



Modular Multi Channel Power Controller

SPRS Series

PRODUCT MANUAL

For your safety, read and follow the considerations written in the instruction manual, other manuals and Autonics website.

The specifications, dimensions, etc. are subject to change without notice for product improvement. Some models may be discontinued without notice.

Safety Considerations

- Observe all 'Safety Considerations' for safe and proper operation to avoid hazards.
- ⚠ symbol indicates caution due to special circumstances in which hazards may occur.

⚠ Warning Failure to follow instructions may result in serious injury or death.

- 01. Fail-safe device must be installed when using the unit with machinery that may cause serious injury or substantial economic loss.**(e.g. nuclear power control, medical equipment, ships, vehicles, railways, aircraft, combustion apparatus, safety equipment, crime / disaster prevention devices, etc.)
Failure to follow this instruction may result in personal injury, economic loss or fire.
- 02. Do not use or store the unit in the place where flammable / explosive / corrosive gas, high humidity, direct sunlight, radiant heat, vibration, impact or salinity may be present.**
Failure to follow this instruction may result in explosion or fire.
- 03. Install the device in panel, and ground to the bolt for grounding separately.**
Failure to follow this instruction may result in fire or electric shock.
- 04. Be sure to install, set, and combine the product with a mechanical control system by a qualified user operator.**
When a non-user operator installs, sets, and combines the product with a mechanical control system, the product does not work as intended, resulting in personal injury, economic loss or fire.
- 05. When installing or moving the product and changing the position of the power module, hold the body to move it. Do not hold the input power terminal block or the transparent terminal block protection cover (transparent).**
Separation of the terminal block or cover from the body may result in product damage or personal injury due to falling.
- 06. Do not connect, repair, or inspect the unit while connected to a power source.**
Failure to follow this instruction may result in fire or electric shock.
- 07. Check 'Connections' before wiring.**
Failure to follow this instruction may result in fire.
- 08. Inspect the product daily and regularly every 12 months.**
Failure to follow this instruction may result in personal injury, economic loss or fire with product malfunction.
- 09. Do not disassemble or modify the unit.**
Failure to follow this instruction may result in fire or electric shock.

⚠ Caution Failure to follow instructions may result in injury or product damage.

- 01. Use the unit within the rated specifications.**
Failure to follow this instruction may result in fire or product damage.
- 02. Use a dry cloth to clean the unit, and do not use water or organic solvent.**
Failure to follow this instruction may result in fire or electric shock.
- 03. Keep the product away from metal chip, dust, and wire residue which flow into the unit.**
Failure to follow this instruction may result in fire or product damage.
- 04. Since leakage current still flows right after turning off the power or in the output OFF status, do not touch the load terminal.**
Failure to follow this instruction may result in electric shock.
- 05. Be careful not to injure the edges of the heat sink.**

Cautions during Use

- Follow instructions in 'Cautions during Use'. Otherwise, it may cause unexpected accidents.
- Power supply should be insulated and limited voltage / current or Class 2, SELV power supply device.
- Use the product, after 3 sec of supplying power.
- Before use, set the mode and function according to the specification. Since changing the mode / parameter during operation may result in malfunction, set the mode and function after disconnecting load output.
- Set the operating channel of the control setting mode parameters to match the actual wiring. It may result in malfunction. Refer to the product manual for wiring instructions.
- Re-supply the power to the unit after 3 sec of turning off the power. Failure to follow this instruction may result in malfunction.

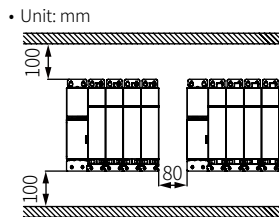
- To ensure the reliability of the product, install the product on the panel or metal surface vertically to the ground.
- When installing the power module, use the terminal block protection cover (transparent).
- When installing the front cover of the power module, fit it toward the rear of the product in accordance with installation groove the angle of 30°.
- Do not apply excessive force to open the front cover of the power module, the cover may be detached and fall off.
- Install the unit in the well ventilated place.
- While supplying power to the load or right after turning off the power of the load, do not touch the product body and heat sink. Failure to follow this instruction may result in a burn due to the high temperature.
- Use twisted pair wire for communication line.
- RS485 communication cannot be used at the same time as other communications.
- Since inter element can be damaged when using with coil load, inductive load, etc., the inrush current must be under the rated load current.
- To prevent product malfunction due to noise, wire power, control input, communication, and load cables separately.
- When installing close to the load line, use a line filter for the power line and use a shield wire.
- For stable operation, use shield wire for control, alarm, and communication wires. Use a ferrite core on the shield wire to cope with EMC.
- Do not use near the equipment which generates strong magnetic force or high frequency noise.
- If environments such as ambient temperature or installation specifications are not satisfied, lower the load rate for use.
- The ambient temperature is -10°C to 40°C. Install a cooling system to ensure that the internal panel temperature does not exceed 40°C. If the ambient temperature unavoidably exceeds 40°C, reduce the load current.
- The power modules with different rated currents can be combined and connected. Connect the power modules to the right of the control module in ascending order of current capacity. Failure to follow this instruction may result in malfunction.
- LCD performance may vary depending on the usage environment. Check the environmental conditions, and do not install the device in places where direct sunlight or high temperatures may be present.
- This unit may be used in the following environments.
 - Indoors (in the environment condition rated in 'Specifications')
 - Altitude max. 2,000 m
 - Pollution degree 2
 - Installation category III

Cautions during Installation


High Temperature Caution
 While supplying power to the load or right after turning off the power of the load, do not touch the body and heat sink. Failure to follow this instruction may result in a burn due to the high temperature.

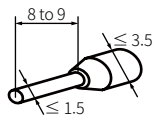
When installing multiple the power controller, keep space for heat radiation.

- Width / Length: ≥ 100 mm
- Separation distance between sets: ≥ 80 mm
- Up to 9 sets of connectivity (power distribution control)



Cautions during Wiring

Ferrule terminal



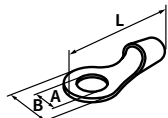
- Unit: mm, Cable specification: AWG 24 - 16
- Applicable connector terminal

Control module	Power connector Control signal / Comm. connector Alarm output connector [CC-Link Comm. model] CC-Link connector
Power module	Feedback signal connector FAN power connector, FAN connector terminal

Copper pipe terminal

- Unit: mm, Use copper tube terminal certificated by UL.
- Be sure to use a copper pipe terminal with an insulating sleeves (tubes) that meets a dielectric strength of 600 V or more.

- [Power module] Cable / tightening torque spec. is different depending on the model based on the rated load current. Be sure to check as below.



Rated load current (A)	Copper pipe terminal			Cable (mm ²)	Tightening torque (N m)
	A	B	L		
25 / 40 / 55 / 70	M6 ⁽¹⁾	≤ 13	≥ 40	25	5.6 to 6.0
90 / 110 / 150 / 180	M8	≤ 25	≥ 64	95	13.6 to 14.5
200 / 250 / 350	M12	≤ 40	≥ 92	240	47.0 to 50.0
400 / 500 / 600	M12×2	≤ 35	≥ 78	185×2	47.0 to 50.0

(1) When assembling the M6 terminal bolt (R/U), use a 10 mm 1/4" type hex socket wrench (outer diameter less than 15 mm).

Product Components

- Product (+ bracket), Instruction manual
- [Control module] Module connection ribbon cable (2 mm pitch, 24-pin) × 1, Power connector × 1, Control signal / communication connector × 1, Alarm output connector × 1
[CC-Link comm. model] CC-Link connector × 1
- [Power module] Module connection ribbon cable (2 mm pitch, 24-pin) × 1, FAN power connector × 1, Feedback signal connector × 1, Terminal block protection cover × 2

Ordering Information

This is only for reference, the actual product does not support all combinations. For selecting the specified model, follow the Autonics website.

Control Module

SPRS	-	①	-	②
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① Module

CM: Control module

② Communication

R: RS485

EC: RS485 + EtherCAT

EI: RS485 + EtherNet/IP

CL: RS485 + CC-Link

PN: RS485 + PROFINET

Power Module

SPRS	-	①	-	②	③
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① Module

No mark: Power module

② Rated load voltage

F: Free voltage

③ Rated load current

Number: Rated load current (unit: A)

Manual

For proper use of the product, refer to the manuals and be sure to follow the safety considerations in the manuals.

Download the manuals from the Autonics website.

Software

Download the installation file and the manuals from the Autonics website.

DAQMaster

It is the comprehensive device management program for Autonics' products, providing parameter setting, monitoring and data management.

Specifications

Series	SPRS Series
Control phases	Single-phase control, single-phase dual control, 3-phase control (wiring and parameter setting)
Rated load voltage	Free voltage 220 - 490 VAC ~ 50 / 60 Hz
Permissible voltage range	± 10 % of rated load voltage
Load rated frequency	50 / 60 Hz ± 3 Hz (frequency auto identification)
Rated load current	25 / 40 / 55 / 70 / 90 / 110 / 150 / 180 / 200 / 250 / 350 / 400 / 500 / 600 A
Min. load current	1 A
Display method	5 digit 11 segment LCD (white) × 4, Output BAR
Auto control input	Current: DC 4 - 20 mA × 4 ch (input impedance: 100 Ω) Voltage: 0 - 5 / 1 - 5 / 0 - 10 VDC $\Rightarrow$ × 1 ch External adjuster: 10 k Ω Communication: RS485 / EtherCAT / CC-Link / PROFINET / EtherNet/IP
Manual control input	Parameter setting
Digital input (DI)	RUN (short) / STOP (open), MAN (short) / AUTO (open), Alarm reset (short) / Inactivate (open), Not used (4 ch)
Alarm output	8 relay contact output (parameter setting) 250 VAC ~ 2 A / 30 VDC $\Rightarrow$ 3 A 1a resistance load
Comm. output	RS485 / EtherCAT / CC-Link / PROFINET / EtherNet/IP model
Cooling method	Natural cooling ⁽¹⁾ : 25 / 40 A, Forced cooling (with cooling fan): 55 / 70 / 90 / 110 / 150 / 180 / 200 / 250 / 350 / 400 / 500 / 600 A
Certification	CE UK   
SCCR Rating	100 kA (UL certification)

(1) Forced cooling is available by installing FAN separately.

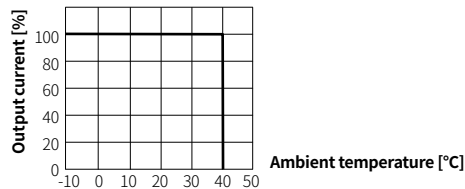
(2) This applies only to control module models (SPRS-CM-□).

