AG500

General Description

The AG500 is a digital indicator in a panel saving 60mm depth 1/8 DIN case. The 21mm high LED readout has a luminance double that of conventional indicators and the easy-to-read five digit display.
The options available for the AG500 include universal input types, up to six programmable alarms, analog retransmission, digital input, 12 or 24 V DC sensor power supply and RS-485 or MODBUS-RTU communications.

Features

☆ Bright, easy-to-read LED displays (21mm high)
☆ Digital communications
☆ Up to 6 alarms
☆ Analog retransmission output
☆ 12V or 24V DC sensor power supply
☆ Resolution 1/100°C is available (RTD input)

Easy-To-Read Oversized LED Displays

The easy-to-read 21mm height five-digit display can show a range up to 19999. Luminance is double that of conventional indicators.
Alarm status can be checked easily with alternate displays of PV and alarm number.

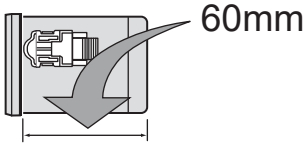
● PV and alarm number will be displayed alternately when the alarm is ON.

(when alarm 3 is in alarm state) Alternate display

• Alternate display function can be set ON/OFF for each alarm (1 to 6).

Panel space saving : 60mm

Depth of AG500 is only 60mm, requiring less panel space.

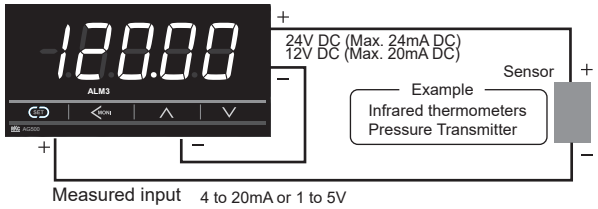


Display function

■ Peak and Bottom Hold Function
■ PV Bias and PV Ratio

12/24V DC Sensor power supply (Optional)

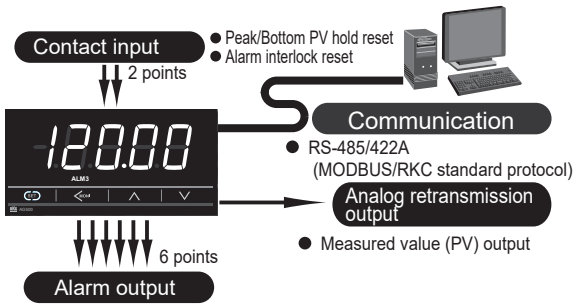
Sensor power supply function is available. Supply voltage can be specified from 12V DC or 24V DC.



• If 24V DC is specified, the maximum number of alarm outputs will be 2.
• If 12V DC is specified, the maximum number of alarm outputs will be 5.

Numerous Input and Output Options

• Contact input (max. 2 points)
• Alarm output (max. 6 points)
• Analog retransmission output
• Communication



Alarm function

■ Interlock (Latch) Function
■ Alarm Delay Timer
■ Hold Action
■ Alarm energized/de-energized action selection

Specifications

Input

Input
Universal input
a) Temperature, Current, Low voltage input group
Thermocouple : K, J, R, S, B, E, T, N (JIS/IEC), PLII (NBS), W5Re/W26Re (ASTM), U, L (DIN)
•Influence of external resistance : Approx. 0.2μV/Ω
•Input break action : Up-scale / Down-scale (Selectable)
RTD : Pt100 (JIS/IEC), JPt100 (JIS)
•Influence of input lead resistance : Approx. 0.01[%/Ω] of reading
•Maximum 10Ω per wire
•Input break action : Up-scale
Low voltage : 0 to 1V DC, 0 to 100mV DC, 0 to 10mV DC, -100 to +100mV DC, -10 to +10mV DC
•Input break action : Up-scale / Down-scale (Selectable)
Current : 4 to 20mA DC, 0 to 20mA DC
•Input break action : Uncertain (indicates a value around 0mA)
b) High voltage input group
High voltage : 0 to 5V DC, 1 to 5V DC, 0 to 10V DC, -1 to +1V DC
•Input break action : Uncertain (indicates a value around 0V)

Sampling Time
0.25 sec

Input Digital Filter
0.1 to 100.0 sec (OFF when 0 is set.)

PV Bias
-span to +span

PV Ratio
0.500 to 1.500

Performance

Measuring Accuracy
a) Thermocouple
Type : K, J, T, E, N, PLII, U, L
Less than -100°C (-148°F) : ±1.0°C (±1.8°F)
-100 to 500°C (-148 to 932°F) : ±0.5°C (±0.9°F)
More than 500°C (932°F) : ±(0.1% of Reading + 1 digit)
Type : N, S, R, W5Re/W26Re
Less than 0°C (32°F) : ±2.0°C (±3.6°F)
0 to 1000°C (-148 to 1832°F) : ±1.0°C (±1.8°F)
More than 1000°C (1832°F) : ±(0.1% of Reading + 1 digit)
Type : B
Less than 400°C (752°F) : ±70.0°C (±126°F)
400 to 1000°C (752 to 1832°F) : ±1.4°C (±2.5°F)
More than 1000°C (1832°F) : ±(0.1% of Reading + 1 digit)
Cold junction temperature compensation error
±1.0°C (1.8°F) [23±2°C (75.4±3.6°F)]
Within ±1.5°C (± 2.7°F) [Between 0 and 50°C (32 to 104°F)]
b) RTD
Less than 200°C (392°F) : ±0.2°C (±0.4°F)
More than 200°C (392°F) : ±(0.1% of Reading + 1 digit)
c) DC voltage and DC current
±(0.1% of span)

Insulation Resistance
More than 20MΩ (500V DC) between measured terminals and ground
More than 20MΩ (500V DC) between power terminals and ground

Dielectric Strength
1000V AC for one minute between measured terminals and ground
1500V AC for one minute between power terminals and ground

Hold

Maximum and minimum measured values are memorized.
• Memorized value can be reset via front key operation, digital input or communication.
• Data is not backed up when the instrument power supply is off.

Alarms (Optional)

Alarms
Number of outputs : 6 points
• With 12V DC sensor power supply : Up to 5 points
• With 24V DC sensor power supply : Up to 2 points

Alarm type : Process High, Low
•Hold action can be programmed.
Differential gap : 0 to input span

Alarm Output
Relay output, Form A contact 250V AC 3A, 30V DC 1A (resistive load)

Other Function
a) Energized/de-energized action is configurable.
b) Interlock (latch) function is configurable.

Digital Input (Optional)

Number of Inputs
2 points (DI 1 and DI 2)

Input Rating
Non-voltage contact input
(OPEN : 500kΩ or more, CLOSE : 500Ω or less)

Determination time
50ms)

Functions
DI1 : Hold reset, DI2 : Alarm interlock reset)

Communications (Optional)

a) Communication method :	RS-485 (2-wire), RS-422A (4-wire)
b) Communication protocol :	ANSI X3.28 sub-category 2.5A4 (RKC standard) MODBUS-RTU • Selectable
c) Communication speed :	1200, 2400, 4800, 9600, 19200, 38400 bps
d) Bit format	
Start bit :	1
Data bit :	7 or 8 •For MODBUS 8 bit only
Parity bit :	Even, odd or without parity
Stop bit :	1 or 2
d) Maximum connection :	31 units

Analog outputs (Optional)

a) Number of outputs :	1 point
b) Output signal :	0 to 1V DC, 0 to 5V DC, 1 to 5V DC, 0 to 10V DC Load resistance : More than 1kΩ Output impedance : Less than 0.1Ω 0 to 10mV DC, 0 to 100mV DC Load resistance : More than 20kΩ Output impedance : 10Ω 4 to 20mA DC, 0 to 20mA DC Load resistance : Less than 600Ω Output impedance : More than 1MΩ
c) Output type :	Measured value (PV)
d) Output accuracy :	±0.1% of span
e) Output resolution :	More than 12 bits

Sensor Power Supply (Optional)

a) Output voltage :	24V DC ±1.2V or 12V DC ±1V
b) Output current :	24V DC type : Less than 24mA DC 12V DC type : Less than 20mA DC
c) Load resistance :	24V DC type : More than 1kΩ 12V DC type : More than 600Ω

General specifications

Waterproof/dustproof protection
NEMA4X, IP66
• Waterproof/dustproof protection only effective from the front in panel mounted installations.

Supply voltage
a) 90 to 264V AC (Including supply voltage variation)
[Rating : 100 to 240V AC] (50/60Hz common)
b) 21.6 to 26.4V AC (Including supply voltage variation)
[Rating : 24V AC] (50/60Hz common)
c) 21.6 to 26.4V DC (Ripple rate 10% p-p or less) [Rating : 24V DC]

Power consumption
Less than 10.8VA (at 240V AC) for standard AC type
Less than 7.6VA for 24V AC type
Less than 230mA for 24V DC type

Power Failure Effect
Not affected by power failure shorter than 20msec, otherwise reset to the initial state.

Operating environments : -10 to 50°C [14 to 122°F], 5 to 95% RH.
Absolute humidity : MAX. W.C 29.3g/m^3 dry air at 101.3kPa.

Memory backup : Backed up by non-volatile memory (FRAM)
• Data retaining period : Approx. 10 years
• Number of writing : Approx. 10,000,000,000 times.
(Depending on storage and operating conditions.)

Net weight
Approx. 190g

External dimensions (W x H x D)
96 x 48 x 60mm

Compliance with standards

• CE Mark
• UL/c-UL Recognized
• RCM Mark

Model and Suffix Code

	Specifications	Model and Suffix Code	Hardware coding only ① ② ③ ④ ⑤ ⑥ ⑦ ⑧ ⑨
		AG500 (96 X 48mm) (W X H)	– □ * □ – □ – □ – □ – □ – □ □ – □□□ /Y
①	Power Supply	24V AC/DC 100 to 240V AC	3 4
②	Alarm output	Not supplied Specify output points (1 to 6)	N 1 to 6
③	Contact input (DI)	Not supplied Contact inputs : 2 points	N 2
④	Sensor power supply/ LED drive supply (For SP500)	Not supplied 12V DC : Sensor power supply or LED drive supply 24V DC : Sensor power supply	N P Q
⑤	Analog retransmission output (AO)	Not supplied See Analog Output Code Table	N □
⑥	Communication	Not supplied RS-422A RS-485	N 4 5
⑦	Quick Start Code	No quick start code	N
		Specify Input and range code	1
		Specify Input and range code and quick start code	2
⑧	Input and range	See Input range Code Table	□□□
⑨	Instrument version	Version symbol	Y

*1 : When 12V DC (For sensor power supply/LED drive supply) is used, alarm output is max. 5 points.
*2 : When 24V DC (Sensor power supply) is used, alarm output is max. 2 points.

Range and Input Code Table

Thermocouple

Input	Code	Range
K	K 35	-200.0 to +400.0℃
	K 40	-200.0 to +800.0℃
	K 09	0.0 to 400.0℃
	K 10	0.0 to 800.0℃
	K 41	-200 to +1372℃
	K 02	0 to 400℃
	K 04	0 to 800℃
	K C6	-250.0 to +800.0℉
	K C4	-328.0 to +400.0℉
	K A4	0.0 to 800.0℉
	K C5	-328 to +2502℉
	K A1	0 to 800℉
	K A2	0 to 1600℉
J	J 27	-200.0 to +400.0℃
	J 32	-200.0 to +800.0℃
	J 08	0.0 to 400.0℃
	J 09	0.0 to 800.0℃
	J 15	-200 to +1200℃
	J 02	0 to 400℃
	J 04	0 to 800℃

Input	Code	Range
J	J C7	-200.0 to +700.0℉
	J C6	-328.0 to +1200.0℉
	J B6	0.0 to 800.0℉
	J B9	-328 to +2192℉
	J A1	0 to 800℉
	J A2	0 to 1600℉
T	T 19	-200.0 to +400.0℃
	T C2	-328.0 to +752.0℉
S	S 06	-50 to +1768℃
	S A7	-58 to +3214℉
R	R 07	-50 to +1768℃
	R A7	-58 to +3214℉
E	E 21	-200.0 to +700.0℃
	E 06	-200 to +1000℃
	E A9	-328.0 to +1292.0℉
	E B1	-328 to +1832℉
B	B 03	0 to 1800℃
	B B2	0 to 3272℉
N	N 02	0 to 1300℃
	N A7	0 to 2372℉

Input	Code	Range
PLII (NBS)	A 02	0 to 1390℃
	A A2	0 to 2534℉
W5Re/W26Re (ASTM)	W 03	0 to 2300℃
	W A2	0 to 4200℉
U (DIN)	U 04	0.0 to 600.0℃
	U B2	0.0 to 1112.0℉
L (DIN)	L 04	0.0 to 900.0℃
	L A3	0.0 to 1652.0℉

RTD

Input	Code	Range
Pt100	D 34	-100.00 to+100.00℃
	D 35	-200.0 to +850.0℃
	D 21	-200.0 to +200.0℃
	D C8	-199.99 to+199.99℉
	D C9	-328.0 to +1562.0℉
JPt100	P 29	-100.00 to+100.00℃
	P 30	-200.0 to +640.0℃
	P C8	-199.99 to+199.99℉
	P C9	-328.0 to +1184.0℉
	P D1	-200.0 to +200.0℉

DC Current・voltage *1

Input	Code	Range
0 to 10mV	1 01	0.0 to 100.0%
0 to 100mV	2 01	
0 to 1V	3 01	
0 to 5V	4 01	
0 to 10V	5 01	
1 to 5V	6 01	

Input	Code	Range
0 to 20mA *2	7 01	0.0 to 100.0%
4 to 20mA *2	8 01	
-100 to +100mV	9 01	
-1 to +1V	9 02	
-10 to 10mV	9 03	

*1:Low limit scale > High limit scale setting is possible.
*2: Shunt resistor is not required for current input.

Analog Output Code Table

1	0 - 10mV DC	2	0 - 100mV DC	3	0 - 1V DC	4	0 - 5V DC	5	0 - 10V DC	6	1 - 5V DC	7	0 - 20mA DC	8	4 - 20mA DC

■ Quick Start Code

- Quick start code tells the factory to ship with each parameter preset to the values detailed as specified by the customer. Quick start code is not necessarily specified when ordering, unless the preset is requested. These parameters are software selectable and can be re-programmed in the field.

Specification	Quick start code	□	□	□	□	□	□
Alarm function 1	No alarm	N					
	See Alarm Code Table	□					
Alarm function 2	No alarm		N				
	See Alarm Code Table		□				
Alarm function 3	No alarm			N			
	See Alarm Code Table			□			
Alarm function 4	No alarm				N		
	See Alarm Code Table				□		
Alarm function 5	No alarm					N	
	See Alarm Code Table					□	
Alarm function 6	No alarm						N
	See Alarm Code Table						□

Alarm Code Table

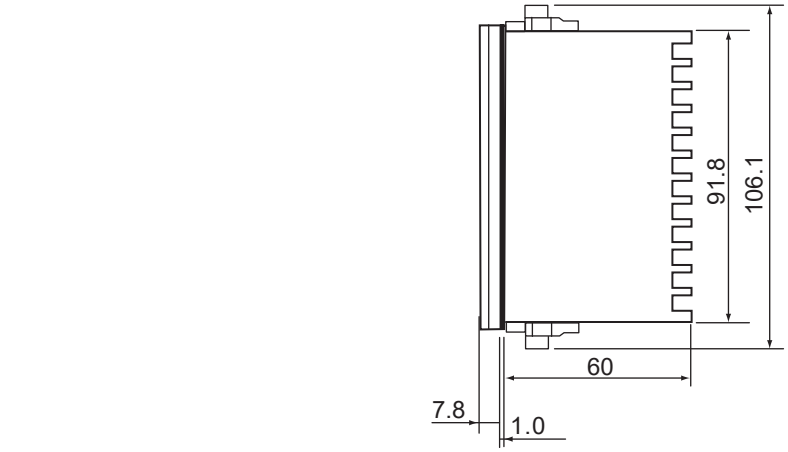
Code	Type
H	Process High
J	Process Low
K	Process High with hold
L	Process Low with hold

Accessory

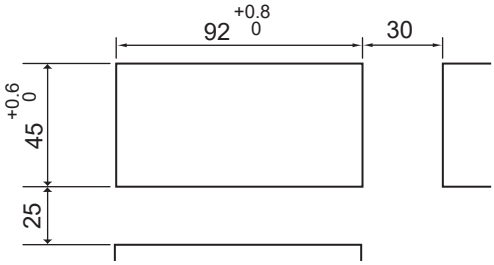
Terminal cover
KFB400-58

External Dimensions and Rear Terminals

(Unit:mm)

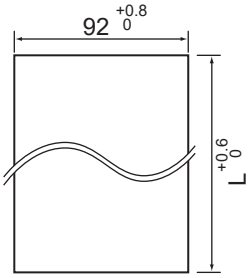


Panel cutout



(Panel thickness must be between 1 to 10mm)

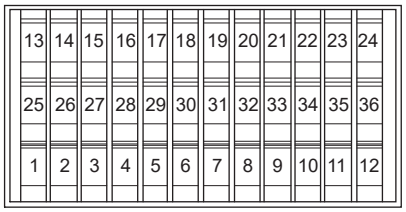
<Close vertical mounting>
* Up to 6 units



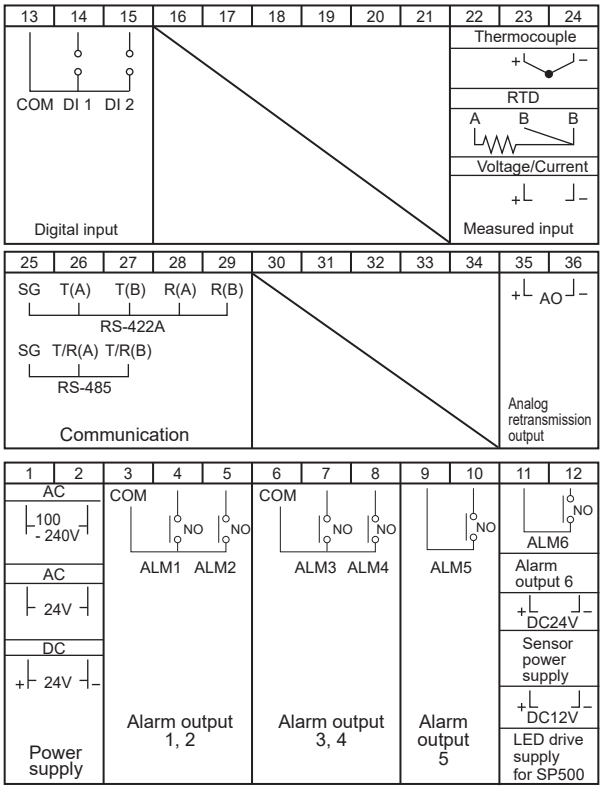
$L=(48Xn-3)^{+0.6}_{0}$

n : Number of controllers
(2=<n=<6)

• Waterproof/dustproof is not available for close horizontal mounting.



