PIDMaxWell

MW30E Operation Manual

Three-phase professional power regulator

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1 Safety Precautions

1.1 Symbol identification in the operating instructions

The following are some of the markings on the regulator; please pay attention to the warnings or markings listed below during operation.

	Risk of electric shock		Anti-static measures must be taken during handling.
	warn		Grounding terminal
	Beware of high temperatures.		

1.2 Requirements for Operating Personnel

- √ Comply with relevant safe operating procedures.
- √ Comply with applicable national accident prevention regulations and general safety regulations.
- √ Adhere to the constraints regarding operating conditions and technical specifications.
- √ In the event of abnormal voltage, noise, temperature, vibration, or similar conditions, the equipment in operation must be stopped immediately, and maintenance personnel must be notified at once.
- √ No modifications to the equipment or repurposing of parts is permitted without prior consent.
- √ The equipment may only be used for applications such as power regulation.
- √ For engineering applications, the normal operating environment of the equipment must be addressed.

1.3 Equipment Use

- √ The equipment may only be energized when there is no danger to personnel, systems, or loads.
- √ Ensure the vents are not blocked.
- √ Ensure the power supply parameters are correct.
- √ If the device has been stored in a cold environment for an extended period, ensure it is completely dry before use.
- √ Check whether the power supply parameters on the nameplate match the actual ones.
- √ Whether it is installed vertically.
- √ If the space is small, ensure adequate ventilation.
- √ The minimum installation clearance must comply with the requirements specified in this manual.
- √ Ensure that the device is not affected by surrounding heat sources.
- √ Whether the grounding complies with the regulations.

2 product information

2.1 Overview

The MW30E series is a professional-grade (current range 25-3000A) three-phase power regulator. It can be used in applications requiring control of AC voltage, AC current, or heat treatment process output. The MW30E series offers various control and regulation modes, making it easy to apply in process and automation control technologies.

★ Fully digital circuitry, user-friendly design, and simple, quick operation.

★ The control core utilizes a highly stable microprocessor and advanced SMT (Surface Mount Technology) soldering processes.

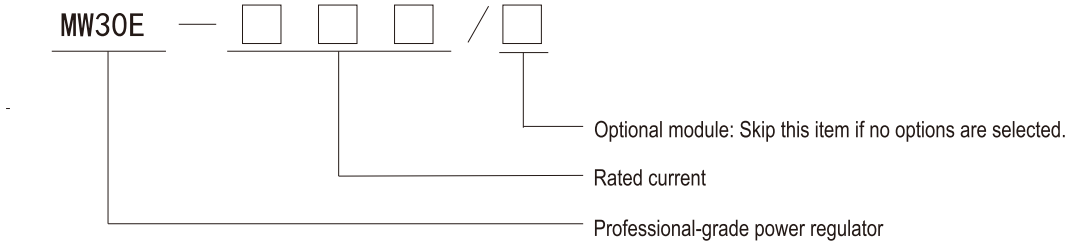
★ Both signal input and output interfaces employ isolation technology, ensuring strong interference immunity.

★ Equipped with a standard RS485 communication interface, facilitating centralized control of multiple units.

★ It integrates multiple modes—including open-loop, constant output voltage, constant output current, constant output power, phase-shift (zero-crossing) control, and combined phase-shift/zero-crossing control—into a single unit; functions can be enabled or disabled simply by adjusting parameters, offering greater operational flexibility.

★ Featuring professional heat transfer design and stable, reliable quality, the products are widely used in industrial sectors such as nuclear power, vacuum technology, glass manufacturing, air separation, packaging machinery, and industrial furnaces.

2.2 Model Designation



2.3 Optional Module Code

No.	name	Model and Specifications	Functional Description
1	Show external references	ED	Display and operation panel routed to the cabinet door.
2	External feedback	EF	External current and voltage feedback
3	True RMS	R	True RMS detection of current and voltage
4	MODBUS TCP/IP	C	Ethernet communication
5	Profibus communication	P	Profibus DP communication
6	Temperature control	T	Temperature control
7	Analog output	DA	Analog output
8	Online power allocation	PM	Online power allocation

2.4 Explanation of Abbreviations

CRC	Cyclic Redundancy Check
Tp	Load disconnection threshold value
TRMS	True RMS
Ip	Peak current
Ve	Rated voltage
Ie	Rated current
Re	Rated resistance

2.5 Maintenance and Service

To prevent casualties and equipment damage, users must adhere to the following maintenance rules:

√ All power sources must be disconnected before equipment maintenance.

√ Ensure device safety in the event of an unexpected restart.

√ Use appropriate instruments to verify that the equipment is de-energized.

√ Ensure the device is reliably grounded.

√ Maintenance of the equipment must be performed only by qualified engineering personnel.

√ When the equipment is stored for an extended period, it should be powered on once every quarter.

√ Routine inspections of the equipment must be performed every 3 to 6 months to extend its service life.

● Check the main circuit connection terminals for looseness.

● Whether the line insulation complies with standards.

● Clean accumulated dust from cooling fans, air ducts, and circuit boards.

√ Please use genuine parts supplied by PIDMaxwell for any repair work; otherwise, PIDMaxwell will void all repair agreements for this product.

√ PIDMaxwell assumes no liability for damage to the regulator caused by repairs using parts from other models.

√ Please contact PIDMaxwell after-sales service (0838-2443568) to purchase accessories or for repairs.

2.6 Technical Parameters

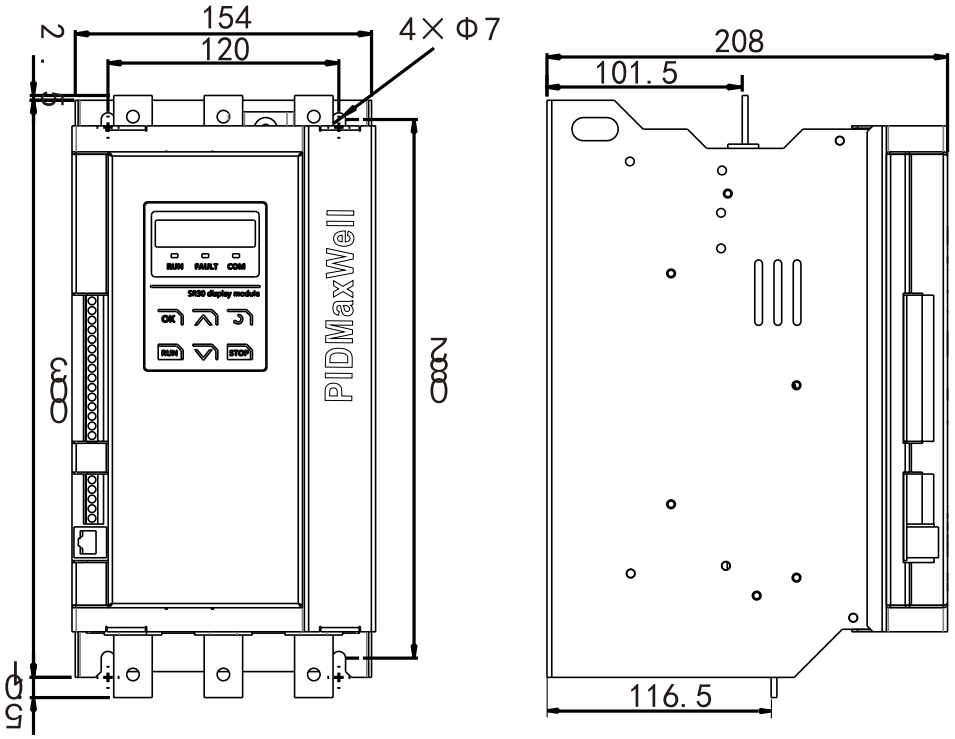
Main circuit power supply	AC260–440V
Control power supply	AC160–240V
Power supply frequency	45Hz-65Hz
Rated output voltage	0–98% main circuit voltage
Rated output current	AC25-3000A
Working method	continuous
Control method	V/I/P/Any
Trigger method	Full-wave control / Phase control
Accuracy	±1%
Resolution	0.1%
Static stability	±0.2%
Analog input 0–5V/0–10V 0–20mA/4–20mA	support
Digital input	Route 3
Programmable analog output	/
Digital output	Route 1
RS485 communication	support
Soft-start/soft-shutdown	support
Show external references	Support (Extension)
External feedback	Support (Extension)
True RMS	Support (Extension)
Ethernet communication	Support (Extension)
Profibus communication	Support (Extension)
Temperature control	Support (Extension)
Phase loss protection	support
Overcurrent protection	support
Overheat protection	support
Load disconnection protection	support
Operating Environment	−10 to +50°C; derating required above 45°C; derating required for altitudes above 1,000 m in accordance with GB/T 3859.2-93.
Storage environment	−10 – +70°C
Relative humidity	20% – 90% RH, no condensation

3 Installation and Wiring

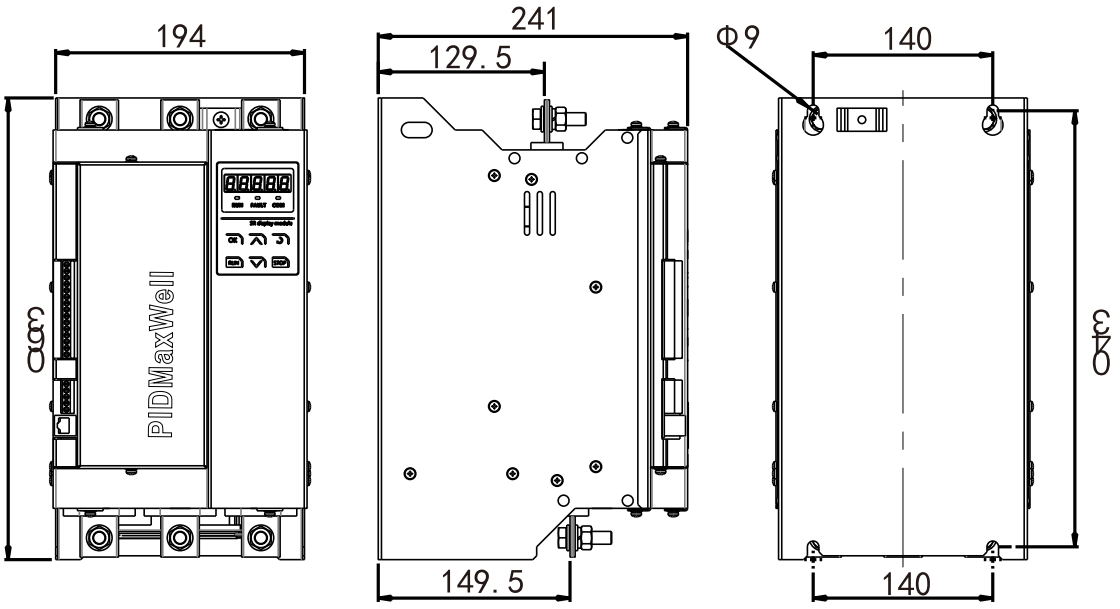
3.1 Outline and mounting dimensions

(The unit dimension is : mm)