Control method	Phase control	Cycle control
Control mode	Normal / Constant current / Constant voltage / Constant power feedback	Fixed cycle / Variable cycle / Power distribution control
Applied load	Resistance load, inductive load	Resistance load
Output range	2 to 98 %	0 to 100 %
Output accuracy	Varies by control mode	
Normal	Within ± 10 % F.S. of rated load voltage	-
Constant current / voltage / power feedback	Within ± 3 % F.S. of rated load current / voltage / power	-

Control module power supply	24 VDC $\Rightarrow$
Permissible voltage range	90 to 110 % of power voltage
Fan power supply	24 VDC $\Rightarrow$
Power consumption	Control module: ≤ 7 W, power module: each ≤ 2 W (FAN power separately)
Insulation resistance	≥ 200 M Ω (500 VDC $\Rightarrow$ megger)
Dielectric strength	Between the charging part and the case: 3,000 VAC ~ 50 / 60 Hz for 1 min
Output leakage current	≤ 10 mA rms
Noise immunity	± 500 V square wave noise (pulse width: 1 μ s) by the noise simulator
Memory retention	≈ 10 years (when using non-volatile semiconductor memory type)
Vibration	0.5 mm double amplitude at frequency of 5 to 55 Hz in each X, Y, Z direction for 2 hours
Vibration (malfunction)	0.5 mm double amplitude at frequency of 5 to 55 Hz in each X, Y, Z direction for 10 min
Ambient temperature	-10 to 40 °C, storage: -20 to 70 °C (no freezing or condensation)
Ambient humidity	35 to 85 %RH, storage: 35 to 85 %RH (no freezing or condensation)

Module	Control module	Power module			
		25 / 40 / 55 / 70 A	90 / 110 / 150 / 180 A	200 / 250 / 350 A	400 / 500 / 600 A
Unit weight (packaged)	0.76 kg (1.26 kg)	2.04 kg (2.62kg)	3.96 kg (4.72kg)	6.10 kg (7.14kg)	13.26 kg (14.82kg)

Derating Curve



Communication Interface

■ Modbus RTU

Comm. protocol	Modbus RTU (16 bit CRC), Modbus ASCII
Application standard	Compliance with EIA RS485
Max. connection	31-unit (address: 1 to 99)
Comm. synchronous method	Asynchronous
Comm. method	2-wire half duplex
Comm. distance	≤ 800 m
Comm. speed	2,400 / 4,800 / 9,600 (default) / 14,400 / 19,200 / 38,400 / 57,600 / 115,200 bps
Comm. response time	0 to 9999 ms (default: 0 ms)
Start bit	-
Data bit	8 bit (fixed)
Parity bit	None (default), Even, Odd
Stop bit	1 bit (default), 2 bit
EEPROM life cycle	≈ 100,000 operations (Erase / Write)

■ EtherCAT

Comm. specifications	EtherCAT
Association approval ⁽¹⁾	EtherCAT
Connection cable	CAT5e class or over (Shield type: SF/FTP, S/FTP, SF/UTP)
Max. comm. distance	Within 100 m distance between nodes
Max. buad rate	10 / 100 Mbps
Topology	Star, Line, Tree

(1) EtherCAT® is registered trademark and patented technology, licensed by Beckhoff Automation GmbH, Germany.

■ CC-Link

Comm. specifications	CC-Link Ver.2.0
Association approval	CC-Link
Station type	Remote Device station
Connection cable	CC-Link Exclusive Cable
Baud rate	156 k, 625 k, 2.5 M, 5 M, 10 M bps
Station number	01 to 64
No. of occupied station	1 station occupied, 2 station occupied
Max. comm. distance	Depending on baud rate

■ PROFINET

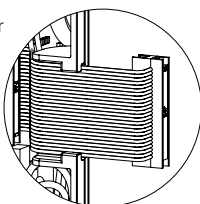
Ethernet standard	100BASE-TX
Association approval	PROFINET
Cable specifications	Cat 5 over STP (Shield Twisted Pair) Ethernet cable
Transmission rate	100 Mbps
Cable length	≤ 100 m
GSDML file	Download the GSDML file from the Autonics website

■ EtherNet/IP

Ethernet standard	100BASE-TX
Association approval	EtherNet/IP
Cable specifications	Cat 5 over STP (Shield Twisted Pair) Ethernet cable
Baud rate	10 / 100 Mbps
Cable length	≤ 100 m
Protocol	EtherNet/IP
Address setting	Parameter
Factory default	IP address: 192.168.1.10 Subnet mask: 255.255.255.0 Gateway address: 192.168.1.1
ESD file	Download the ESD file from the Autonics website

Module Connection

- Up to 4 power modules can be connected and controlled based on 1 control module. Power modules with different rated load current capacities can be used.
- The control module must be installed on the leftmost side.
- When installing multiple modules, connect the concave (凹) of the lower right bracket / the convex (凸) of the lower left bracket.
- For more information about the control module + power modules connectivity, follow the Autonics website.
- Use the module connection ribbon cable to connect between modules.
On power modules, connect the above module connector to the left module and the below module connector to the right module.
- After connecting the module connection ribbon cable, it is possible to close the front cover by organizing the cable according to the inner groove.
- Remove the unused ribbon cable from the last power module before operation. Failure to remove it may result in damage, fire, or malfunction.
- An error in the module connection may result in a module connection error alarm.



Dimensions

- **Control Module**

-
- Technical drawing of the 19-inch rack-mountable device, showing front, top, and side views with dimensions in millimeters.
- Front View Dimensions:**
- Total height: 239
 - Mounting bracket height: 8
 - Mounting hole spacing (center-to-center): 60
 - Mounting hole diameter: 4-Ø 5.4
 - Mounting hole offset from top: 22.5
 - Top panel width: 54.5
 - Top panel offset from center: 35
 - Top panel thickness: 25
 - Device height (excluding mounting bracket): 200
 - Device height (excluding mounting bracket and top panel): 110
 - Device height (excluding mounting bracket, top panel, and bottom panel): 2
 - Bottom panel width: 34
 - Bottom panel offset from center: 30
 - Bottom panel thickness: 60
- Top View Dimensions:**
- Total width: 200
- Side View Dimensions:**
- Mounting bracket angle: 110°

- Rated load current 25 / 40 / 55 / 70 A model

Technical drawing of the 1000 Series cabinet, showing front and side views with dimensions in millimeters.

Front View Dimensions:

- Overall width: 50
- Top panel width: 43.5
- Top panel depth: 25
- Top panel thickness: 8
- Top panel mounting holes: 4-Ø 5.4
- Top panel mounting hole offset: 25
- Overall height: 242
- Door height: 200
- Door thickness: 25
- Door bottom offset: 34
- Door bottom mounting holes: 3
- Door bottom mounting hole offset: 30
- Door bottom mounting hole diameter: 50

Side View Dimensions:

- Overall depth: 200

Technical drawing of the SPS 1000 cabinet, showing front and side views with dimensions in millimeters.

Front View Dimensions:

- Total width: 70
- Top panel width: 60.5
- Top panel depth: 35
- Top panel thickness: 10
- Top panel mounting holes: 4-Ø 6.4
- Top panel height: 29
- Main body height: 270
- Base height: 47
- Base mounting holes: 47
- Base width: 70
- Base thickness: 3
- Base mounting holes: 2
- Total height: 346
- Total depth: 325.5

Side View Dimensions:

- Depth: 200

Technical drawing of the S 1000 cabinet, showing front and side views with dimensions in millimeters.

Front View Dimensions:

- Overall width: 85
- Top panel width: 75.5
- Top panel depth: 42.5
- Top panel thickness: 12
- Top panel mounting holes: 4-Ø 8.4
- Top panel height: 38
- Main body height: 350
- Overall height: 456.6
- Bottom panel height: 61
- Bottom panel width: 57
- Bottom panel depth: 85
- Bottom panel mounting holes: 2

Side View Dimensions:

- Overall depth: 200

Technical drawing of the E 1000 cabinet, showing front and side views with dimensions in millimeters.

Front View Dimensions:

- Overall width: 120
- Internal width (between doors): 110.5
- Door width: 60
- Number of doors: 4 (indicated by 4 Ø 8.4)
- Door thickness: 12
- Internal height (between shelves): 400
- Overall height: 508.9
- Bottom height (from floor to bottom of cabinet): 67
- Bottom width (between feet): 92
- Overall bottom width: 120

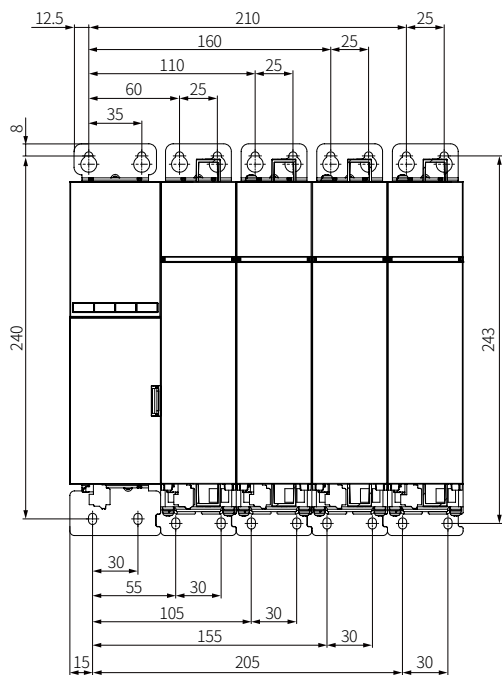
Side View Dimensions:

- Overall depth: 240

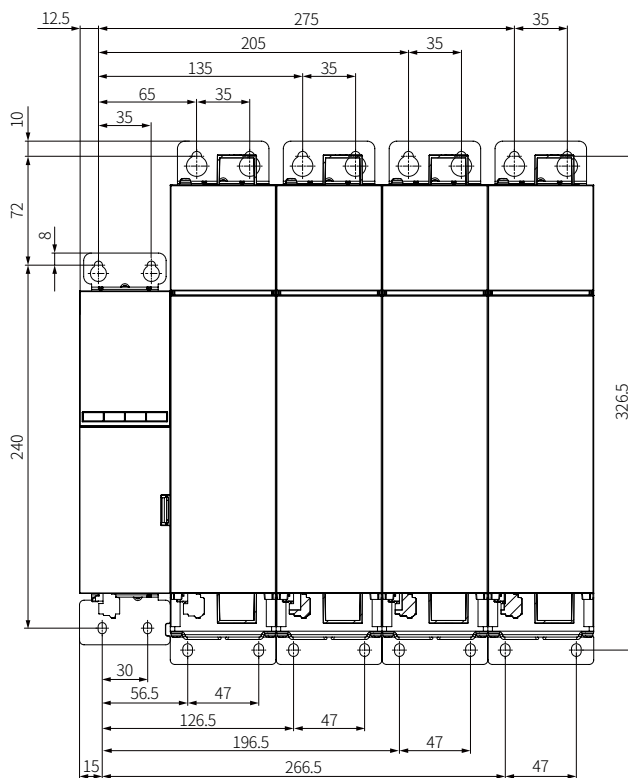
Control Module + 4 Power Modules Connection

- The power modules with different rated currents can be combined and connected.
Connect the power modules to the right of the control module in ascending order of current capacity.
- The dimensions may vary depending on the module connection.
- Unit: mm

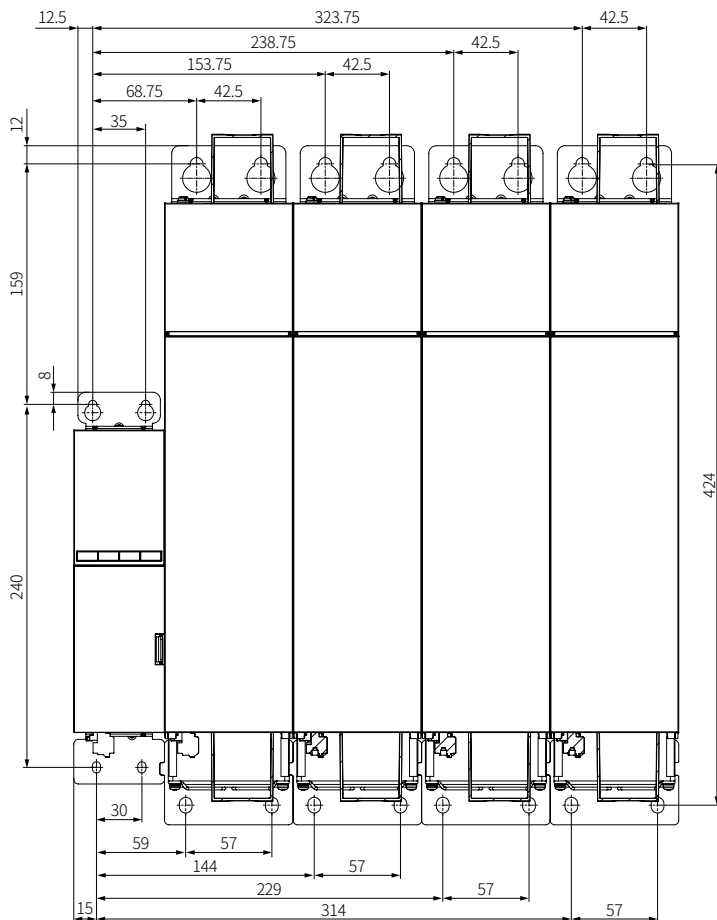
■ Control module + Power module (25 / 40 / 55 / 70 A)