• Use a solderless terminal for screw size M3X6.



AE500

General Description

The AE500 is a powerful digital indicator with up to four (4) alarms. The AE500 has various options such as digital communications, analog retransmission output, waterproof, and power supply for LED drive of SP400/SP500. In combination with the input selector SP400/500, a maximum 16 points of input can be connected to one AE500. The AE500 matches the physical appearance of the CB series (CB100/400/500/700/900, CB103/403/903).

Features

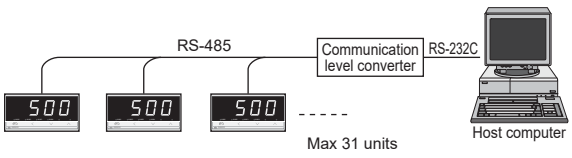
- ☆ Bright, easy-to-read LED displays (20mm high)
- ☆ Digital communications
- ☆ Up to 4 alarms
- ☆ Analog retransmission output
- ☆ SP500 input selector

Bright, Easy-To-Read LED Displays

Very clear and easy-to-read large LED display (20mm high).

Digital Communications (Optional)

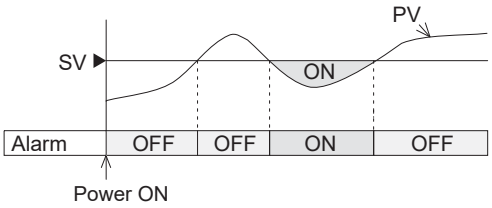
The AE500 offers an optional RS-485 communications interface for networking to computers, PLCs and SCADA software in your plant. Up to 31 units can be interfaced on one RS-485 communication line.



Up to 4 Alarms (Optional)

The AE500 is available with up to 4 alarms. Each alarm is available with hold function which suppresses alarm activation upon start-up until the measured value has entered the non-alarm range.

Example : Low alarm with hold

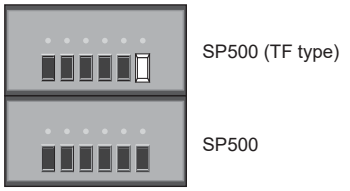


Analog Retransmission Output (Optional)

The measured value can be transmitted by 0-20mA or 4-20mA.

SP500 Input Selector Unit

The SP500 is an input selector unit with 6 inputs (standard) or 5 inputs (transfer type).
SP400 is a vertical 1/8 DIN, and SP500 is a horizontal 1/8 DIN type.
Maximum 3 units can be connected by using transfer type SP500 with 5 inputs.



Specifications

Input

Input

a) Thermocouple : K, J, R, S, B, E, T, N (JIS/IEC), PLII (NBS)
W5Re/W26Re (ASTM), U, L (DIN)
- Influence of external resistance : Approx. 0.2μV/Ω
- Input break action : Up-scale (Alarm output is ON.)

b) RTD : Pt100 (JIS/IEC), JPt100 (JIS)
- Influence of input lead resistance : Approx. 0.01[%/Ω] of reading
- Maximum 10Ω per wire
- Input break action : Up-scale (Alarm output is ON.)
- Input short circuit action : Down scale (Alarm output is ON.)

c) DC voltage : 0 to 5V, 1 to 5V
- Input break action : Down-scale (Alarm output is ON.)
When "0 to 5V" input, value around zero.

d) DC current : 0 to 20mA, 4 to 20mA
- For DC current input, connect a 250 Ω resister to the input terminals.
- Input break action : Down-scale (Alarm output is ON.)
When "0 to 20mA" input, value displayed will be around zero.

Sampling time

0.5 sec

PV bias

Temperature input : -1999 (-199.9) to 9999 (999.9)°C[°F]
DC voltage, DC current : - span to +span

Performance

Measuring accuracy

a) Thermocouple
±(0.3% of reading + 1 digit) or ±2°C (4°F) whichever is larger
- Accuracy is not guaranteed between 0 and 399°C (0 and 749°F) for type R, S and B.
- Accuracy is not guaranteed between -199.9 and -100.0°C (-199.9 and -158.0°F) for type T and U.

b) RTD
±(0.3% of reading + 1 digit) or ±0.8°C (1.6°F) whichever is larger

c) DC voltage and DC current
±(0.3% of span + 1 digit)

Insulation resistance

More than 20MΩ (500V DC) between measured terminals and ground
More than 20MΩ (500V DC) between power terminals and ground

Dielectric strength

1000V AC for one minute between measured terminals and ground
1500V AC for one minute between power terminals and ground

Alarms (Optional)

Alarms

Number of outputs : 4 points
Alarm type : Process High, Low
- Hold action can be programmed.

Differential gap : 0 to 100°C or 0.0 to 100.0°C (Temperature input)
0.0 to 10.0% (Voltage, current input)

Alarm Output

Alarm 1, 2 : Relay output, Form A contact 250V AC 1A (resistive load)
Alarm 3, 4 : Relay output, Form A contact 250V AC 3A (resistive load)

Power supply for LED of SP500 (Optional)

Output : 12V DC, +1V, -2V
Number of link : Up to 2 with TF and 1 without TF.
(TF : Transfer switch type)
- This option is not available when alarm 4 output is specified.

Communications (Optional)

a) Communication method : RS-485 (2-wire)
b) Communication speed : 2400, 4800, 9600, 19200 BPS
c) Bit format
Start bit : 1
Data bit : 7 or 8
Parity bit : Even, odd or without parity
Stop bit : 1 or 2
d) Communication code : ASCII(JIS) 7-bit code
e) Maximum connection : 31 (Address can be set from 0 to 99.)

Analog outputs (Optional)

a) Number of outputs : 1 point
b) Output signal : 0 to 20 mA DC, 4 to 20 mA DC
(Load resistance : Less than 600Ω)
c) Output scaling : Available for High and Low limit.
d) Output resolution : More than 10 bits
- This option is not available when alarm 3 is specified.

Waterproof/Dustproof (Optional)

Waterproof/dustproof protection : IP65
- Waterproof/dustproof protection only effective from the front in panel mounted installations.
- Waterproof/dustproof protection is not available for close vertical mounting installations.

General specifications

Supply voltage

a) 85 to 264V AC (Including supply voltage variation)
[Rating : 100 to 240V AC] (50/60Hz common)
b) 21.6 to 26.4V AC (Including supply voltage variation)
[Rating : 24V AC] (50/60Hz common)
c) 21.6 to 26.4V DC (Ripple rate 10% p-p or less) [Rating : 24V DC]

Power consumption

Less than 10VA for standard AC type
Less than 5VA for 24V AC type
Less than 160mA for 24V DC type

Power Failure Effect

Not affected by power failure shorter than 20msec, otherwise reset to the initial state.

Operating environments : 0 to 50°C [32 to 122°F] , 45 to 85% RH

Memory backup : Backed up by non-volatile memory.
Data retaining period : Approx. 10 years
Number of writing : Approx. 1,000,000 times

Net weight

Approx. 250g

External dimensions (W x H x D)

96 x 48 x 100mm

Compliance with standards

- CE Mark
- UL/cUL Recognized

Model and Suffix Code

Specifications	Model and Suffix Code
Model	AE500 □□□−□∗□ □ □ □−□ □/□/Y
Input and Range	See Range and Input Code Table □□□
Power Supply	24V AC/DC 3 100 to 240V AC 4
Alarm 1	Not supplied N See Alarm Code Table □
Alarm 2	Not supplied N See Alarm Code Table □
Alarm 3 / Analog output	Not supplied N See Alarm Code Table □ 0 to 20mA DC 7 4 to 20mA DC 8
Alarm 4 / Power supply for LED of SP500	Not supplied N See Alarm Code Table □ Power supply for LED of SP500 P
Digital communications	Not supplied N RS-485 5
Waterproof/Dustproof	Not supplied N Waterproof/Dustproof protection 1
Body color	Black A White N
Instrument version	Version symbol Y

Range and Input Code Table

Thermocouple (Field-programmable)

Input	Code	Range
K	K 01	0 − 200°C
	K 02	0 − 400°C
	K 03	0 − 600°C
	K 04	0 − 800°C
	K 05	0 − 1000°C
	K 06	0 − 1200°C
	K 07	0 − 1372°C
	K 13	0 − 100°C
	K 14	0 − 300°C
	K 20	0 − 500°C
	K A1	0 − 800°F
	K A2	0 − 1600°F
	K A3	0 − 2502°F
	K A9	20 − 70°F
J	J 01	0 − 200°C
	J 02	0 − 400°C
	J 03	0 − 600°C
	J 04	0 − 800°C
	J 05	0 − 1000°C
	J 06	0 − 1200°C
	J A1	0 − 800°F
	J A2	0 − 1600°F
	J A3	0 − 2192°F
	J A6	0 − 400°F
R [1]	R 01	0 − 1600°C
	R 02	0 − 1769°C
	R 04	0 − 1350°C
	R A1	0 − 3200°F
	R A2	0 − 3216°F
S [1]	S 01	0 − 1600°C
	S 02	0 − 1769°C
	S A1	0 − 3200°F
	S A2	0 − 3216°F
B [1]	B 01	400 − 1800°C
	B 02	0 − 1820°C
	B A1	800 − 3200°F
	B A2	0 − 3308°F

Input	Code	Range
E	E 01	0 − 800°C
	E 02	0 − 1000°C
	E A1	0 − 1600°F
	E A2	0 − 1832°F
N	N 01	0 − 1200°C
	N 02	0 − 1300°C
	N A1	0 − 2300°F
	N A2	0 − 2372°F
T [2]	T 01	-199.9 − 400.0°C
	T 02	-199.9 − 100.0°C
	T 03	-100.0 − 200.0°C
	T 04	0.0 − 350.0°C
	T A1	-199.9 − 752.0°F
	T A2	-100.0 − 200.0°F
	T A3	-100.0 − 400.0°F
	T A4	0.0 − 450.0°F
	T A5	0.0 − 752.0°F
W5Re /W26Re	W 01	0 − 2000°C
	W 02	0 − 2320°C
	W A1	0 − 4000°F
PL II	A 01	0 − 1300°C
	A 02	0 − 1390°C
	A 03	0 − 1200°C
	A A1	0 − 2400°F
	A A2	0 − 2534°F
U [2]	U 01	-199.9 − 600.0°C
	U 02	-199.9 − 100.0°C
	U 03	0.0 − 400.0°C
	U A1	-199.9 − 999.9°F
	U A2	-100.0 − 200.0°F
	U A3	0.0 − 999.9°F
L	L 01	0 − 400°C
	L 02	0 − 800°C
	L A1	0 − 800°F
	L A2	0 − 1600°F

RTD (Field-programmable)

Input	Code	Range
Pt100	D 01	-199.9 − 649.0°C
	D 02	-199.9 − 200.0°C
	D 03	-100.0 − 50.0°C
	D 04	-100.0 − 100.0°C
	D 05	-100.0 − 200.0°C
	D 06	0.0 − 50.0°C
	D 07	0.0 − 100.0°C
	D 08	0.0 − 200.0°C
	D 09	0.0 − 300.0°C
	D 10	0.0 − 500.0°C
	D A1	-199.9 − 999.9°F
	D A2	-199.9 − 400.0°F
	D A3	-199.9 − 200.0°F
	D A4	-199.9 − 100.0°F
	D A5	-100.0 − 300.0°F
	D A6	0.0 − 100.0°F
	D A7	0.0 − 200.0°F
	D A8	0.0 − 400.0°F
	D A9	0.0 − 500.0°F
JPt100	P 01	-199.9 − 649.0°C
	P 02	-199.9 − 200.0°C
	P 03	-100.0 − 50.0°C
	P 04	-100.0 − 100.0°C
	P 05	-100.0 − 200.0°C
	P 06	0.0 − 50.0°C
	P 07	0.0 − 100.0°C
	P 08	0.0 − 200.0°C
	P 09	0.0 − 300.0°C
	P 10	0.0 − 500.0°C

Voltage and Current [3] (Field-programmable)

Input	Code	Range
0 − 5V DC	4 01	0.0 − 100.0 (Default)
0 − 10V DC [1]	5 01	0.0 − 100.0 (Default)
1 − 5V DC	6 01	0.0 − 100.0 (Default)
0 − 20mA DC	7 01	0.0 − 100.0 (Default)
4 − 20mA DC	8 01	0.0 − 100.0 (Default)

[1] Specify Z-1010 when ordering.

[1] Type R, S and B input : Accuracy is not guaranteed between 0 and 399°C (0 and 749°F)
[2] Type T and U input : Accuracy is not guaranteed between -199.9 and -100.0°C (-199.9 and -158.0°F)
[3] DC current input : A 250 Ω resistor is externally connected to the input terminals.

Alarm Code Table

Code	Type
H	Process High
J	Process Low
K	Process High with hold
L	Process Low with hold

Accessory

Shunt resistor for DC current input
KD100-55

SP500 input selector unit

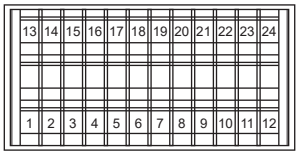
Input type : Thermocouple K,J,E,T,R,S,B,N (JIS/IEC), U,L (DIN)
RTD Pt100 (JIS/IEC), JPt100 (JIS)
Voltage, current inputs 0 to 5V DC, 1 to 5V DC, 0 to 20mA DC, 4 to 20mA DC
Number of inputs : 6 points
5 points : Transfer switch type
Link method : Serial connecting transfer switch type
• Maximum 3 units with TF type and 1 unit non-TF type
Display : LED lights by the power supply from the indicator (AE500 option : 12V DC).
Life of switch : 30 thousand operations (at 70mm/sec.)
Contact resistance : 15mΩ (initially), and less than 40mΩ after 30 thousand operations.
Switching timing : Non-shooting.
Switching force : Less than 800g, within ± 30% of initial value after 30 thousand operations.

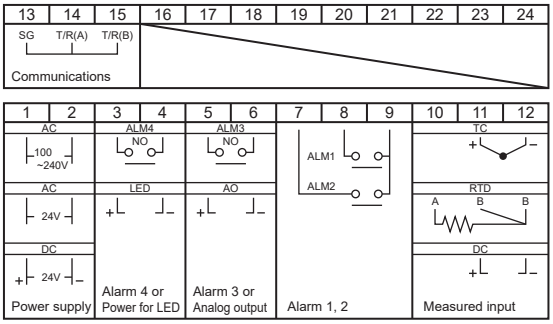
SP500 Model and Suffix Code

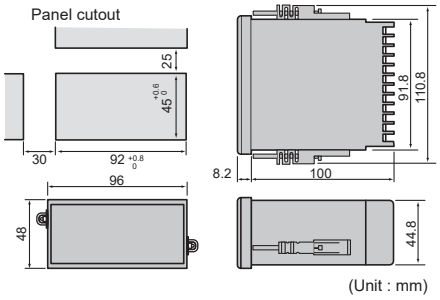
Specifications	Model and Suffix Code	
Model	SP500 (Horizontal type)	
Input	Thermocouple : K	K
	Thermocouple : J	J
	Thermocouple : R	R
	Thermocouple : S	S
	Thermocouple : B	B
	Thermocouple : E	E
	Thermocouple : T	T
	Thermocouple : N	N
	Thermocouple : U	U
	Thermocouple : L	L
	RTD input	D
	Voltage/Current DC input	V
Transfer switch	Not supplied	N
	With transfer switch	T
Body color	Black	A
	White	N

External Dimensions and Rear Terminals

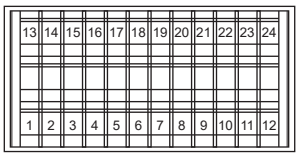
AE500



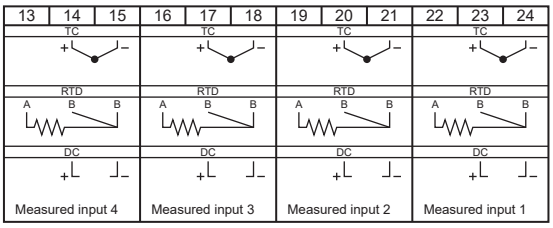




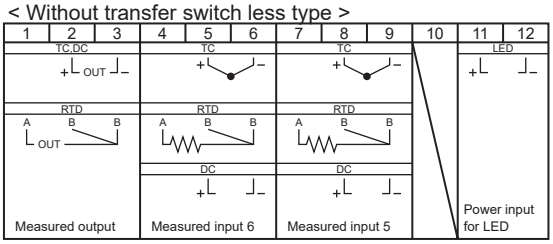
SP500



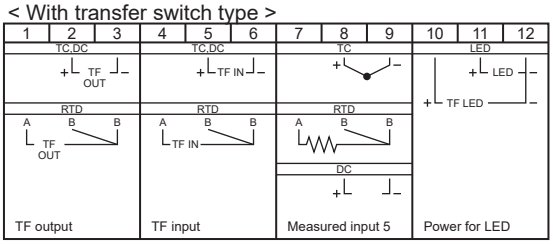
SP500

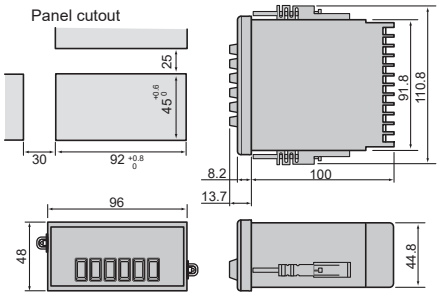


< Without transfer switch less type >



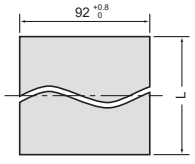
< With transfer switch type >





Panel cutout for closely contacted mounting

AE500, SP500



DP-350C*A

DP-350C*A

ST-230

General Description

The DP-350 is an economical thermometer with a wide temperature range and useful functions, such as measured value and peak hold, sensor burnout, battery alarm, and automatic power off.