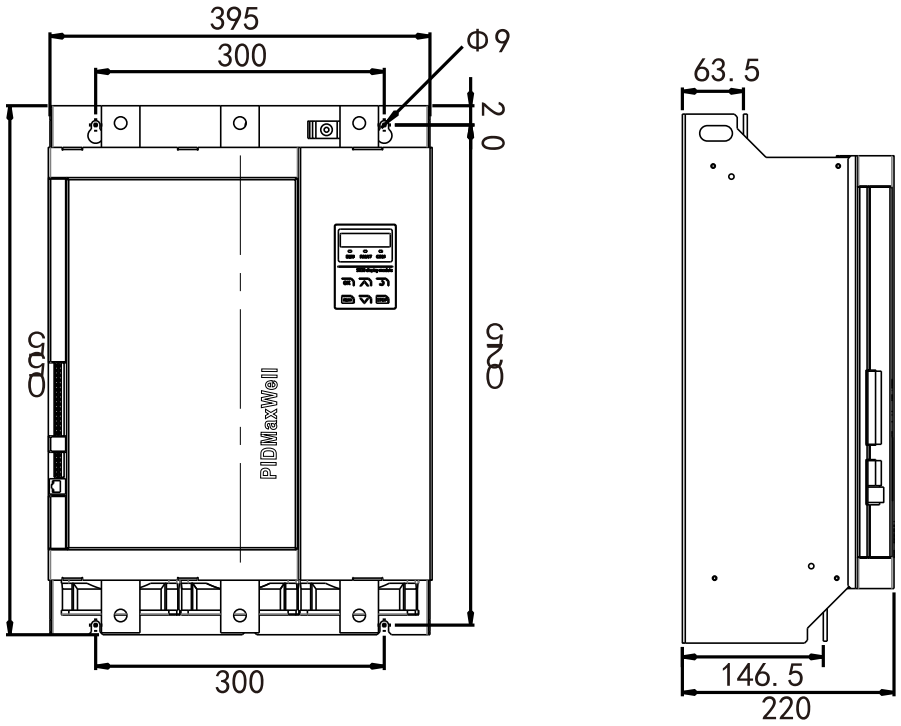
① Current 25–170 A



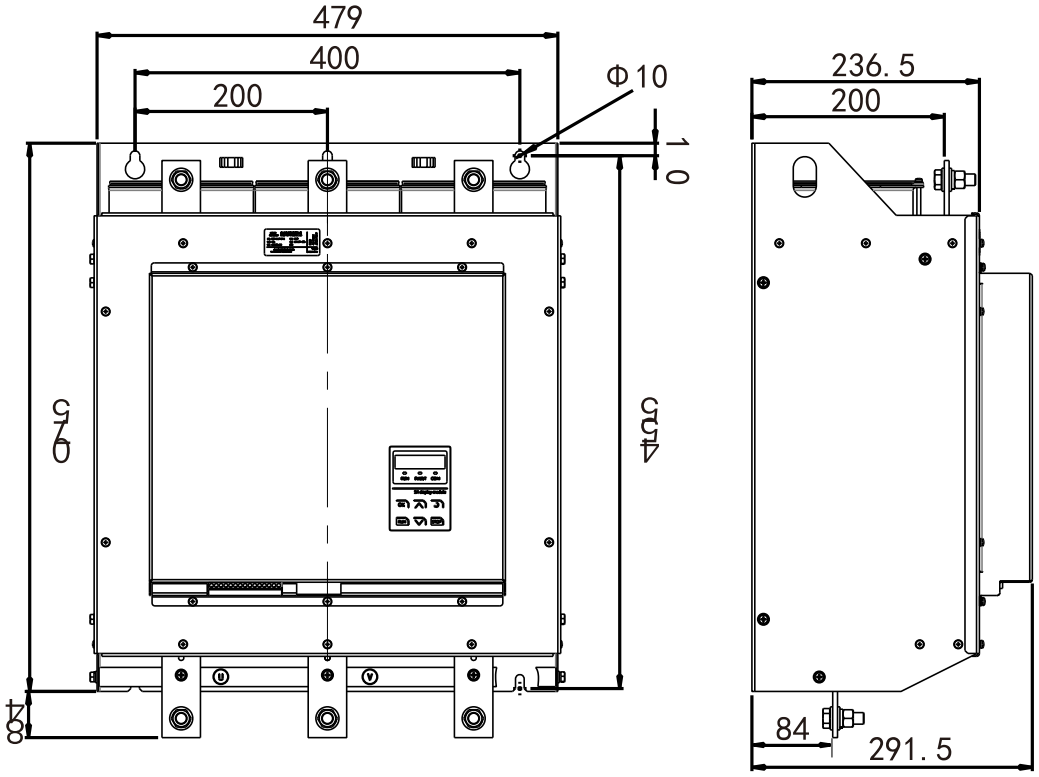
② Current 200–320 A



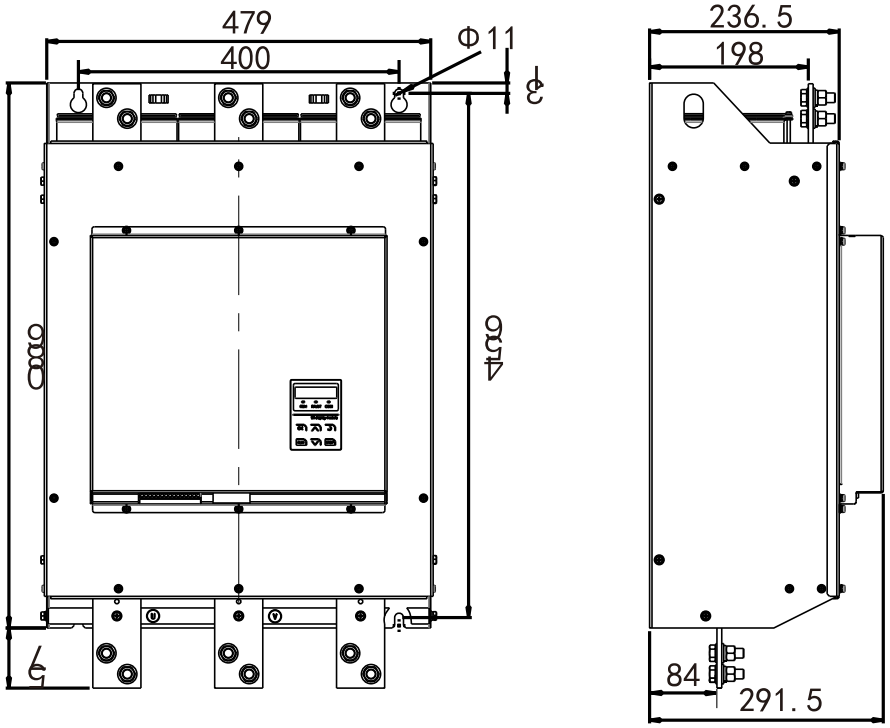
③ Current 450A



④ Current 600A



⑤ Current 800A

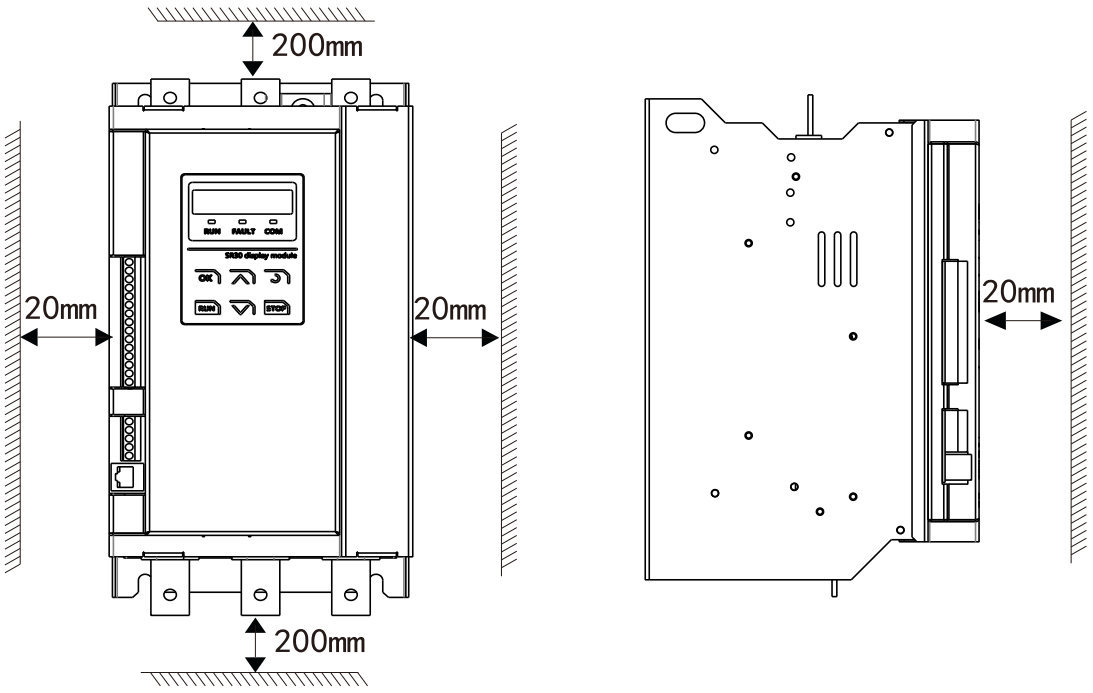


3.2 Installation

① Indoor installation; a location free from direct sunlight and water condensation.

② Install the regulator vertically, leaving sufficient space to ensure proper heat dissipation; the minimum...

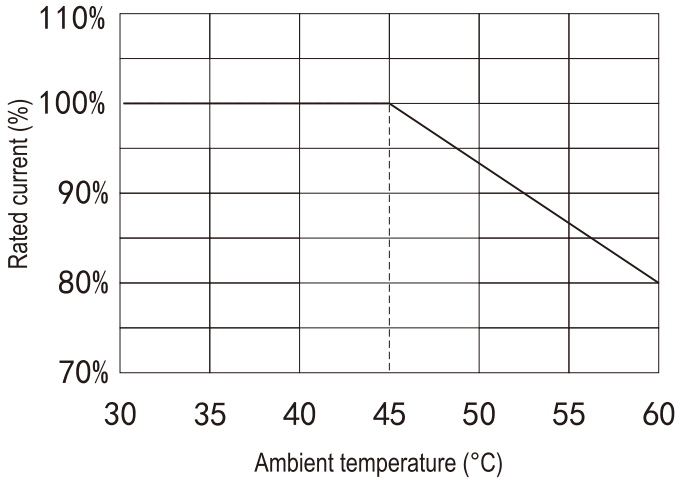
The space is as shown in the image below:



3.3 Work Environment

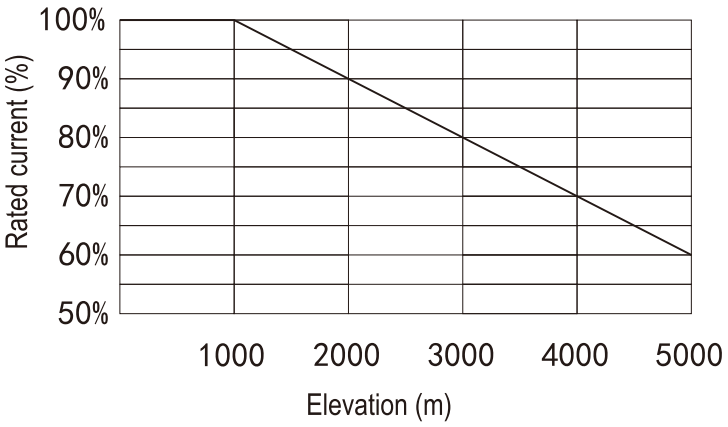
① Avoid installation in locations with high levels of conductive dust or metal powder, or in the presence of corrosive or explosive gases.

② Ambient temperature: -10 to 50°C. The relationship between ambient temperature and the controller's rated current is shown in the figure below:



③ Humidity: 20% to 90% RH, non-condensing.

④ Altitude: In areas with an altitude exceeding 1000 meters, the rated current and altitude shall be determined according to GB/T 3859.2-93.The relationship is shown in the figure below.



3.4 Electrical Wiring

① Select appropriate conductors or copper busbars based on the controller's rated current to connect the main circuit inputs (R/S/T) and outputs (U/V/W).

② Use 0.5–1.0 mm wires to connect the control power supply L and N terminals.