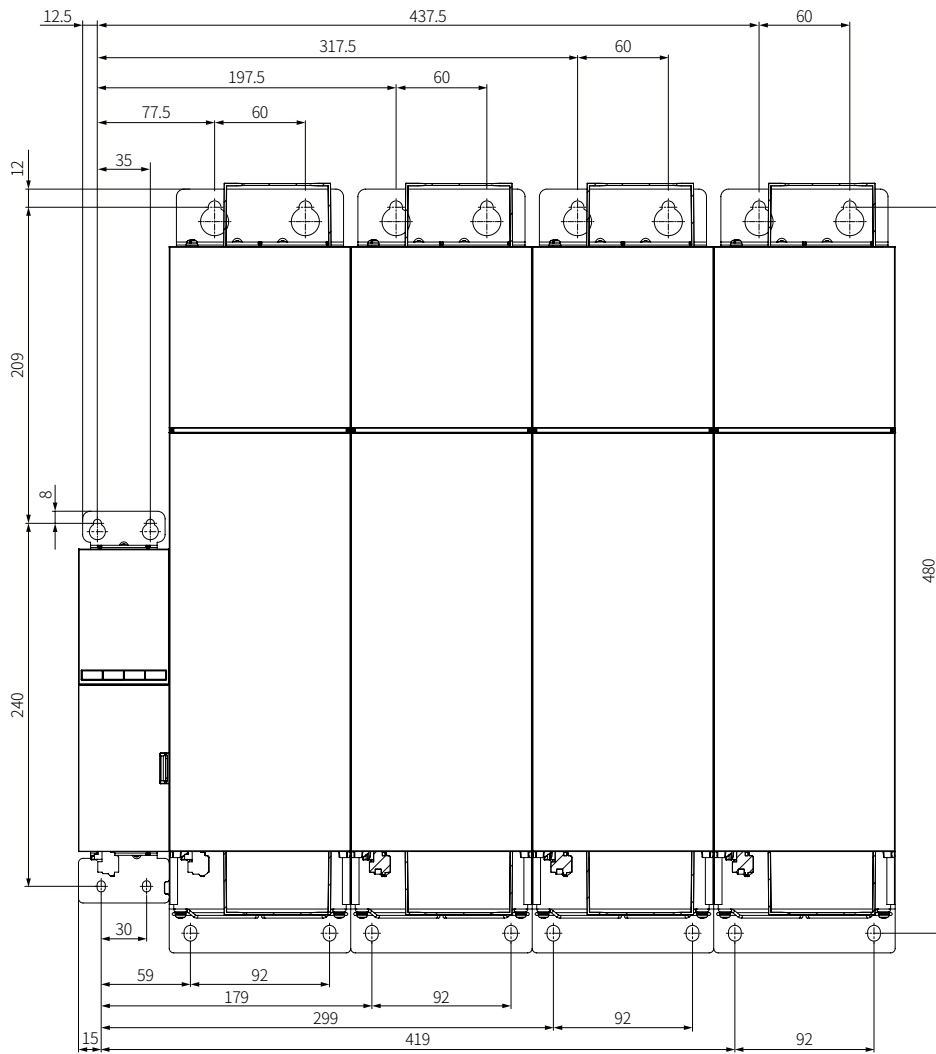
■ Control module + Power module (90 / 110 / 150 / 180 A)



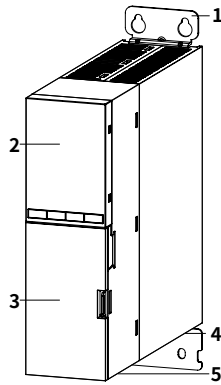
■ Control module + Power module (200 / 250 / 350 A)



■ Control module + Power module (400 / 500 / 600 A)

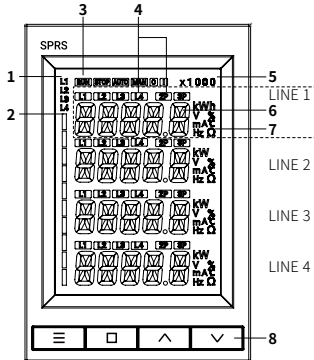


[Control Module] Unit Descriptions



1. Bracket
2. Display
3. Front cover
4. Control power connector
5. Comm. connector

■ Display



1. BAR output phase (orange)

Turns ON L1, L2, L3 or L4 phase of output BAR display.

2. Output BAR (orange)

Turns ON from the bottom bar. About 10 % of output displays per one bar. (Total of 10 BARs)

3. Control status indicator (green)

RUN	Control	MAN	Manual
STOP	Stop	O	Output
AUTO	Auto	I	Input

4. Control / Monitor phase (green)

Turns ON L1, L2, L3, L4 control phase or monitor phase 2P / 3P in the line.

5. × 1000 indicator (green) (only LINE1)

Turn ON for over 6 digit accumulated power. Multiply 1000 times for the present value. E.g.) 1,000 kWh, × 1000 means 1,000,000 kWh when turned ON.

6. PV / SV display part (white)

Turns ON the monitoring value. It is possible to set the value for each LINE in the monitoring setting mode.

- Display range: 0000.0 to 9999.9 (fixed decimal point)

7. Unit indicator (green)

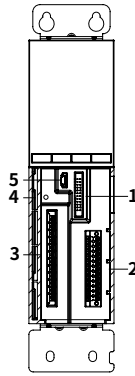
kWh ⁰¹⁾	kW ⁰²⁾	V	%	A	mA	°C	Hz	Ω
Accumulated power	Power	Voltage (RMS)	Input / Output	Input / Output current	Control input current	Heatsink temp.	Input power freq.	Load resistance

01) Only LINE1.

02) For LINE2 to 4.

8. Setting keys (≡, □, ▲, ▼)

■ Inside the front cover



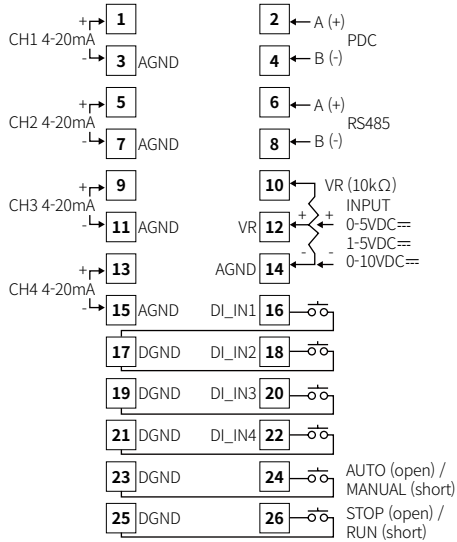
1. Module connector

Connect the module connection ribbon cable to the power module.

	Model	Manufacturer
Socket	BHCM01-24G0BBW	Antenk

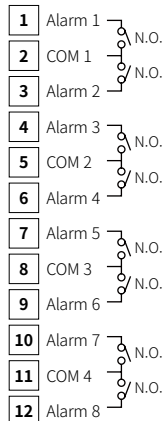
2. Control signal / Comm. connector

	Model	Manufacturer
Socket	0159-1226	Dinkle
Plug	0159-0426	



3. Alarm connector

	Model	Manufacturer
Socket	0226-2712	Dinkle
Plug	0226-0712	



4. RESET button

Reset the operation or alarm.

5. USB connector (do not use)

It is for maintenance of manufacturer. Do not use this connector.

■ Control power connector



[Specification]

	Model	Manufacturer
Socket	0150-2602	Dinkle
Plug	0150-2002	

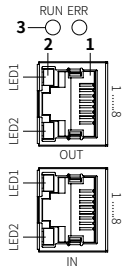
[Function]

Pin	Function
1	+ 24 VDC
2	- 24 VDC

■ Communication Connector and Indicator

It depends on the communication support module.

• [EtherCAT comm. model]



1. EtherCAT comm. connector (OUT/IN)

RJ45

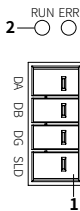
Pin	Function	Pin	Function
1	TD+	5	-
2	TD-	6	RD-
3	RD+	7	-
4	-	8	-

2. RJ45 LED 1 (green) / LED 2 (yellow)

LED1 Turns ON: Link / activated input
LED2 Flashes: Data transmission status

3. ERR (red) / RUN (green) indicator

• [CC-Link comm. model]



1. CC-Link comm. connector

[Specification]

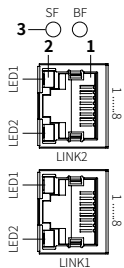
	Model	Manufacturer
Socket	0150-2604	Dinkle
Plug	0150-2004	

[Function]

Pin	Function	Pin	Function
1	DA	2	DB
3	DG	4	SLD

2. ERR (red) / RUN (red) indicator

• [PROFINET comm. model]



1. PROFINET comm. connector

(LINK2/LINK1) RJ45

Pin	Function	Pin	Function
1	TD+	5	-
2	TD-	6	RD-
3	RD+	7	-
4	-	8	-

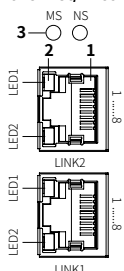
2. RJ45 LED 1 (green) / LED 2 (yellow)

LED1 Turns ON: LINK input
LED2 Flashes: Data transmission status

3. BF (red) / SF (red) indicator

BF: Bus Fail / SF: System Fail

• [EtherNet/IP comm. model]



1. EtherNet/IP comm. connector

(LINK2/LINK1) RJ45

Pin	Function	Pin	Function
1	TD+	5	-
2	TD-	6	RD-
3	RD+	7	-
4	-	8	-

2. RJ45 LED 1 (green) / LED 2 (yellow)

LED1 Turns ON: LINK input
LED2 Flashes: Data transmission status

3. MS (red / green) / NS (red / green) indicator

• MS: Module Status

Color	Status	Descriptions
Green	ON	Normal operation
	Flashes	Standby state: Device is not configured
Red	ON	Major fault : An unrecoverable error has occurred
	Flashes	Minor fault : A recoverable error has occurred - Configuration Error (Invalid configuration)
Green / Red	OFF	No power supply
	Flashes	Self-Test: Power

• NS: Network Status

Color	Status	Descriptions
Green	ON	Connected
	Flashes	Not connected
Red	ON	IP conflict : Another device with the same IP address exists
	Flashes	Connection timeout
Green / Red	OFF	No power supply and no IP address
	Flashes	Self-Test: Power

Load Output Formula

Type	Input	Formula
Auto control (AUTO)	Current	DC 4 - 20 mA
	Voltage	1 - 5 VDC
		0 - 5 VDC
		0 - 10 VDC
Manual control (MANU)	RS485 / EtherCAT / CC-Link / PROFINET / EtherNet/IP	0 to 100.0 %
	External adjuster	0 to 10 kΩ
	Parameter	0 to 100.0 %

Load output [%]
= (Control input [%] × Output slope [%])
+ Offset

Load output [%] = Parameter SV [%]

[Control Module] Initial Display When Power is ON

When power is supplied, after the entire display will turn on for 2 sec. Next, it will flash for 0.5 seconds to indicate the model specification (comm. specification, firmware version). Once this process is complete, the product will enter its RUN mode.

	1. All displays	2. Model spec.	3. Run mode
LINE1	0000.0	Model	0.0
LINE2	0000.0	PN (Communication)	0.0
LINE3	0000.0	FW	0.0
LINE4	0000.0	Ver. (Firmware version)	0.0

[Control Module] Digital Input (DI_IN 1 to 4) Setting

Digital input (DI_IN1 to DI_IN4) pins can be connected to external devices (e.g., PLC) to perform set functions based on contact operations. Functions can be configured for each pin of '1-14. digital input'.

The digital input (DI_IN1 to DI_IN4) performed based on the wired channels of the power module connected to the right side of the control module.

Ex) 1P4 wiring: CH1 → DI_IN1 / CH2 → DI_IN2 / CH3 → DI_IN3 / CH4 → DI_IN4

3P1P1 wiring: 3P1(CH1) → DI_IN1 / P1(CH4) → DI_IN4

Function	Display	Contact operation	
		ON	OFF
Not used	DISAL	Not used	
RUN / STOP	R_S	RUN	STOP
AUTO / MAN	A_M	MANUAL	AUTO
Alarm reset	ALM_I	Alarm reset	Inactivate

[Control Module] Mode setting

• It is based on Run mode entering / return.