For DP series, there are more than 50 types of sensors available so that it allows you to select an appropriate sensor for your application.

Features

☆ Wide Temperature Range

The temperature range is between -200 to 1200°C (-328 to 1999°F).
The range of -199.9 to 199.9°C (-199.9 to 199.9°F) is also available.

☆ Measured Value Hold

Press the HOLD button to hold the current measured value on the display. Press the HOLD button again to go back to the normal display mode.

☆ Peak Hold

The maximum/minimum measured value is automatically stored.

☆ Automatic Power OFF

The power will be automatically turned off after 3 (or 30) minutes from power-on. (This function can be inactivated.)

☆ 1°C/0.1°C (°F) Measuring Resolution

The temperature measuring resolution can be switched between 0.1°C and 1°C (°F).
The temperature range varies with resolution.

☆ Burnout

In case the temperature sensor is broken, "BO" will be displayed on the display.

☆ Battery Alarm

"BAT" is displayed on the display when the batteries become low. It tells you the time to change the batteries for precise temperature measurement.
(Two pieces of 1.5V R6 type dry cell).

Specifications

Input
Thermocouple : K (JIS/IEC)

Input	Scale range
K	-200 – 1200°C(-199.9 –199.9°C)
	-328 – 1999°F(-199.9 – 199.9°F)

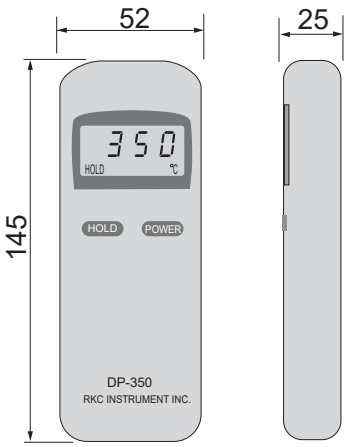
Sampling time
Approx. 0.3 sec

Performance
Measurement accuracy
±(0.2% of indicated value + 1digit) or ±2°C (4°F)
(Whichever is larger)
• ±4°C (8°F) in the range of –100°C (-150°F) or less.
Display
LCD

General specifications
External dimensions (W x H x D)
52 x 145 x 25 mm
Power supply
R6 type dry cell, 1.5V x 2pcs.
Life of battery
Approx. 1000 hours
Operating environments
0 to 50°C (32 to 122°F), 45 to 85% RH
Net weight
Approx. 140g (Including dry cells)

External Dimensions

Unit:mm



Model and Suffix Code

Model Code	Accessory (Optional)
DP-350C*A	No optional
DP-350C*A-1	With anti-shock cover (Silicon jacket) *
DP-350C*A-2	With hard carrying case *
DP-350C*A-3	With soft case *

* Purchase of each cover only is available. Refer to the following part numbers:
350P-K01: Anti-shock cover (Silicon jacket)
350P-K02: Hard carrying case
350P-K03: Soft case


Anti-shock cover (Silicon jacket)

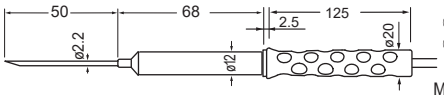

Hard carrying case


Soft case

Temperature Sensors (Type K Thermocouple)

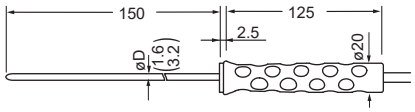
* Separately
① Maximum usable temperature ② Applications (Unit : mm)

JB-150



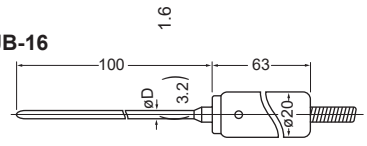
① 400°C
② For semi-solid, viscous material and liquid
Model Code :
JB-150-K-50-1000-3C/F
Silicone rubber cable (Green)
JB-150-K-50-1000-3C/A
Silicone rubber cable (Blue)

JB-160



① 650°C (ø1.6), 750°C (ø3.2)
② For semi-solid, viscous material and liquid
Model Code :
ø1.6 : JB-160-K-1.6-150-1000-3C/F
Silicone rubber cable (Green)
JB-160-K-1.6-150-1000-3C/A
Silicone rubber cable (Blue)
ø3.2 : JB-160-K-3.2-150-1000-3C/F
Silicone rubber cable (Green)
JB-160-K-3.2-150-1000-3C/A
Silicone rubber cable (Blue)

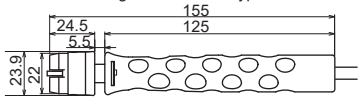
JB-16



① 650°C (ø1.6), 750°C (ø3.2)
② For semi-solid, viscous material and liquid
Model Code :
ø1.6 : JB-16-K-1.6-100-1000-3C/A
ø3.2 : JB-16-K-3.2-100-1000-3C/A

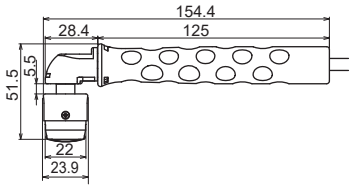
※ Many other types are available.

ST-230 Tilting Sensor Head Type



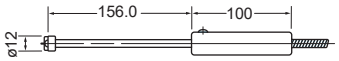
① -40 to 300°C
② For static surface
Model Code : ST-230-K-1000-3C/F
Silicone rubber cable (Green)
ST-230-K-1000-3C/A
Silicone rubber cable (Blue)

ST-230L Tilting Sensor Head Type



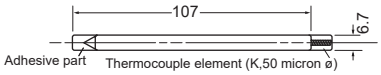
① -40 to 300°C
② For static surface
Model Code : ST-230L-K-1000-3C/F
Silicone rubber cable (Green)
ST-230L-K-1000-3C/A
Silicone rubber cable (Blue)

ST-30



① 300°C
② For static surface
Model Code : ST-30-K-1000-3C/A

ST-50 (Adhesive type)



① 300°C
② For very small spaces
Model Code : ST-50

CE

LTM-100

General Description

Measure surface temperature easily from a distance. This non-contact type temperature sensor is ideal for applications where contact may cause contamination, the operator may be at risk due to high temperature, or when an object is in motion.

Features

Washable

The unit has a water-proof and dust-proof structure (IP67) to allow washing with water.
Use of antibacterial resin allows sanitary operation.

Easy-to-Use

Easy operation and useful functions such as °C/°F switchable, auto-power off and adjustable emissivity.

High Speed Response

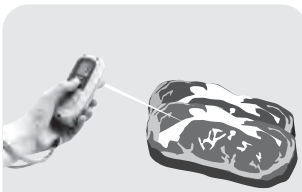
Temperature can be measured in approximately one second after a measurement button has been pressed.
Temperature can be monitored while the measurement button is kept pressed.

Compact and Lightweight

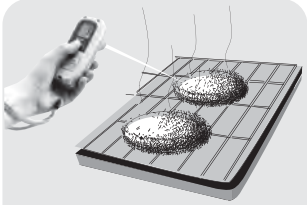
Fits into your pocket for easy portability.

Major Applications

Food industry

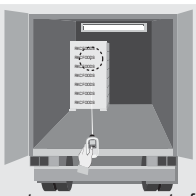


Surface temperature measurement of frozen food

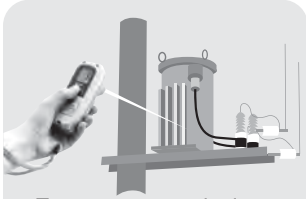


Surface temperature of foods

Refrigerator and maintenance

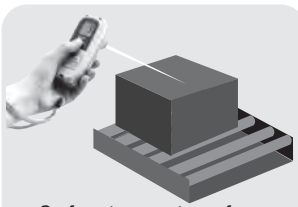


Temperature management of stored items in a refrigerator and transported items.



Temperature monitoring of transformers

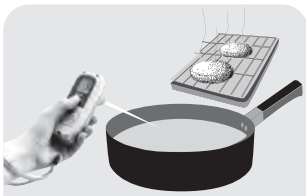
Various industries



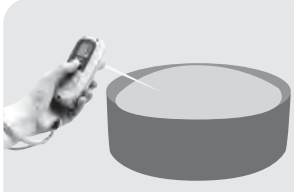
Surface temperature of heat treated metals

Temperature measurement of road surface (asphalt).

Cooking



Temperature measurement of frying oil.



Fermentation temperature of yeast

Specifications and External Dimensions

Specifications

Measuring Range
-40 to 300°C (-40 to 570°F)

Operating Environments
0 to 50°C [32 to 122°F], , Less than 90% RH (No condensations)

Accuracy
When emissivity = 1 at ambient temperature 25°C ±2°C (78±4°F)
0 to 300°C (32 to 570°F) : ±(1% + 1 digit) of measured value or ±(2°C[4°F] + 1 digit), whichever is larger.
0 to -30°C (32 to 10°F) : ±3°C(6°F) ± 1 digit
Lower than -30°C(10°F) : ±5°C(10°F) ±1 digit

Repeatability
Within 1°C(2°F) ± 1 digit

Response
1 second (90% response)

Collimation
Laser beam (650nm 1mW JIS class 2) specifies the center

Display Resolution
0.5°C (lower than -20°C), 1°C (higher than 100°C), 1°F

Emissivity Setting
0.8 to 1.0 (0.05 step, changeable with internal switch)
• Default: 0.95

Auto Power OFF
Power goes off about 30 seconds after the last key operation

Water-proof and Dust-proof Structure
IP67

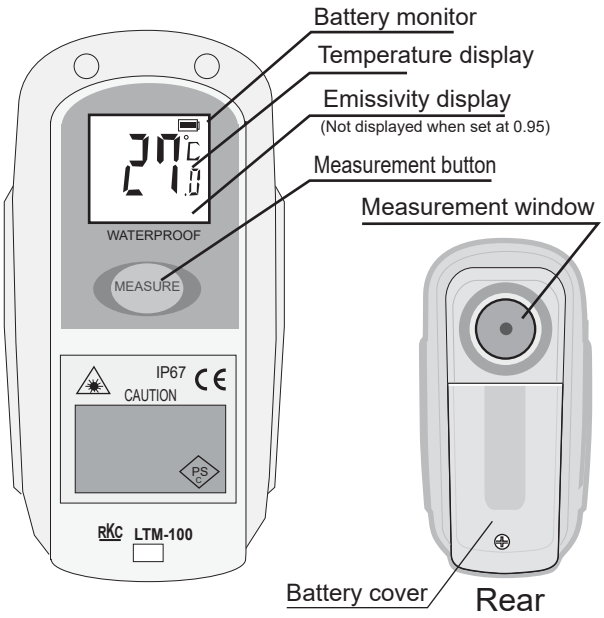
Safety standards
CE marking (EMI EN61326 ClassB, EMS EN61326 Annex C)
PS/C mark (for portable devices with laser beam)

Housing material
ABS (antibacterial)

Net Weight
123g (including batteries)

Power supply
Batteries (2 pieces, AAA), continuous operation of 10 hours.

Name of Parts

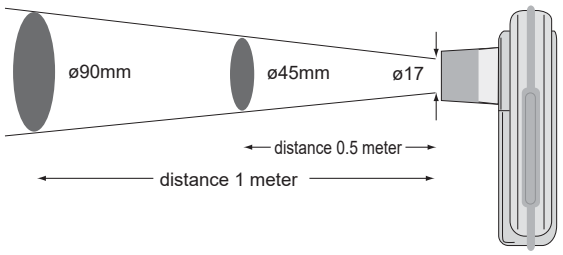


Model Code

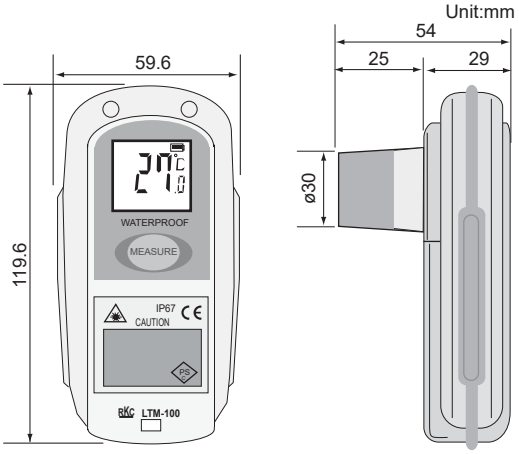
Pocket-size Infrared Thermometer	**LTM-100 (Order code : LTM-100*A)**

Accessory: Strap (1 piece), Alkaline batteries (2 pieces, AAA [triple A])

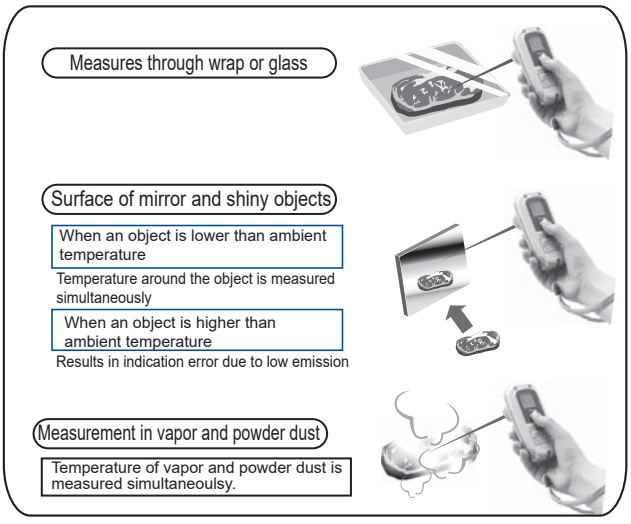
Measuring Range



External Dimensions



Use caution to measure under the following conditions.



VGR-B100

General Description

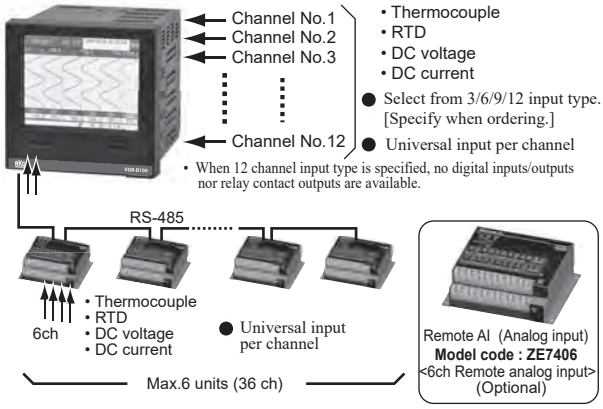
The VGR-B100 is a paperless recorder with touch screen operation.
The VGR-B100 offers universal input (voltage, current, thermocouple and RTD), ethernet communication and versatile optional functions such as serial communication, digital input (9 points), digital output (12 points) or relay contact output (6 points).

Features

☆ 3, 6, 9 or 12 channel
☆ Universal inputs per channel
☆ 5.7 inch LCD touch screen
☆ Use of optional remote inputs expands the inputs up to 36 points.
☆ Ethernet communication (Standard function)

Flexible Inputs

Up to 12 analog data can be handled on the main unit.
Use of optional remote inputs expands the inputs up to 36 points.



Quick start of recording at the press of REC button

Recording starts immediately after upon pressing the REC button.
The recorded data can be easily copied to the SD card and viewed with Excel or the supplied software.software.