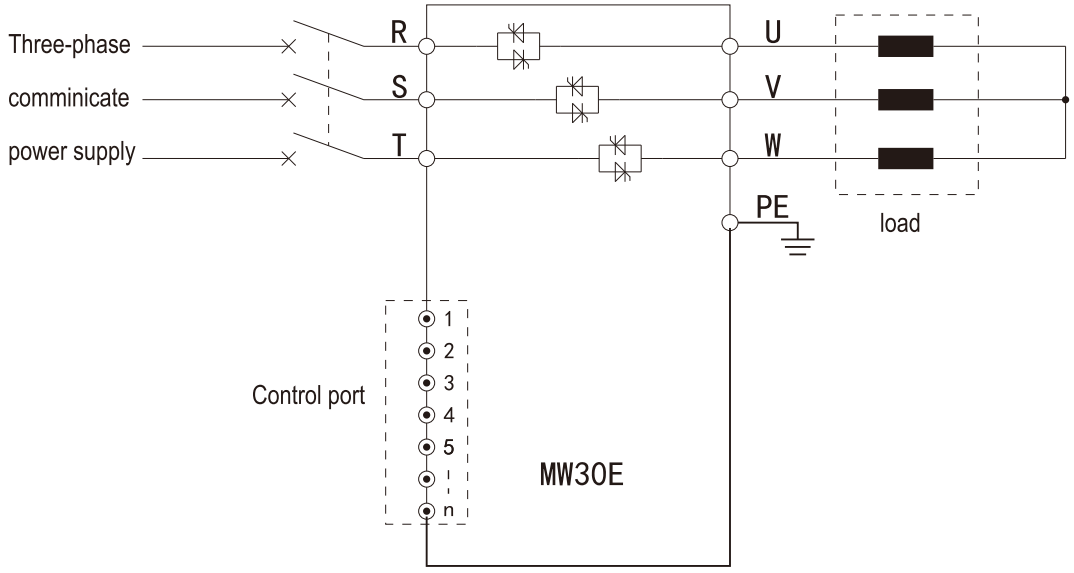
③ Reliably connect the regulator's "PE" terminal to the protective earth.

④ Use multi-core shielded cable to connect the regulator signal port. When wiring, it should be perpendicular to lines with strong interference.

⑤ If the load on the controller's output contacts is inductive, a surge suppression circuit should be connected across the load.

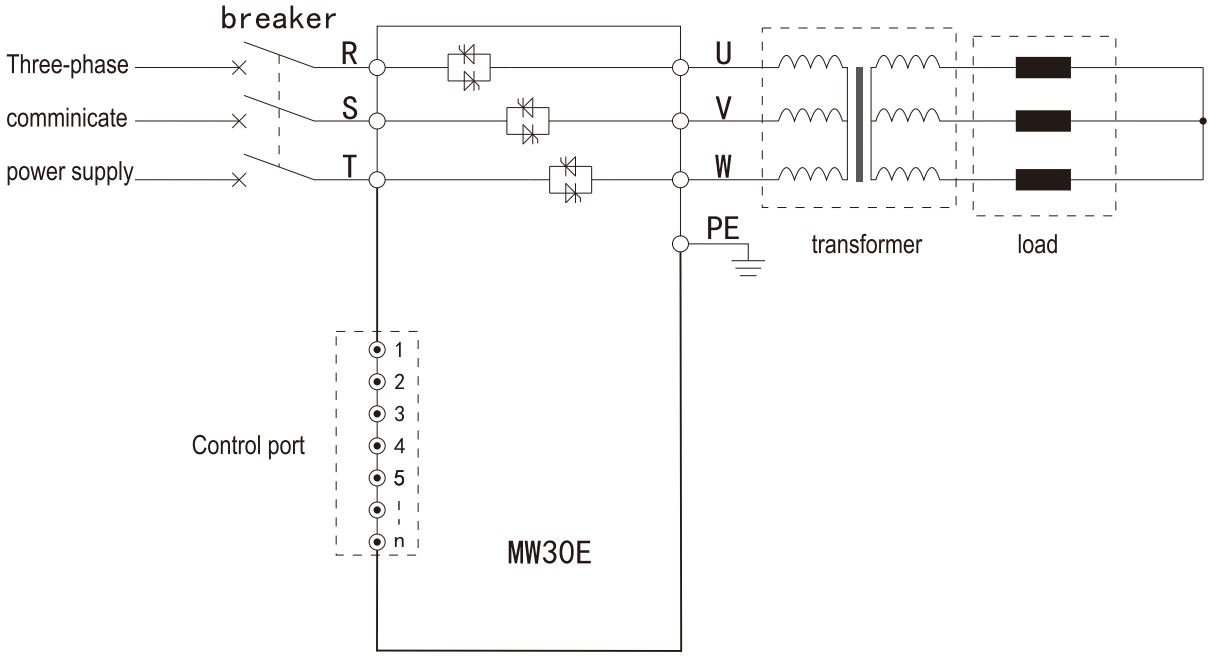
3.5 Application Examples

① Main circuit wiring example 1



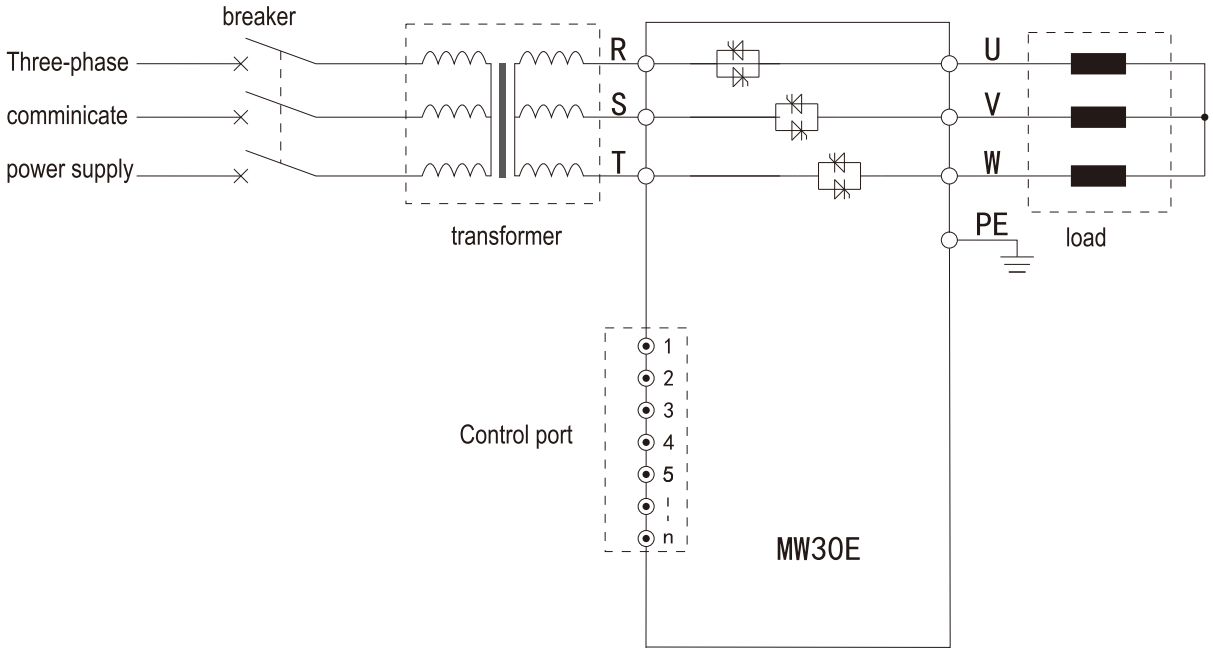
Wiring diagram for main circuit resistive load

② Main Circuit Wiring Example 2



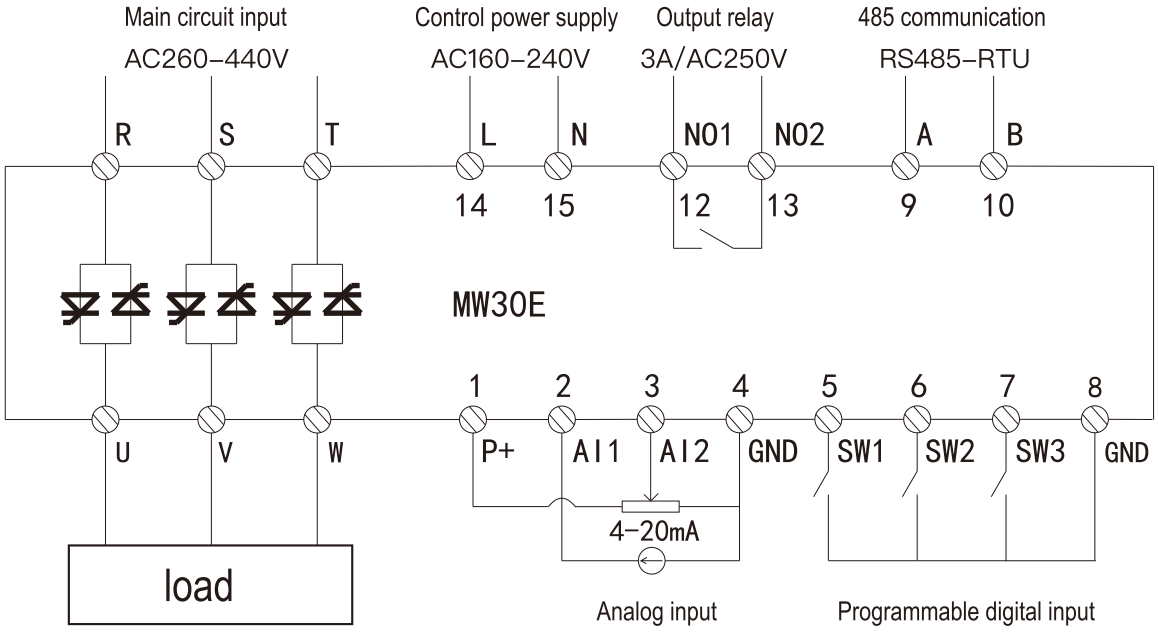
Transformer primary-side control wiring diagram

③ Main Circuit Wiring Example 3



Transformer Secondary-Side Control Wiring Diagram

④ Control wiring example (for wiring of extended functions, refer to Chapter 8, "Extended Functions")



Note:

① SW1 defaults to the start/stop signal.

② SW2 toggles between AI1 and AI2 signals by default; the AI2 signal is active when the switch is closed, and the AI1 signal is active when it is open.

③ SW3 is a programmable input; refer to F-046 for details on its function.

④ AI2 is a 0–5V/0–10V input interface.

3.6 Wiring Precautions:

- Ensure that the polarity of the input cables matches the requirements during connection.
- Shielded cables should be used for the control board signal connections.

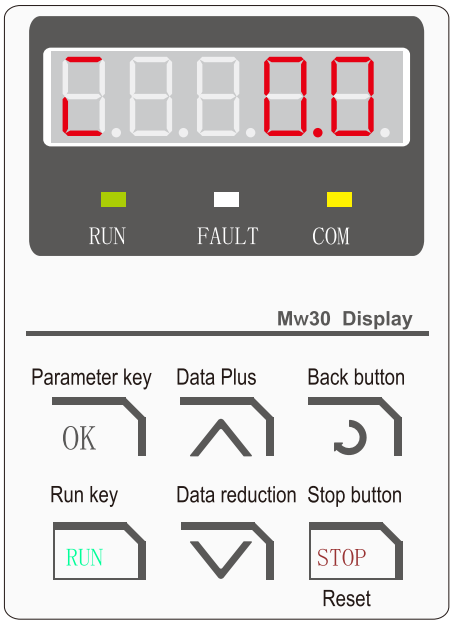
- Relay contact specifications: AC 250V/3A, DC 24V/5A.
- This controller supports Modbus-RTU communication and connects via a standard RS-485 interface.
- Termination resistors (120Ω ±5%, ≥1/2W) must be connected to both ends of the communication line.
- Do not directly short-circuit the communication ports; doing so may damage the regulator.