Mode	Entering	Return
Control setting mode	[≡] 2 sec.	[≡] 2 sec.
Alarm setting mode	[≡ + □] 2 sec.	[≡] 2 sec.
Monitoring setting mode	[≡ + ▲] 2 sec.	[≡] 2 sec.
BAR output phase setting	[≡]	Auto
Switch to monitor display on LINE1	[□]	Auto
Display current control status in forward direction on LINE1 screen	[▲]	Auto
Display current control status in reverse direction on LINE1 screen	[▼]	Auto
Alarm RESET	[▼] 2 sec.	Auto
EtherCAT status monitoring mode	[≡ + ▼] 2 sec.	[≡] 2 sec.
Manual control input	[□ + ▼] 2 sec.	[≡] 2 sec.
Parameter reset	[▲ + ▼] 2 sec.	[≡] 2 sec.

[Control Module] Alarm

- When an alarm occurs, the following message will flash on LINE 1, and the configured relay (A contact) output will turn ON. If multiple alarms occur, the messages will flash sequentially.
- It is possible to set enabling / disabling the alarm, setting range, delay time, output, and return options with parameter adjustment.

LINE 1 display	Alarm	Output (default)	Alarm release ⁰¹⁾
αC.R	Overcurrent	Stop (SCR OFF)	• Re-supply power. • Press [RESET]. • Press [▼] for over 2 sec. • Set the DI-IN parameter ALM_I and apply a signal of digital input terminal. • Set ENABL = OFF of each alarm parameter.
αV.R	Overvoltage		
αtH.R	Heatsink overheat	Maintain (normal operation)	
αtP.R	Heatsink overheat protection	Stop (SCR OFF)	
HtbH.R	Heater break		
dLF.R	Partial heater break	Maintain (normal operation)	
SC.R.R	SCR error	Stop (SCR OFF)	
FUSE.R	Fuse break		
FAN.R	FAN error	Maintain (normal operation)	
FRQ.Y.R	Frequency error	Stop (SCR OFF)	
LPWR.R	Input low voltage		
PM_R	Module connection error		
UL.R	Load imbalance	Maintain (normal operation)	

01) If the alarm occurrence condition is not removed, the alarm is re-occur even if the alarm release method is applied.

[Control Module] Parameter Setting

- Some parameters are activated / deactivated depending on the model or setting of other parameters.

■ Control setting mode

Parameter	LINE1
Operating channel	$\alpha P - 5$
Control input	$i.NPUt$
Load type	$L\alpha Rd$
Control mode	αPER
Feedback control time	$Fdb - t$
PI coefficient	$PI - G$
Soft start / up / down	$5\alpha F - t$
Output high / low-limit	$\alpha Ut - L$
Output current limit	$C - LM$
Input slope correction	$SL\alpha PE$
Input offset correction	$\alpha FSEt$
Partial heater break scan	dLF
Power distribution control	PdC
Digital input	$dI SEt$
RS485 Comm.	$RS4B5$
CC-Link Comm.	CL
EtherNet/IP Comm.	EI
Parameter reset	$RSt - P$
Accumulated power reset	$RSt - I$
Parameter lock	$L\alpha Ck$
Manual control input	$MANU$

■ Alarm setting mode

Parameter	LINE1
Overcurrent alarm	$\alpha C.R$
Overvoltage alarm	$\alpha V.R$
Heatsink overheat alarm	$\alpha t.H.R$
Heatsink overheat protection alarm	$\alpha t.P.R$
Heater break alarm	$Ht.b.H.R$
Partial heater break alarm	$dL.F.R$
Element (SCR) error alarm	$SC.R.R$
Fuse break alarm	$FUSE.R$
FAN error alarm	$FAN.R$
Frequency error alarm	$FRQ.Y.R$
Input low voltage alarm	$LPWR.R$
Module connection error alarm	$PM - CN.R$
Load imbalance alarm	$UL.R$
Alarm log	$L\alpha G$
System time	$t - SEt$

■ Monitoring setting mode

Parameter	LINE1
LINE 1 monitor display	$LI NE 1$
LINE 2 monitor display	$LI NE 2$
LINE 3 monitor display	$LI NE 3$
LINE 4 monitor display	$LI NE 4$
Current time	$tI M - C$
Alarm history	$AL M - d$
Troubleshooting	$dI RGN$

[Control Module] Parameter Setting_ Control Setting Mode

- Some parameters are activated / deactivated depending on the model or setting of other parameters. Refer to the description of each parameter.
- Do not change parameters during output.
- If any key is not entered for 60 sec in each parameter, it returns to RUN mode.
- [≡], [▲], [▼] key: Changes LINE
- [□] key: When LINE1 flashes, saves current set value and moves to the next parameter.
Changes set values.
Changes setting digits.
- [▲], [▼] key: Changes number when numerical set value is changed
- **Bold** specifications for each parameter setting range are factory default.

1-0. Entering

In the RUN mode, press the [≡] key for more than 2 seconds to enter.

1-1. Operating channel

LINE1	OP-S: Operating channel Set the configuration to match the actual wiring of the power module. Failure to follow this may result in malfunction. Refer to the load wiring for the wiring method.		
LINE2	1P1: Single-phase control + 1 Power module (Load 1-channel) 1P2: Single-phase control + 2 Power modules (Load 2-channel) 1P3: Single-phase control + 3 Power modules (Load 3-channel) 1P4: Single-phase control + 4 Power modules (Load 4-channel)	2P1: Single-phase dual control + 1 Power 2-module (Load 1-channel) 2P2: Single-phase dual control + 2 Power 2-modules (Load 2-channel) 2P1P1: Single-phase dual control + 1 Power 2-modules + 1 Power module (Load 2-channel) 2P1P2: Single-phase dual control + 1 Power 2-modules + 2 Power modules (Load 3-channel)	3P1: 3-phase control + 3 Power module (3-phase load 1-channel) 3P1P1: 3-phase control + 3 series controls of power modules + 1 power module (3-phase load 1-channel + load 1-channel)
LINE3	-		
LINE4	-		

1-2. Control input

LINE1	INPUT: Control input		
LINE2	Displays the channel set in the 1.1. operating channel OP-S.		
LINE3	4-20: 4 - 20 mA Single-phase: 4 channel / 3-phase: 1 channel	1-5: 1 - 5 VDC⇒ 1 channel (Integration) 0-5: 0 - 5 VDC⇒ 1 channel (Integration) 0-10: 0 - 10 VDC⇒ 1 channel (Integration)	EX-R: External volume 10 kΩ RS485: RS485 Comm. F-NET: EtherCAT / CC-Link / PROFINET / EtherNet/IP Comm.
LINE4	CH1: Channel 1 CH2: Channel 2 CH3: Channel 3 CH4: Channel 4	-	

1-3. Load type

LINE1	LOAD: Load type		
LINE2	Displays the channel set in the 1.1. operating channel OP-S.		
LINE3	RESIS: Resistive load TRANS: Inductive load		
LINE4	-		

1-4. Control mode

LINE1	OPER: Control mode				
LINE2	Displays the channel set in the 1.1. operating channel OP-S.				
LINE3	PA: Normal phase control F-CY: Fixed cycle control mode V-CY: Variable cycle control mode	FB.C: Constant current phase control (%)	FB.V: Constant voltage phase control (%)	FB.W: Constant power phase control (%)	PDC: Power distribution control
LINE4	-	10 to 100 to 110	10 to 44 to 110	10 to 100 to 110	-

1-5. Feedback control time

LINE1	FDB-T: Feedback control time The time to reach the feedback target value can be controlled. (Display condition) 1-4. control mode OPER: FB.C / FB.V / FB.W		
LINE2	Displays the channel set in the 1.1. operating channel OP-S.		
LINE3	0 to 100 : Slow feedback control time to Fast		
LINE4	-		

1-6. PI coefficient

LINE1	PI-G: PI coefficient Controls the time for the output voltage to reach the steady status and the overshoot.		
LINE2	Displays the channel set in the 1.1. operating channel OP-S.		
LINE3	PGAIN: P coefficient	IGAIN: I coefficient	
LINE4	1 to 60 to 300: Slow steady status reach to Fast	1 to 60 to 300	

1-7. Soft start / Soft up / Soft down

LINE1	SOF-T: Soft start /Soft up / Soft down Sets the time to reach the set value upon initial or re-output.		
LINE2	Displays the channel set in the 1.1. operating channel OP-S.		
LINE3	ST_T: Soft start time The time it takes to reach 100% from the initial 0% output (sec)	UP_T: Soft up time Rise time to reach the target value when the control value is changed during operation (sec)	DN_T: Soft down time Drop time to reach the target value when the control value is changed during operation (sec)
LINE4	0 to 3 to 999 : Fast target output value reach to Slow	0 to 3 to 999 : Fast target output value reach to Slow	0 to 3 to 999 : Fast target output value reach to Slow

1-8. Output high / low-limit

LINE1	OUT-L: Output high / low-limit Protects the load by limiting the output range.		
LINE2	Displays the channel set in the 1.1. operating channel OP-S.		
LINE3	HIGH: Output high-limit value (%)	LOW: Output low-limit value (%)	
LINE4	0 to output high-limit value to 100	0 to output low-limit value to 100	

1-9. Output current limit

LINE1	C-LM: Output current limit Protects load to limit output current				
LINE2	Displays the channel set in the 1.1. operating channel OP-S.				
LINE3	10 to 110 : Output current limit value (%)				
LINE4	Rated current of the power module × 110 % (e.g., SPRS-F600 model, 660 displayed)				

1-10. Input slope correction

LINE1	SLOPE: Input slope correction Limits the power supplied to the load.				
LINE2	Displays the channel set in the 1.1. operating channel OP-S.				
LINE3	-99.9 to 0.0 to 99.9: Input slope correction value (%)				
LINE4	-				

1-11. Input offset correction

LINE1	OFFSET: Input offset correction It compensates the offset between actual input value and measured input value.				
LINE2	Displays the channel set in the 1.1. operating channel OP-S.				
LINE3	-99.9 to 0.0 to 99.9: Input offset correction value (%)				
LINE4	-				

1-12. Partial heater break scan

LINE1	DLF: Partial heater break (Display condition) 1-1. operating channel OP-S: 1P1 / 1P2 / 1P3 / 1P4				
LINE2	Displays the channel set in the 1.1. operating channel OP-S.				
LINE3	START: Partial heater break scan	LO_C: Number of parallel connections for partial load heaters of the same capacity (units)	LIM-O: Scan range (No alarm for partial heater break in the excess range)	UP-T: Scan UP time	DN-T: Scan DOWN time
LINE4	ON: Start OFF: Stop	2 , 3, 4, 5, 6	25, 50, 75, 100	0 (OFF), 1 to 100	0 (OFF), 1 to 100

1-13. Power distribution control

LINE1	PDC: Power distribution control				
LINE2	Displays the channel set in the 1.1. operating channel OP-S.				
LINE3	ID: Power distribution control power module ID	T-NUM: Total number of power distribution control power modules (units, including Master)			
LINE4	1 (Master), 2 to 36	2 to 4 to 36			

1-14. Digital input

LINE1	DISET: Dital input			
LINE2	Displays the channel set in the 1.1. operating channel OP-S.			
LINE3	DISAL: No use	R_S: RUN / STOP	A_M: AUTO / MANUAL	ALM_I: Alarm reset
LINE4	-			

1-15. RS485 Comm.

LINE1	RS485: RS485 Comm.					
LINE2	PROTO: Protocol	ADDR: Address code	BPS: Comm. speed (bit)	P-BIT: Parity bit	S-BIT: Stop bit (bit)	RS-T: Response waiting time (msec)
LINE3	RTU: Modbus RTU ASCII: Modbus ASCII	1 to 99	24: 2,400 48: 4,800 96: 9,600 144: 14,400 192: 19,200 384: 38,400 576: 57,600 1152: 115,200	NONE: No use EVEN: Even number ODD: Odd number	1 , 2	0 to 9999
LINE4	-					

1-16. CC-Link Comm.

LINE1	CL: CC-Link Comm. (Display condition) Control module CC-Link Comm. model: SPRS-CM-CL Re-supply power after setting to apply settings.		
LINE2	ID: Address code	STN: Subscriber trunk dialing number	BAUD: Communication speed (bps)
LINE3	1 to 64	1, 2	156K, 625K, 2.5M, 5M, 10M
LINE4	-		

1-17. EtherNet/IP Comm.

