

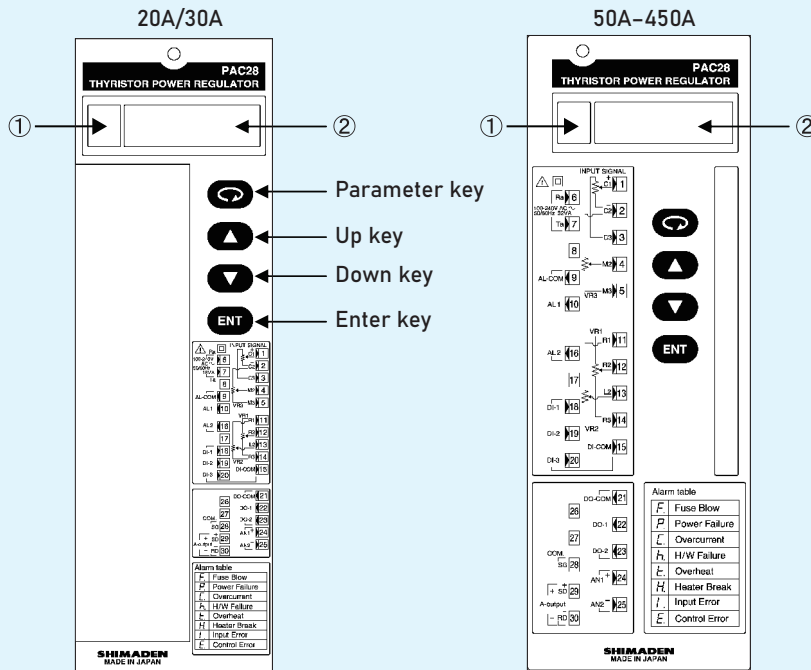
| | |
|-----|--|
| °C | Series PAC28 THYRISTOR SINGLE PHASE POWER REGULATOR |
| %RH | |
| | |



Rated current up to 100 A (main supply voltage: 100 V to 240 V)
Employs a noise filter to comply with EMC standards.

BASIC FEATURES

- Source frequency 50/60 Hz automatically discernible
- Control circuit power supply can be 100 V to 240 V to support a wide supply voltage range.
- Two types of main power supply: 100 V to 240 V and 240 V to 480 V
- Analogue auxiliary input with insulation is optional; ramping can be set by remote signal.
- Standard heater break alarm as standard feature (not available for variable resistive loads)
- Operation control and output monitoring by communication function (optional)
- Output voltage range: 0 to 98% (not including thyristor forward voltage drop [1 to 2 V])
- CE marking compliant / rated current up to 100 A (main supply voltage: 100 V to 240 V)
Employs a noise filter to comply with EMC standards.

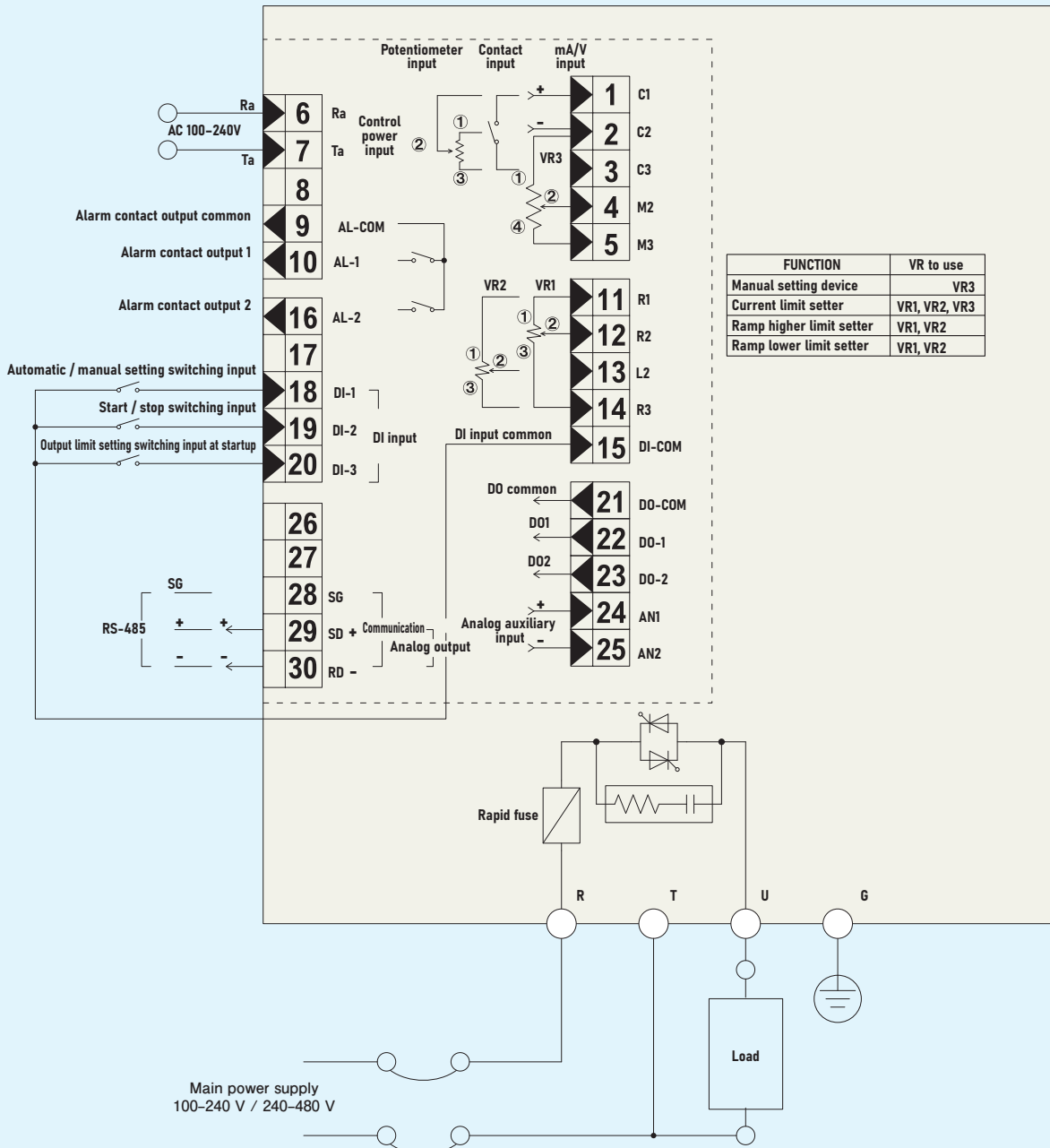


Display

- ① Status display (red, 1 digit)
Indicates equipment status and displays parameter screens.
- ② Parameter display (green, 4 digits) Displays parameter names and related data.