3.7 Port Description

Terminal number	Function	Functional Description
Main circuit terminals		
R/S/T	Main circuit input	MW30E—□□□ AC260V–440V 40–65Hz
		MW30E—□□□ /X >AC440V 40–65Hz
		MW30E—□□□ /N <AC260V 40–65Hz
U/V/W	Main circuit output	Connect the load
⏚	Protected area	Reliable grounding is required.

4 operate

4.1 Control panel

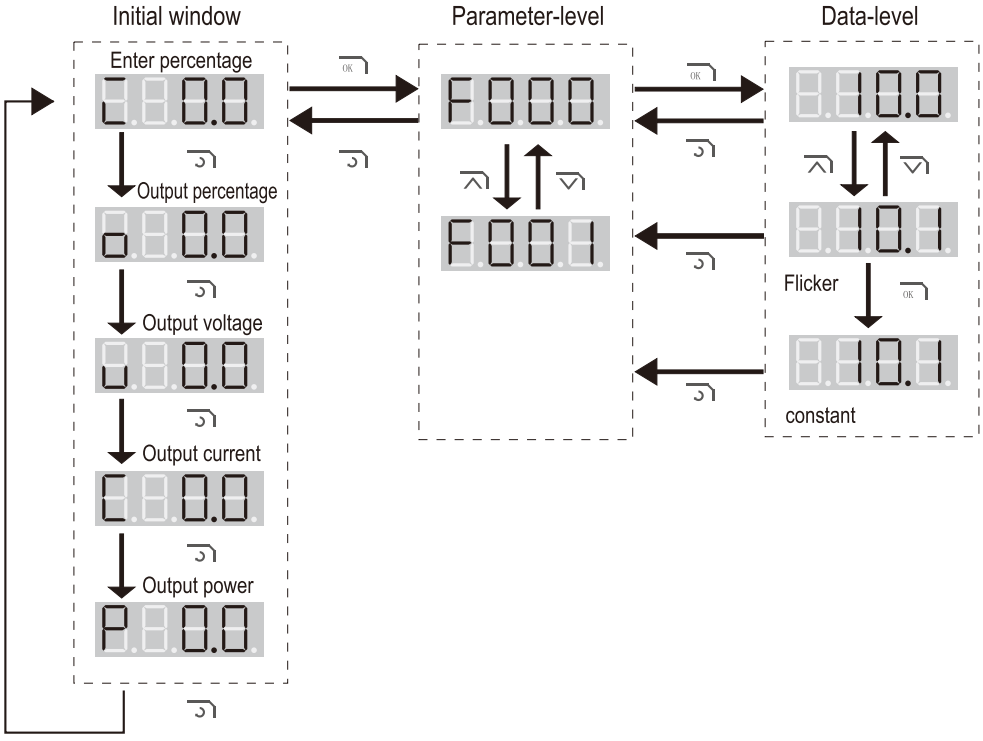


Operation indicator: Lights up when the controller is in operation.

Fault indicator light: Illuminates when the regulator is in a fault state.

Communication indicator: Modbus RTU or Profibus DP
Flashes during normal communication

4.2 Button Operations



Notice:

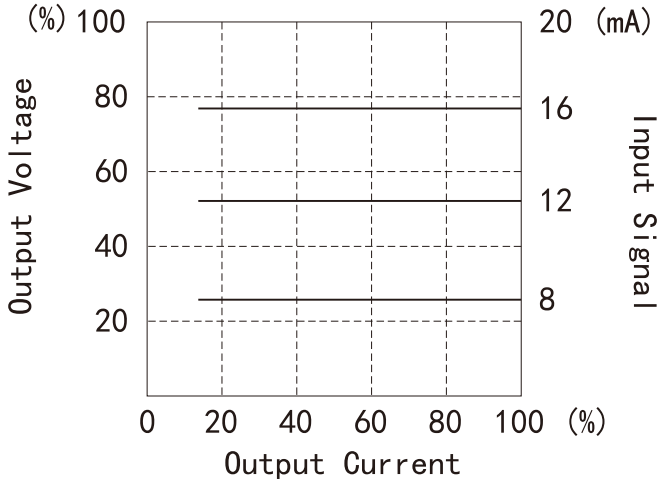
- During normal display, the digital tube is in a non-flashing state, indicating that the data has not been modified or saved.
- If you press the Back button without saving after modifying the data, the changes will be discarded.
- If the display is in the parameter setting window and no operation is performed for 15 seconds, it will automatically return to the basic display state. Any parameters that were modified but not saved will be discarded.
- When the controller issues an alarm, pressing the Stop key resets the fault.

5 Functions

5.1 Function introduction

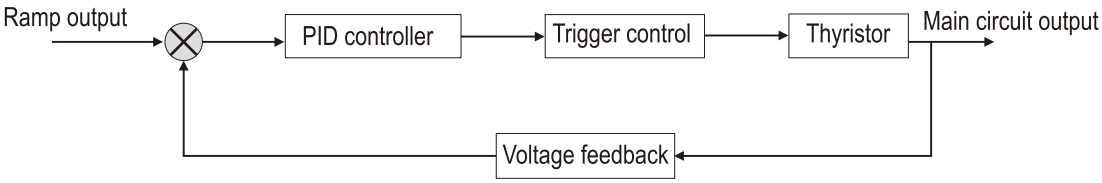
① Constant voltage control

- Control mode settings: F-020=0, F-023=0
- A control method that maintains the output voltage at a constant setpoint. When grid voltage fluctuates or load impedance changes, the regulator performs adjustments based on PID control logic. It is suitable for inductive, resistive, and capacitive loads.



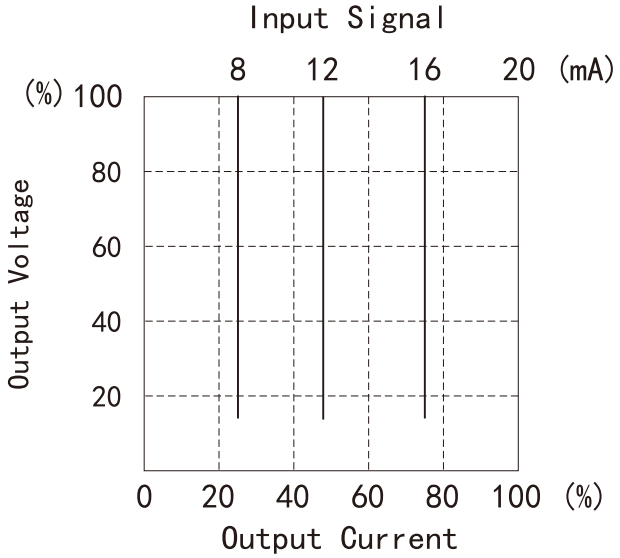
Constant-voltage output characteristic curve

- Constant-voltage logic control block diagram



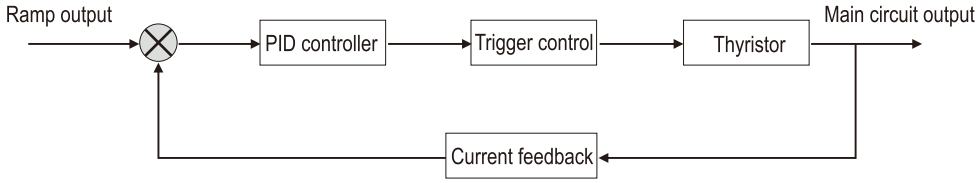
② Constant-current control

- Control mode settings: F-020=1, F-023=0
- A control method that maintains the output current at a constant setpoint. When grid voltage fluctuates or load impedance changes, the regulator performs adjustments based on PID control logic. It is suitable for inductive, resistive, and capacitive loads.



Constant-current output characteristic curve

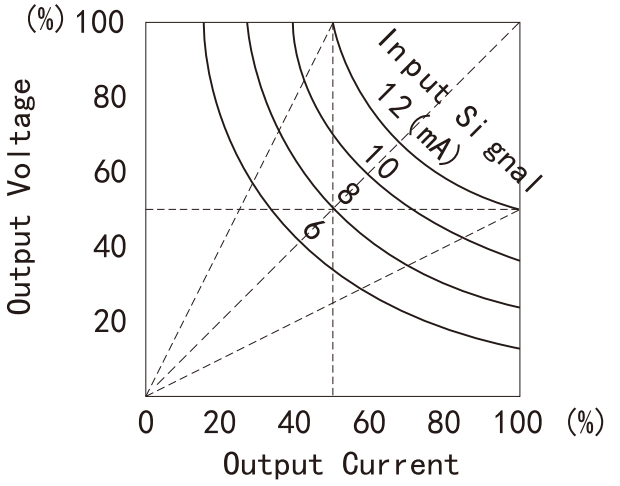
● Constant-current logic control block diagram



③ Constant power control

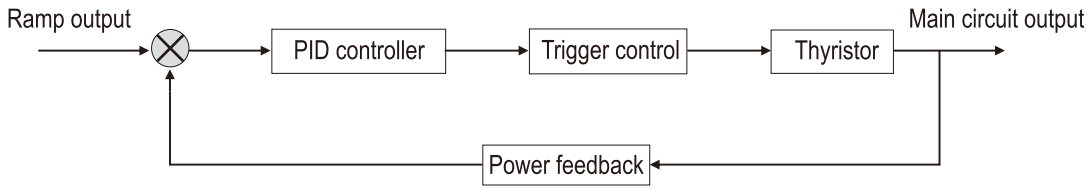
● Control mode settings: F-020=2, F-023=0

● A control method that maintains the power output at a constant setpoint. When grid voltage fluctuates or load impedance changes, the regulator performs adjustments based on PID control logic. It is suitable for inductive, resistive, and capacitive loads.



Constant Power Output Characteristic Curve

● Constant-power logic control block diagram

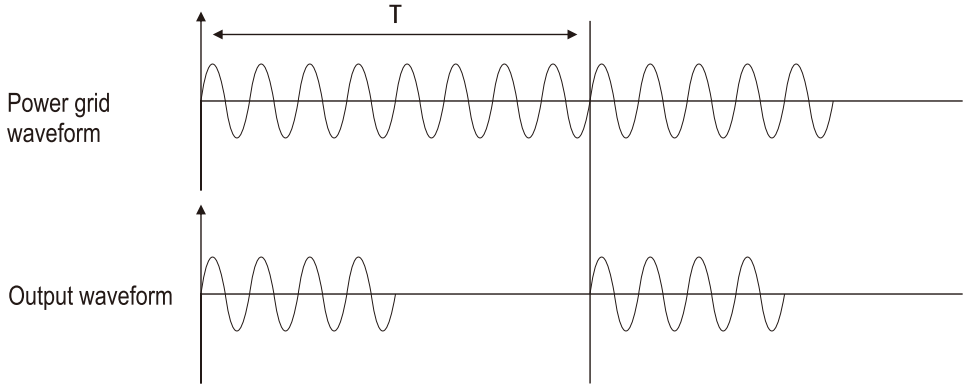


④ Zero-crossing power control

● Control mode setting: F-023=2

● A control method that causes no harmonic pollution to the power grid. It determines the number of cycles—out of a 100-cycle period—during which the thyristor conducts based on the input value; it is suitable for resistive and inductive loads.

● Diagram of zero-crossing power control output waveform (50% setpoint)

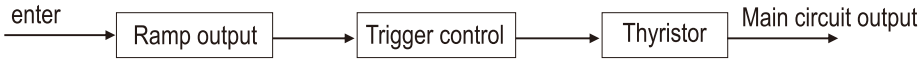


⑤ Open-loop control

● Control mode setting: F-023=1

● A control method that directly uses the input value to regulate the firing angle of the thyristor. Voltage or current cannot be maintained at a constant level when grid voltage fluctuates or load impedance changes. Suitable for inductive, resistive, and capacitive loads.

