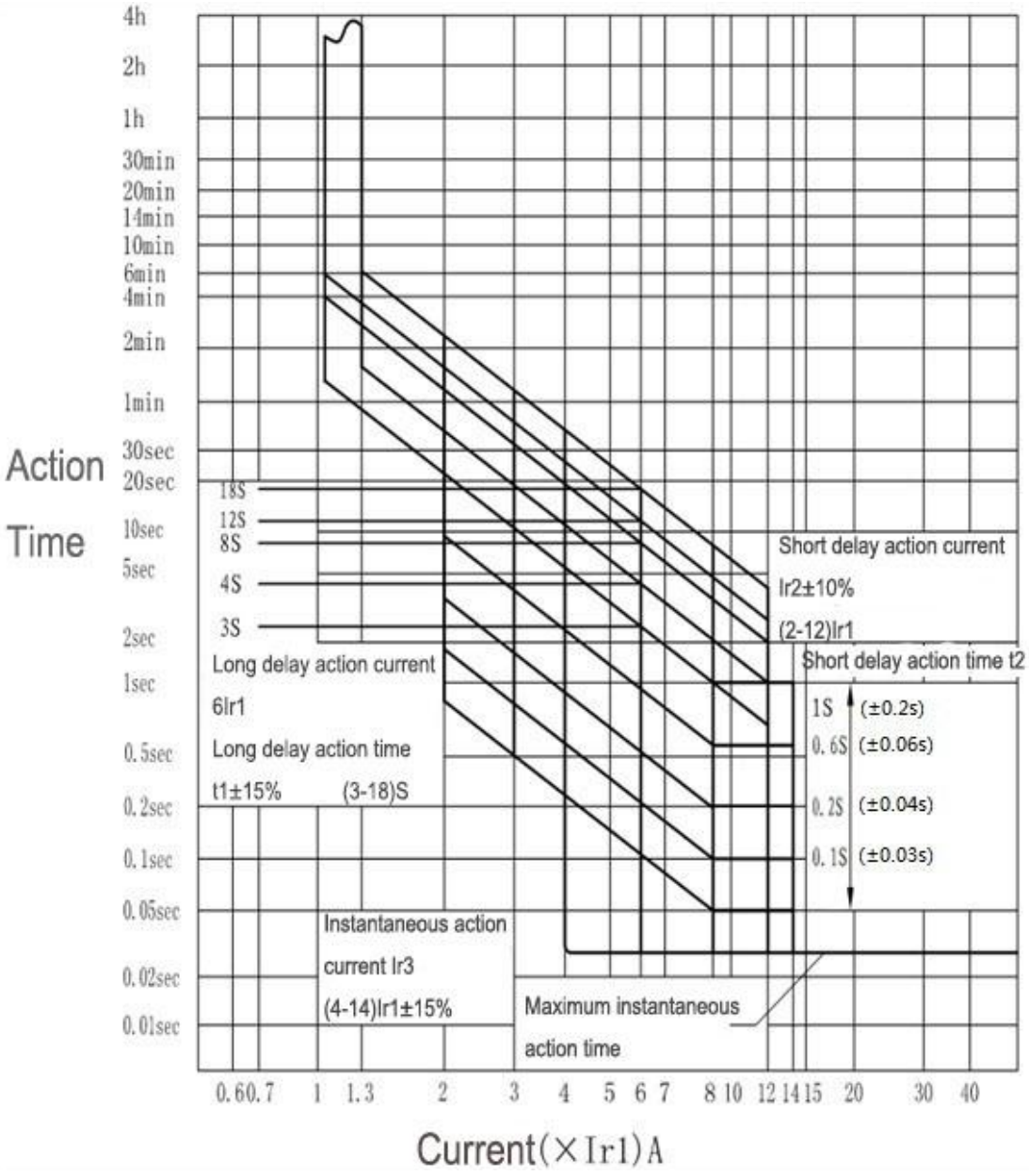
This device can be used as an external circuit breaker in connection with a cost-controlled meter, and is compatible with impulse and level cost control meters. This function can be used only when the switch is set to cost control mode and the multi-machine control permit is turned on. When working in the cost control mode, the multi-machine protection automatically exits. When there is no cost control signal, it cannot manually or automatically close. Forced close will automatically disconnect the device.

3.10 Time Control Protection

This device can be used in occasions requiring time-controlled open and close, such as smart street lights, school energy management, etc.. When operating in time control mode, the start time and end time of close can be adjusted. This device can be set for 4 time periods, during which the device will automatically close if the line fault is not detected. If there is a safety fault (such as overvoltage, undervoltage, leakage, etc.) during operation, it will automatically open for protection, and

automatically close when it is safe. The device will automatically open and lock if it is not within the preset time period. If emergency power supply is required during this period, the working mode must be changed to the normal mode before close and powering. Otherwise, the device will automatically open.