LINE1	EI: EtherNet/IP Comm. (Display condition) Control module EtherNet/IP Comm. model: SPRS-CM-EI Re-supply power after setting to apply settings.			
LINE2	CoFIG: Select H/W change method	ID1 to ID4: Device IP	SUB1 to SUB4: Subnet IP	GW1 to GW4: Gateway IP
LINE3	HWoFF: H/W is changed by Master or PLC HWON: H/W is changed by parameter setting or RS485 communication	192.168.1.10 : ID1.ID2.ID3.ID4	255.255.255.0 : SUB1.SUB2.SUB3.SUB4	192.168.1.1 : GW1.GW2.GW3.GW4
LINE4	-			

1-18. Parameter reset

LINE1	RST-P: Parameter reset 1		
LINE2	NONE: No use		START: Start
			LINE1 RST: Parameter reset 2
			LINE2 NO: Cancel YES: Start ⁰¹⁾
		01) When 'Yes' is executed, 'INIT' blinks on the display, followed by a reboot, and the parameters are reset to default.	
LINE3	-		
LINE4	-		

1-19. Accumulated power reset

LINE1	RST-I: Accumulated power reset 1				
LINE2	NONE: No use		START: Start		
LINE1			RST: Accumulated power reset 2		
	LINE2	NO: Cancel	YES: Start		
LINE3	-				
LINE4	-				

1-20. Parameter lock

LINE1	LOCK: Parameter lock
LINE2	OFF: No use LOCK1: Control setting mode lock LOCK2: Alarm setting mode lock
LINE3	-
LINE4	-

1-21. Manual control input

LINE1	MANU: Manual control input The manual control input is activated when the control input signal (terminal 24) is shorted to DGND.
LINE2	Displays the channel set in the 1.1. operating channel OP-S. ALL: All channel
LINE3	0 to 100: Manual control input value (%)
LINE4	-

[Control Module] Alarm Setting Mode

- Some parameters are activated / deactivated depending on the model or setting of other parameters. Refer to the description of each parameter.
- Do not change parameters during output.
- If any key is not entered for 60 sec in each parameter, it returns to RUN mode.
- [≡], [▲], [▼] key: Changes LINE
- [□] key: When LINE1 flashes, saves current set value and moves to the next parameter.
Changes set values.
Changes setting digits.
- [▲], [▼] key: Changes number when numerical set value is changed.
- Bold** specifications for each parameter setting range are factory default.

2-0. Entering

In the RUN mode, press [≡+□] keys for more than 2 seconds to enter.

2-1. Overcurrent alarm

LINE1	OC: Overcurrent alarm It is possible to protect the load, fuse, and element from overcurrent. (Alarm operating condition) An alarm occurs when the set overcurrent is output for longer than the delay time. Overcurrent = rated current × overcurrent upper limit (%)					
LINE2	Displays the channel set in the 1.1. operating channel OP-S.					
LINE3	ENABL: Enable	LMT-C: Overcurrent upper limit (% based on RMS)	DLY-T: Delay time (sec)	OUT-S: Control output during alarm	RLY-O: Relay output	A-RCY: Alarm return (fixed for 5 sec.)
LINE4	ON OFF	1 to 110	3 to 5 to 600	STOP: Stop OUT: Hold	DISAL RL1 /2/3/4/5/6/7/8	ON OFF

2-2. Overvoltage alarm

LINE1	OV: Overvoltage alarm It is possible to protect the load from overvoltage. (Alarm operating condition) An alarm occurs when the set overvoltage is output for longer than the delay time.					
LINE2	Displays the channel set in the 1.1. operating channel OP-S.					
LINE3	ENABL: Enable	LMT-V: Overvoltage upper limit (V, based on RMS)	DLY-T: Delay time (sec)	OUT-S: Control output during alarm	RLY-O: Relay output	A-RCY: Alarm return (fixed for 5 sec.)
LINE4	ON OFF	20 to 550	3 to 5 to 600	STOP: Stop OUT: Hold	DISAL RL1 /2/3/4/5/6/7/8	ON OFF

2-3. Heatsink overheat alarm

LINE1	OTW: Heatsink overheat alarm (Alarm operating condition) An alarm occurs when the heatsink temperature exceeds the overheat threshold for longer than the delay time.					
LINE2	ENABL: Enable	TEMP: Overheat temp. (°C)	DLY-T: Delay time (sec)	OUT-S: Control output during alarm	RLY-O: Relay output	A-RCY: Alarm return (fixed for 5 sec.)
LINE3	ON OFF	50 to 60 to 70	3 to 5 to 600	STOP: Stop OUT: Hold	DISAL RL2 /1/3/4/5/6/7/8	ON OFF
LINE4	-					

2-4. Heatsink overheat protection alarm

LINE1	OTP: Heatsink overheat protection alarm (Alarm operating condition) An alarm occurs when the heatsink temperature exceeds the overheat threshold for longer than the delay time.					
LINE2	ENABL: Enable	TEMP: Overheat temp. (°C)	DLY-T: Delay time (sec)	OUT-S: Control output during alarm	RLY-O: Relay output	A-RCY: Alarm return (fixed for 5 sec.)
LINE3	ON OFF	70 to 80 to 90	3 to 5 to 600	STOP: Stop OUT: Hold	DISAL RL1 /2/3/4/5/6/7/8	ON OFF
LINE4	-					

2-5. Heater break alarm

LINE1	HT_BK: Heater break alarm (Alarm operating condition) An alarm occurs when the output exceeds the upper limit and current falls below the lower limit for longer than the delay time.						
LINE2	Displays the channel set in the 1.1. operating channel OP-S.						
LINE3	ENABL: Enable	LMT-O: Upper output limit (%)	LMT-C: Lower current limit (A)	DLY-T: Delay time (sec)	OUT-S: Control output during alarm	RLY-O: Relay output	A-RCY: Alarm return (fixed for 5 sec.)
LINE4	ON OFF	5 to 50 to 100	0 to 660	3 to 5 to 600	STOP: Stop OUT: Hold	DISAL RL1 /2/3/4/5/6/7/8	ON OFF

2-6. Partial heater break alarm

LINE1	DLF: Partial heater break alarm (Alarm operating condition) An alarm occurs if any load becomes disconnected during parallel load operation. (Alarm activation condition) A scan of control settings modes 1 to 12 is required A load quantity × DEAD.Z setting current or higher					
LINE2	Displays the channel set in the 1.1. operating channel OP-S.					
LINE3	ENABL: Enable	DEAD.Z: Non-operating alarm range (A)	DLY-T: Delay time (sec)	OUT-S: Control output during alarm	RLY-O: Relay output	A-RCY: Alarm return (fixed for 5 sec.)
LINE4	ON OFF	1 to 3 to 200	3 to 5 to 600	STOP: Stop OUT: Hold	DISAL RL2 /1/3/4/5/6/7/8	ON OFF

2-7. Element (SCR) error alarm

LINE1	SCR: Element (SCR) error alarm (Alarm operating condition) An alarm occurs when the output is below the set value and the current exceeds the set threshold during the delay time.						
LINE2	Displays the channel set in the 1.1. operating channel OP-S.						
LINE3	ENABL: Enable	LMT-O: Lower output limit (%)	LMT-C: Upper current limit (A)	DLY-T: Delay time (sec)	OUT-S: Control output during alarm	RLY-O: Relay output	A-RCY: Alarm return (fixed for 5 sec.)
LINE4	ON OFF	0 to 100	0 to 3 to 660	3 to 5 to 600	STOP: Stop OUT: Hold	DISAL RL1 /2/3/4/5/6/7/8	ON OFF

2-8. Fuse break alarm

LINE1	FUSE: Fuse break alarm (Alarm operating condition) An alarm occurs if the fuse is broken for longer than the delay time or if the load power is not supplied.					
LINE2	Displays the channel set in the 1.1. operating channel OP-S.					
LINE3	ENABL: Enable	DLY-T: Delay time (sec)	OUT-S: Control output during alarm	RLY-O: Relay output	A-RCY: Alarm return (fixed for 5 sec.)	
LINE4	ON OFF	3 to 5 to 600	STOP: Stop OUT: Hold	DISAL RL1 /2/3/4/5/6/7/8	ON OFF	

2-9. FAN error alarm

LINE1	FAN: FAN error alarm (Alarm operating condition) An alarm occurs if the FAN operating condition (heatsink temp.: ON at 35 °C or higher / OFF at 30 °C or lower) is not met or if the FAN does not operate for longer than the delay time.				
LINE2	Displays the channel set in the 1.1. operating channel OP-S.				
LINE3	ENABL: Enable	DLY-T: Delay time (sec)	OUT-S: Control output during alarm	RLY-O: Relay output	A-RCY: Alarm return (fixed for 5 sec.)
LINE4	ON OFF	3 to 5 to 600	STOP: Stop OUT: Hold	DISAL RL2 /1/3/4/5/6/7/8	ON OFF

2-10. Frequency error alarm

LINE1	FRQY: Frequency error alarm (Alarm operating condition) An alarm occurs if the load power frequency is 0 Hz, 44 Hz or lower, or 66 Hz or higher for longer than the delay time.				
LINE2	Displays the channel set in the 1.1. operating channel OP-S.				
LINE3	ENABL: Enable	DLY-T: Delay time (sec)	OUT-S: Control output during alarm	RLY-O: Relay output	A-RCY: Alarm return (fixed for 5 sec.)
LINE4	ON OFF	3 to 5 to 600	STOP: Stop OUT: Hold	DISAL RL2 /1/3/4/5/6/7/8	ON OFF

2-11. Input low voltage alarm

LINE1	LPWR: Input low voltage alarm (Alarm operating condition) An alarm occurs when the input voltage falls below the lower input voltage limit for longer than the delay time.					
LINE2	Displays the channel set in the 1.1. operating channel OP-S.					
LINE3	ENABL: Enable	LMT-V: Lower input voltage limit (V)	DLY-T: Delay time (sec)	OUT-S: Control output during alarm	RLY-O: Relay output	A-RCY: Alarm return (fixed for 5 sec.)
LINE4	ON OFF	100 to 500	3 to 5 to 600	STOP: Stop OUT: Hold	DISAL RL1 /2/3/4/5/6/7/8	ON OFF

2-12. Module connection error alarm

LINE1	PM-CN: Module connection error alarm (Alarm operating condition) An alarm occurs when the communication between the control module and power module is not connected for longer than the delay time. If one power module is connected and operation channel 1P4 (requires 4 power modules) is selected, a module connection error alarm may occur.				
LINE2	Displays the channel set in the 1.1. operating channel OP-S.				
LINE3	ENABL: Enable	DLY-T: Delay time (sec)	OUT-S: Control output during alarm	RLY-O: Relay output	A-RCY: Alarm return (fixed for 5 sec.)
LINE4	ON OFF	3 to 5 to 600	STOP: Stop OUT: Hold	DISAL RL1 /2/3/4/5/6/7/8	ON OFF

2-13. Load imbalance alarm

LINE1	UL: Load imbalance alarm (Display condition) 3-phase control (Alarm operating condition) An alarm occurs when the load imbalance ratio is below the lower limit for longer than the delay time. Load imbalance ratio = (Max. 3-phase current - Min. 3-phase current) × 100 / average 3-phase current					
LINE2	Displays the channel set in the 1.1. operating channel OP-S.					
LINE3	ENABL: Enable	LMT-P: Lower limit load imbalance ratio (%)	DLY-T: Delay time (sec)	OUT-S: Control output during alarm	RLY-O: Relay output	A-RCY: Alarm return (fixed for 5 sec.)
LINE4	ON OFF	5 to 30 to 100	3 to 5 to 600	STOP: Stop OUT: Hold	DISAL RL2 /1/3/4/5/6/7/8	ON OFF

2-14. Alarm log

LINE1	LOG-S: Alarm log		
LINE2	ENABL: Enable		CLEAN: Reset
LINE3	ON OFF		NONE: Cancel START: Start
LINE4	-		

2-15. System time

LINE1	T-SET: System time					
LINE2	YEAR: Year	MONTH: Month	DAY: Day	HOUR: Hour	MIN: Minute	SET: Reset
LINE3	2000 to 2100	1 to 12	1 to 31	0 to 23	0 to 59	NONE: Cancel START: Start
LINE4	-					

[Control Module] Monitoring Setting Mode

- Some parameters are activated / deactivated depending on the model or setting of other parameters. Refer to the description of each parameter.
- Do not change parameters during output.
- If any key is not entered for 60 sec in each parameter, it returns to RUN mode.
- [≡], [▲], [▼] key: Changes LINE
- [□] key: When LINE1 flashes, saves current set value and moves to the next parameter.
Changes set values.
Changes setting digits.
- [▲], [▼] key: Changes number when numerical set value is changed
- **Bold** specifications for each parameter setting range are factory default.