● Constant-current logic control block diagram



⑥ CM Model

● Control mode setting: F-023=3

● This control mode is specifically designed for variable loads such as silicon carbide (SiC) and molybdenum disilicide (MoSi2) heating elements; these loads exhibit negative resistance characteristics below a certain temperature inflection point and positive resistance characteristics above it. This mode leverages these characteristics to minimize the impact on the power grid and the load itself during the heating-up phase by employing phase-angle control. Once the operating temperature is reached, the system switches to zero-crossing triggering mode to reduce harmonic pollution. The switching method is determined by parameter F32: if "time-based switching" is selected, the duration is set via F34 (with timing commencing upon the start of operation); if "digital input switching" (F32=1) is selected, the switch is controlled via the external digital input SW3 (F46=5).

⑦ Protection functions

● Main circuit power supply monitoring:

When the regulator is in running state, the regulator will conduct real-time detection of the main circuit power supply.

● Overcurrent detection:

When the regulator is in operation, it monitors the load current in real time. If the load current reaches 125% of the rated current, the regulator outputs an alarm signal and ceases output.

● Thyristor Overheat Detection:

When the thyristor temperature exceeds 85°C, the regulator will output an alarm signal and stop outputting.

● Load Disconnection Detection:

When the regulator is in operation, it outputs an alarm signal if the load current falls below the preset threshold for load disconnection. If the load-break shutdown function is enabled, the regulator will cease output.

Note: Refer to the corresponding parameter descriptions for the setting and calculation of the load threshold current value.

⑧ Communication functions

The controller features communication capabilities with industrial PCs, touch screens, PLCs, and other devices.

Note: The communication protocol is the standard Modbus-RTU protocol, supporting standard functions 3, 4, 6, and 16.

5.2 Functional Parameters

Parameter attributes: Attributes describing the operation of menu parameters.

R: Read-only; cannot be modified via the keypad or communication parameters.

R/W: Read/Write; can be modified via the keypad or communication parameters.

Note: All parameter modifications must be performed while the controller is in the stopped state; otherwise, accidents may occur.

Menu Number	Parameter code	Parameter Name	scope	Ex-factory value	property
Initially display menu					
	I	Valid input	0.0–100.0%	–	R
	O	Effective output	0.0–100.0%	–	R
	U	Output voltage	Actual measured value	–	R
	C	Output current	Actual measured value	–	R
	P	Output power	Actual measured value	–	R
Data Display Menu					
1	F–000	Effective output	0.0–100.0%	–	R
2	F–001	Valid input	0.0–100.0%	–	R
3	F–002	Output voltage	Actual measured value	–	R
4	F–003	reserve	–	–	R
5	F–004	Phase A output current	Actual measured value	–	R
6	F–005	Phase B output current	Actual measured value	–	R

Menu Number	Parameter code	Parameter Name	scope	Ex-factory value	property
7	F-006	Phase C output current	Actual measured value	-	R
8	F-007	Output power	Actual measured value	-	R
Control Function Settings Menu					
9	F-008	Start-stop status	0、stop 1、start 2、Fault	0	R
10	F-009	Digital setpoint signal input	0. 0-100.0%	0	R/W
11	F-010	Selection of Start-Stop Control Method	0、External discrete signal 1、panel 2、communication	0	R/W
12	F-011	Selection of given signal type	0、Analog quantity 1、Digital quantity 2、SW3 Control	0	R/W
13	F-012	Analog type	0、AI1 0-20mA/AI2 0-5V 1、AI1 4-20mA/AI2 0-5V 2、AI1 4-20mA/AI2 0-5V Composite slope 3、AI1 4-20mA/AI2 0-10V Composite slope 4、AI1 0-20mA/AI2 0-10V 5、AI1 4-20mA/AI2 0-10V 6、AI1 4-20mA/AI2 1-5V	1	R/W
14	F-013	Ramp-up time	0-120S	2	R/W
15	F-014	Ramp-down time	0-120S	2	R/W
16	F-015	Given upper limit	0-100%	100	R/W
17	F-016	Given lower limit	0-100%	0	R/W
18	F-017	Proportionality coefficient	0-200	80	R/W
19	F-018	Point coefficient	0-200	2	R/W
20	F-019	differential coefficient	0-200	0	R/W
21	F-020	Source of the feedback signal	0、Voltage 1、Electric current 2、power / /	0	R/W
22	F-021	Limit signal source	0、Voltage 1、Electric current	0	R/W
23	F-022	Limit percentage	0-100. 0%	100	R/W
24	F-023	Control method	0、Phase-shifting closed-loop control 1、Phase-shifted open-loop 2、Zero-crossing triggering 3、CM Model	0	R/W

Menu Number	Parameter code	Parameter Name	scope	Ex-factory value	property
25	F-024	Load characteristics	0: Resistive 1: Inductive	1	R/W
26	F-025	Phase shift angle correction	2000-10000	4300	R/W
27	F-026	Zero-crossing type	0: Fixed cycle 1 Variable period	-	R/W
28	F-027	AI1 High-End Calibration	50-150%	1000	R/W
29	F-028	AI1 Low-End Calibration	50-150%	206	R/W
30	F-029	AI2 High-End Calibration	50-150%	100	R/W
32	F-031	Zero-crossing cycle time	0:2S 1:4S 2:8S	0	R/W
33	F-032	CM mode control source	0:time 1:switch quantity	-	R/W
34	F-034	CM switching time	0-6000(minute)	120	R/W
Communication Settings					
36	F-035	Device Address	1-247	2	R/W
37	F-036	Baud rate	0、2400 1、4800 2、9600 3、19200 4、38400 5、56000	2	R/W
38	F-037	Data format	0、8n2 1、8e1 2、8o1 3、8n1	1	R/W
Analog output					
39	F-038	Programmable Analog Output 1	0、none 1、Enter percentage 2、Output percentage 3、Voltage 4、Phase A current 5、Phase B current 6、Phase C current 7、Output power	1	R/W
40	F-039	Programmable Analog Output 2		0	R/W
41	F-040	Programmable Analog Output 3		0	R/W
42	F-041	Programmable Analog Output 4		0	R/W
43	F-042	Analog Output 1 Type	0：0-20mA 1：4-20mA	1	R/W
44	F-043	Analog Output 2 Type		1	R/W
45	F-044	Analog Output Type 3		1	R/W
46	F-045	Analog Output Type 4		1	R/W

Menu Number	Parameter code	Parameter Name	scope	Ex-factory value	property
Programmable module					
47	F-046	Programmable port Sw3	0:none 1:Operation Enable 2:Fault Reset 3:External fault input 4: Emergency Stop 5: CM Switch 6: Phase C output stopped	0	R/W
49	F-048	Programmable relay	0、Fault output 1、Execution output	0	R/W
Fault Alarm Settings					
50	F-049	Previous malfunction	0-100	0	R/W
51	F-050	Overcurrent protection enabled	0、prohibit 1、allow 2、Auto-recovery	1	R/W
52	F-051	Phase loss protection enabled	0、prohibit 1、allow	1	R/W
53	F-052	Load protection enabled	0、prohibit 1、allow 2、Alarm and shutdown	1	R/W
54	F-053	Load imbalance threshold	10-70%	70	R/W
55	F-054	Thyristor overheat protection	0、prohibit 1、allow	1	R/W
56	F-055	Enable extended functions	0:none 64:Ethernet	-	R/W
Rated parameters					
57	F-056	Rated voltage	0-1000V	380	R/W
58	F-057	Rated current	0-6000A	Nameplate value	R/W
59	F-058	Rated frequency	0、50Hz 1、60Hz 2、Auto-tracking	0	R/W
73 - 76	F-073 - F-076	IP address	192. 168. 1. 0 - 192. 168. 1. X	0	R/W

Note: The parameter number corresponds to the parameter's register address; for example, the register number for Phase A current (F-004) is 4. Since the regulator's register addressing starts at 0, the register number must be incremented by 1 when communicating with a host system that uses 1-based addressing.

5.3 Parameter Description

● Parameter Menu: Show Menu

Window codes F-000 through F-008 display various information while the regulator is operating normally.

F-000	Effective output	scope	0-100%	Factory value	-	property	R

The percentage of effective output when the regulator is operating normally.

F-001	Valid input	scope	0-100%	Factory value	-	property	R

The percentage of the effective setpoint input when the regulator is operating normally.

F-002	Output voltage	scope	Actual measured value	Factory value	-	property	R

The actual output voltage value measured during normal operation of the regulator.

F-004	Phase A output current	scope	Actual measured value	Factory value	-	property	R
F-005	B-phase output current	scope	Actual measured value	Factory value	-	property	R
F-006	C-phase output current	scope	Actual measured value	Factory value	-	property	R

The actual three-phase output current values detected during normal operation of the regulator.

F-007	Output power	scope	Actual measured value	Factory value	-	property	R

The actual output power value detected during normal operation of the regulator.

● Parameter Menu: Control Function Menu

F-008	Controller start/stop status	scope	0、1、2	Factory value	-	property	R

0: Stop, 1: Start, 2: Fault. Note: Writing 2 to this parameter resets the communication fault.

F-009	Given a number input	scope	0-100. 0%	Factory value	0	property	R/W

The regulator's output is controlled via a digital setpoint entered through the internal keypad or a communication interface.

Note: Data written to this function window will not be saved after power loss.

F-010	Start-stop method	scope	0、1、2	Factory value	0	property	R/W

0: External digital control; closing digital input port 1 starts the regulator, while opening it stops the regulator.

1: Panel control—control the start and stop of the controller via the RUN and STOP buttons on the display panel.

2: Communication control—controlling the start and stop of the controller via communication. For example, setting the window code in the function menu...

Set F-008 to 1 to activate the regulator.

F-011	Given signal type	scope	0、1、2	Factory value	0	property	R/W

0: Analog reference method; uses an external current (0–20/4–20 mA) or voltage (0–5/10 V) signal.

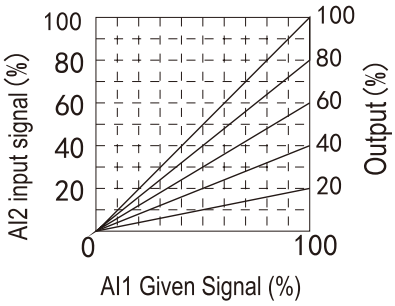
1: Digital setpoint input is provided via the control panel or communication interface.

For example, by setting window code F-011 in the function menu to 1, the controller's setpoint can be controlled via communication or the keypad.

2: SW3 control, using SW3 to control the switching between analog and digital signals.

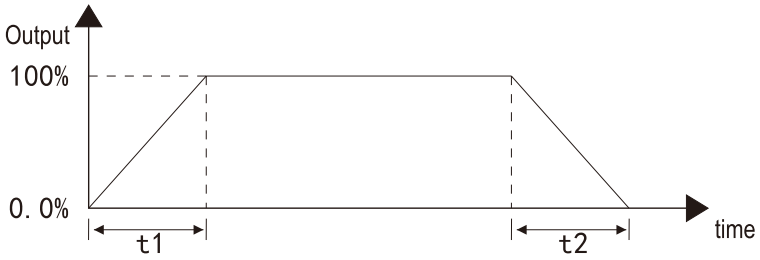
F-012	Analog input type		0-5		1		R/W

0: AI1 0-20mA/AI2 0-5V
1: AI1 4-20mA/AI2 0-5V
2: AI1 4-20mA/AI2 0-5V Overall slope
3: AI1 4-20mA/AI2 0-10V Overall slope
4: AI1 0-20mA/AI2 0-10V
5: AI1 4-20mA/AI2 0-10V
6: AI1 4-20mA/AI2:1-5V



F-013	Slope ascent time	scope	0-120S	Factory value	2	property	R/W
F-014	Slope descent time	scope	0-120S	Factory value	2	property	R/W

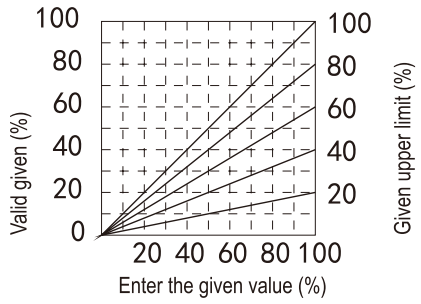
The ramp-up time refers to the time required for the regulator output to rise from 0.0% to 100% (as shown in Figure t1 below);
The ramp descent time refers to the time required for the regulator output to drop from 100% to 0.0% (as shown in Figure t2 below).