3.11 Electronic Overcurrent and Short Circuit Protection Characteristics Curve



3.12 Communication Function

Communication Interface	Interface Type	Communication Protocol	Communication Address	Communication Rate
RS485	External terminal	DL/T-645 Modbus(option)	1-255	600-38400(option)
Carrier	Pluggable			
Bluetooth	Built-in			

4 RS485 COMMUNICATION

MT88M can be connected by interface port RS485 and Modbus-RTU.

4.1 Communication

The twisted-pair cable with mesh shielding (at least 3 wires) must be used in RS485, and the maximum distance between the MT88M and the main device is 1200 meters.

Use an intelligent RS485 protocol converter to establish communication with a master device.

4.2 MODBUS Protocol

In the Modbus protocol, the MT88M uses the RTU (Remote Terminal Unit) mode. For the Modbus functions implemented in the device, see "MT88M Protocol Appendix".

4.3 MODBUS Communication Parameter Setting

The prerequisite for the communication between the device and the master station is that the settings of the communication parameters must be accurate. The communication parameters of MT88M include:

- Communication address: 01 by default, which can be modified by the host computer in the range of 01~247 in decimal.
- Baud rate: 9600 by default, which can be modified by the host computer software.
- Communication parameters can be freely set if necessary.

5 TECHNICAL FEATURES

5.1 Technical Parameter Table

Model		250A	400A	630A
Electrical Characteristics				
Case Current (A)		250	400	630
Poles		3P+N		
Rated Voltage Ue(V)		AC 400 50HZ		
Rated Insulation Voltage Ui(V)		AC 1000		
Rated Impact Withstand Voltage Uimp(V)		8000		
Arcing Distance (mm)		≥50	≥100	≥100
Limiting Short-circuit Breaking Capability Icu(KA)		50	72	70
Operating Short-circuit Breaking Capability Ics(KA)		35	50	50
Rated Residual Current Making (Breaking) Capability I△m(mA)		12.5	20	20
Residual Current Operating Characteristics		AC type		
Rated Residual Operating Current I△n (mA)		30/50/75/100//200/300/500/800/1000/Auto		
Residual Action Time Characteristics		Delay type/Non-delay type		
The Delay Limiting Non-actuating Time (s)		0.06/0.1/0.2 for option; 2 I△n see residual current protection characteristics for details		
Operational Performance (times)	Power-on	1000	1000	1000
	Power-down	7000	4000	4000
	Total number of times	8000	5000	5000
Overload/Short Circuit Characteristics		Three-stage protection, electronically adjustable, see "Description of protection characteristics" for details		
Overvoltage Protection Value (V)		Set value (265~350V)		
Undervoltage Protection Value (V)		Set value (100~200V)		
Phase Loss Protection		Set value (10~100V)		

Value (V)			
Function Description			
Auto-recloser	●	●	●
Leakage Protection	●	●	●
Safety Padlock	●	●	●
Leakage Value Adjustable	●	●	●
Environmental Characteristics			
Operating Temperature	-25℃~+55℃		
Storage Temperature	-40℃~+70℃		
Relative Humidity (non-condensing)	5%~95%		
The Highest Altitude	2000m		
Protection Grade	IP20		

6 FAQ

Problems	Possible Causes	Solutions
Auto-close fails	The recloser function is inhibited in Auto mode	Activate the reclosing function through the host computer software
	Setup error of the working mode	Push the button to Auto mode.
	Reclosing fails, and enters logic lock status	Control the close through the host computer software, or manually close once.
Send ON/OFF command but no response	Incorrect setting of safety lock button	Make sure the safety lock button indication in the "Auto" position.
	Abnormal communication line	Check whether the communication cable is disconnected.
The host computer cannot communicate with the device	Incorrect RS485 communication address	Check whether the device address is consistent with the definition
	Incorrect RS485 baud rate	Check whether the device communication rate is consistent with the definition
	The 485 bus is long and does not use terminal adaptation resistors, so the current signal reflection will interfere with the bus.	Check whether the 120 ohm resistor is added
	Communication link is disturbed	Check whether the communication shield is well grounded
	Abnormal communication line	Check whether the communication cable is disconnected

7 TECHNICAL SREVICE

Anyone who purchases this smart MCCB MT88M enjoys a 24-month warranty period from the date of purchase. During the warranty period, if the quality of the device itself affects the normal use, you can enjoy free repair and replacement, and the condition of paid service as follows: the improper use, drop, installation and wiring errors that cause irreversible damage. Besides, if you disassemble and modify the device yourself, you will not enjoy the warranty service.

If you have any questions about the operation or malfunction of the device, please contact Matis technical support service.

Statement:

- The information provided in this manual can be changed without prior notice.
- Shanghai Matis Electric Co., Ltd. reserves the right to interpret the foregoing information.

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