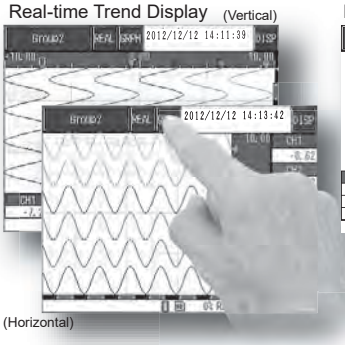
• The recorder has an onboard Flash memory. (approximately 100MB).
• The data can be saved in CSV format that can be directly edited with Excel or binary format. (whichever is selected *1).
• Recording cycle is 0.1 second (sub-recording) or adjustable from 1 second to 60 minutes.
*1 : The storage format is either binary format only or binary format +CSV format.

SD Card Capacity	2GB				
File saving cycle	1 hour			1 day	
Data recording cycle	1 sec	2 sec	5 sec	10 sec	1 min
Recording capacity	1.0 year	1.4 year	1.8 year	14.0 year	33.7 year

(Recording beyond the service life of the SD card is not warranted.)

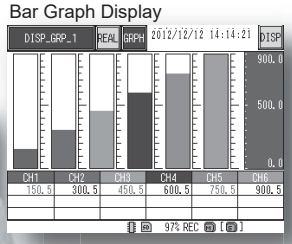
Basic Display Screens

Real-time Trend Display (Vertical)

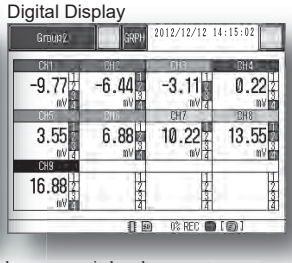


(Horizontal)

Bar Graph Display

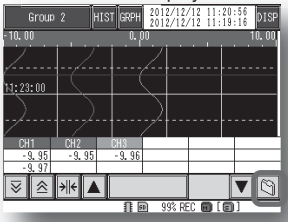


Digital Display



● Each press of the GRAPH key on the screen switches the present screen to the next.

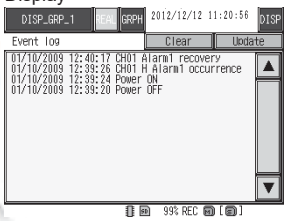
Historical Trend Display



(Saved record files)

● The REAL key on the real time trend screen allows access to the historical data of the currently displayed data and the data from saved file.

Event History/Communication History Display



● Any event that became active in the currently recorded data as well as a user defined message can be saved in the data file.
The LAN communication history can also be logged into the file.

Features

Math Function

In addition to arithmetic operations and totalizing of inputs, the math function enables storage of various computed data such as F-value and DI status.

Lock screen to prevent unintentional operations

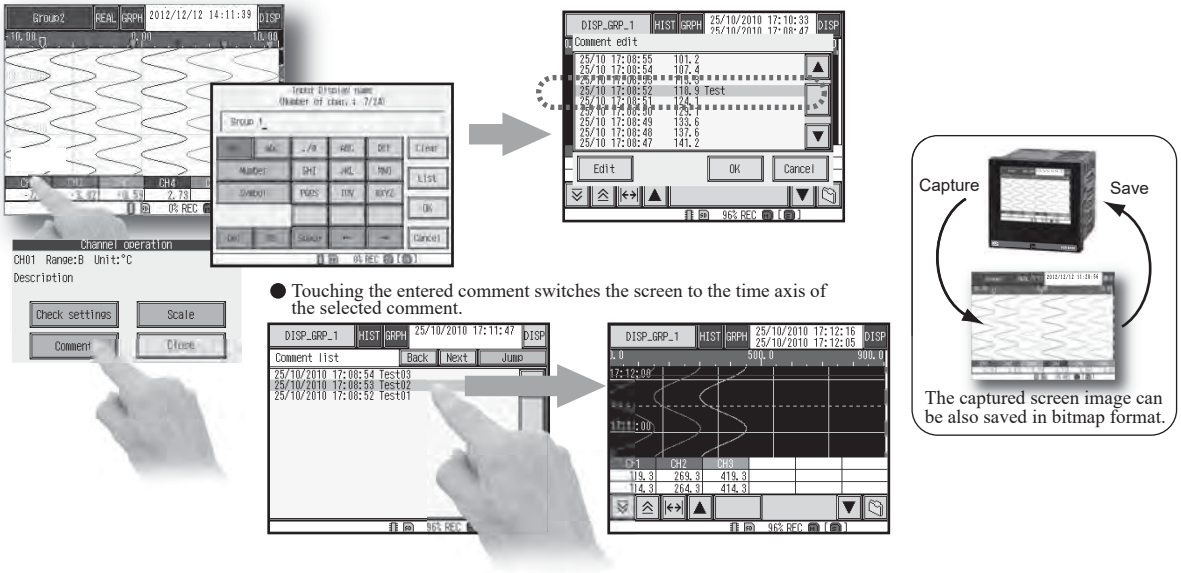
Operations via touch screen and front keys can be locked.

Versatile Data Management Function

Comment function allows the user to enter a comment at any time axis. Data management of plural recorders using the supplied software.

■ Comment Function

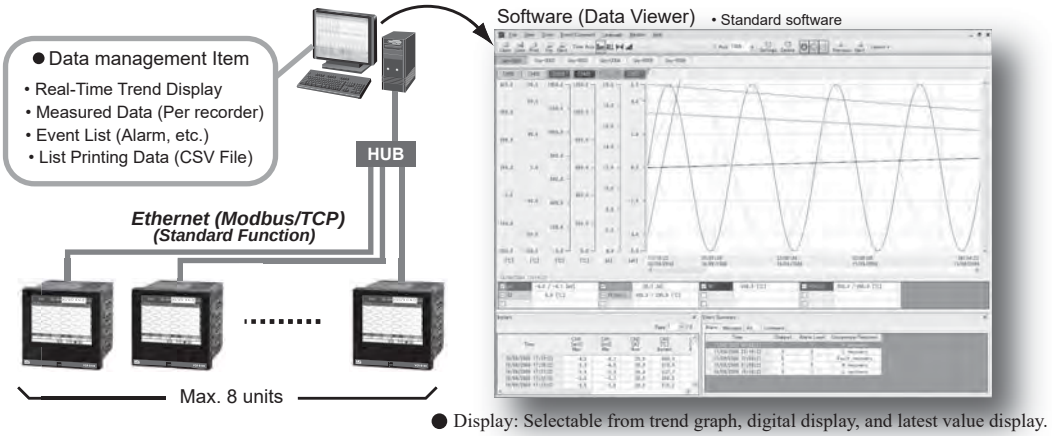
Comment can be entered at any time axis.



● Touching the entered comment switches the screen to the time axis of the selected comment.

■ Real-time Trend Graph

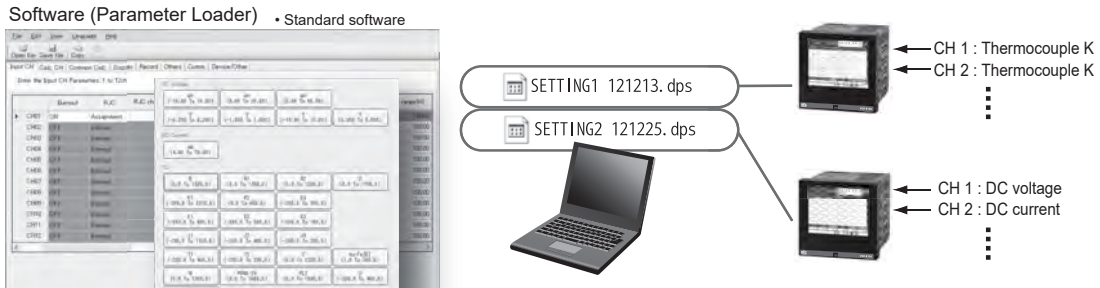
Maximum 8 recorders can be viewed on the same screen via Ethernet.



● Display: Selectable from trend graph, digital display, and latest value display.
● Recorder can be started/stopped from the Data Viewer (running on PC).

■ Parameter Loader Function

The recorder setup data can be uploaded to the recorder and downloaded from the recorder.



● Setup data can be managed with the SD card and via Ethernet.

Specifications

Input

Number of Inputs : 3, 6, 9, 12 points •Isolated between each input)
Input Type
DC voltage, DC current (Using external shunt resistor),
Thermocouple, RTD
Measurement interval : 100m sec
Burnout
Available on TC and DC mV range, • ON/OFF selectable (per channel)
Influence of external resistance (Thermocouple) : Approx. 0.18mV/Ω
Influence of input lead resistance (RTD) : Maximum 5Ω per wire
PV Digital filter : 0 to 99 sec (OFF when 0 is set.)
Scaling range : -32000 to +32000 (DC voltage, DC current input)
• Decimal point is programmable
Unit sign
Preset units or 20 units (each unit eight characters or less) that can be made.
Square Root Extraction : PV ratio + PV bias
Math function
Number of math channel : 36 channels
Arithmetic, general, multiplication and F value calculation can be computed with each math channel.
• The content of the math can be set and be confirmed only with the Parameter Loader Software (Standard supplied)
F value computation function
F value of each channel (fatal value of the bacterium by the heating sterilization) is computed from the measurement temperature.
The content of the computation can be set and be confirmed only with the Parameter Loader Software (Standard supplied)

Display

Display : Touch Panel type 5.7-inch TFT color LCD (320 X 240 dots)
Display language : English/Japanese (Selectable by setting)
Display group : Number of groups : Main records 6, Sub record 1
Number of channels : Max. 12 channels/group
Display color : 16 colors
Display interval : 1 sec

Recording

External memory : SD memory card (SD/SDHC)
Internal memory : Approx. 100MB
Memory Capacity : SD : Max. 2GB, SDHC : Max. 32GB
Main record data : Trend graph, Event Data, Message data
Sub record data
Trend graph
• The record condition can be selected from "sync.", "Alarm", "DI".
Recording cycle
1 sec to 60 min (SUB record is possible 100m sec)
Data saving cycle
1 hour to 1 year
• Data is first saved to the internal memory and then copied to the SD card at the specified cycle. When the internal memory is full or when recording is stopped, data is saved to the SD card.
Trend data
Minimum value, Maximum value, Current value, Average value (Selectable)
Other record data : Alarm status, Message
Memory remaining capacity display
When the SD card is full, recording is stopped or data can overwrite oldest data (whichever is selected)
Data format : Binary or Binary + CSV format (Selectable)

Standard Function

Alarm
Number of alarm setting : Max. 4 point per channel
Alarm type : High limit, Low limit, Abnormal data
Alarm output : 1 point, Open collector output, 30V DC. 20mA

Communication
Type : Ethernet (10BASE-T)
Protocol : Modbus/TCP
• Built in HTTP server and FTP server

Optional Function

Communication
Type : RS-485
Protocol : Modbus RTU
Bit format :
Start bit : 1, Data bit :8, Parity bit : Without, Odd or Even
Communication speed : 9600 bps
Maximum connection : 32 units (Including host)

Digital input/Digital output
• 12 channel type is not available with Digital input/Digital output.
Number of Digital input : 9 points, Non-voltage input (Same common)
Digital input function
Recording RUN/STOP, Message setting, Multiplication value RESET
LCD backlight ON/OFF
Number of Digital output : 12 points, Open collector output (Same common)
30V DC, 20mA/point
Digital output function : Alarm output
Relay contact output
• 12 channel type is not available with Relay contact output.
Number of Relay contact output : 6 points, 250V AC 3A, 30D DC 3A
(• 3A/common, Total : Less than 9A)
Output function : Alarm output
Remote AI
A maximum of 6 remote units can be connected via RS-485.

General Specifications

Supply Voltage : 85 to 264V AC (50/60Hz common)

Power Consumption

Power supply voltage	LCD ON	LCD OFF
100V AC	15VA	12VA
200V AC	25VA	22VA

Memory Backup : Flash memory.
Clock backup : Lithium battery.
(Life : Approx 5years at non power supply status)

Insulation resistance
Between terminals and ground : 20MΩ or more (at 500V DC)

Dielectric strength
500V AC for one minute between input terminals
500V AC for one minute between input terminals and ground
2000V AC for one minute between power terminals and ground

Operating Environments : 0 to 50°C, 20 to 80%RH

Net Weight : Approx 1.0kg (3 channels type)

Waterproof/Dustproof : IP65 (Front panel)

Compliance with Standards

CE marking : EMC : EN61326-1
LVD : EN61010-1

Measurement range/accuracy

Input		Range	Max. Resolution	Measurement Accuracy
DC Voltage/ DC Current	mV	-10.00 to +10.00	10μV	±(0.1%+1digit)
		0.00 to +20.00	10μV	
		0.00 to +50.0	10μV	
	V	-0.200 to +0.200	1mV	
		-1.000 to +1.000	1mV	
		-10.00 to +10.00	10mV	
		0.000 to +5.000	1mV	
	mA	4.00 to 20.00	0.01mA	
Thermocouple *5	B *1	0.0 to 1820.0	0.1°C	±(0.1%+1digit)
	R *2	0.0 to 1760.0	0.1°C	
		0.0 to 1200.0	0.1°C	
	S *2	0.0 to 1760.0	0.1°C	
	K	-200.0 to 1370.0	0.1°C	±(0.1%+1digit) • -200.0 to 0.0°C : ±(0.15%+1digit)
		-200.0 to 600.0	0.1°C	
		-200.0 to 300.0	0.1°C	
	E	-200.0 to 800.0	0.1°C	
		-200.0 to 300.0	0.1°C	
		-200.0 to 150.0	0.1°C	
	J	-200.0 to 1100.0	0.1°C	
		-200.0 to 400.0	0.1°C	
		-200.0 to 200.0	0.1°C	
	T	-200.0 to 400.0	0.1°C	
		-200.0 to 200.0	0.1°C	
	C(W5Re/W26Re)	0.0 to 2320.0	0.1°C	±(0.1%+1digit)
	Au-Fe *3	1.0 to 300.0	0.1K	±(0.2%+1digit)
	N	0.0 to 1300.0	0.1°C	±(0.1%+1digit)
	PR40-20 *4	0.0 to 1880.0	0.1°C	±(0.2%+1digit)
	PLII	0.0 to 1390.0	0.1°C	±(0.1%+1digit)
	U	-200.0 to 400.0	0.1°C	±(0.1%+1digit) • -200.0 to 0.0°C : ±(0.15%+1digit)
	L	-200.0 to 900.0	0.1°C	
RTD	Pt100	-200.0 to 650.0	0.1°C	±(0.1%+1digit)
		-200.0 to 200.0	0.1°C	
	JPt100	-200.0 to 630.0	0.1°C	
		-200.0 to 200.0	0.1°C	

*1 0.0 to 400°C : ±4%, 400 to 800°C : ±(0.15%+1digit)
*2 0.0 to 200°C : ±(0.15%+1digit)
*3 1 to 20K : ±(0.5% + 1 digit), 20 to 50K : ±(0.3%+1digit)
*4 0 to 300°C : ±(1.5% + 1 digit), 300 to 800°C : ±(0.8%+1digit)
*5 Reference Junction Compensation (Ambient temperature : 23±2°C)
R, S, PR40-20, Au-Fe : ±1.0°C, K, E, J, T, C, N, PLII, U, L : ±0.5°C

Model and Suffix Code

Specifications	Model and Suffix Code			
Model	VGR-B	□□	– □	□
Analog Input	3 points (3 channels)	103		
	6 points (6 channels)	106		
	9 points (9 channels)	109		
	12 points (12 channels) *1	112		
RS-485 Communication	Not supplied		0	
	RS-485		6	
Digital Input/Output function	Not supplied			0
	Digital Input (DI) : 9 points, Digital Output (DO) : 12 points *1			1
	Relay contact output : 6 points *1			2

Standard Accessories
: Mounting brackets, Packing for waterproof (Panel packing, O-ring)
CD-ROM (Instruction Manual, Software)

*1 When 12 channel input type is specified, no digital inputs/outputs nor relay contact outputs are available.

*2 Ethernet communication is standard function.