Switches and their names

- Parameter key: Primarily used for switching screen groups.
- Up key: Primarily used for modifying parameter values. Increases numerical value.
- Down key: Primarily used for modifying parameter values. Decreases numerical value.
- Enter key: Primarily used to register parameter settings.

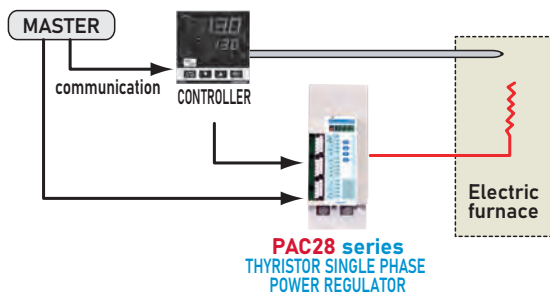


- Incorporates countermeasures against instantaneous power failure and power supply malfunctions to eliminate overcurrent problems during transformed load and offers improved performance concerning power fluctuations, distortion and noise.
- Detects thyristor element shorting, shuts gate and outputs alarm.
- Load current is detected by the CT, gate is shut in case of overcurrent and alarm is output.
- Built-in rapid fuse protects against overcurrent.

SETTING

- Setup panel provided as standard feature, Front keys and digital display facilitate ramping, slow-up/slow-down, output limiter, and manual output settings. Manual setting, current limit setting, ramping higher limit value setting, and ramping lower limit setting can be set with an externally attached adjuster.
- Memory function allows the user to save setup in the memory so you can easily restore equipment settings even if they are altered.

EXAMPLE



Two types of main power supply (100 V to 240 V and 240 V to 480 V) support a wide range of voltages.

The control circuit is a 100 V to 240 V free supply, so phase-matching is not required.

CHARACTERISTICS AND OUTPUT WAVEFORMS BASED ON CONTROL SYSTEMS

| CONTROL SYSTEMS \ ITEM | Harmonic Disturbance | Occurrence of Flicker | Applicable load | OUTPUT WAVEFORMS | | |
|---|----------------------|-----------------------|--|------------------|------------|------------|
| | | | | 10% output | 50% output | 90% output |
| PHASE CONTROL SYSTEM | May occur | None | Constant resistance load Inductive load (primary control of transformer) | | | |
| CYCLE CALCULATION ZERO VOLTAGE SWITCHING CONTROL SYSTEM | None | May occur | Constant resistance load | | | |

| Type of heater | Feedback control method Additional function |
|---|--|
| Kanthal Super | Constant voltage control + current limit, constant power control + current limit, constant current control |
| Pure metal (platinum, molybdenum, tungsten, etc.) | Constant voltage control + current limit, constant power control + current limit, constant current control |
| Carbon | Constant voltage control (+ current limit), constant power control |
| Salt bath | Constant voltage control (+ current limit), constant current control |
| SiC (silicon carbide) | Constant voltage control (+ current limit), constant power control, constant current control |

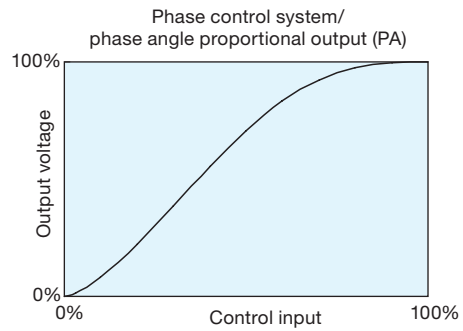
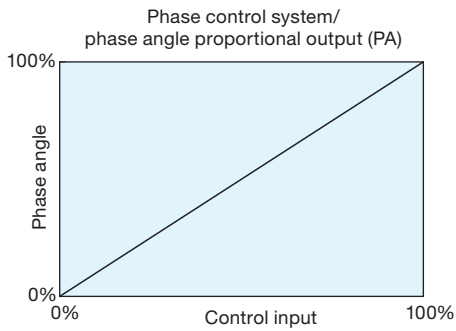
Note: Variable resistance of SiC, etc., can be controlled as heaters. Resistance variation is significant, so heater break cannot be detected in some cases. In addition, to prevent malfunctions, the heater break alarm is disabled when output current is less than 10% of the rated current.

| Parameter symbol Control system | Control type | Feedback function |
|------------------------------------|---|---|
| $U-Fb$ | Phase control system / Constant voltage output | Voltage feedback by true actual value |
| $I-Fb$ | Phase control system / Constant current output | Current feedback by true actual value to handle variable resistance load |
| $P-Fb$ | Phase control system / Constant power control | Power feedback, accuracy control to handle variable resistance load Error becomes large when there is a difference in voltage and current phases. |
| U^2-Fb | Phase control system / Square voltage output | Voltage square feedback, control signal / output power varies linearly for constant resistance load. |
| PR | Phase control system / phase angle proportional output | none |
| ΞC | Cycle calculation zero voltage switching control system | none |

| | |
|---|--|
| <p>■ Phase control system / Constant voltage output : Voltage feedback by true actual value</p> <p>This function obtains the output voltage corresponding to the control input signal.</p> | |
| <p>■ Phase control system / Constant current output : Current feedback by true actual value to handle variable resistance load</p> <p>Constant current output (current feedback): phase control system This function calculates and controls the current setting value provided by the control signal and the current signal from the current regulator (built-in CT). If the control input is constant, current is controlled consistently even when load and current fluctuate, making it suitable for controlling platinum, molybdenum, tungsten, Kanthal Super, etc.</p> <p>-Characteristics Description- Adjusts voltage to attain the current value provided by control signal. As a precaution, the thyristor capacity and the load capacity should match as much as possible. When a 30 A negative load is connected to a 60 A power regulator, the control outputs for the control inputs 0 to 50% (4 to 12 mA) are 0 to 30 A. On the other hand, a 60 A load connected to a 30 A power regulator still has a control range of 0 to 30 A.</p> | |
| <p>■ Phase control system / Constant power output : Power feedback, accuracy control to handle variable resistance load Error becomes large when there is a difference in voltage and current phases.</p> <p>This function controls the power proportional to the control input and its effect is evident in SiC heater control, where the resistance value varies significantly depending on the temperature range. Controlling power provides a more stable control of heat generation, which provides better control than just controlling voltage or current alone. When selecting this characteristic, there must be sufficient thyristor capacity. The maximum power characteristics of the thyristor range from 50% rated current multiplied by 100% rated voltage to 100% rated current, as shown in the figure on the right.</p> | |
| <p>■ Phase control system / Square voltage output : Voltage square feedback, control signal / output power varies linearly for constant resistance load.</p> <p>This function outputs power proportional to the control input and also has a constant voltage characteristic. It therefore offers better control and can be applied to nichrome wire heaters. Power regulator proportional to the scale of the regulator, when manually adjusting, for example.</p> | |

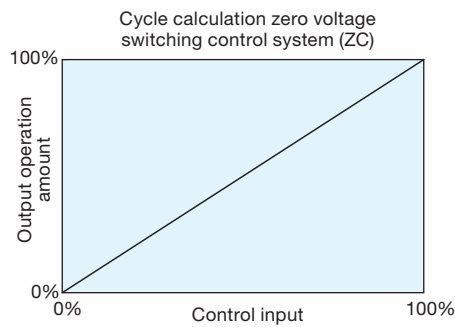
■ Phase control system / phase angle proportional output

Phase angle output proportional to control input signal can be obtained.
Please use the current limit function and the variation limit function concurrently when inrush current load is large.