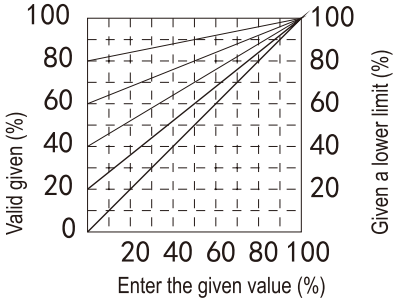
F-15	Given upper limit	scope	0. 0-100%	Factory value	100	property	R/W
F-16	Given a lower bound	scope	0. 0-100%	Factory value	0	property	R/W

Limit the maximum and minimum setpoints of the regulator (see figure below).

upper limit function diagram when the lower limit is 0%.



Functional diagram with upper limit set to 100% and lower limit set.



F-017	proportionality coefficient	scope	0-200	Factory value	80	property	R/W
F-018	Integral coefficient	scope	0-200	Factory value	2	property	R/W
F-019	Differential coefficients	scope	0-200	Factory value	0	property	R/W

A larger proportional gain results in a faster dynamic response, but an excessively large gain can easily cause oscillations. Proportional control alone cannot completely eliminate steady-state error; integral control is added to eliminate it. A larger integral gain results in a faster dynamic response, but an excessively large integral gain can easily cause oscillations. The differential gain multiplied by the error yields the correction value, which has a damping effect.

F-020	Feedback signal source	scope	0、1、2	Factory value	0	property	R/W

0: Voltage 1: Current 2: Power

F-021	Limiter signal source	scope	0、1	Factory value	0	property	R/W

0: Voltage. 1: Current.

F-022	Percentage limit	scope	0-100%	Factory value	0	property	R/W

It functions as an inner-loop limiter. For example, if F-021=1 and F-022=50, and Vi=100%, then under the effect of the limiter, Vo=50%.

F-023	Control Mode	scope	0、1、2	Factory value	0	property	R/W

0: Phase-shifted closed loop.

Phase-shift triggering adjusts the error between the setpoint and the output feedback value according to the PID control law. This parameter is used in conjunction with parameter F-020. It offers three modes: 1. Constant voltage; 2. Constant current; 3. Constant power.

(1): Constant voltage control. F-020=0 F-023=0.

A constant output voltage is maintained, and the error between the given value and the output voltage feedback value is adjusted according to the PID control law to make the output voltage tend to or equal to the given value.

(2): Constant current control. F-020=1 F-023=0.

Constant output current, with the same function as above.

(3): Constant power control. F-020=2 F-023=0.

Constant output power, same function as above.

1: Phase shift open loop. F-023=1

The control signal originates from the ramp output, which directly controls the thyristor firing angle. A 100% ramp output corresponds to full thyristor conduction. In open-loop control, the relationship between the given voltage and the output voltage is non-linear.

2: Zero-crossing trigger. F-023=2

The control signal originates from the ramp output, and a corresponding proportional frequency is continuously output within a period T according to its magnitude.

2:CM mode. F-023=3

CM control mode is a function specifically developed for load characteristics such as silicon carbide rods. See page 14 for function description.

F-025	Triggering start angle correction	scope	2000-10000	Factory value	4300	property	R/W

The firing angle must be corrected in open-loop mode.

F-026	Zero-crossing type	scope	0-1	Factory value	0	property	R/W

0: Fixed period 1: Variable period

F-027	AI1 High-End Correction	scope	50-150%	Factory value	1000	property	R/W

Perform high-end calibration on the 0-20/4-20mA signal input to the analog port AI1 to make the 20mA input 100%.

F-029	AI2 Advanced Correction	scope	50-150%	Factory value	1000	property	R/W

Perform high-side calibration on the 0-5/10V signal input to the analog port AI2 to ensure that the 5/10V corresponds to 100% of the input.

- Parameter Menu: Communication Function Menu

Window codes F-035 to F-037 are for communication function settings. Configure according to the specific communication protocol.

F-035	Mailing address	scope	0-247	Factory value	2	property	R/W

Each regulator has a unique device address.

F-036	baud rate	scope	0、1、2、3、4、5	Factory value	2	property	R/W

0: 2400. 1: 4800. 2: 9600. 3: 19200. 4: 38400. 5: 56000.

F-037	Data format	scope	0、1、2、3	Factory value	1	property	R/W

0: 8 data bits, 2 stop bits, no parity. 1: 8 data bits, 1 stop bit, even parity.

2. 8 data bits, 1 stop bit, odd parity.3. 8 data bits, 1 stop bit, no parity.

● Parameter menu: Analog output menu

F-038	Programmable analog output 1	scope	0-7	Factory value	3	property	R/W
F-039	Programmable analog output 2	scope	0-7	Factory value	4	property	R/W
F-040	Programmable analog output 3	scope	0-7	Factory value	5	property	R/W
F-041	Programmable analog output 4	scope	0-7	Factory value	6	property	R/W

The regulator output value of 0-100% corresponds to a 0-20mA or 4-20mA output.

F-042	Analog output type 1	scope	0、1	Factory value	1	property	R/W

0: 0-20mA. 1: 4-20mA.

F-043	Analog output type 2	scope	0、1	Factory value	1	property	R/W

0: 0-20mA. 1: 4-20mA.

F-044	Analog output type 3	scope	0、1	Factory value	1	property	R/W

0: 0-20mA. 1: 4-20mA.

F-045	Analog output type 4	scope	0、1	Factory value	1	property	R/W

0: 0-20mA. 1: 4-20mA.

F-046	Programmable Port Sw3	scope	0-6	Factory value	0	property	R/W

0: None. 1: Run Enable. 2: Fault Reset. 3: External Fault Input. 4: Emergency Stop.
5: CM switch. 6: C-phase output stopped.

F-048	Programmable relays	scope	0、1	Factory value	0	property	R/W

● Parameter Menu: Protection Function Menu

Window codes F-049 to F-054 are for protection function settings. Changing the parameters in each function setting menu will modify the settings of various protection functions of the regulator to achieve the desired results.

F-049	Previous fault query	scope	0-100	Factory value	0	property	R/W

Query the type of the most recent failure.

F-050	Overcurrent protection allows	scope	0、1、2	Factory value	1	property	R/W

0: Disabled. 1: Allowed. 2. Automatic recovery.

F-051	Input phase loss protection allowed	scope	0、1、2	Factory value	1	property	R/W

0: Disabled. 1: Allowed. 2. Automatic recovery.

F-052	Load protection allows	scope	0、1、2	Factory value	1	property	R/W

0: Disabled. 1: Allowed. 2. Automatic recovery.

F-053	Load imbalance threshold	scope	1-70%	Factory value	70	property	R/W

Sets the load imbalance protection threshold current. This value is a percentage of the rated current.

Input percentage (F-001) * rated current * unbalance protection threshold percentage (F-053) = threshold current

F-054	Thyristor overheat protection allows	scope	0、1	Factory value	1	property	R/W

0: Prohibited. 1: Allowed.

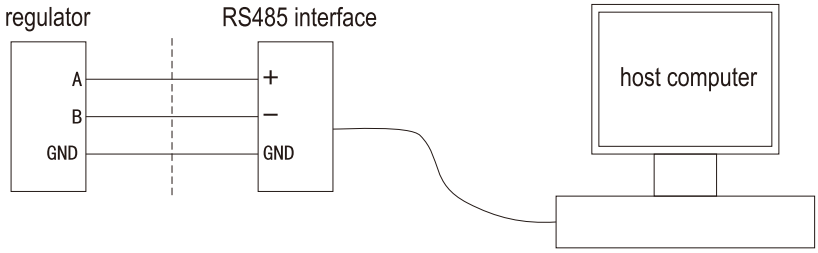
F-056	Rated voltage	scope	0-1000V	Factory value	380	property	R/W
F-057	Rated current	scope	0-6000A	Factory value	Nameplate value	property	R/W
F-058	Rated frequency	scope	0. 50Hz 1. 60Hz 2. Auto	Factory value	0	property	R/W

F-073 – F-076	IP address	scope	192. 168. 1. 0 – 192. 168. 1. x	Factory value	1	property	R/W

6. Communication

6.1 MODBUS Communication Configuration

The MW30E series three-phase thyristor power regulator is equipped with MODBUS communication as standard, enabling communication with industrial PCs, touch screens, and PLCs. The regulator also features a standard RS485 communication interface, using the MODBUS communication protocol in RTU mode, and supports standard functions for versions 3, 4, 6, and 16.



6.2 Communication Data Reading and Writing

The regulator's function menu attributes R/W can be modified via the communication function.

6.3 MODBUS Communication Protocol

When communication is set to RTU mode on a Modbus network, each 8-bit byte packet in the message...

It contains two 4-bit hexadecimal characters.

Code System

- Eight-bit binary

Bits per byte

- 1 start bit
- Eight data bits, with the least significant bit sent first.
- 1 parity bit
- One stop bit (two stop bits if no parity is used)

Error detection domain

- CRC (Cyclic Redundancy Check)

Keywords:

Frame: A set of commands that perform an operation on a possible function, consisting of several bytes, to implement a specific operation.

Device address: The communication address defined by a device when operating on it.

Register address: The address corresponding to a register when performing an operation on a specific register of a device. The address is split into high and low bytes in the frame.

Command words: Operation function codes defined by MODBUS. Each command code represents a specific operation procedure.

Function code 3: Read holding register, which means that multiple consecutive registers can be read in batch.

Function code 4: Read input register, which means that multiple consecutive registers can be read in batch.

Function code 6: Write a single holding register.

Function code 16: Write multiple holding registers, which means that multiple consecutive registers can be written in batches.

▶ RTU message frame format

Device address	Function code	data	CRC check
1 byte	1 byte	N bytes	2 bytes

Data is transmitted in an 8-bit data format and organized in a 16-bit hexadecimal system.

▶ Read holding register

Read command frame format

0	1	2	3	4	5	6	7
Device Address	03H	Parameters Address H	Parameters Address L	length H	length L	CRC L	CRC H

Parameter address: refers to the starting address of the continuously read parameter unit.

Length: refers to the number of consecutive parameter reading units.

Returned command frame format

0	1	2	3	4		13	14
Device Address	03H	byte count	Data 1H	Data 1L	· · · · ·	CRC L	CRC H

Number of bytes: The total number of bytes of data returned.

▶ Read input register

Read command frame format

0	1	2	3	4	5	6	7
Device Address	04H	Parameters Address H	Parameters Address L	length H	length L	CRC L	CRC H

Parameter address: refers to the starting address of the continuously read parameter unit.

Length: refers to the number of consecutive parameter reading units.

Returned command frame format

0	1	2	3	4		13	14
Device Address	04H	byte count	Data 1H	Data 1L	· · · · ·	CRC L	CRC H

Number of bytes: The total number of bytes of data returned.

▶ Write Single Holding Register

Command frame format

0	1	2	3	4	5	6	7
Device Address	06H	Parameters Address H	Parameters Address L	length H	length L	CRC L	CRC H

Returned command frame format

0	1	2	3	4	5	6	7
Device Address	06H	Parameters Address H	Parameters Address L	length H	length L	CRC L	CRC H

Write-hold register

▶ Command frame format

0	1	2	3	4	5	6	7	8		17	18
Device Address	10H	Parameters Address H	Parameters Address L	length H	length L	byte tree	data 1H	data 1L	. . . . .	CRC L	CRC H

Parameter address: refers to the starting address of the consecutive parameter writing unit.

Length: refers to the number of consecutive parameter writing units.