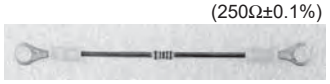
Optional Accessories

DI/DO cable • Terminal : No treatment

(1m)
Model Code : WMSU0468A01

(3m)
Model Code : WMSU0468A02

Shunt resistance for a current input
Model Code : HMSU3081A11
(250Ω±0.1%)



The terminator for RS-485
Model Code : WMSU0303A01
200Ω

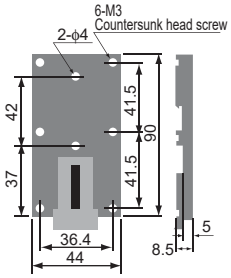
Remote AI (Analog Input)

Specifications	ZE74	06	A001
Analog Input	6 points	06	

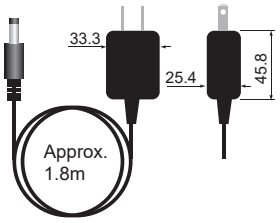
Standard Accessories : CD-ROM (Instruction Manual)

Remote AI Optional Accessories

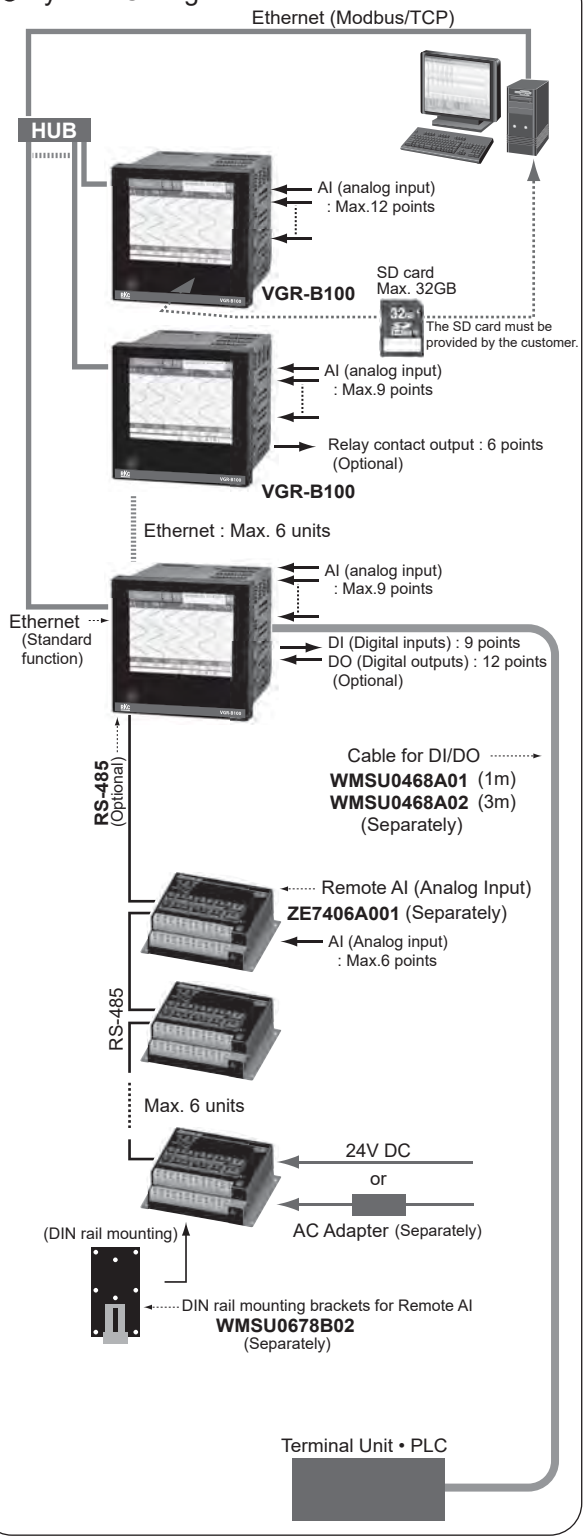
DIN Rail Mounting Bracket
Model Code : WMSU0678B02



AC Adapter
Model Code : WMSU0678B01

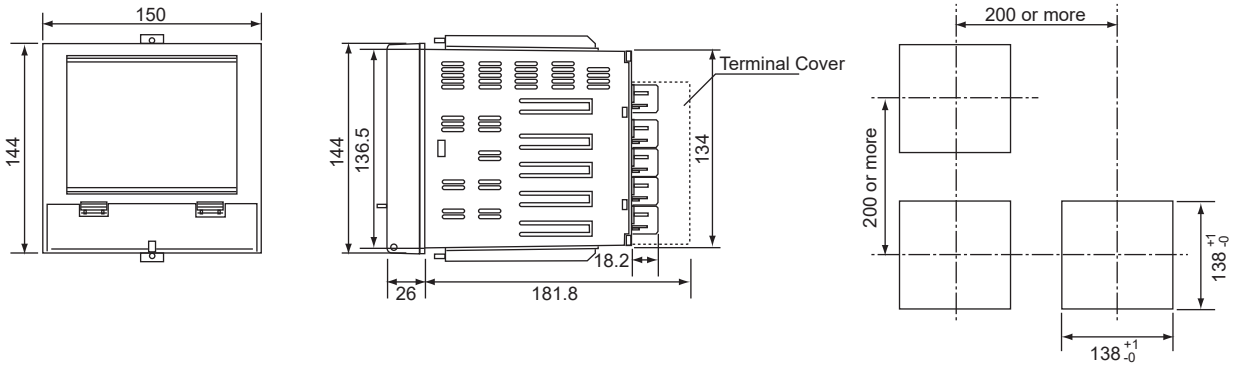


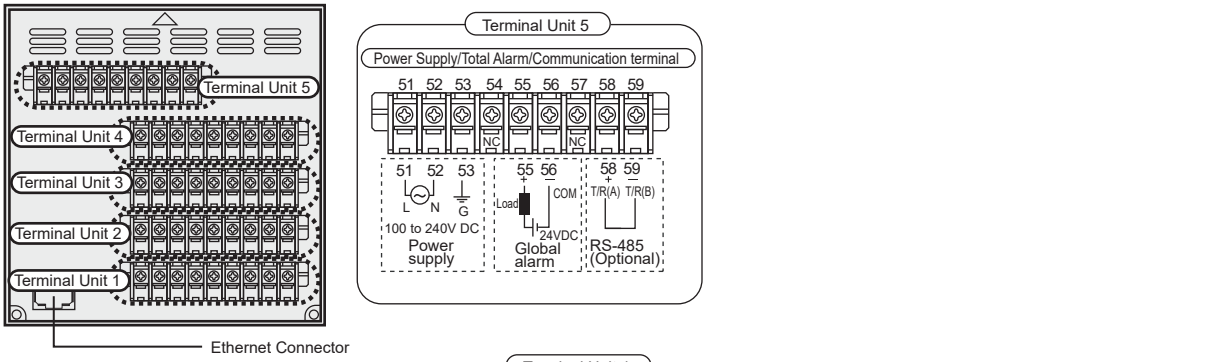
● System Configuration

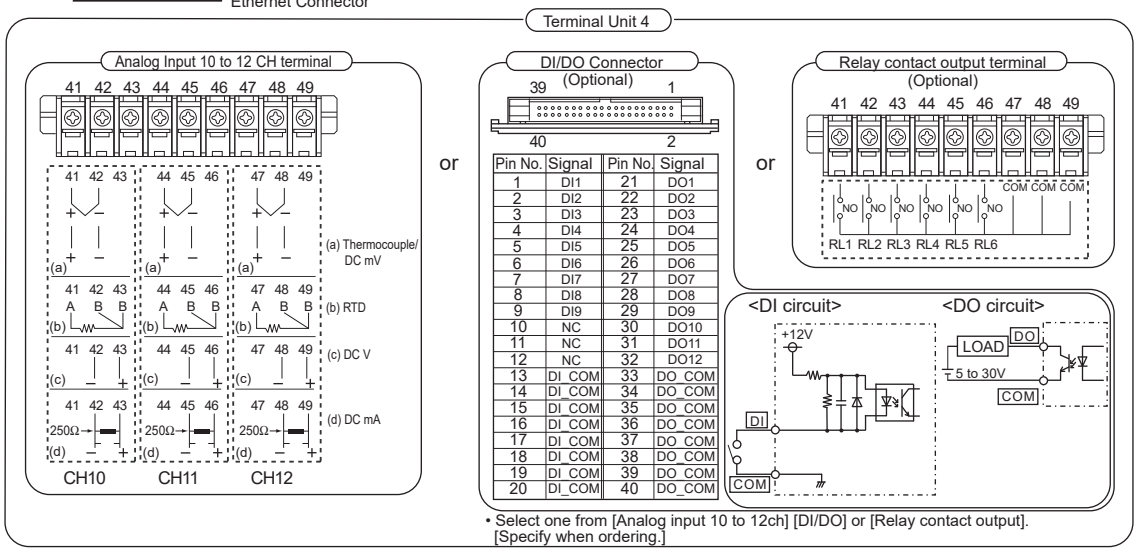


External Dimensions and Rear Terminals

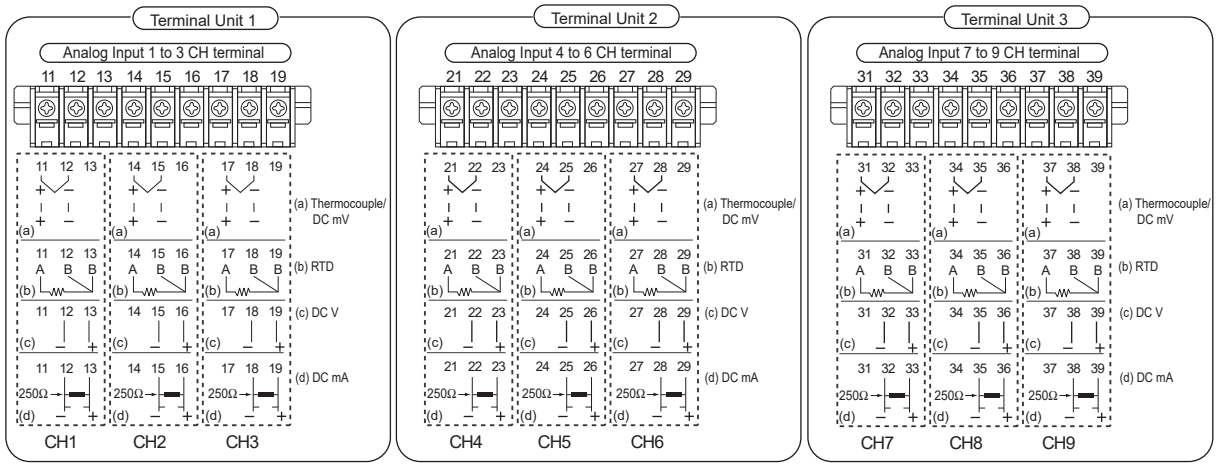
(Unit:mm)







• Select one from [Analog input 10 to 12ch] [DI/DO] or [Relay contact output].
[Specify when ordering.]



Remote AI

● Specifications

Input

Number of Inputs : 6 points
Sampling time : Approx. 0.1 sec/all channel
Input type and Scaling setting : Set by parameter loader
• Other specifications is same to VGR-B100.

Communication

Communication method : RS-485
Protocol : Modbus RTU
Bit format : Start bit : 1, Data bit :8, Parity bit : Without, Odd or Even
Stop bit : 1
Communication speed : 9600, 19200, 38400bps • Selectable
Data communication cycle : 1 sec
Slave address : 1 to 9
Maximum connection : 6 units to VGR-B100

General Specifications

Supply Voltage : 21.6 to 26.4V DC (Rating 24V DC)

Power Consumption :1.8W

Insulation resistance
Between terminals and ground : 20MΩ or more (at 500V DC)

Dielectric strength
500V AC for one minute between input terminals
500V AC for one minute between input terminals and ground
500V AC for one minute between power terminals and ground

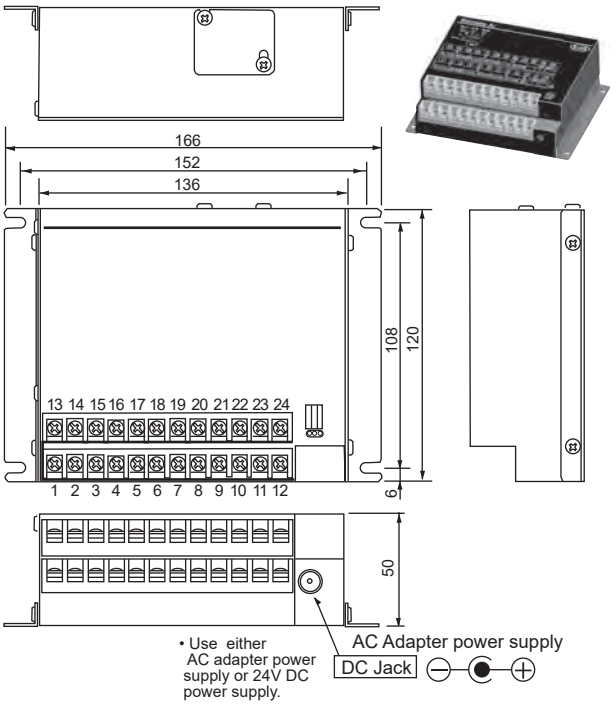
Operating Environments : 0 to 50°C, 20 to 80%RH

Net Weight : Approx 670g

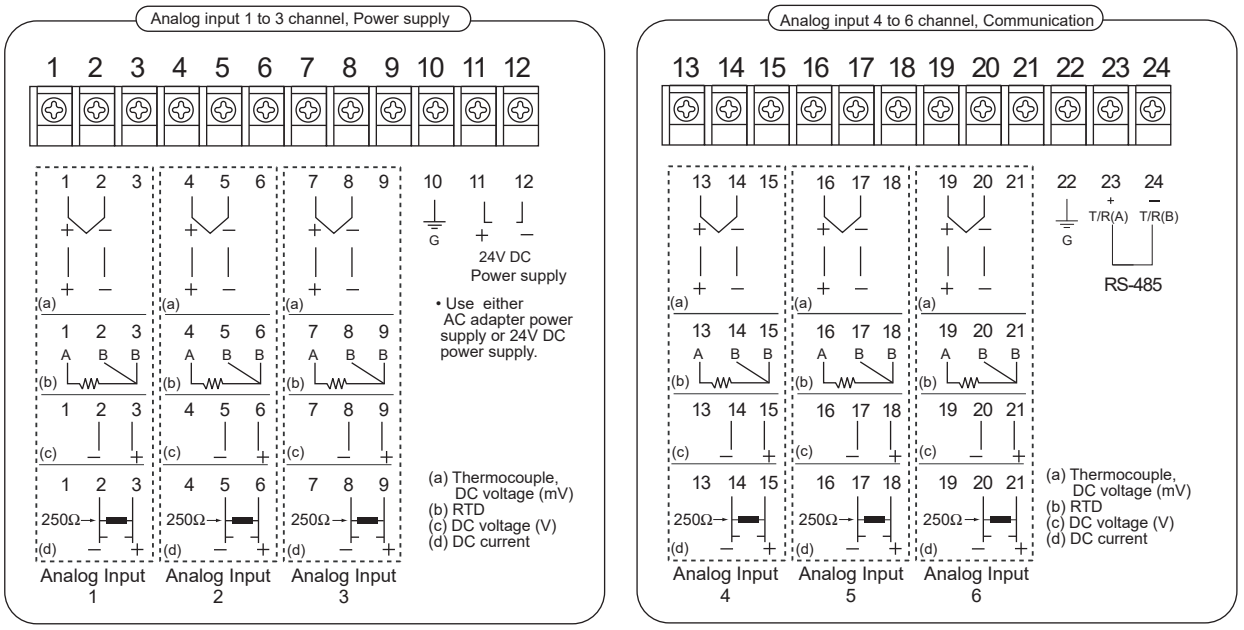
Mounting Method : DIN rail or screw mounting

Compliance with Standards : CE marking : EMC : EN61326-1
• To be released soon

● External Dimension/Terminals



● Terminals



SBR-EW series

General Description

The chart recorder SBR-EW series covers a wide range of specifications with 13 models of 144 x 144mm DIN size SBR-EW100 series (1- pen, 2-pen, 3-pen, 4-pen, 6 dot-matrix and 12 dot-matrix) and 288 x 288mm DIN size SBR-EY180 series (1-pen, 2-pen, 3-pen, 4-pen, 6 dot-matrix, 12 dot-matrix, 18 dot-matrix, and 24 dot-matrix).
The SBR-EY series offers universal input (voltage, thermocouple, RTD, and contact input) and versatile optional functions such as serial communication, mathematical computations, IC memory card slot, alarms, remote control.

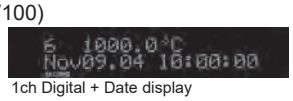
Features

- ☆ Universal inputs
- ☆ Interactive setup
- ☆ Digital contact inputs
- ☆ Long Life & High Speed Scanning

Multi-Display (Displays a Variety of Screens)

80 kinds of display patterns are prepared.
Example of Display (SBR-EW100)

1ch Digital + Bar graph display



1ch Digital + Date display

1ch Digital display

2ch Digital + Bar graph display

6ch Digital display

Flag display

Digital Input/Output status display

Alarm display

Navigational display Makes Setup a Snap

The instrument features a simple configuration, with Operation mode for normal use, and Setting mode for use during setup.
In Operation mode, measured values, time, and alarms are updated, and lists are printed. In Setting mode, you can enter measuring ranges, alarm values, and other parameters. Also, Setting mode offers a navigational display that eases entry of settings.

Scroll display

Bright Internal Illumination

By using a high intensity white LED and light diffusing rod for the internal illumination, the visibility of the chart section has been greatly increased.

Chart Ejection Function

The chart cassette is equipped with a chart ejection function.
You can write memos on the chart and check the historical trend during recording.

Universal inputs

Universal inputs allows you to select input types among DC voltage (mV, V), thermocouple, RTD and contact input for operation recording, without setting DIP switches or replacing circuit cards.
In addition, interactive setup assures you easy operations.

Digital Communication (Optional)

The SBR-EW series offers an optional RS-422A/RS-485 communications interface for networking to computers, PLCs and SCADA softwares.

Digital Contact Input (Optional)

The contact input can be selected to Recording STOP/RUN, Chart speed change, Message printout start, Manual printout start, Alarm interlock reset, Time set, Math start/stop, Math reset. (Up to 5 points)

Light Weight

High integrated circuit and the new servo unit achieve high efficiencies and low heat emissions in all of the 1-, 2-, 3-, and 4-pen and 6-dot models while simultaneously limiting the weight to approximately 2.5 kg (SBR-EW100 6-dot model), and approximately 2.4 kg (SBR-EW100 4-pen model).