3-0. Entering

In the RUN mode, press [≡+▲] keys for more than 2 seconds to enter.

3-1. LINE 1 monitor display

LINE1	LINE1: LINE 1 monitor display		
LINE2	CTL-O: Control output value (%)	WATT: Power (kw)	CONN: Wiring method
	CTL-I: Control input value (%)	I-WAT: Accumulated power (kwh)	INPUT: Input channel
	OUT-V: Output voltage (V)	OHM: Load resistance (Ω)	TEMP: Heatsink temperature (°C)
	IN-V: Input voltage (V)	FRQY: Frequency (Hz)	P_FW: Power module FW version
	AMP: Current (A)	CTL-M: Control method	PNAME: Power module model name
LINE3	-		
LINE4	-		

3-2. LINE 2 monitor display

LINE1	LINE2: LINE 2 monitor display		
LINE2	CTL-O: Control output value (%) CTL-I: Control input value (%) OUT-V: Output voltage (V) IN-V: Input voltage (V) AMP: Current (A)	WATT: Power (kw) OHM: Load resistance (Ω) FRQY: Frequency (Hz) CTL-M: Control method TEMP: Heatsink temperature (°C)	
LINE3	CH1/2/3/4		
LINE4	-		

3-3. LINE 3 monitor display

LINE1	LINE3: LINE 3 monitor display		
LINE2	CTL-O: Control output value (%)	WATT: Power (kw)	
	CTL-I: Control input value (%)	OHM: Load resistance (Ω)	
	OUT-V: Output voltage (V)	FRQY: Frequency (Hz)	
	IN-V: Input voltage (V)	CTL-M: Control method	
	AMP: Current (A)	TEMP: Heatsink temperature (°C)	
LINE3	CH2/1/3/4		
LINE4	-		

3-4. LINE 4 monitor display

LINE1	LINE4: LINE 4 monitor display		
LINE2	CTL-O: Control output value (%)	WATT: Power (kw)	
	CTL-I: Control input value (%)	OHM: Load resistance (Ω)	
LINE3	OUT-V: Output voltage (V)	FRQY: Frequency (Hz)	
	IN-V: Input voltage (V)	CTL-M: Control method	
	AMP: Current (A)	TEMP: Heatsink temperature (°C)	
LINE4	CH3/1/2/4		
LINE5	-		

3-5. Current time

LINE1	TIM-C: Current time				
LINE2	YEAR: Year	MONTH: Month	DAY: Day	HOUR: Hour	MIN: Minute
LINE3	Current year	Current month	Current day	Current hour	Current minute
LINE4	-				

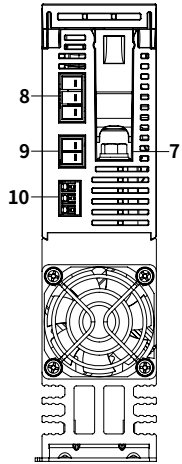
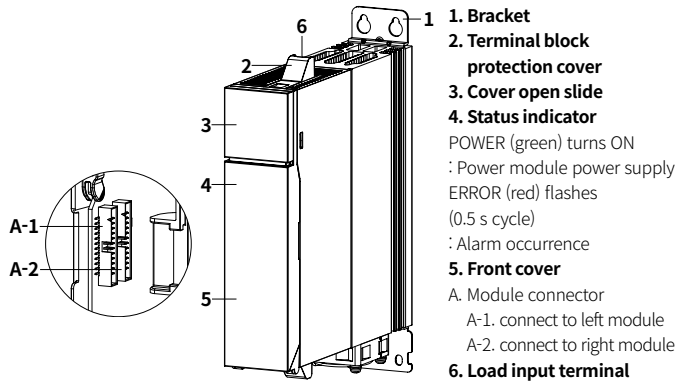
3-6. View alarm history

LINE1	ALM-D: View alarm history (Alarm history occurrence condition) The SPRS device switches from a normal status (no alarms) to an alarm status (at least one alarm active), and all alarms occurring within 1 minute are saved. (No. of alarm history saves) Up to 50 logs can be saved.				
LINE2	LOG 01 to 50 (No alarm history, EMPTY display)				
LINE3	2000 to 2100 (year)	1 to 12 (month)	1 to 31 (day)	0 to 23 (hour)	0 to 59 (minute)
LINE4	OC.A: Overcurrent alarm OV.A: Overvoltage alarm OTW.A: Heatsink overheat alarm OTP.A: Heatsink overheat protection alarm SCR: SCR element error alarm HTBKA: Heater break alarm	DLF.A: Partial heater break alarm FUSE.A: Fuse break alarm FAN.A: FAN error alarm FRQY.A: Frequency error alarm LPWRA: Input low voltage alarm PM_A: Module connection error alarm ULA: Load imbalance alarm			

3-7. Troubleshooting

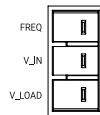
LINE1	DIAGN: Trouble shooting		
LINE2	Displays the channel set in the 1.1. operating channel OP-S.		
LINE3	CTL-O: Control output value (%) CTL-I: Control input value (%) MIN-O: Output limit MIN setting (%) MAX-O: Output limit MAX setting (%) DLF-C: Partial load scan completion status MPW-S: Power module status ST-T: Soft start setting time		UP-T: Soft start setting time DN-T: Soft start setting time CH1-A: Analog connection status CH2-A: Analog connection status CH3-A: Analog connection status CH4-A: Analog connection status PDC-S: Power distribution control setting status PM-P: Number of communication completion (per sec.)
LINE4	Check the setting values of the parameters selected in Line3		

[Power Module] Unit Descriptions



7. Load output terminal

8. Feedback signal connector



[Specification]

	Model	Manufacturer
Socket	0150-3603	Dinkle
Plug	0150-3003	

[Function]

Pin	Function
FREQ	Input power frequency detection
V_IN	Input voltage measuring detection
V_LOAD	Output heater voltage measuring detection

9. FAN power connector



[Specification]

	Model	Manufacturer
Socket	0150-2602	Dinkle
Plug	0150-2002	

[Function]

Pin	Function
+	+ 24 VDC
-	- 24 VDC

10. FAN connector



[Specification]

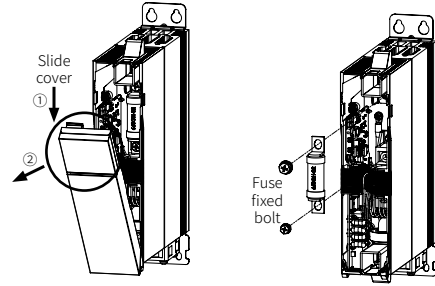
	Model	Manufacturer
Socket	0138-6103	Dinkle

[Function]

Pin	Function
FAN+	FAN power supply + 24 VDC
FAN_A	FAN operating status signal
FAN-	FAN power supply - 24 VDC

[Power Module] Fuse Replacement

- Push the Slide Cover in the direction of the arrow indicated on the top of the front cover of the power module to open it and check the fuse.
- The performance of the product is guaranteed only when using the fuse provided by us. For replacing the fuse, use the recommended fuse.



■ Fuse recommended specifications

- Rated short circuit test is evaluated as a recommended fuse.

Model	Rated load current	Recommended fuse	Manufacturer	Fuse fixed bolt
SPRS-F25	25 A	50FE	BUSSMANN	M5 × 12, M6 × 16
SPRS-F40	40 A	50FE		
SPRS-F55	55 A	80ET		
SPRS-F70	70 A	100FE		
SPRS-F90	90 A	170M1368	BUSSMANN	M6 × 12, M8 × 20
SPRS-F110	110 A	170M1369		
SPRS-F150	150 A	170M1370		
SPRS-F180	180 A	170M1372		
SPRS-F200	200 A	170M2620	BUSSMANN	M6 × 16, M10 × 25
SPRS-F250	250 A	170M2620		
SPRS-F350	350 A	170M3471		
SPRS-F400	400 A	170M4018		
SPRS-F500	500 A	170M4018	BUSSMANN	M10 × 25, M10 × 50
SPRS-F600	600 A	170M4018		

[Power Module] Cooling FAN Specification

- Models with a rated load current of 25 A / 40 A are not equipped with a separate cooling fan.

Rated load current	55 / 70 A	90 / 110 / 150 / 180 A	200 / 250 / 350 A	400 / 500 / 600 A
FAN power	24 VDC=	24 VDC=	24 VDC=	24 VDC=
FAN model	DA05015B24UF	DA07025B24UF	DA08032B24HF	DF12038B24VF
Signal type	Tachometer	Tachometer	Tachometer	Tachometer
Manufacturer	HENGTAI	HENGTAI	HENGTAI	HENGTAI
Power consumption (W)	1.44	1.68	12	25.2
FAN size (mm)	50×50×15	70×70×25	80×80×32	120×120×38

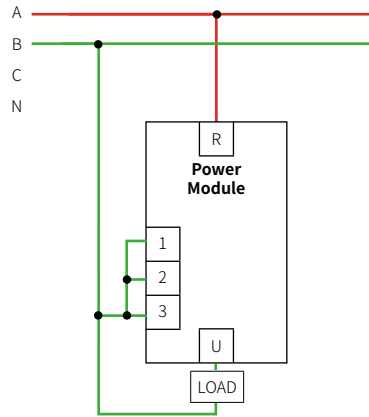
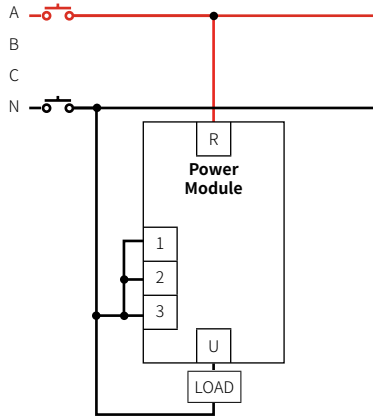
[Power Module] Load Wiring

- Set the operating channel of the control setting mode parameters to match the actual wiring. Failure to do so may result in malfunction.
- R: Load input power
- U: Heater (load) connection
- Connecting a capacitor (CAP) across the input phase-to-neutral (A-N, B-N, C-N) or input line-to-line voltage (A-B, B-C, C-A) will ensure compliance with EMC standards.
 - FILM CAPACITOR: $\geq 1\mu\text{F} / 500\text{ VAC}$

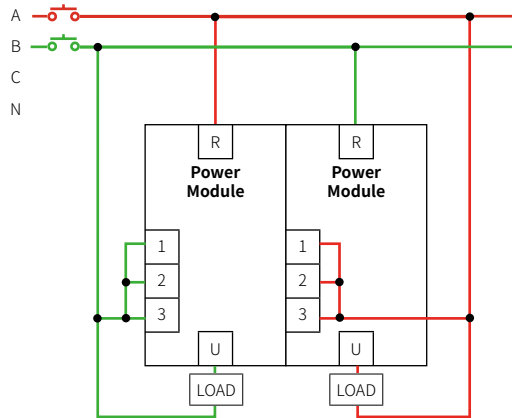
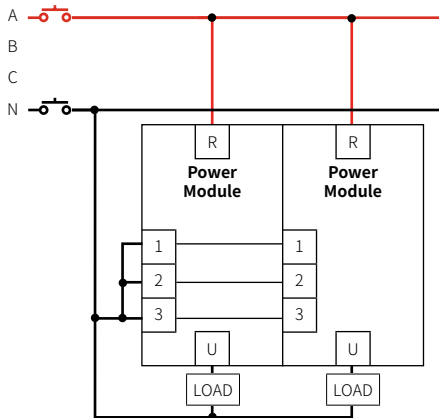
- Feedback connector