■ Cycle calculation zero voltage switching control system

Cycle output proportional to control input can be obtained.
There is less noise occurrence compared to phase angle control. Current limit function will be disabled.

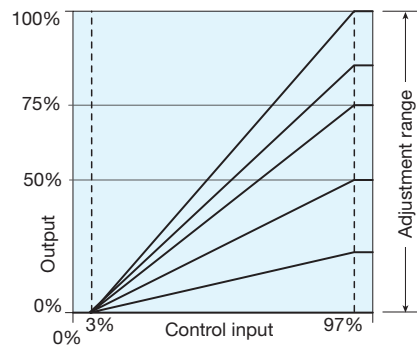


OUTPUT ADJUSTMENT FUNCTION

■ Ramp higher limit (high power) adjustment

The output value for ramp upper limit can be adjusted from 0.1 to 100.0% when control input is 97%.
Because maximum output is narrowed down, output ramp of the device relative to the control input signal is changed.

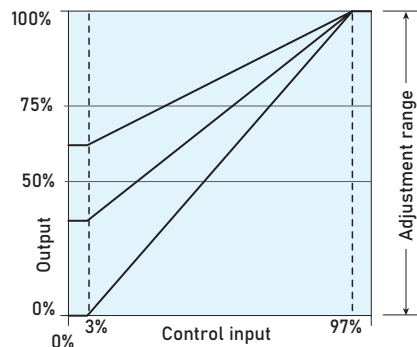
Ramp higher limit output characteristics diagram



■ Ramp lower limit (base power) adjustment

The output value for ramp lower limit can be adjusted from 0.0 to 99.9% when control input is 3%.
Used when you want to output even when control input is 3% or lower.
Because minimum output is adjusted, output ramp of the device relative to the control input signal is changed.

Ramp lower limit output characteristics diagram



■ **Heater break alarm function**

Detects load voltage and load current, compares them with the alarm set point and an alarm is output if load resistance exceeds the set value.

Note: Variable resistance of SiC, etc., can be controlled as heaters. Resistance variation is significant, so heater break cannot be detected in some cases. In addition, to prevent malfunctions, the heater break alarm is disabled when output current is less than 10% of the rated current.

■ When thyristor rating is 100A and the heat source uses five heaters of the same rating:

Heater rating (per heater)
Voltage: 200V
Current: 20A
Power: 4kW
Type: nichrome

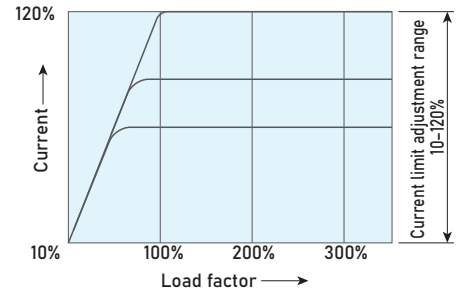
□ Setting for alarm in case one heater breaks among the five heaters

The current value resulting from a single heater break will be 80% of the rating.
When considering variation in heater resistance, in order to alarm securely, it is recommended to establish setting at 50% higher than the current value per heater.
In this case, the current value per heater becomes 20% of the rating, thus the setting for a single heater break alarm will be as follows: Current value (80%) when single heater break + current value (20%) of a single heater × 0.5 = 90%.

■ **Current limit: only for phase control system**

This is a function for limiting the current to the set current value (within 10 to 120% of the rated current) and used when controlling platinum/molybdenum/tungsten heaters which generate an initial inrush current, and SiC heaters.

Caution: Do not apply a continuous load which exceeds the current limit value. This may cause hunting of output current.



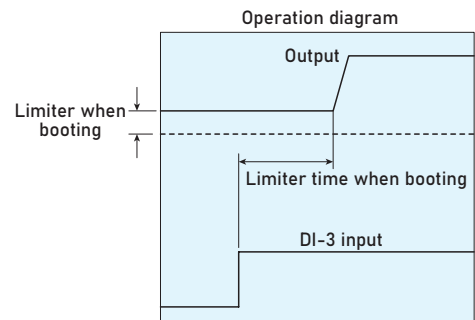
■ **Start up output limiting**

This characteristic is useful when controlling the load (platinum, molybdenum, tungsten, infrared lamp, etc.) under which rush current flows when power is applied and when load is switched. Load can also be protected.

-Characteristics Description-

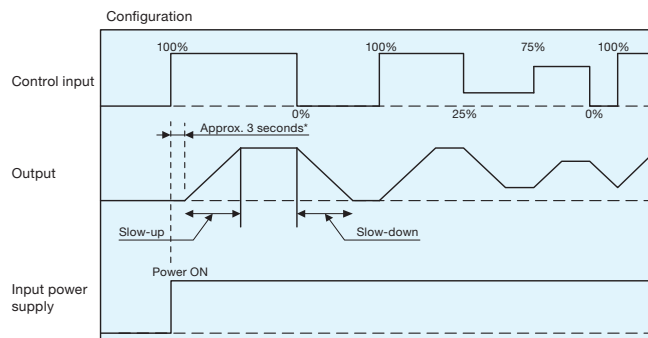
System for outputting limited output (0.0 to 100.0%) for a limited amount of time (0.0 to 99.9 seconds) when power is applied and when external sequence signals (15 to 20 terminals) are input. Adjustment system whereby output and time are adjusted to current values so as not to adversely affect the heater, provided rush current does not exceed rated current, depending on heater characteristics.