Select of Recording Style

SBR-EW100 (Chart width100mm)	SBR-EW100 (Chart width100mm)
1-pen recorder	1-pen recorder
2-pen recorder	2-pen recorder
3-pen recorder	3-pen recorder
4-pen recorder	4-pen recorder
6 dot-matrix recorder	6 dot-matrix recorder
	12 dot-matrix recorder
	18 dot-matrix recorder
	24 dot-matrix recorder

Specifications

Inputs

Number of measured points
1, 2, 3, 4 (pens) or 6, 12, 18 and 24 (dots) points
(12, 18, 24 points are only for SBR-EW180)

Input signals
DC voltage : 20/60/200mV, 2/6/20/50V, 1 to 5VDC
TC (Thermocouple) : R, S, B, K, E, J, T, N, W5Re/W26Re, W3Re/W25Re, L, U
RTD (Resistance temperature detector) : Pt100, JPt100
DC current (Using external shunt resistor)
DI : Digital input (Contact or DC Voltage, TTL level)
• Refer to measuring range code table (P.5) for input signals, measuring range and measuring range limits.

Measurement range/accuracy: Refer to following table

Recording accuracy
Measurement accuracy : ±(0.3% of recording span)
* Recording span : SBR-EW100 :100mm
SBR-EW180 :180mm

Reference junction compensation accuracy (more than 0°C)
Type R, S, B, W5Re/W26Re, W3Re/W25Re : ±1°C
Type K, J, E, T, N, L, U : ±0.5°C

Measuring interval
Pen models : 0.125sec/channel
Dot models : 1sec/6dot or 2.5sec/12 to 24dot

Input resistance
10M or more (TC, 20mV, 60mV, 200mV range)
Approx. 1MΩ (2V range or more)

Burnout
Available on TC and DCV (1 to 5V) range
• ON/OFF selectable (per channel)
• Up scale / Down scale selectable
• 1-5V Burnout: less than 0.2V

Filter
Pen model: Signal damping
• ON/OFF selectable (per channel)
Time constant (2,5,10sec)
Dot model: Moving average
• ON/OFF selectable (per channel)
Moving average cycle (2 to 16)

Computation
Differential computation, Linear scaling, Square root, Bias addition

Maximum input voltage
200mVDC ranges or less and TC, RTD, DI ranges : ±10VDC (continuous)
2VDC or more : ±60VDC (continuous)

Common mode rejection ratio
120dB (50/60 Hz ±0.1%, 500Ω imbalance between minus and ground)

Normal mode rejection ratio
40dB (50/60Hz ±0.1%)

Recording

Recording system
Pen-recording : Disposable felt pens, plotter pens
Dot-recording : 6-color wire dot

Recording paper
Total length of Z-fold chart : 16m (SBR-EW100)
20m (SBR-EW180)
Effective analog recording width : 100mm (SBR-EW100)
180mm (SBR-EW180)

Step response time (Pen model)
1sec. or max. / IEC TC85 (SBR-EW100)
1. 5sec. or max. / IEC TC85 (SBR-EW180)

Recording colors
Pen-recording : 1st pen, red ; 2nd pen, green ; 3rd pen, blue ; 4th pen, violet ; plotter, purple
Dot-recording : CH 1, 7, 13, 19 purple
CH 2, 8, 14, 20 red
CH 3, 9, 15, 21 green
CH 4, 10, 16, 22 blue
CH 5, 11, 17, 23 brown
CH 6, 12, 18, 24 black
(Colors can be assigned for each channel)

Analog recording cycle
Pen model : Continuous
Dot model : 6 dots/10 sec. (Maximum)
12 dots/15 sec. (Maximum)
18 dots/20 sec. (Maximum)
24 dots/30 sec. (Maximum)

Chart speed
Pen model : 5 to 12000mm/h (82 increments)
Dot model : 1 to 1500mm/h (1mm step)

Chart speed change
Speed 1, speed 2 change by remote control signals (option)

Chart Speed Accuracy:
Within ±0.1% (for recordings longer than 1000mm, related to the grid of the chart paper)

Recording format
1. Analog recording :
Analog recording ON/OFF selectable for each channel of dot model
Zone recording : Span: 5mm or more (1mm step)
Partial expanded recording: Boundary position: 1 to 99%
Boundary value: Within recording span
2. Digital printout:
Channel (dot model only):
Channel number or TAG will be printed during analog recording.
Approx. every 25mm this print will occur.
ON / OFF selectable (common for all channels)
Alarm:
At the right side of the chart, CH. No. or TAG, Type of alarm, (date/time) of alarm ON / OFF will be printed. Time of alarm ON / OFF, time of alarm ON, OFF selectable (common for all channels).
Periodic printout contents:
Date (mm/dd/yy), time(hh:mm), measurement data of each channel, scale printout, recording color, chart speed
Message printout :
With panel key or remote control option, up to 5 messages can be printed. Contents: Date/time and message (up to 16 characters).
Record start time:
Date/time will be printed when recording starts, ON / OFF selectable.
Chart speed printout:
Date/time when chart speed is changed will be printed, ON / OFF selectable.
List printout:
Listings of range and alarm setting, etc. will be printed.
Manual printout:
With panel key or remote control option, measuring value will be printed.
SET UP List printout:
Listings of settings in SET UP Mode will be printed.

Display

Display method :
SBR-EW100: VFD 101 x 16 dot matrix
SBR-EW180: VFD 181 x 16 dot matrix

Display contents :
Digital display (Channel No. Measured value, Alarm type, Bar graph, Flag display, DI/DO display, Alarm status, Date/Time display, Chart speed display, Status display, System display
• 15 display types can be selected from approx. 80 display types.

Status display:
Recording in progress (RECORD), Shared alarm display (ALARM)
Alarm occurrence No. display,
Chart end indicator (CHART END) (Option /F1)
Computation in progress(MATH) (Option /M1)
Key lock display (KEY LOCK)

Setting
Settings display by interactive mode.In setting, navigator method is used.

Display update of measured values
When displayed channels are fixed
Dot model: Updated at the scan interval
Pen model: Updated every 2 s
When displayed channels are automatically switched
Switches the channel and measured values at 1, 2, 3, 4, or 5 second intervals.

Display brightness setting
Display brightness level: 1 to 8

Alarms

Number of alarm levels
Four levels per channel

Alarm types:
High and low, limits, differential high and low limits, high and low rate-of-change limits and delay high and low
Alarm delay time: 1 to 3600s
Interval time of rate-of-change alarms:
The measurement interval times 1 to 15

Display:
Alarm value is indicated as a point on the bar graph.
In occurring an alarm:
On bar graph display, a point indicator is flashing.
On digital display, an alarm type indicator is shown.
A channel number of occurring alarm is displayed.
Flashing on bar-graph

Hysteresis:
0.0 to 1.0% (0.1% step) of recording span
(only High, Low alarm, common for all channels and all levels).

General specifications

Clock:
With calendar function
Clock Accuracy : 100 ppm, however not including error due to turning ON / OFF power

Panel Key Lock:
Protection by password

Internal illumination:
White LED

Memory backup
Lithium battery to protect setup parameters.
Life : approx. 10 years (at 23°C ±2°C, 55% ±10%RH, for standard model)

Ambient temperature and humidity
0 to 50°C, 20 to 80%RH

Operating Position:
Frontwards: 0° Backwards: Within 30° from horizontal input

source external resistance
DC voltage : TC input : 2kΩ max.
RTD input : 10Ω max. each line

Insulation resistance
Between terminals and ground : 20MΩ or more (at 500V DC)

Dielectric strength
1000V AC for one minute between measured terminals and ground
2700V AC for one minute between contact output terminals and ground
3000V AC for one minute between power terminals and ground
• Between each input terminals (between measuring channels) ; 1,000V AC (50/60Hz) for one minute (Except RTD input dot printing model as the "b" terminal is common.)

Construction / power source

Power source
Rated power voltage : 100 to 240V AC
Usable power voltage ranges : 90 to 132V AC, 180 to 264V AC
Rated power frequency : 50/60 Hz

Power consumption

		100V AC power supply (Approx.)	240V AC power supply (Approx.)	Max. (Approx.)
SBR-EW100	Pen model	12VA	17VA	40VA
	Dot model	13VA	18VA	40VA
SBR-EW180	Pen model	17VA	25VA	55VA
	Dot model	17VA	23VA	55VA

Weight : approx.
SBR-EW100 : 1-pen, 2.1kg ; 4-pen, 2.4kg ; 6-dot, 2.5kg
SBR-EW180 : 4-pen, 7.6kg ; 6-dot, 8.4kg ; 24-dot, 9.0kg

Optional functions

Alarm relay contact output (/A1, /A2, /A3, /A4, /A5)
Number of output points : SBR-EW100 : 2, 4, or 6 points
SBR-EW180 : 2, 4, 6, 12 or 24 points
Contact capacity : 250V DC 0.1A, 250V AC 3A (Resistive load)

Digital communications (/C3)
Conforms to EIA RS-422A/485
Asynchronous method : Start - stop synchronization
4-wire half-duplex multi-drop connection
Data bit : 7 or 8 bits
Stop bit : 1 bit
Parity bit : Without, Odd or Even
Communication speed : 1200, 2400, 4800, 9600, 19200, 38400bps

Remote Control (/ R1)
5 type are selectable from the below mentioned remote controls.
Recording start / stop, Chart speed change, Message printout start, Manual printout start, Alarm ACK, Time adjustment (Adjusting the time to a preset time), Computation start / stop, Computation reset

Computation function (/M1)
Arithmetic operation, Square, Absolute, Common logarithm, Exponential, Power, Relational operator, Logic
Statistical computation : Statistical type : MAX, MIN, AVE, SUM, MAX-MIN

FAIL/chart end detection, output (/F1)
If an error in the CPU board occurs, or when the chart reaches its end, output relay on the rear terminal will be activated. Besides, when the chart reaches its end, CHART END indicator will be shown on the display.
Relay contact rating : DC 250V / 0.1A, AC 250V / 3A
Chart end: Energized, FAIL: Deenergized

3-Wire Isolated RTD input (/N2)
A, B, b wires are isolated input type
• Only Dot Models (Pen Models : Standard function)

Other Functions
Clamped input terminals (/H2)
Non-reflective glass door (/H3)

Measurement range/accuracy

Input		Range	Measurement Accuracy	Max. Resolution
DC V	20mV	-20.00 to +20.00mV	±(0.1% of reading + 2 digits)	10µV
	60mV	-60.00 to +60.00mV		10µV
	200mV	-200.0 to +200.0mV		100µV
	2V	-2.000 to +2.000V		1mV
	6V	-6.000 to +6.000V		1mV
	20V	-20.00 to +20.00V		10mV
	50V	-50.00 to +50.00V	±(0.1% of reading + 3 digits)	10mV
	1 to 5V	1.000 to 5.000V	±(0.1% of reading + 2 digits)	1mV
TC (Thermocouple) • excluding the accuracy of reference junction compensation	R	0.0 to 1760.0°C	±(0.15% of reading+1°C) R, S : 0 to 100°C ±3.7°C 100 to 300°C ±1.5°C B : 400 to 600°C ±2°C Less than 400°C : Not guaranteed	0.1°C
	S	0.0 to 1760.0°C		
	B	0.0 to 1820.0°C		
	K	-200.0 to +1370.0°C	±(0.15% of reading+0.7°C) * -200 to -100°C: ±(0.15% of reading+1°C)	
	E	-200.0 to +800.0°C	±(0.15% of reading+0.5°C)	
	J	-200.0 to +1100.0°C	±(0.15% of reading+0.5°C) J : -200 to -100°C: ±(0.15% of reading+0.7°C)	
	T	-200.0 to +400.0°C		
	N	0.0 to 1300.0°C	±(0.15% of reading+0.7°C)	
	W (W5Re/W26Re)	0.0 to 2315.0°C	±(0.15% of reading+1°C)	
	L	-200.0 to +900.0°C	±(0.15% of reading+0.5°C) L : -200 to -100°C: ±(0.15% of reading+0.7°C)	
	U	-200.0 to +400.0°C		
	WRe (W3Re/W25Re)	0.0 to 2400.0°C	±(0.2% of reading+1.0°C)	
RTD	Pt100	-200.0 to +600.0°C	±(0.15% of reading+0.3°C)	0.1°C
	JPt100	-200.0 to +550.0°C		

Reference junction compensation accuracy
Type R, S, B, W, WRe: ±1.0°C, Type K, J, E, T, N, L, U : ±0.5°C
Maximum input voltage
±10 VDC (continuous) for ranges of 200 mV or less, TC, RTD, and DI ranges
±60 VDC (continuous) for 2 VDC or higher ranges
Input resistance
Approximately 10MΩ or more for ranges of 200 mV or less and TC
Approximately 1 MΩ for 2 VDC or higher ranges
Input source resistance
Volt, TC: 2 kΩ or less
RTD input: 10Ω or less per wire (The resistance of all three wires must be equal).

Expansion Inputs

Input		Range	Measurement Accuracy	Max. Resolution
TC (Thermocouple) • excluding the accuracy of reference junction compensation	PR40-20	0.0 to +1900.0°C	0 to 450°C : Not guaranteed 450 to 750°C : ±(0.9% of reading +3.2°C) 750 to 1100°C : ±(0.9% of reading +1.3°C) 1100 to 1900°C: ±(0.9% of reading +0.4°C)	0.1°C
	PLII *1	0.0 to +1400.0°C	±(0.25% of reading + 2.3°C)	
	NiNiMo	0.0 to +1310.0°C	±(0.25% of reading + 0.7°C)	
	W/WRe26	0.0 to +2400.0°C	0 to 400°C: ±15.0°C 400 to 2400°C : ±(0.2% of reading+2.0°C)	
	Type N(AWG14)	0.0 to +1300.0°C	±(0.2% of reading + 1.3°C)	
	Kp vs Au7Fe	0.0 to +300.0K	0 to 20K : ±4.5K 20 to 300K : ±2.5K	0.1K
	Pt25	-200.0 to +550.0°C	±(0.15% of reading+0.6°C)	0.1°C
	Pt50	-200.0 to +600.0°C	±(0.3% of reading+0.6°C)	
	Ni100(SAMA)	-200.0 to +250.0°C	±(0.15% of reading+0.4°C)	
	Ni100(DIN)	-60.0 to +180.0°C		
	Ni120	-70.0 to +200.0°C		
	J263*B	0.0 to 300.0K	0 to 40K : ±3.0K 40 to 300K : ±1.0K	0.1K
RTD	Cu53	-50.0 to +150.0°C	±(0.15% of reading+0.8°C)	0.1°C
	Cu100	-50.0 to +150.0°C	±(0.2% of reading+1.0°C)	

*1: PR40-20 : No reference junction compensation (0°C fix)

Model and Suffix Code

Specifications	Model and Suffix Code			
Model	SBR-EW10 SBR-EW18	□	□	□
SBR-EW10	1-pen recorder 2-pen recorder 3-pen recorder 4-pen recorder 6-dot recorder	1 2 3 4 6		
SBR-EW18	1-pen recorder 2-pen recorder 3-pen recorder 4-pen recorder 6-dot recorder 12-dot recorder 18-dot recorder 24-dot recorder	1 2 3 4 6 7 8 9		
Language	Japanese English & deg F / DST		-1 -2	
Options	Alarm output relay 2 points *1 4 points *1 6 points *1, *3 12 points *1, *2 24 points *1, *2, *4			/A1 /A2 /A3 /A4 /A5
	Digital communications (RS-422A/485)			/C3
	FAIL/chart end detection and output *3, *4,			/F1
	Clamped input terminal *5			/H2
	Non-reflective door glass			/H3
	Portable type, Power cable UL, CSA st'd7			/H5D
	Mathematical function			/M1
	Cu10, Cu25 RTD input			/N1
	3-leg isolated RTD input (Dot model only) *5,*6			/N2
	Expansion inputs			/N3
	Remote controls (5 contacts)			/R1

*1 : /A1, /A2, /A3, /A4, /A5 cannot be specified together.
*2 : /A4 is for SBR-EW180 series.
/A5 is for 12, 18, 24 dot model of SBR-EW180.
*3 : If /F1 is selected for SBR-EW100, alarm relay contact output can be specified up to 4 points (/A1 or /A2).
*4 : For SBR-EW180, /F1 and /A5 cannot be specified together.
*5 : /N2 and /H2 cannot be specified together.
*6 : /N2 can be specified only for dot model
• Sample of model and suffix code with more than 2 options ; SBR-EW104-2/A2/C3/M1.....