Pin No	Pin	Function
1	FREQ	Input power frequency detection
2	V_IN	Input voltage measuring detection
3	V_LOAD	Output heater voltage measuring detection

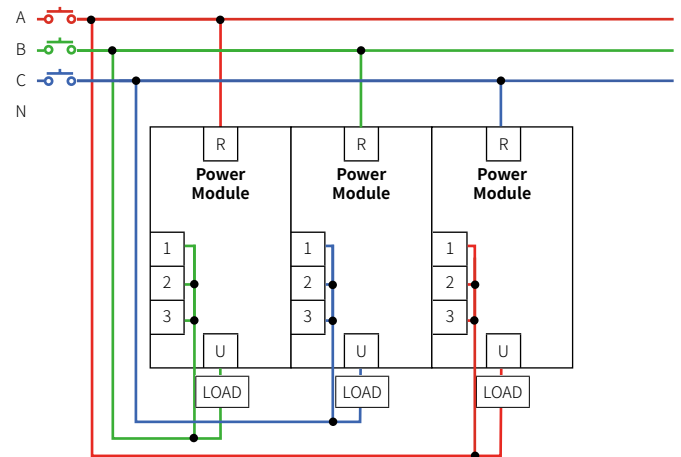
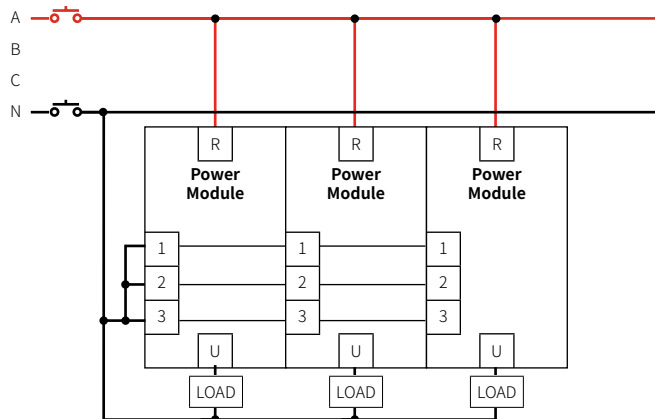
Single-phase: 1P1



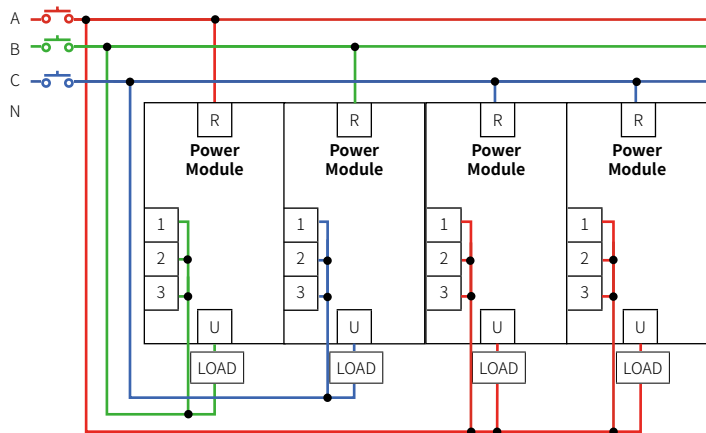
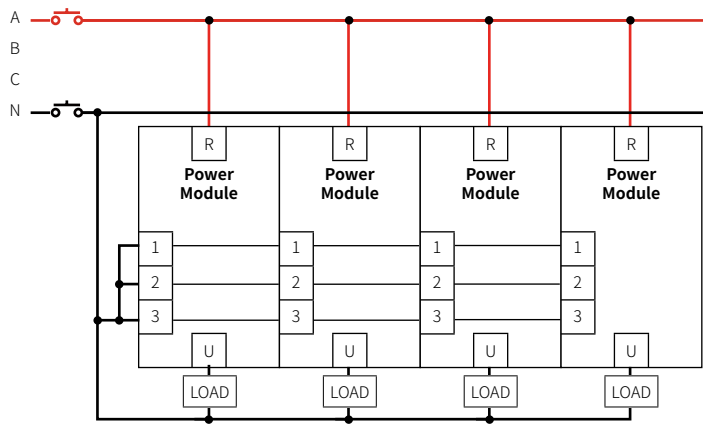
Single-phase: 1P2



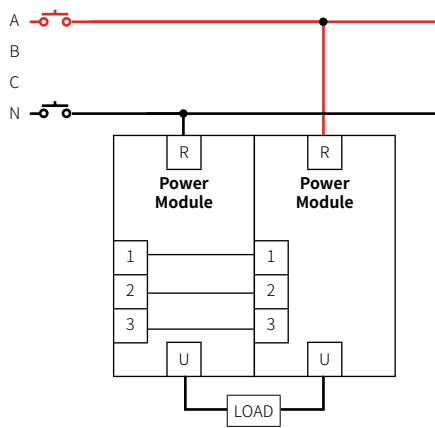
Single-phase: 1P3



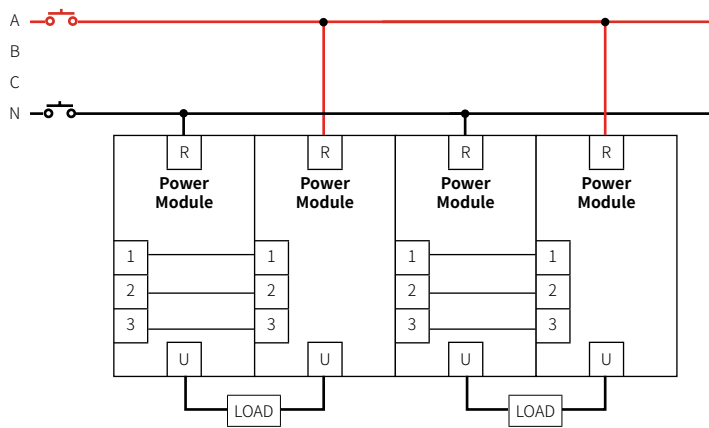
■ Single-phase: 1P4



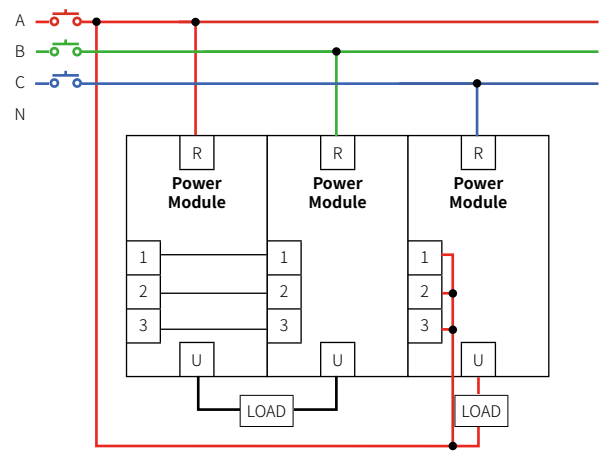
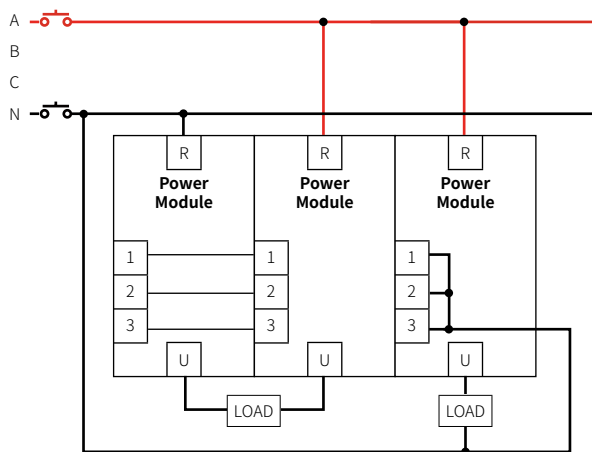
■ Single-phase dual: 2P1



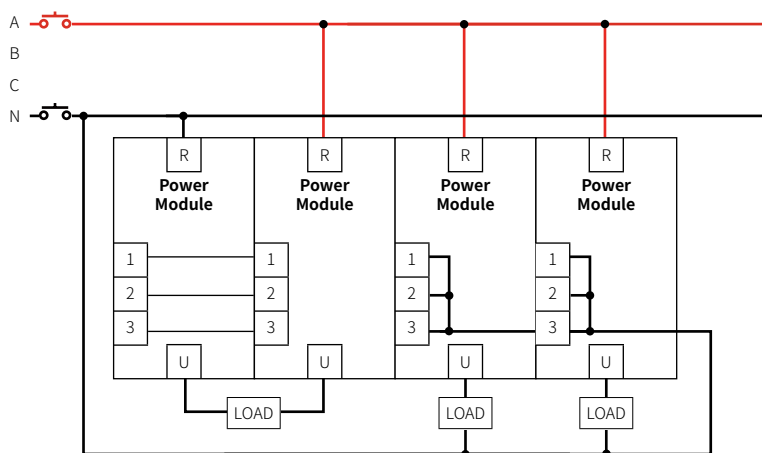
■ Single-phase dual: 2P2



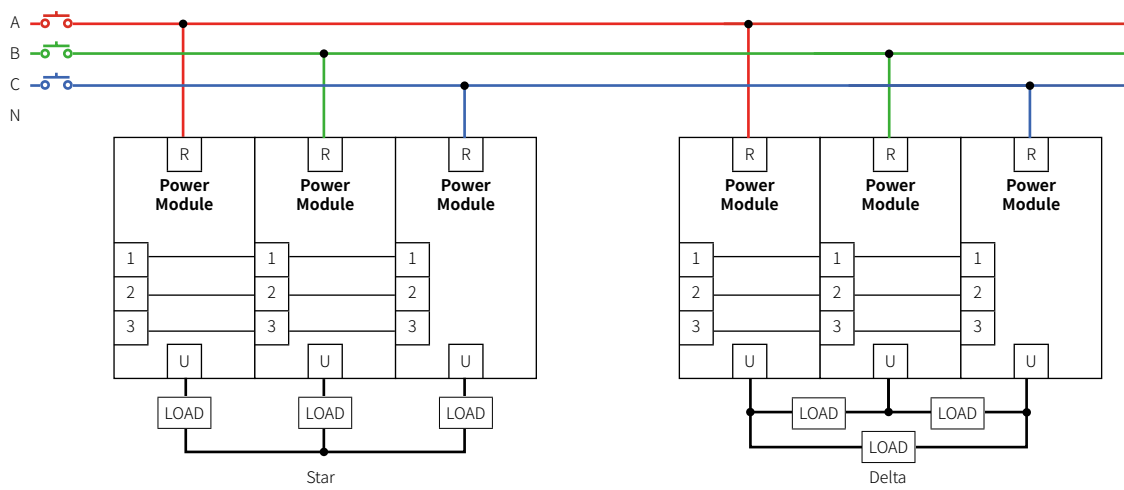
■ Single-phase dual: 2P1P1



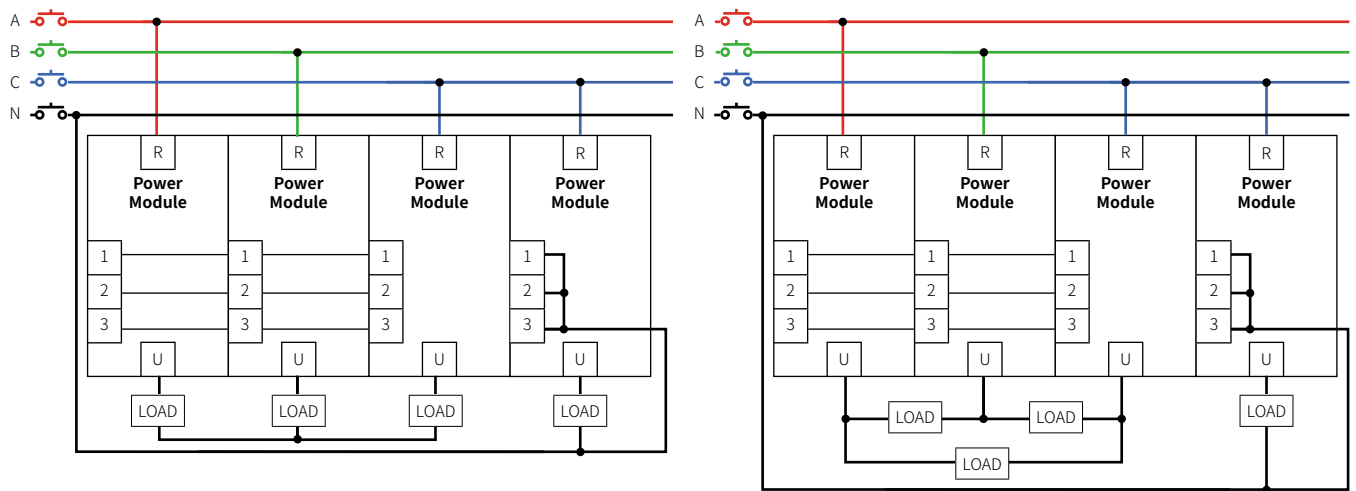
■ Single-phase dual: 2P1P2



3-phase: 3P1



3-phase: 3P1P1

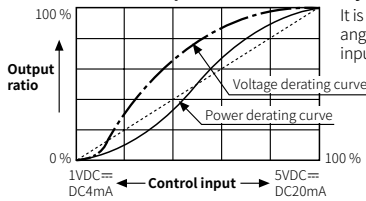


Control Method

■ Phase control

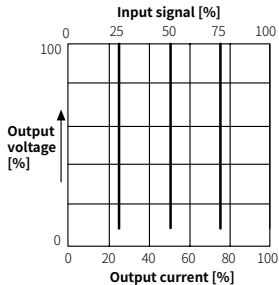
Phase control method is to control output by dividing AC phase by control input signal.