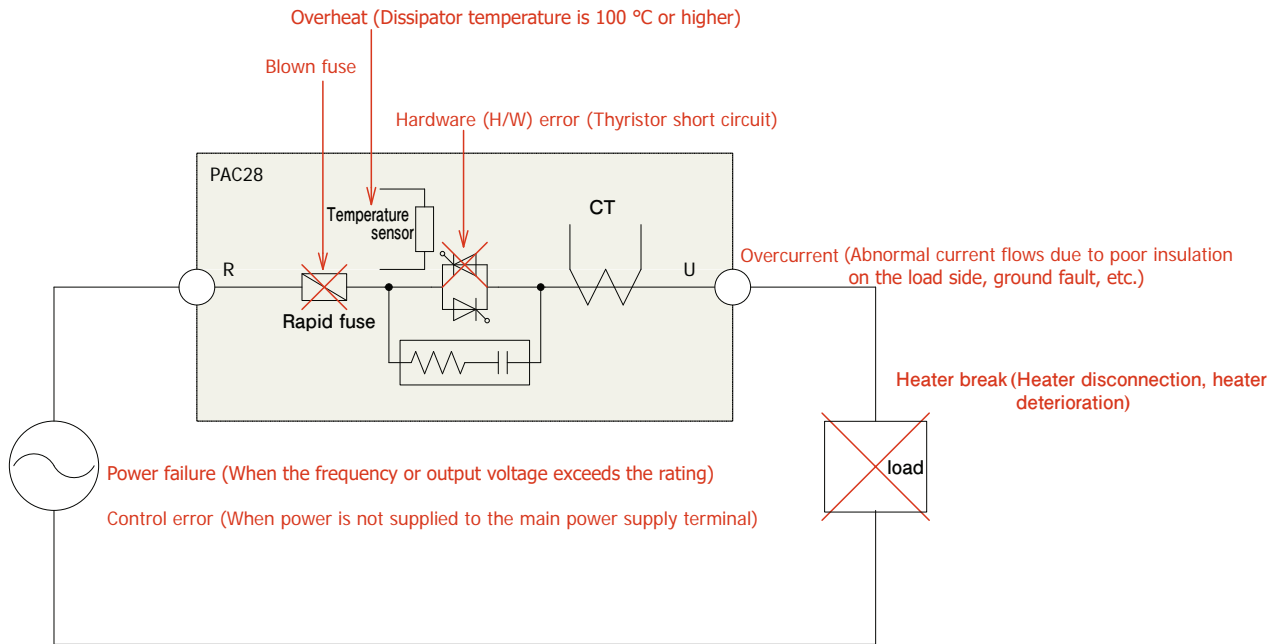
*Be careful that time is not too long.



■ **Variation limit (slow-up time/slow-down time)**

The variation limit function delays the output response of PAC28 against rapid changes in the control input signals and settings. This function prevents the excessive change in load current, thus lowering the burden on load equipment and power equipment.





| Alarm types | Display | Conditions | Alarm output | Alarm history | Corresponding action |
|----------------------|---------|---|--------------|---------------|--|
| Blown fuse | "F" | Built-in fast-blow fuse (optional) has blown. | OK | Recorded | Switch to standby. (output off) You cannot return to control by communication or DI-2 input. Turn off the power, remove the cause and then return to ordinary operation by turning the power back on. Status display flashes. |
| Power failure | "P" | Frequency has exceeded the 40—70 Hz range or output voltage has exceeded the rating by 120%. | | | |
| Overcurrent | "I" | Output current has exceeded the rating by 130% or output current has exceeded the rating with less than 10 V of output voltage. | | | |
| H/W (hardware) error | "H" | Output voltage has exceeded main circuit voltage by 75% with less than 20% of output phase angle or output cycle (output current is at least 5% of rating). | | | |
| Overheat | "T" | Radiator temperature has exceeded approx. 100°C. | | | |
| Heater break | "H" | Heater break has been detected. | | | |
| Input error | "I" | Control input or analog auxiliary input level is too high or too low. | None | Not recorded | Continue ordinary operation. Status display flashes. |
| Control error | "E" | No power supply synchronizing signals | | | |

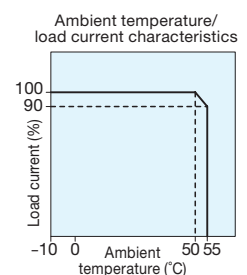
OUTPUT ADJUSTMENT FUNCTION

Voltage (0.9to1.3V) is produced between terminals by current flowing to the thyristor. Voltage between terminals and accumulation of current (W) turn into Joule heat resulting in a rise in temperature of the thyristor elements.

Take radiation and ventilation into account.

■ PAC28 Rated current and heat value

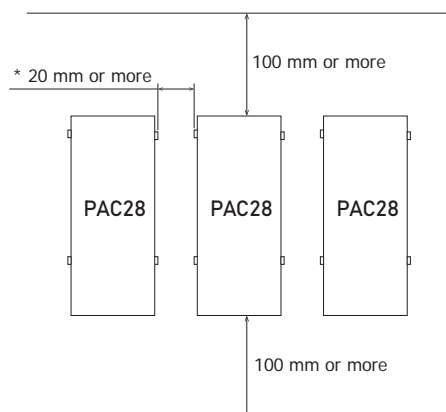
| Current capacity | 20A | 30A | 50A | 75A | 100A | 150A | 200A | 300A | 450A |
|-------------------------------|-----|-----|-----|------|------|------|------|------|------|
| Rapid fuse without heat value | 32W | 44W | 63W | 89W | 109W | 176W | 246W | 336W | 476W |
| Rapid fuse with heat value | 34W | 48W | 69W | 102W | 123W | 194W | 278W | 354W | 515W |