Standard Accessories

Name		1 pen	2 pen	3 pen	4 pen	6/12/18/24 dot
Z-fold chart		1 piece	1 piece	1 piece	1 piece	1 piece
6 color ribbon cassette		—	—	—	—	1 piece
Disposable felt-pen cartridge	Red	1 piece	1 piece	1 piece	1 piece	—
	Green	—	1 piece	1 piece	1 piece	—
	Blue	—	—	1 piece	1 piece	—
	Violet	—	—	—	1 piece	—
Plotter pen	Purple	1 piece	1 piece	1 piece	1 piece	—
Mounting brackets		2 piece	2 piece	2 piece	2 piece	2 piece

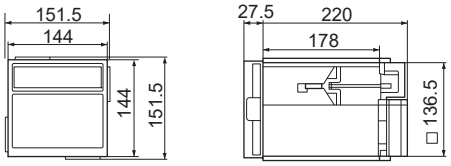
Separates/Optional Accessories

Name		Model code	Sales Unit	Specification
Z-fold chart for EW100		B-100EX	1	10 pieces/unit
Z-fold chart for EW180		R-100EX		
6 color ribbon cassette for EW100		B9901AX	1	1 pieces/unit
6 color ribbon cassette for EW180		B9906JA		
Disposable felt-pen cartridge	Red	B9902AM	1	3 pieces/unit
	Green	B9902AN	1	3 pieces/unit
	Blue	B9902AP	1	3 pieces/unit
	Violet	B9902AQ	1	3 pieces/unit
Plotter pen	Purple	B9902AR	1	3 pieces/unit
Mounting brackets		B9900BX	2	
Shunt resistor (for screw input terminal)		415920	1	250Ω±0.1%
		415921	1	100Ω±0.1%
		415922	1	10Ω±0.1%
Shunt resistor (for clamped input terminal)		438920	1	250Ω±0.1%
		438921	1	100Ω±0.1%
		438922	1	10Ω±0.1%

External Dimensions and Rear Terminals

SBR-EW100

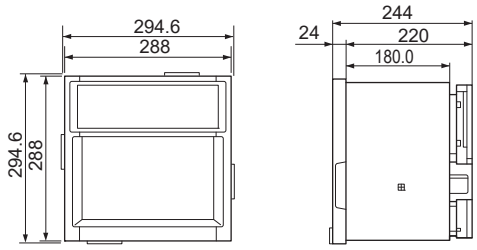
Unit:mm



Note) The SBR-EW100 should be mounted by only two brackets, either on the top & bottom of the recorder, or on the left & right side of the recorder.
If not specified, the tolerance is ±3%. However, in cases of less than 10mm, the tolerance is ±0.3mm.

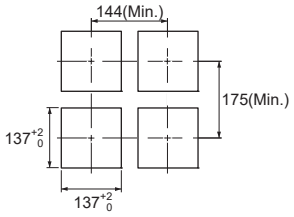
SBR-EW180

Unit:mm

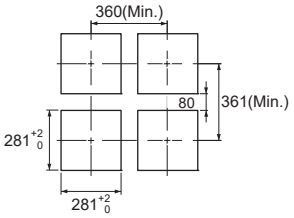


Note) The SBR-EW100 should be mounted by only two brackets, either on the top & bottom of the recorder, or on the left & right side of the recorder.
If not specified, the tolerance is ±3%. However, in cases of less than 10mm, the tolerance is ±0.3mm.

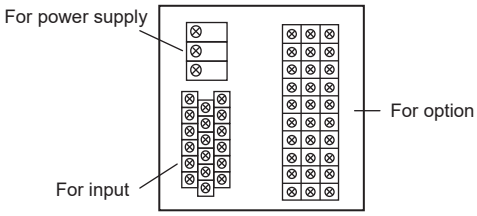
Panel cutout



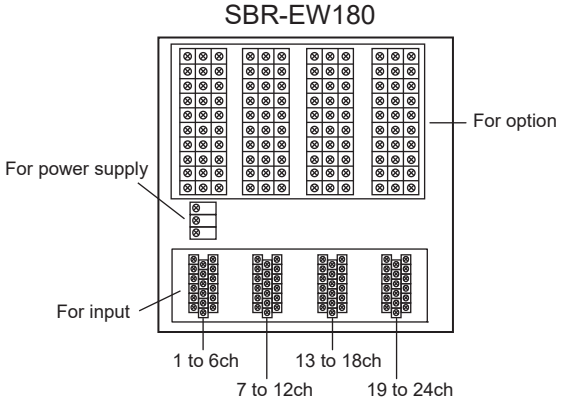
Panel cutout



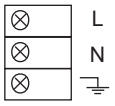
SBR-EW100



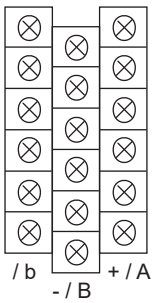
SBR-EW180



[Power supply terminals]



[Input terminals]



Pen model	Dot model			
	1	7	13	19 ch
1 ch	2	8	14	20 ch
2 ch	3	9	15	21 ch
3 ch	4	10	16	22 ch
4 ch	5	11	17	23 ch
	6	12	18	24 ch

• Please be minded that the arrangement of clamped type terminal is different

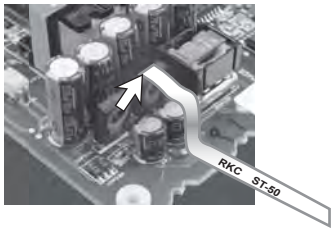
[Option terminals]

NO	C	NC	For alarm relay output
NO	C	NC	
NO	C	NC	
NO	C	NC	
NO	C	NC	Chart run-out output / FAIL output (Added/F1)
NO	C	NC	
1	2	3	For remote control input
4	5	C	
SD A [T(A)]	SD B [T(B)]	SG	For communication (RS-422A)
RD A [R(A)]	RD B [R(B)]	FG	

• Number of terminals varies according to the additional functions.

Memo

ST-50/51



Features

☆ Thin Film Type K Thermocouple Temperature Sensor avialable in thickness of 0.34mm and 0.13mm.
☆ Ideal for measuring temperature of small object by pasting on its surface.
☆ Ideal for inserting between two touching surfaces with Exposed-Tip Type.
☆ Polyimide (PI) Insulation Type for applications where electrical insulation is needed.

Adhesive Type Max.300°C

■ Glass cloth base type **ST-50**

■ Polyimide sheet type **ST-51**

■ Polyimide sheet type (Narrow Version) **ST-51S**

Exposed Tip Type Max.300°C

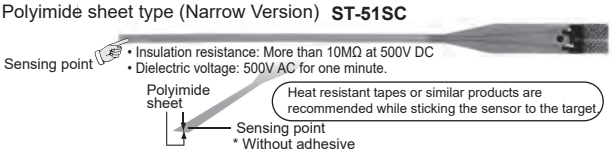
■ Glass cloth base type **ST-50B**

■ Polyimide sheet type **ST-51B**

■ Polyimide sheet type (Narrow Version) **ST-51SB**

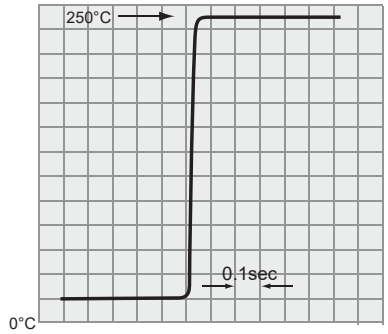
Insulated Type Max.300°C

■ Polyimide sheet type (Narrow Version) **ST-51SC**



- Ideal for measuring hard-to-reach target with its thin film design.
- Compatible with all Type K Thermocouple Input instruments.
- Easily stick on target with Self-Adhesive Type or insert between two touching surfaces with Exposed Tip Type. Use Polyimide (PI) Insulated Type for applications where electrical insulation is needed.

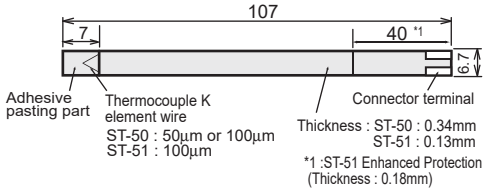
- Rapid Response Time
  Low heat capacity allows instant measurement.
  Ideal for measuring and logging.



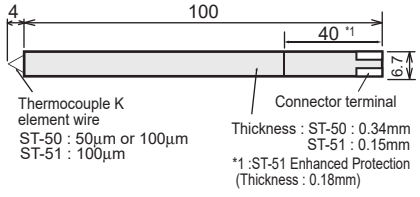
< ST-50B / ST-51B / ST-51SB characteristic curve>

External Dimensions

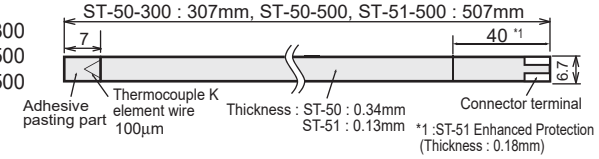
ST-50
ST-51



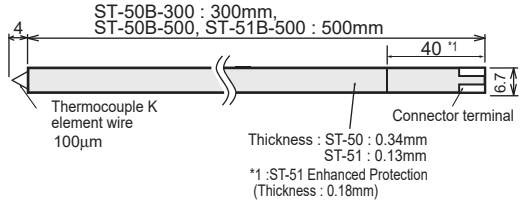
ST-50B
ST-51B



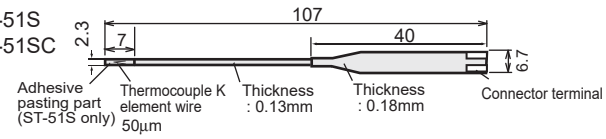
ST-50-300
ST-50-500
ST-51-500



ST-50B-300
ST-50B-500
ST-51B-500



ST-51S
ST-51SC



Specifications

<ST-50/51>

Model	Type	Film Material	Film Thickness (mm)	Thermocouple Wire Diameter	Measuring Range (*1)	95% of Response Time (*2)	Resistance with 1m of extension wire	Accuracy (*3)	Packaging
ST-50	Adhesive Type	Glass cloth base	0.34	50µm	0 to 300°C	0.08sec	51Ω	±1.3°C	5 pieces/pack
ST-50-100-D				100µm			17Ω	±1.5°C	1 piece/pack
ST-50-300							41Ω		
ST-50-500							66Ω		
ST-51-100-C		Polyimide sheet	0.13	50µm			51Ω	±1.3°C	5 pieces/pack
ST-51-500-D				100µm			66Ω	±1.5°C	1 piece/pack
ST-51S-100-C				50µm	-40 to 300°C		51Ω	±1.2°C	5 pieces/pack
ST-50B-100-04	Exposed Tip Type	Glass cloth base	0.34	50µm	0 to 300°C	0.03sec	51Ω	±1.3°C	5 pieces/pack
ST-50B-100-04-D				100µm			17Ω	±1.5°C	1 piece/pack
ST-50B-300-04							41Ω		
ST-50B-500-04							66Ω		
ST-51B-100-04-C		Polyimide sheet	0.13	50µm			51Ω	±1.3°C	5 pieces/pack
ST-51B-500-04-D				100µm			66Ω	±1.5°C	1 piece/pack
ST-51SB-100-04-C				50µm	-40 to 300°C		51Ω	±1.2°C	5 pieces/pack
ST-51SC-100-C	Insulated Type	Polyimide sheet	0.13	50µm	-40 to 300°C	0.32sec	51Ω	±1.2°C	5 pieces/pack

Type of sensor : Type K thermocouple element class 2
Response time of measuring metal surface (Adhesive Type only)
50µm element wire type : 0.4sec. 100µm element wire type : 0.9sec.

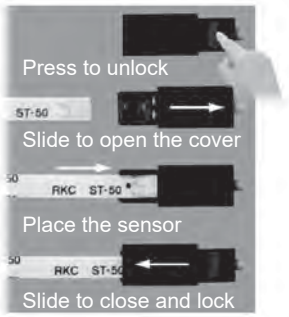
(*1) Self-Adhesive section is good for multiplpe uses under following conditions :
1. Object temperature <=150°C
2. Object temperature is maintained between 150°C and 200°C.
3. Object temperature is maintained between 250°C and 300°C.
• Result may be affected by environment and object surface condition.
• Silicone adhesive is used and no siloxane is generated.
(*2) While measuring paraffin wax temperature of 250°C .
(*3) While measuring copper surface temperature of 100°C .
* Exposed-Tip type is tested with using of polyimide adhesive.

<W-ST50A> Connector Cable

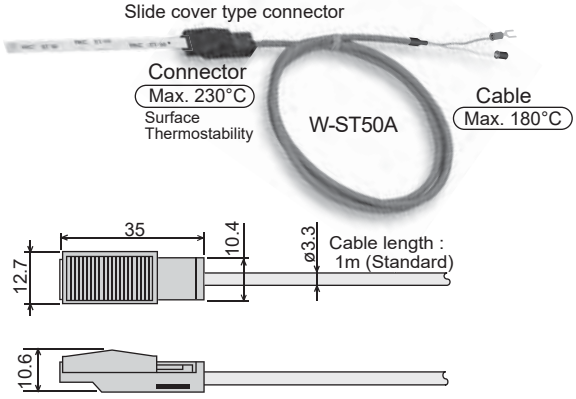
* All ST-50/51 must be used with Connector Cable W-ST50A

Connector material	Polyphenylene sulfide (PPS)
Connector Surface thermostability	230°C
Cable material	Silicone Rubber (Green)
Cable thermostability	180°C
Resistance with 1m cable	8.5Ω or less
Thermocouple Extension Wire	KX Class 1, Φ3.3mm Standard 1m
Weight	Approx. 20g (1m cable, Y-shaped terminal lug)

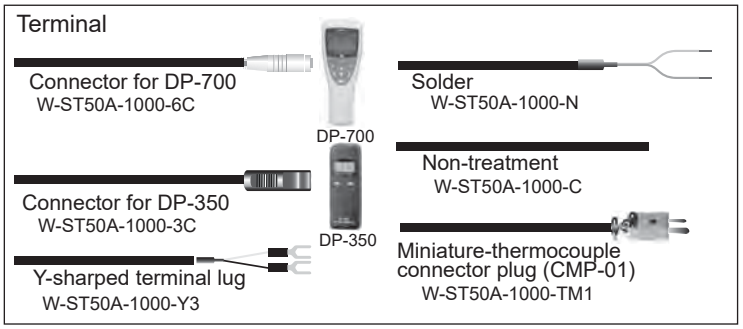
Slide-cover type sensor connector



Slide cover type connector



Terminal



Model and Suffix Code

<ST-50> Glass cloth base type

ST-50 (Adhesive Type)

Model Code	Contents
ST-50	Length : 107mm, Thermocouple Wire Diameter 50mm, 5 pieces/pack
ST-50-100-D	Length : 107mm, Thermocouple Wire Diameter 100mm, 5 pieces/pack
ST-50-300	Length : 307mm, Thermocouple Wire Diameter 100mm, 1 piece/pack
ST-50-500	Length : 507mm, Thermocouple Wire Diameter 100mm, 1 piece/pack

ST-50B (Exposed Tip Type)

Model Code	Contents
ST-50B-100-04	Length : 104mm, Thermocouple Wire Diameter 50µm, 5 pieces/pack
ST-50B-100-04-D	Length : 104mm, Thermocouple Wire Diameter 100mm, 5 pieces/pack
ST-50B-300-04	Length : 304mm, Thermocouple Wire Diameter 100mm, 1 piece/pack
ST-50B-500-04	Length : 504mm, Thermocouple Wire Diameter 100mm, 1 piece/pack

<ST-51> Polyimide sheet type

ST-51 (Adhesive type)

Model Code	Contents
ST-51-100-C	Length : 107mm, Thermocouple Wire Diameter 50mm, 5 pieces/pack
ST-51-500-D	Length : 507mm, Thermocouple Wire Diameter 100mm, 1 piece/pack

ST-50B (Exposed tip type)

Model Code	Contents
ST-51B-100-04-C	Length : 104mm, Thermocouple Wire Diameter 50mm, 5 pieces/pack
ST-51B-500-04-D	Length : 504mm, Thermocouple Wire Diameter 100mm, 1 piece/pack

<ST-51S> Polyimide sheet type (Narrow Version)

ST-51S (Adhesive type)

Model Code	Contents
ST-51S-100-C	Length : 107mm, Thermocouple Wire Diameter 50mm, 5 pieces/pack

ST-51SB (Exposed Adhesive type)

Model Code	Contents
ST-51SB-100-04-C	Length : 104mm, Thermocouple Wire Diameter 50mm, 5 pieces/pack

ST-51SC (Insulated type)

Model Code	Contents
ST-51SC-100-C	Length : 107mm, Thermocouple Wire Diameter 50mm, 5 pieces/pack

<ST-50 Connector>

Model Code	Contents
W-ST50A-1000-3C	ST-50/51 Connector cable for DP-350 connection (1m)
W-ST50A-1000-6C	ST-50/51 Connector cable for DP-700 connection (1m)
W-ST50A-1000-Y3	Y-sharped terminal lug type ST-50/51 Connector cable (1m)

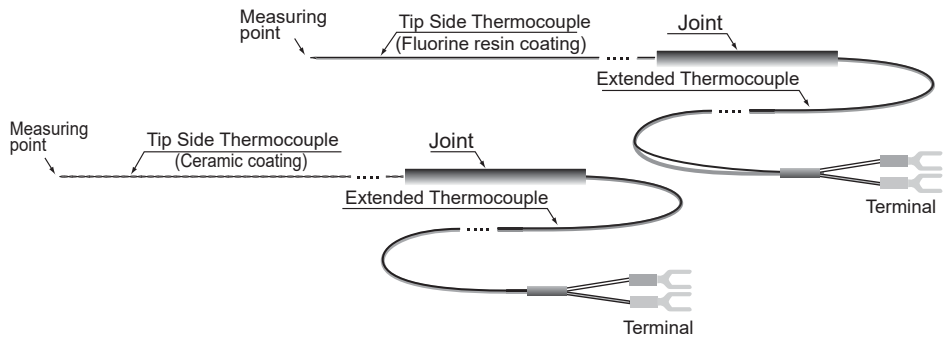
Model Code	Contents
W-ST50A-1000-N	Solder type ST-50/51 Connector cable (1m)
W-ST50A-1000-C	Non-treatment type ST-50/51 Connector cable (1m)
W-ST50A-1000-TM1	Miniature-thermocouple connector plug (CMP-01) type ST-50/51 Connector cable

ST-55/56

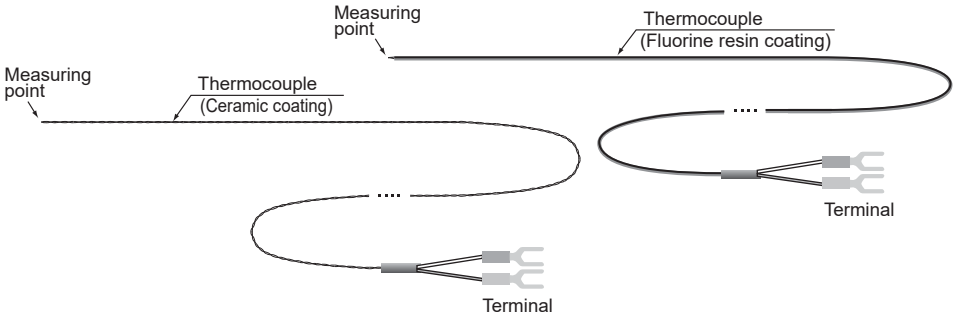
Features

☆ Type K thermocouple to measure the temperature of a fine surface
☆ Fast response with fine thermocouple
☆ Up to 500°C (932°F) with ceramic coating
☆ Adhesive type available

ST-55 ST-55 has a joint which enables a longer length

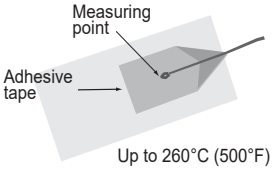


ST-56 ST-56 is a seamless thermocouple

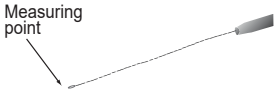


Measuring point on the tip

Fluorine resin coating type
(With adhesive tape)



Ceramic coating type



Measuring temperature in a small surface area

A fine thermocouple enables measurement of a fine surface or a surface with small thermal capacity such as SMT parts.