• Normal = Phase equal division method by control input



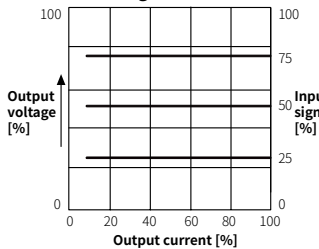
It is general output method to divide control angle proportionally according to control input signal and to output it.

• Constant current feedback control mode



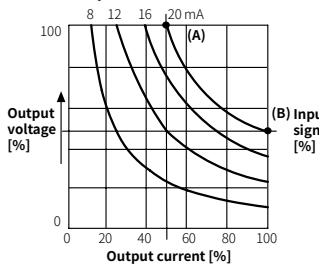
It outputs a constant current proportional to the control input so that the output current does not fluctuate against fluctuations in power voltage and load resistance fluctuations of loads (platinum, molybdenum, tungsten, etc.) in which the temperature coefficient of electrical resistance varies significantly from 6 to 12 times the normal temperature.

• Constant voltage feedback control mode



It outputs a constant voltage proportional to the control input so that the output voltage does not fluctuate against fluctuations in power voltage and load resistance fluctuations of loads (iron, chromium, nichrome, etc.) with a small electrical resistance temperature coefficient.

• Constant power feedback control mode



It is proper control method for a heater which resistance value variation by silicon carbide (SiC) heating is big. It outputs constant power which is proportion to control input even though load variation and power supply variation.

- (A): [output voltage 100 %
× output current 50 %]
- (B): [output voltage 50 %
× output current 100 %]
- Output characteristics is proper 50 % of the curve which connects the point (A) and the point (B). The current output capacity of this unit should be over two times of load capacity.

■ Cycle control, zero cross turn-on

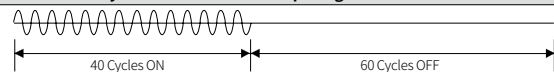
Compared to the phase control method, the load control linearity is better.

Since it is always ON or OFF at the zero point of AC, no noise is generated during ON / OFF, so it is a suitable control method for an environment where noise is not affected or an electric furnace with a large heat capacity.

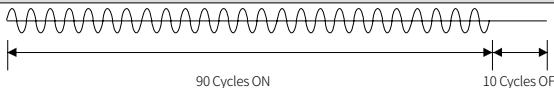
• Fixed cycle control mode

During fixed cycle (100 cycles) of load power, it repeats ON / OFF cycle as constant ratio according to control input signal and controls the power supplies on the load.

When controlled by 40 % of the control output signal



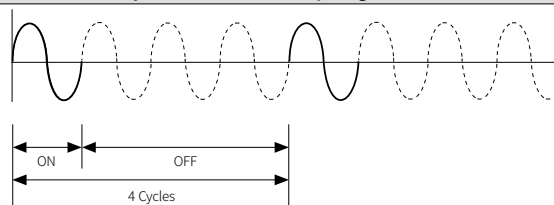
When controlled by 90 % of the control output signal



• Variable cycle control mode

By minimizing the number of cycles of the load power, it controls the power applied to the load (heater) by operating ON / OFF at a ratio proportional to the control input signal.

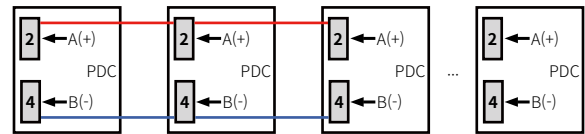
When controlled by 25 % of the control output signal



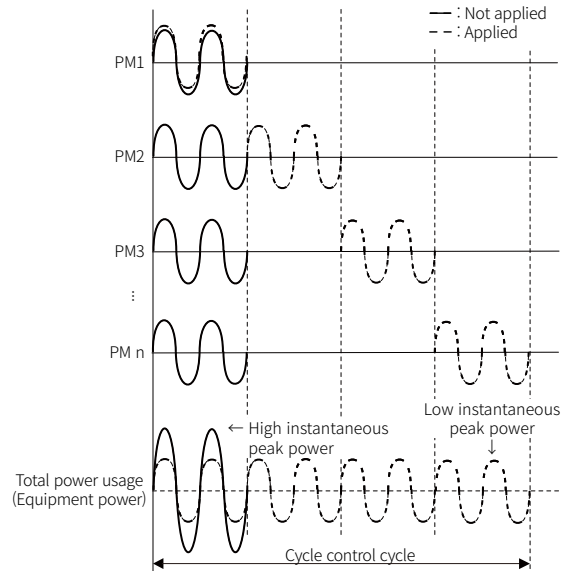
■ Power distribution control

- When operating up to 9 sets of single-phase power modules, the system controls to prevent instantaneous peak power from concentrating at the same time through internal algorithm calculations between modules.
- Separate wiring work is required between control modules. Connect the A(+) and B(-) terminals of the PDC in the control signal / communication connector of control module to the A(+) and B(-) terminals of the other control modules.

• Control module connection



• Power distribution control



Function

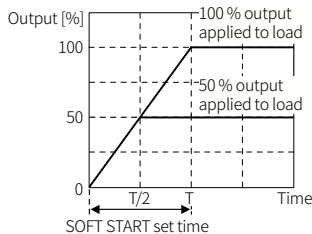
■ PI Coefficient

The PI controller is a control method that combines the proportional and integral coefficients to compensate for the error with respect to the target value. It is set to the optimal values from the factory settings. If the proportional and integral coefficients are arbitrarily set too small, it can lead to a fast response but may cause overshoot or hunting. If set too large, the response speed will be slower.

■ SOFT START

This function protects the load in cases that the set temperature is high, such as controlling the load (platinum, molybdenum, tungsten, infrared lamp, etc.) in which inrush current flows when power is supplied, or showing large width of temperature rise during initial operation.

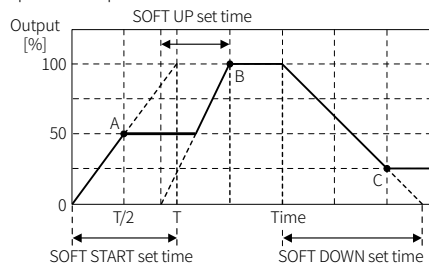
If the input is changed before the end of the SOFT START function, T increases or decreases by the changed difference (%).



- T: SOFT START set time.
Time to get the output which is applied into the load is 100 %.
- T/2: Time to get the output which is applied into the load is 50 %.

■ SOFT UP / DOWN

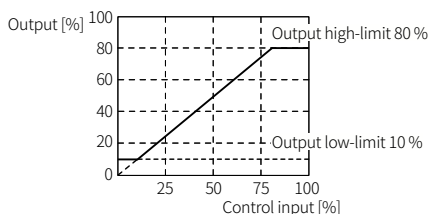
Unlike SOFT START which operates only once at supplying power, this function protects load from the inrush current in the RUN mode. When reached to the target output value, operation stops.



- A: SOFT START function finished
- B: SOFT UP function finished
- C: SOFT DOWN function finished

■ Output high / low-limit value

This function is to limit output range to protect load.



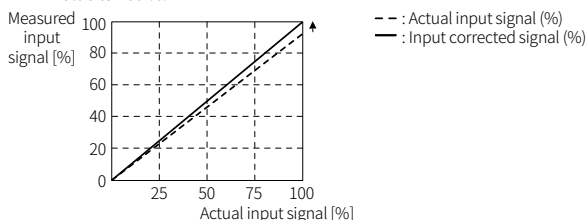
■ Input slope correction

It prevents load damage by limiting 100% of the power supplied to the load. It compensates the gain of the measured 100 % input for actual 100 % input value. Calibrated monitoring value =

Monitoring value +

$$\frac{\text{Monitoring value}}{100 - \text{input slope correction value}} \times \text{Input slope correction value}$$

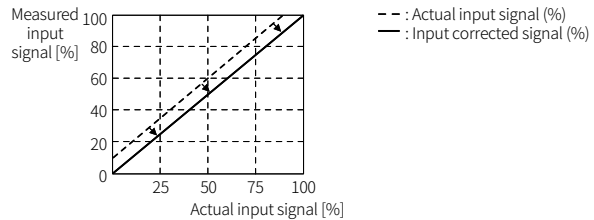
- E.g.) When the input monitoring value is 99 % at 20 mA in DC 4 - 20 mA control input, setting LINE3 of 1-10 Input slope correction = 1 % calibrates the input monitoring value to 100 %.



■ Input OFFSET correction

It compensates the offset between actual input value and measured input value.

- E.g.) When input monitoring value is 5 % at 4 mA in DC 4 - 20 mA control input, setting LINE3 of 1-11 Input offset correction = -5.0 % calibrates the input monitoring value to 0 %.



■ Partial heater break

The partial heater break alarm is available for single-phase control. When the alarm occurs, DLFA flashes on the display (LINE1) at 0.5-second intervals, while the output is maintained.

• Operating conditions

The alarm occurs when a load (heater) is disconnected (break) during single-phase 1-channel parallel load operation.

A load quantity × DEAD.Z setting current threshold or higher.

Ex) If there are 5 loads and the DEAD.Z setting is 5A,

Alarm occurrence condition = 5 loads × DEAD.Z setting 5 A = 25 A

25 A or higher: Alarm occurs in the power module SCAN value

25 A or lower: No alarm

Segment Table

The segments displayed on the product indicate the following meanings. It may differ depending on the product.

7 segment	11 segment	12 segment	16 segment
0 0 i I	0 0 i I	0 0 i I	0 0 i I
1 1 j J	1 1 j J	1 1 j J	1 1 j J
2 2 k K	2 2 k K	2 2 k K	2 2 k K
3 3 l L	3 3 l L	3 3 l L	3 3 l L
4 4 m M	4 4 m M	4 4 m M	4 4 m M
5 5 n N	5 5 n N	5 5 n N	5 5 n N
6 6 o O	6 6 o O	6 6 o O	6 6 o O
7 7 p P	7 7 p P	7 7 p P	7 7 p P
8 8 q Q	8 8 q Q	8 8 q Q	8 8 q Q
9 9 r R	9 9 r R	9 9 r R	9 9 r R
A A s S	A A s S	A A s S	A A s S
b B t T	b B t T	b B t T	b B t T
c C u U	c C u U	c C u U	c C u U
d D v V	d D v V	d D v V	d D v V
e E w W	e E w W	e E w W	e E w W
f F x X	f F x X	f F x X	f F x X
G G y Y	G G y Y	G G y Y	G G y Y
H H z Z	H H z Z	H H z Z	H H z Z