| | |
|--|---|
| □ Type | : PAC28 |
| □ Control element configuration | : Thyristor x 2 anti-parallel connection |
| □ Main power supply | : 100 to 240V AC (used with full-scale voltage set to 100 to 240V; initial value: 220V) 240 to 480V AC (used with full-scale voltage set to 241 to 480V; initial value: 440V) Specify either of the 2 types described above. |
| □ Control power supply | : 20A to 100A: 100 to 240V AC 18VA 9W 150A to 450A: 100 to 240V AC 32VA 16W |
| □ Voltage fluctuation tolerance | : Max. ±10% of rated voltage |
| □ Rated frequency | : 45 to 65Hz |
| □ Rated current | : Specify any one from among 20A, 30A, 50A, 75A, 100A, 150A, 200A, 300A, 450A |
| □ Minimum load | : 20A/30A : 0.5A 50A/75A : 0.5A 100A/150A/200A : 1.0A 300A/450A : 2.0A |
| □ Control output range | : 0 to above 98% |
| □ Applicable load | : Resistance load or inductive load (transformer primary control: phase control or complex control) |
| □ Control type | : Select from among phase control, cycle calculation zero voltage switching control |
| Control function selection (for phase control) | |
| · Constant voltage output | : Voltage feedback by true actual value |
| · Constant current output | : Current feedback by true actual value to handle variable resistance load |
| · Constant power control | : Power feedback, accuracy control to handle variable resistance load |
| Error becomes large when there is a difference in voltage and current phases. | |
| · Square voltage output | : Voltage square feedback, control signal / output power varies linearly for constant resistance load. |
| □ Cooling | : 20 to 100A Self cooling 150 to 450A Forced air cooling system |
| □ Protection | : Thyristor gate cutoff, alarm output 1) Electronic overcurrent gate cutoff circuit (alarm output when in action) 2) Rapid fuse (alarm output when fuse blows) (optional) 3) Power failure detection: Detects when source frequency is below 40Hz or above 70Hz When output voltage is 120% of the rating or more 4) Thyristor overheat detection: Detects temperature of radiator when temperature rises abnormally 5) Hardware error detection: Detects thyristor error |
| □ Control input | : Current 4 to 20mA, 0 to 20mA DC (receiving impedance 100Ω) Voltage 0 to 10V, 0 to 1V, 1 to 5V DC (input resistance 200kΩ or more) Potentiometer (all resistance values 100Ω to 10kΩ, 3 line type), contact, voltage pulse (12VDC±2V) common Factory set to either current input or voltage input |
| □ Standard functions | |
| · External adjuster | : Can be allocated to ramp, current limiter, manual operation external adjuster Up to 3 can be used; external adjuster 10kΩ, 3 line type (sold separately) |
| · Digital control input (DI) | : 3 point input, no voltage contact or open collector, 5V 4mA Max, insulated from control input and system DI-1: Manual/automatic, DI-2: Standby/operation, DI-3: Allocation fixed to output limit at start-up Level operation, when DI input signal ON, operation / non-operation selection |
| · Alarm output (AL1) | : One a-contact 240V AC 1A, insulated from system Blown fuse, overcurrent, power failure, hardware error, overheat, heater break selection; duplication selection possible |
| Heater break alarm | : Heater break is detected and alarm is output. (Allocated to alarm output) Heater break judgment 0 to 100% setting (In addition, to prevent malfunctions, the heater break alarm is disabled when output current is less than 10% of the rated current.) |
| · Current limit function | : Used for pure metal load, etc., inrush current limitation, response time 0.5 sec. or less (initial value: 100% of rated current) 10 to 100% of rated current setting for external adjuster 10 to 120% of rated current setting for front surface key |
| · Variation limit (slow-up/down) | : 0.0 to 99.9 sec. variable setting (set by front surface key switch) Time required to reach 0 to 100% output, slow-up, slow-down time independent setting, initial value: 1.0 sec. |
| · Error occurrence history | : Leaves a record of errors when they occur. Record of only the first time each type of error occurs is kept. Record items Blown fuse, power failure, overcurrent, hardware error, overheat, heater break |
| · Parameter save function | : 2 parameter files (factory setting values and user file) User file can save set parameters. |
| □ Additional functions | |
| · Alarm output (AL2) | : One point a-contact, 240V AC 1A, insulated from system Blown fuse, overcurrent, power failure, hardware error, overheat selection; duplication selection possible |
| · Rapid fuse | : Protects thyristor / power equipment from load shorting, etc. Alarm output for cutoff |
| · Analog auxiliary input | : 1 point, voltage 0 to 10V, 1 to 5 V DC or current 4 to 20mA DC input, insulated from input control Output adjustment function by analog signal. Multiplied to control input Used for feedback control by external converter, etc. |

- Analog output : 1 point, 0 to 10V DC, 2mA, insulated from control input and system
Control input value or output operation amount 0 to 100% signal output, reverse scaling possible
*Communication function and exclusive selection
 - Digital control output (DO) : 2 points, open collector output (darlington output), 24V DC, 25mA ON voltage 1.5V max.
Insulated from control input and system
Standby state, operating state (including manual), from heater break, selection of output conditions
 - Communication : RS-485 specs., insulated from control input and system
Communication protocol: Selection of SHIMADEN protocol or MODBUS protocol (ASCII/RTU)
Communication speed: 9600/19200 bps
Parity: Selection of EVEN / NON / ODD
Stop bits: 1/2 selection
Power on/off, output control, ramp setting
Operation on/off, control input, operation amount, load voltage, current, power value, alarm status can be obtained
*Analog output and exclusive selection
- General specifications
- Service ambient temperature range : -10 to 55°C (current must be reduced for 50°C or higher.)
 - Service ambient humidity range : 90% RH or lower (no dew condensation)
 - Storage temperature : -20 to 65°C
 - Elevation : Altitude 2000m or below
 - Pollution level : 2(IEC 60644)
 - Applicable standards : Safety EN61010-1 and EN61010-1 (limited to products with main power supply voltage 100 to 240V, 100A or less)
EN IEC 61010-2-030 (limited to products with main power supply voltage 100 to 240V, 100A or less)
EMC EN61326-1 (limited to products with main power supply voltage of 100 to 240V, 100A or less)
The specified noise filter however must be used.
20A NF2020C-SDG
30A NF2030C-SDG
50A NF2050C-SDG
75A NF2080C-SDG
100A NF2100C-SDG
 - Insulation resistance : RoHS directive supported
Between control power supply terminals and control input terminals : 500V DC, 20MΩ min.
Between main power supply terminals and chassis : 500V DC, 20MΩ min.
 - Dielectric strength : 2300V AC, for 1 minute
Between control power supply terminal and control input terminal
Between main power supply terminal and chassis
100 to 240V AC : 2000V AC for 1 minute
240 to 480V AC : 2500V AC for 1 minute
 - Material/finish : Ordinary sheet metal / paint finish
 - External dimensions/weight : 20A/30A : 218 (H) × 58 (W) × 160 (D) mm / approx. 1.7kg
50A/75A : 218 (H) × 98.6 (W) × 172 (D) mm / approx. 3.3kg
100A : 218 (H) × 114.2 (W) × 200.5 (D) mm / approx. 3.8kg
150A/200A : 290 (H) × 127.2 (W) × 270 (D) mm / approx. 7.2kg
300A/450A : 400 (H) × 191.2 (W) × 294.6 (D) mm / approx. 16kg
 - Terminal cover : Standard attached

INTERVALS REQUIRED for MOUNTING



| Item | code | specifications |
|---|-------|---|
| Series | PAC28 | High-performance thyristor type power regulator Standard function: 1 Alarm output (AL1), 3 digital control inputs (DI) |
| Control type | P1- | Phase control / constant voltage output |
| | P2- | Phase control / constant current output |
| | P3- | Phase control / constant power output *1 |
| | P4- | Phase control / square voltage output |
| | P0- | Phase control / angle proportional input |
| | C1- | Cycle calculation zero voltage switching control |
| | | Equipped with feedback function |
| | | Not equipped with feedback function |
| Control input | 6 | Voltage: 0 to 10 V, 0 to 1 V, 1 to 5 V DC Input resistance: 200kΩ |
| | | Contact |
| | 4 | voltage pulse Rated 12V DC ± 2V |
| | | potentiometer input Total resistance 100Ω to 10kΩ 3-wire system |
| | | Current: 4 to 20 mA, 0 to 20 mA DC Reception resistance: 100Ω |
| Main power supply voltage | 90- | 100 to 240V AC |
| | 91- | 240 to 480V AC (*2) |
| Rated current | 020- | 20A |
| | 030- | 30A |
| | 050- | 50A |
| | 075- | 75A |
| | 100- | 100A |
| | 150- | 150A |
| | 200- | 200A |
| | 300- | 300A |
| Analog auxiliary input (Output ramp function is available) | 0 | None |
| | 4 | 4 to 20mA DC reception resistance: 100Ω |
| | 5 | 1 to 5V DC input resistance: 500kΩ |
| | 6 | 0 to 10V DC input resistance: 500kΩ |
| Alarm output 2 (With alarm output 1 / standard) | 0 | None |
| | 1 | 1 contact output |
| Digital control output (DO) | 0 | None |
| | 1 | 2 open collector outputs |
| Communication / analog output | 0 | None |
| | 5 | Communication: RS-485 SHIMADEN standard protocol / MODBUS protocol |
| | 6 | Analog output 0 to 10V DC Load current: 2mA (necessary when using the Operating Output Indicator) |
| Rapid fuse | 0 | Without |
| | 1 | With |
| Remarks | 0 | Without |
| | 9 | With |