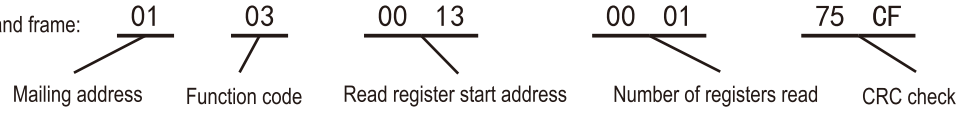
Returned command frame format

0	1	2	3	4	5	6	7
Device Address	10H	Parameters Address H	Parameters Address L	length H	length L	CRC L	CRC H

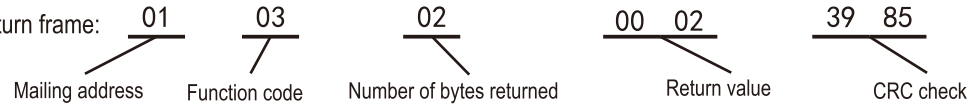
▶ The parameter number of this regulator is the register address.

Example: The device communication address is 1, read the F-18 window parameters (menu number is 19, window parameter value is 2).

Send command frame:



Device return frame:



7 Troubleshooting Guide

7.1 Troubleshooting

The MW30E series three-phase thyristor power regulator features multiple fault protection functions. When a fault occurs, the regulator will automatically activate its protection mechanism and display the corresponding fault code in the display window. Users can determine the scope of the fault based on the displayed fault code and take appropriate countermeasures.

If the display window does not show anything, please check whether the connection between the display window and the control board is correct and reliable, and whether the power supply to the control board is normal.

The fault codes and their solutions are shown in the table below:

Fault phenomenon	Fault Name	Causes and solutions for the malfunction
No display	—	1. Check the control power supply 2. Check the connection between the control panel and the display window.
Uncontrollable output	—	1. Check parameter settings
Unstable output	—	Check PID parameter settings
E--02	Unstable output	1. Check the main circuit power supply 2. Inspect the thyristor
E--03	Overcurrent fault	Overload or short circuit
E--04	Load disconnection fault	1. Check the load disconnection threshold setting. 2. Check if the load is disconnected.
E--05	Thyristor overheating fault	1. Is the load current too high? 2. Are the cooling fan and air ducts functioning properly? 3. Is the ambient temperature too high?
E--21	External fault input	1. Is the load current too high?

7.2 Maintenance and upkeep

The regulator may malfunction due to factors such as temperature, humidity, dust, vibration, and the aging of internal components. Therefore, routine and periodic maintenance is necessary. Depending on the operating environment, users should perform regular inspections every 3-6 months to extend the regulator's lifespan.

The inspection contents are as follows:

① Check whether the main circuit terminals are reliably connected and whether there are any signs of overheating on the copper busbars.

② Dust on circuit boards, air ducts, and cooling fans must be thoroughly cleaned.

③ Check if the control terminal screws are reliably connected.

④ Check the insulation of the regulator and connecting lines to ensure it is in good condition.

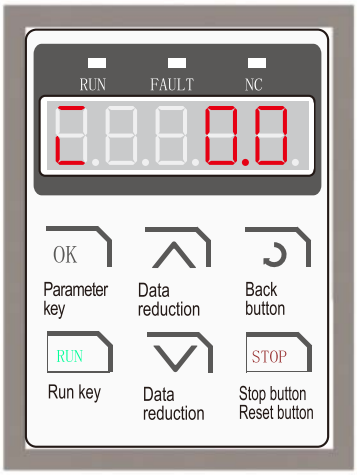
⑤ If the regulator is not used for a long period of time, it should be powered on and run once every 3 months.

⑥ The storage location for the regulator should avoid high temperature, humidity, and areas containing dust and metal dust.

8 Extended Functionality

8.1 Displaying external references

Extending the display panel externally facilitates parameter viewing and setting, as well as real-time data observation. It allows for easy monitoring of the latest status, such as real-time current, voltage, and power data. The external network cable should not exceed 4 meters and must comply with structured cabling specifications. The image below shows the external display panel layout.



For button functions, please refer to Chapter 4, Panel Operation.

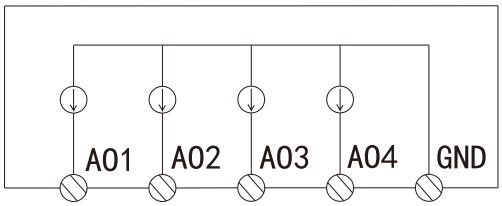
External panel dimensions: 69mm*92mm

External panel opening size: 64mm*87mm

8.2 Analog Output

Supports 4-channel analog output (4-20mA/0-20mA); other signal types (0-10V) require special customization. Supports the transmission of input percentage, output percentage, output voltage, A-phase current, B-phase current, C-phase current, and output power. Relevant parameters are listed in F-038 to F-045. The following diagram shows the wiring for analog output.

picture:



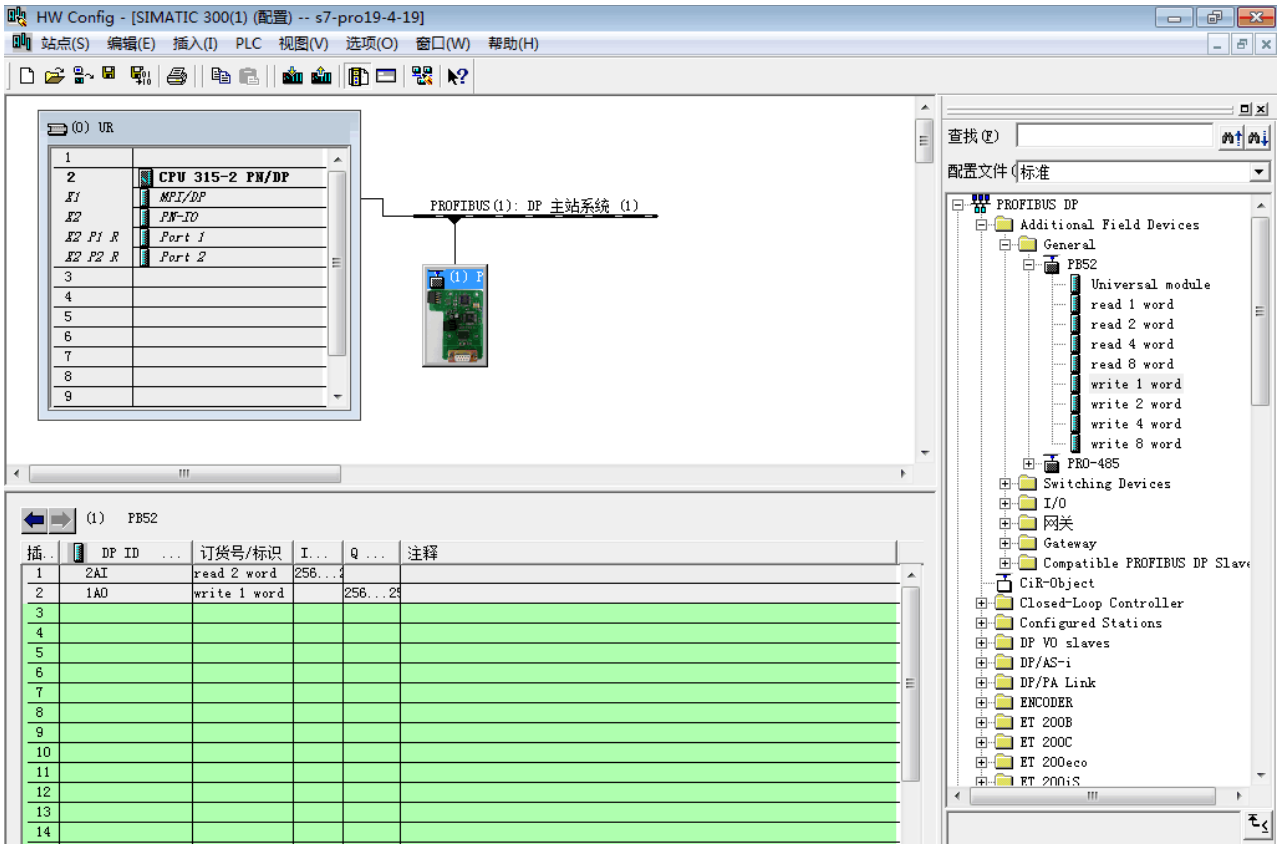
A01	Analog output 1
A02	Analog output 2
A03	Analog output 3
A04	Analog output 4
GND	Analog output common terminal

8.3 Profibus DP

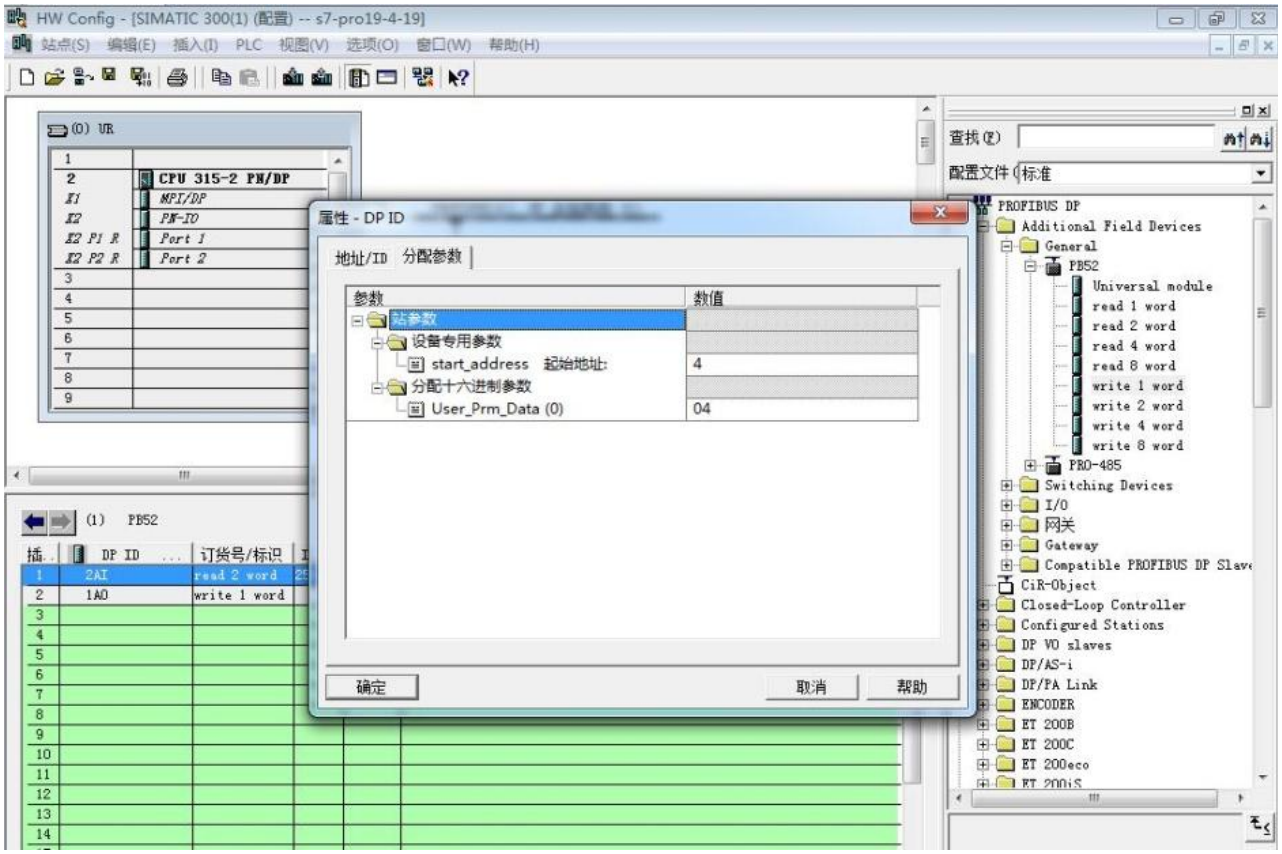
It uses the standard Profibus DP communication protocol, supporting a maximum baud rate of 12 Mbps and adaptive baud rate. It supports 20 slots, sufficient for reading and writing device parameters. The device address is set in F-035. When communication is normal, the COM indicator light on the display panel will flash.