Note) *1 Variable resistance heating elements such as silicon carbide (SiC) heaters have a high negative temperature coefficient (their resistance greatly affected by temperature). During a temperature rise, their resistance falls far below that within the ordinary temperature range, leading to inadequate power. Maintaining output power within an appropriate range at every temperature requires the device's current capacity to be multiplied by a square root of the heating element's resistance ratio. To give an example, the approximate resistance ratio of SiC heaters is 1:3, a square root of which is $\sqrt{3}$, or approx. 1.73. The required current capacity when using those heaters is thus 1.73 times the original capacity. However, since heater deterioration may further widen the ratio, a current capacity even higher than the abovementioned must be selected. As for use of SiC heaters, we recommend about double the original capacity.

*2 If main power supply voltage is 240 – 480 V, a separate 100 to 240 V power supply must be provided for the control circuit.

ITEMS SOLD SEPARATELY

■ Rapid fuse

| Current capacity | code |
|------------------|--------|
| 20A | QSF009 |
| 30A | |
| 50A | QSF010 |
| 75A | |
| 100A | QSF011 |
| 150A | QSF012 |
| 200A | QSF013 |
| 300A | QSF014 |
| 450A | |

Fuse maker: HINODE ELECTRIC CO., LTD

■ Operating Output Indicator

/ Input: 0 to 10V Scale: 0 to 100%

| SPECIFICATIONS | code |
|----------------|--------|
| □60 mm | QSM003 |
| □80 mm | QSM004 |

■ External Power Adjuster / B10kΩ, knob, scale plate, with lead 1m

| code |
|--------|
| QSV003 |

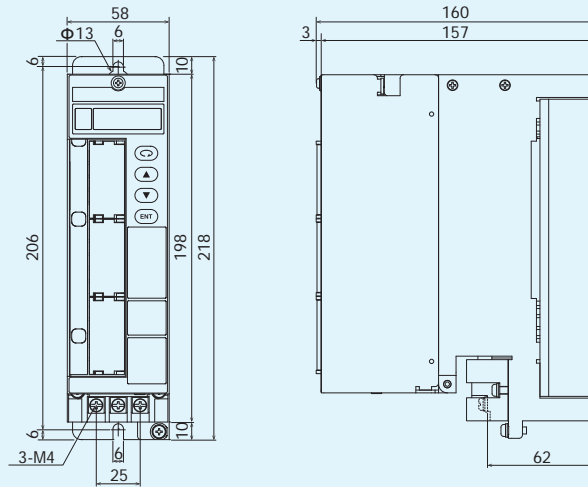
■ Noise filter

| Current capacity | code | Rated capacity |
|------------------|-------------|----------------|
| 20A | NF2020C-SDG | 20A |
| 30A | NF2030C-SDG | 30A |
| 50A | NF2050C-SDG | 50A |
| 75A | NF2080C-SDG | 80A |
| 100A | NF2100C-SDG | 100A |

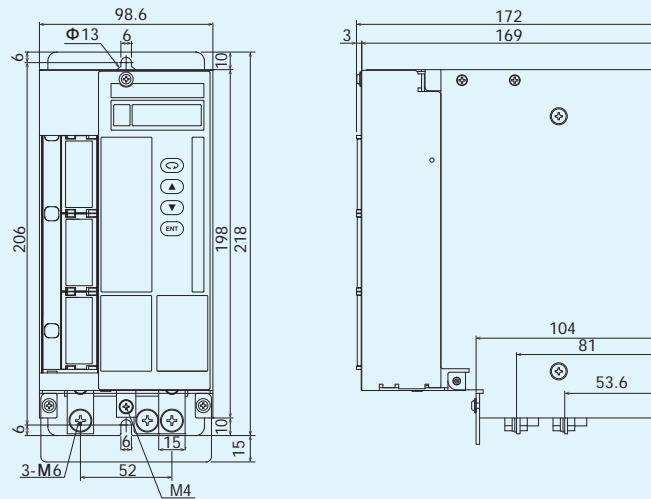
See page 16 for more information on noise filters.

You can see the details of the separately sold items on page 14 and after.

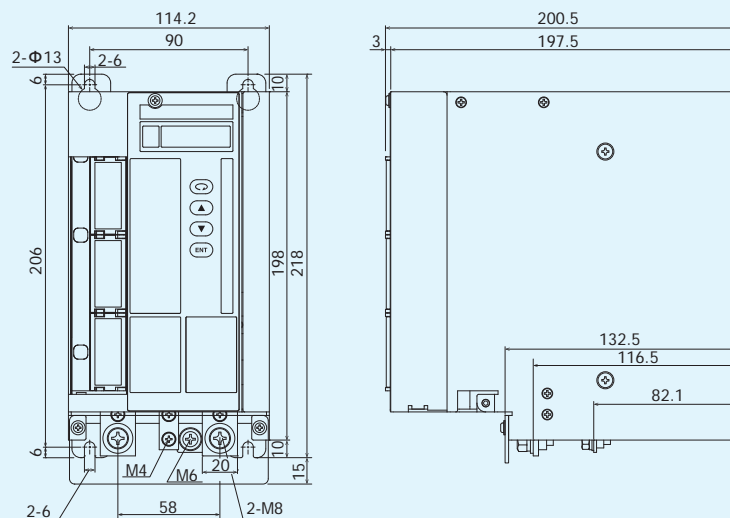
- 20A, 30A Weight: Approx. 1.7kg.



- 50A, 75A Weight: Approx. 3.3kg.

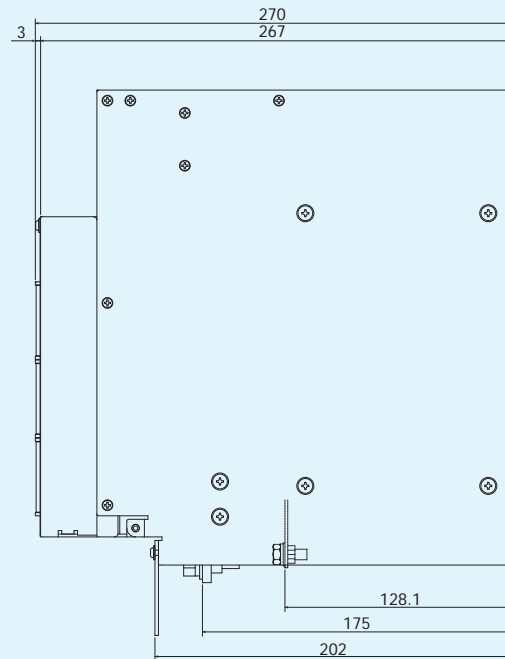
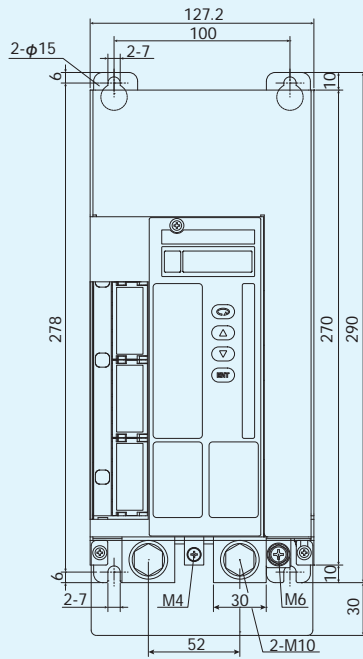


- 100A Weight: Approx. 3.8 kg

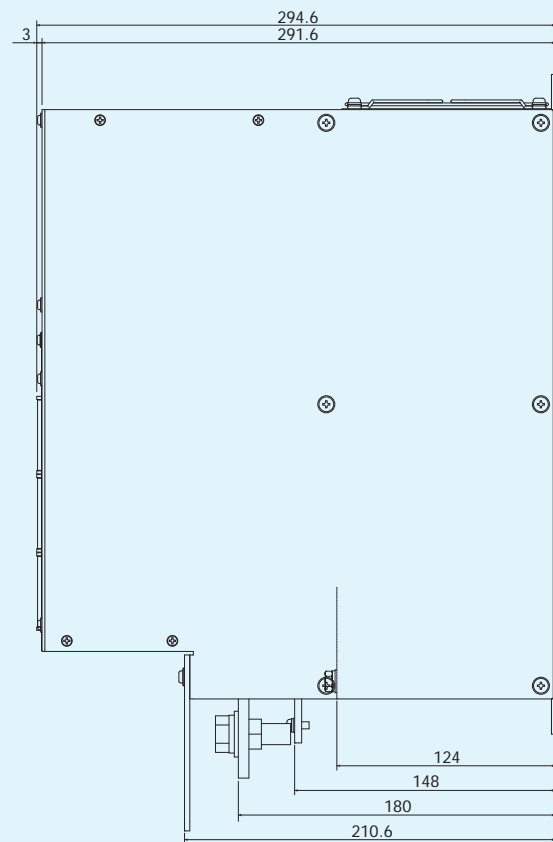
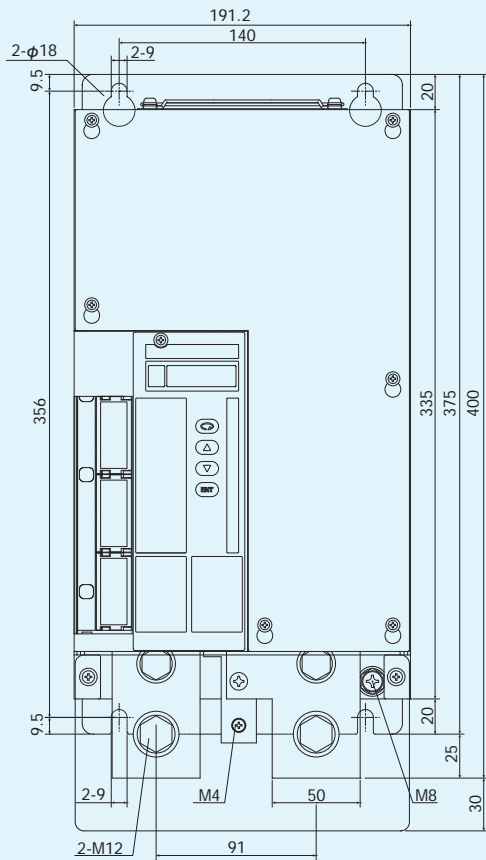


Unit: mm

- 150A, 200A Weight: Approx. 7.2 kg



- 300A, 450A Weight: Approx. 16.0 kg



Unit: mm

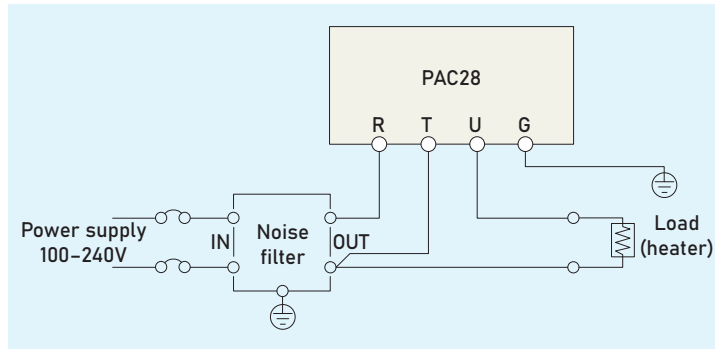
With phase control, part of the power supply sine wave is dropped. This produces distortion in the sine wave if the power supply impedance is high. Also, because the power supply is switched each half cycle, a switching noise is produced. These power supply distortion and noise may affect other equipment.

In the case of cycle calculation zero voltage switching, an extremely small amount of noise is produced in comparison with phase control due to switching near the zero cross point of the power supply. However, because some noise is produced by switching to a large current, you should use a noise filter if necessary. Also, if power supply impedance is high, the power supply may flicker in synch with the ON/OFF status of the thyristor.

■ Noise filter

The frequency of noise produced by the thyristor is distributed in a place below several megahertz, and the noise dampening effect of commonly available commercial noise filters is insufficient.

Using noise filters specified by Shimaden can dampen this noise.