The following is a configuration example.

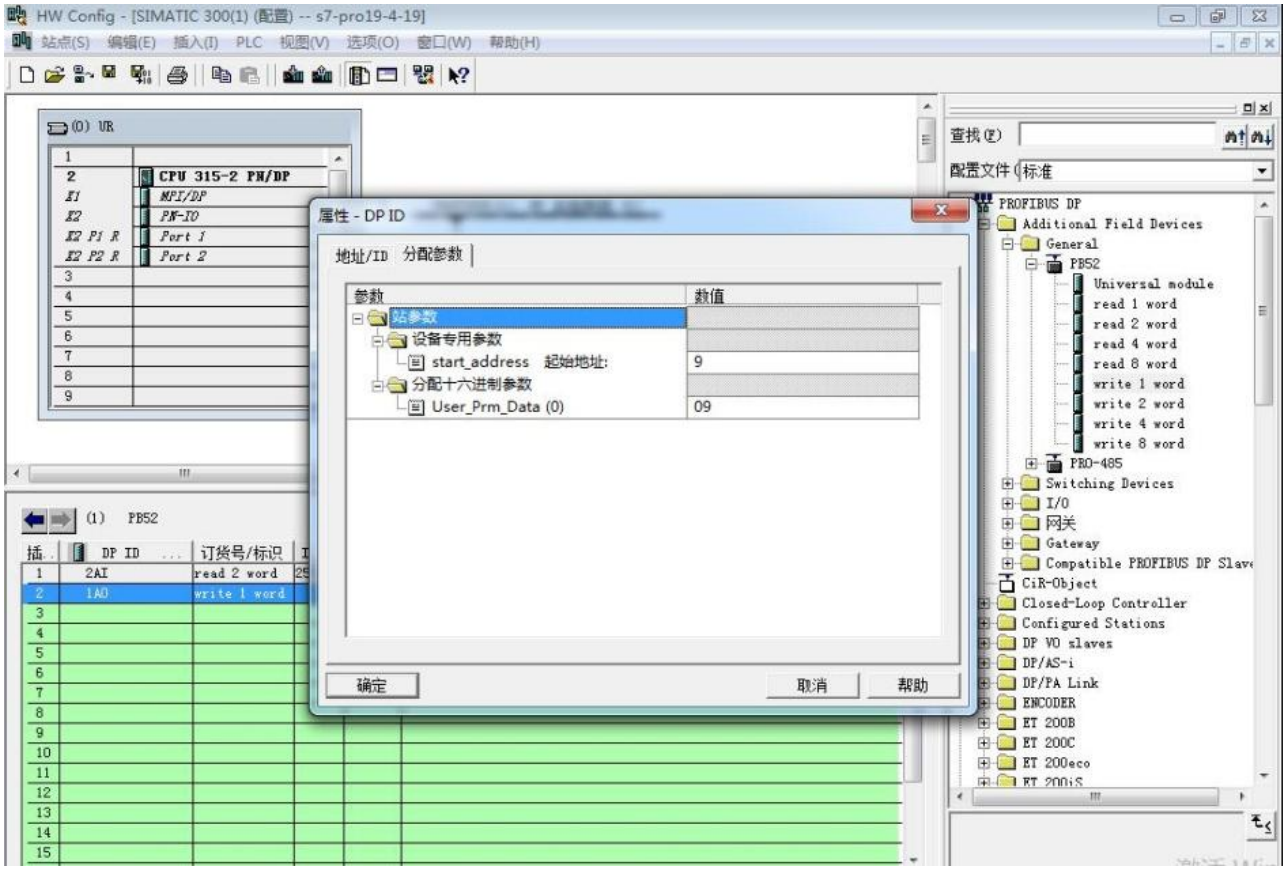
8.3.1 Insert "read 2 word" into slot 1 and "write 1 word" into slot 2.



8.3.2 Insert "read 2 word" into slot 1, fill in the starting address of the register, and read 2 parameters consecutively.



8.3.3 Insert “write 1 word” into slot 2, fill in the starting address of the register, and write a parameter.



8.3.4 The following table shows the correspondence between parameter numbers and register numbers. Register read/write attributes are shown in the parameter table:

Parameter number	Register number	Parameter number	Register number	Parameter number	Register number
F-000	0	F-004	4	F-008	8
F-001	1	F-005	5	F-009	9
F-002	2	F-006	6	F-0. .	. .
F-003	3	F-007	7	F-058	58

8.4 Second Relay Function

8.4.1 The second function relay is the operation output by default, with terminal numbers NO3 and No4.

8.5 Online Power Allocation

8.5.1 Function Introduction

Zero-crossing triggering offers significant advantages, including reduced harmonics and a power factor close to 1. It effectively lowers the cost of harmonic handling and power compensation, and avoids the harmful effects of harmonics on other network devices. Where application permits, this triggering method should be the preferred choice. However, in situations with a large number of devices without synchronized online power distribution, this method may result in the worst-case scenario shown in Figure 8-5-1.

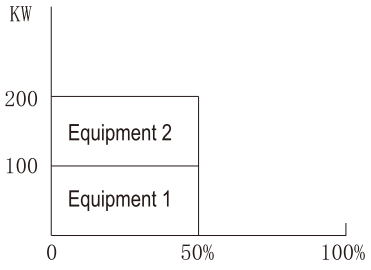


Figure 8-5-1
The worst-case scenario without synchronized online power distribution

In this situation, the activation of the two devices overlaps, causing a discontinuity in the current on the busbar. This could potentially affect other equipment.

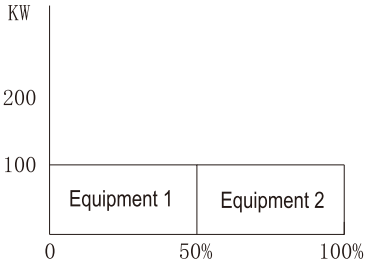


Figure 8-5-2
After using synchronous online power distribution

Synchronous power distribution can ensure the continuity of bus current to the greatest extent and improve the situation of bus current overlap.

8.5.2 Power Distribution Method

1. Power Distribution

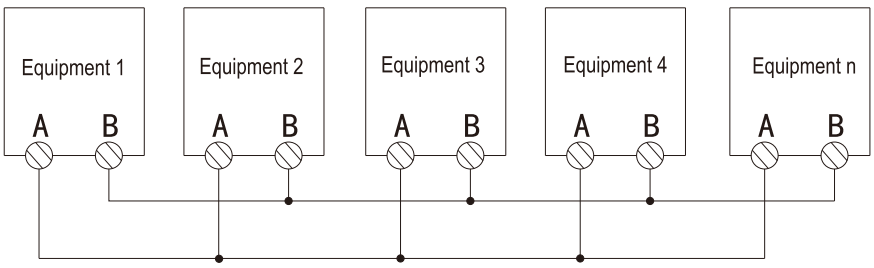
Power allocation refers to calculating the actual power of connected devices at the initial stage of operation and then allocating power reasonably based on the actual power.

2. Time allocation

The time allocation method refers to the reasonable allocation of the on-time of connected devices based on the number of devices configured for online power allocation.

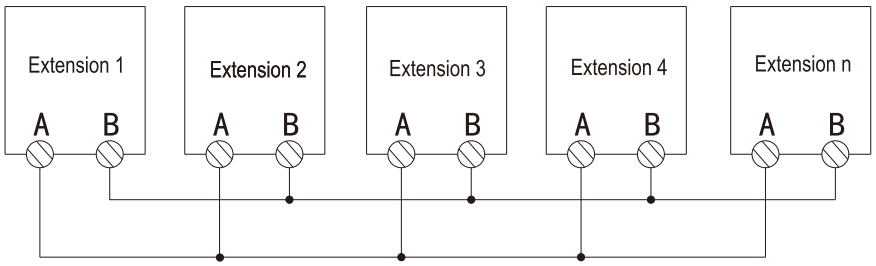
8.5.3 Synchronous Bus Connection

1. Standard product wiring example



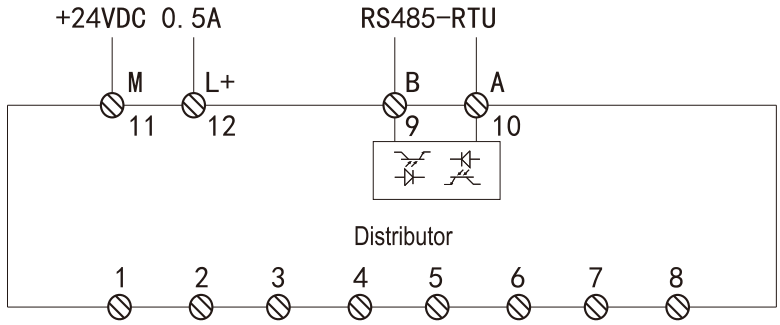
Note: The online power distribution bus uses the RS485 interface for communication between devices, occupying the RS485 interface. Therefore, if this interface is used to communicate with the host computer, the online power distribution function cannot be used. In this case, you can choose to expand the RS485 for online power distribution, using the expansion board port for connection, or use an online power distributor for power distribution.

2. Example of extending 485 interface connection



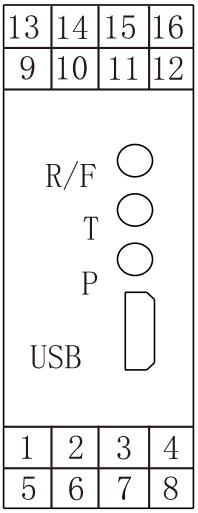
3. Online power divider connection example

①Distributor Terminal Description



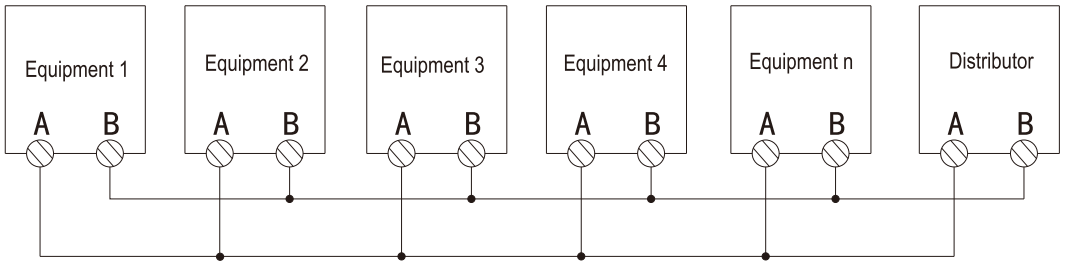
◆	1：null	◆	9：RS485-RTU-
◆	2：null	◆	10：RS485-RTU+
◆	3：null	◆	11：Common power supply terminal
◆	4：null	◆	12：Power supply +24VDC 0.5A
◆	5：null	◆	13：null
◆	6：null	◆	14：null
◆	7：null	◆	15：null
◆	8：null	◆	16：null

② Distributor indicator light description



R/F: Receive indicator light. Flashing indicates that a data frame sent by the host computer has been received.
T: Send indicator light. Flashing indicates that a data frame is being sent to the host computer.
P: Power indicator light.
USB: Alternate.

②Distributor Connection Instructions



Note: ◆ The distributor connection occupies the device's RS485 communication interface. If communication is required, an RS485 expansion board needs to be added.

◆ Online power distribution via a splitter only supports power distribution mode.

4. Description of Online Power Allocation Parameters

	Parameter number	illustrate
Total number of power distribution devices	F-081	Number of devices requiring power sharing in the same network
Power distribution device address	F-080	The address for a single device needs to be set starting from 1.

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