Noise filter (sold separately)

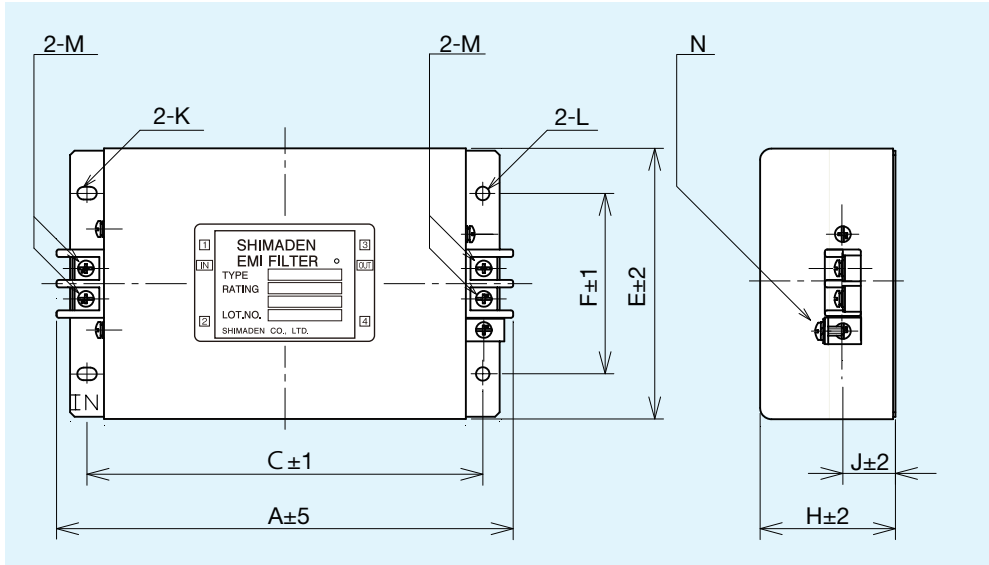
| Type | Rated capacity |
|-------------|----------------|
| NF2020C-SDG | 20A |
| NF2030C-SDG | 30A |
| NF2050C-SDG | 50A |

Make sure that the wiring between noise filter and PAC28 is as short as possible.

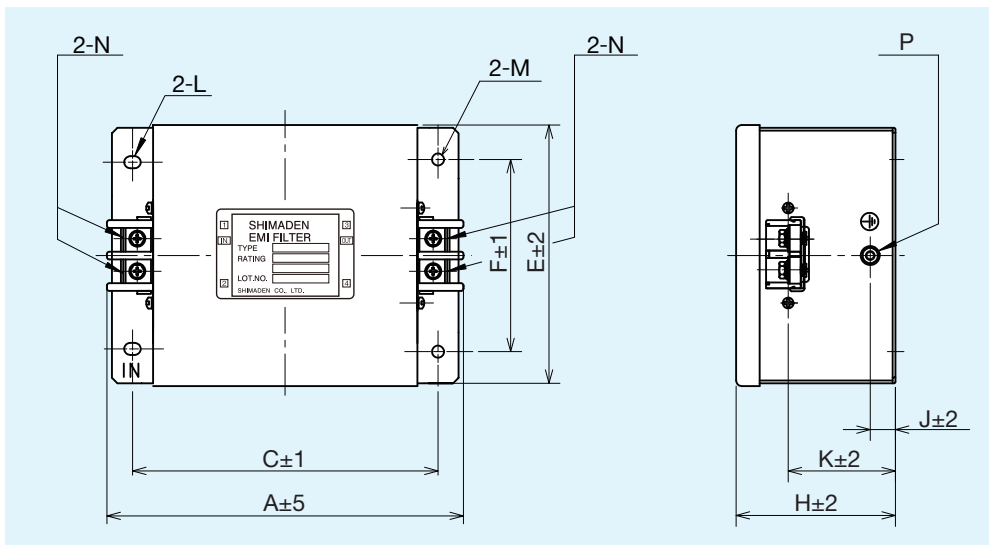
Please contact the nearest Shimaden dealer for details of noise filters.

■ External configuration/dimensions of noise filter (sold separately)

| Type | Current capacity | Dimensions (unit: mm) | | | | | | | | | | Weight (kg) | Case material | |
|-------------|------------------|-----------------------|-----|-----|----|----|----|----------------|------|----|----|-------------|-----------------|--------------|
| | | A | C | E | F | H | J | K | L | M | N | | Body | Bottom cover |
| NF2020C-SDG | 20A | 154 | 125 | 95 | 70 | 50 | 20 | R2.25 length 6 | φ4.5 | M4 | M4 | 0.8 | SPCC Ni coating | |
| NF2030C-SDG | 30A | 154 | 125 | 95 | 70 | 50 | 20 | R2.25 length 6 | φ4.5 | M4 | M4 | 0.8 | | |
| NF2050C-SDG | 50A | 180 | 145 | 110 | 80 | 70 | 25 | R2.75 length 7 | φ5.5 | M6 | M4 | 1.5 | SPCC Ni coating | SUS304 |

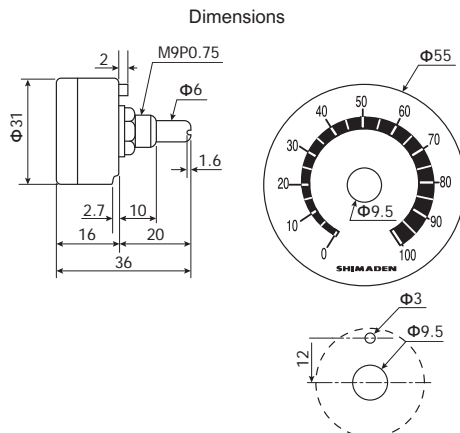
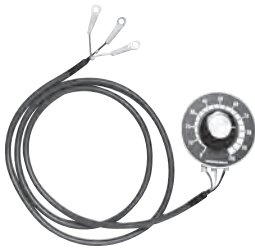


| Type | Current capacity | Dimensions (unit: mm) | | | | | | | | | | | Weight (kg) | Case material | |
|-------------|------------------|-----------------------|-----|-----|----|----|----|----|----------------|------|----|----|-------------|---------------|--------------|
| | | A | C | E | F | H | J | K | L | M | N | P | | Body | Bottom cover |
| NF2080C-SDG | 80A | 205 | 165 | 120 | 90 | 90 | 20 | 63 | R2.75 length 7 | φ5.5 | M8 | M6 | 2.4 | SGCC or SECC | SUS304 |
| NF2100C-SDG | 100A | 205 | 165 | 120 | 90 | 90 | 20 | 63 | R2.75 length 7 | φ5.5 | M8 | M6 | 2.6 | | |



1. EXTERNAL POWER ADJUSTER

Type: QSV003 / B10kΩ, knob, scale plate, with lead 1m (with M3 Crimp terminal)



Unit: mm

2. OPERATING OUTPUT INDICATOR

□ This manipulated variable indicator receives an analog output signal (0 to 10V) and displays%.

(Analog output option is required when using.)

| Model | Specifications | External Dimensions / Panel Cutout (Unit: mm) |
|---------------|--|---|
| <p>QSM003</p> | <p>60 mm Input: 0-10 V Scale: 0-100%</p> | |
| <p>QSM004</p> | <p>80 mm Input: 0-10 V Scale: 0-100%</p> | |

Head Office & Saitama Factory
ISO 9001/ISO 14001 Certification Obtained

(The contents of this brochure are subject to change without notice.)

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