Measuring up to 500 °C (932°F)

Ceramic coating type can measure up to 500°C (932°F) and fluorine resin coating type up to 260°C (500°F).

Optional adhesive tape on the tip

Optional adhesive tape on the fluorine resin coating type allows the tip to stick to an exact spot for measurement.

Typical application

Mount Device temperature by reflow soldering

Electronic device temperature

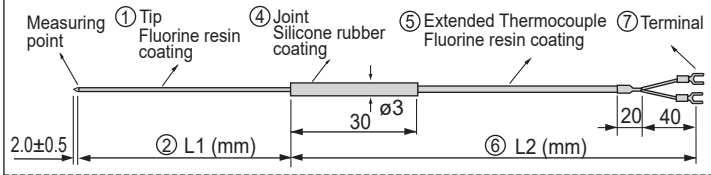
- Testing for assessment of parts test equipment
- Temperature distribution analysis of ovens
- LCD test equipment
- Semiconductor fabrication equipment
- Automotive parts testing

Specifications

Fluorine resin coating type — Thermocouple type : K

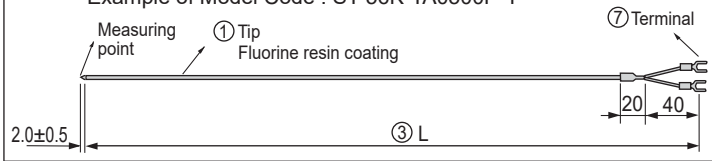
ST-55K-□□ □□□□ □ −G−□□ □□□□−□
① ② ③ ④ ⑤ ⑥ ⑦

Example of Model Code : ST-55K-TA0500P-G-TD1000-Y

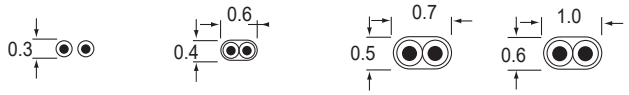


ST-56K-□□ □□□□ □ −□
① ② ③ ⑦

Example of Model Code : ST-56K-TA0500P-Y



① Shape of Thermocouple (Element wire diameter/Coating)



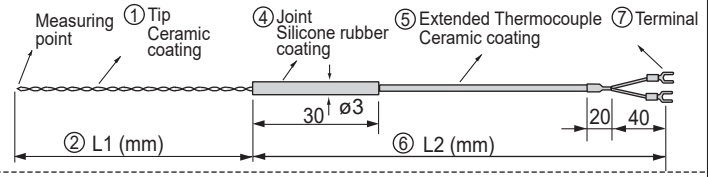
Code :TA	Code :TB	Code :TC	Code :TD
ø0.076	ø0.076	ø0.127	ø0.254
Fluorine resin coating Single thermocouple type	Fluorine resin coating Paired thermocouple type	Fluorine resin coating Paired thermocouple type	Fluorine resin coating Paired thermocouple type • ST-56 only

Code	Contents
TA	ø0.076 Fluorine resin coating (Single thermocouple type)
TB	ø0.076 Fluorine resin coating (Paired thermocouple type)
TC	ø0.127 Fluorine resin coating (Paired thermocouple type)
TD	ø0.254 Fluorine resin coating (Paired thermocouple type) • ST-56 only

Ceramic coating type — Thermocouple type : K

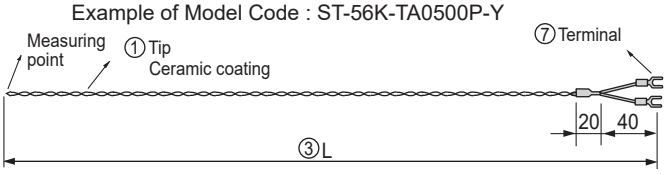
ST-55K-□□ □□□□ N −G−□□ □□□□−□
① ② ③ ④ ⑤ ⑥ ⑦

Example of Model Code : ST-55K-CA0500N-G-TD1000-Y



ST-56K-□□ □□□□ N −□
① ② ③ ⑦

Example of Model Code : ST-56K-TA0500P-Y



① Shape of Thermocouple (Element wire diameter/Coating)

Code :CA	Code :CB	Code :CC
ø0.1 x 2	ø0.2 x 2	ø0.32 x 2
Ceramic coating	Ceramic coating	Ceramic coating • ST-56 only

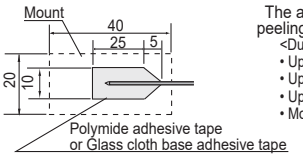
Code	Contents
CA	ø0.1 x 2 Ceramic coating
CB	ø0.2 x 2 Ceramic coating
CC	ø0.32 x 2 Ceramic coating • ST-56 only

② Thermocouple length

Unit : mm (ST-55: Min.50mm, ST-56: Min 200mm) Specify every 50mm unit

③ Adhesive tape for tip

Code	Contents
P	Polymide tape • Fluorine resin coating type only
G	Glass cloth base tape • Fluorine resin coating type only
N	None



The adhesive tape permits the tip to stick to various types of surfaces. Repeated peeling and sticking is possible.

<Durability of adhesive tape>
- Up to 150°C (302°F) : Repeated use.
- Up to 200°C (392°F) : Repeated use, as long as temperature stays above 150°C (302°F).
- Up to 250°C (482°F) : Repeated use, as long as temperature stays above 200°C (392°F).
- More than 250°C (482°F) : Adhesive will burn and no longer be used.

However, the number of sticking times differs depending on the environment where the adhesive is used.

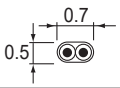
④ Joint specifications

Silicone rubber coating (Max. temperature : 170°C) • ST-55 only

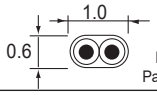
⑤ Shape of Extended Thermocouple (Element wire diameter/Coating)

Code	Contents
TC	ø0.127 Fluorine resin coating (Paired thermocouple type)
TD	ø0.254 Fluorine resin coating (Paired thermocouple type)

• ST-55 only



Code : TC
ø0.127
Fluorine resin coating
Paired thermocouple type



Code : TD
ø0.254
Fluorine resin coating
Paired thermocouple type

⑥ Extended thermocouple length

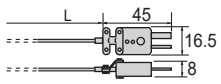
Unit : mm (Min.200mm) Specify every 50mm unit

⑦ Terminal

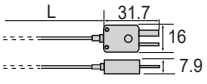
Code	Contents
C1	CMP01-K (RKC product) Material : Polyamide (Max. temperature : 140°C (284°F))
C2	CMR01-K (RKC product) Material : PPS resin (Max. temperature : 220°C (428°F))
C3	1260-K (MARINE product) (Max. temperature : 205°C (401°F))
Y	Y-shaped terminal lugs for M3
G	Confirming to cable connector for DP-350/700 connection
N	Non-treatment

Code : C1 or C2, Miniature-thermocouple connector plug (RKC product)

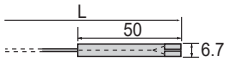
Code C1 : CMP01-K (Material : Polyamide)
Code C2 : CMR01-K (Material : PPS resin)



Code : C3, Miniature-thermocouple connector plug 1260-K (MARINE product)

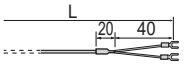


Code : G, Confirming to cable connector for DP-300/500 connection

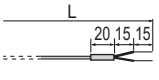


Code : Y, Y-sharped terminal lugs for M3

- Y-sharped terminal lugs for M3 is not available if thermocouple was specified ø0.076/ø0.127/ø0.1 (Code : TA/TB/TC/CA).



Code : N, Non-treatment



< Specifications >

Thermocouple : Type K (Grounding type)
Class : Equal to JIS class 2 (Only for fluorine resin coating type)
Accuracy : ±0.5%±1°C
- Accuracy when temperature 100°C on metal surface (copper) is measured. (Prior to to factory)

Response time : ø0.076 Fluorine resin coating
0.2 sec (Response of 63.2%)
0.8 sec (Response of 95.0%)
ø0.1 x 2 Ceramic coating
0.2 sec (Response of 63.2%)
0.5 sec (Response of 95.0%)
- Accuracy when temperature on metal surface is measured.

Maximum operating temperature : 1) Measuring point
Fluorine resin coating : 300°C
(Coating section 260°C)
Ceramic coating : 500°C
2) Adhesive tape : 300°C
3) ST-55 joint section : 170°C (ST-55)
4) ST-55 extended section : 260°C (ST-55)

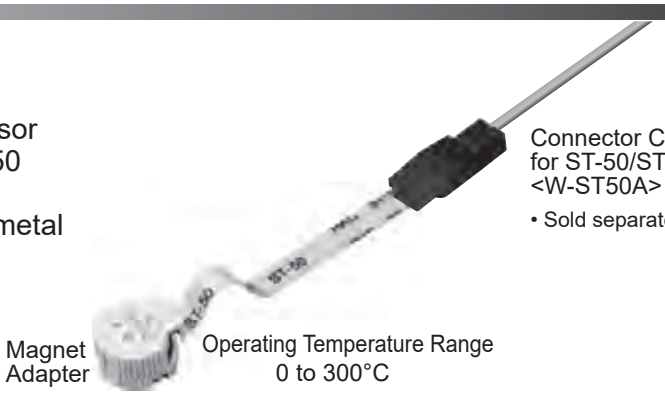
Thermocouple resistance per 100mm : ø0.076mm : 20Ω, ø0.127mm : 8Ω
ø0.254mm : 2Ω,
ø0.10mm : 13Ω, ø0.20mm : 3.1Ω
ø0.32mm : 1.2Ω

- Please select length so that a total resistance of thermocouple become 100Ω or less.

Magnet Mount Temperature Sensors (Thermocouple) STM-A

A magnetic adapter type temperature sensor with a tiny surface measuring sensor ST-50 (adhesive type).
It is possible to measure temperature for metal surface by attaching a magnetic adapter.

• Its usage is for magnetic metals only.



Features

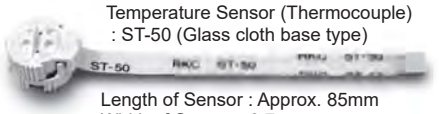
☆ Easy sensor exchange
Sensor can be easily exchanged in case of a sensor break.
☆ Realize an inexpensive magnetic type.
Simple composition and excellent cost performance.

Connecting Thermocouple
(Adhesive Type Thermocouple)

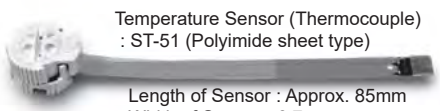
Sensor

Type and Model Code

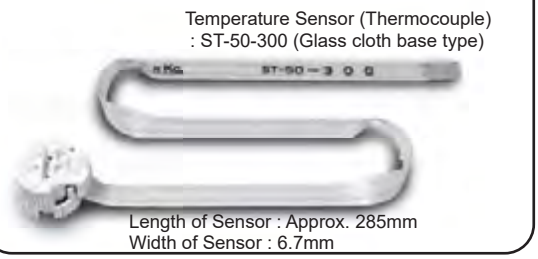
Model Code
STM-A-G-100



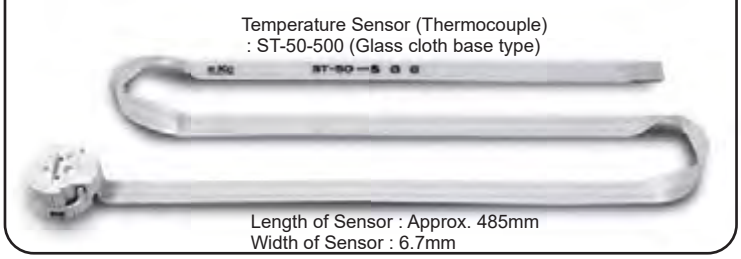
Model Code
STM-A-P-100



Model Code
STM-A-G-300



Model Code
STM-A-G-500



Specifications

(1) Thermocouple	Type K, Class 2 (JIS C 1602-1995)
(2) Operating Temperature	0 to 300°C (Non condensing)
(3) Measuring accuracy	±2°C(100°C flat magnetic surface)
(4) Response time	STM-A-P/G-100 : 0.5sec (90%) Typical Value
	STM-A-G-300/500 : 1.5sec (90%) Typical Value
	Evaluation method

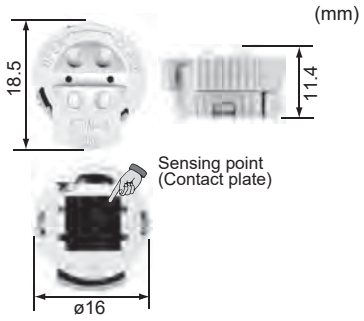
• Sensor put at room temperature is attached with 100°C flat magnetic surface. Time is evaluated when temperature reached to 90% of temperature stable point

(5) Magnetic attraction	3N to 7N(100°C flat magnetic surface)
(6) Contact plate material	SUS304
(7) Adapter material	Liquid crystal polymer resin
(8) Sensor sheet material	STM-A-P-100:Polyimide sheet
	STM-A-G-100/300/500:Glass cloth base sheet
(9) Net weight	Approx. 10g

• Please find the ST-50 series catalog for ST-50's specification details.

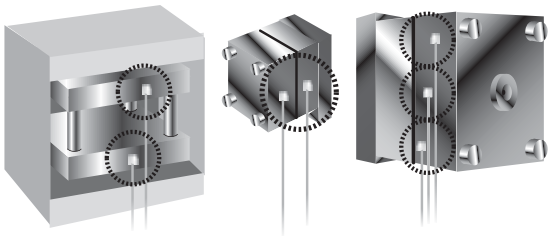
External Dimension of Magnet Adapter

(mm)

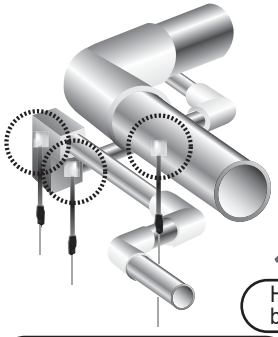


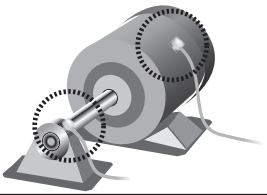
Applications

• Cable need to be fixed at several points if it is dangling in order to prevent a sensor from falling.



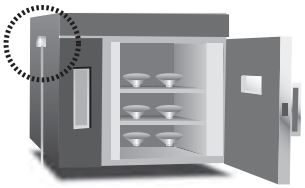
Mold surface temperature measurement for press machine, extruder or injection molding machine.





Heating temperature of a shaft bearing and a motor.

Temperature measurement of pipe arrangement



Temperature measurement of metalic body

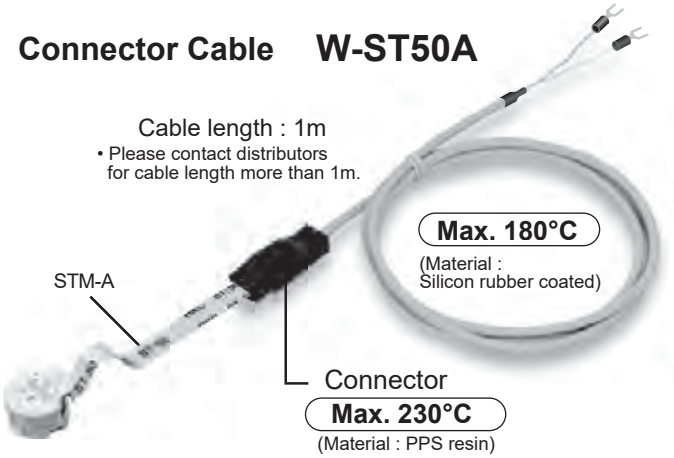
Accessories

W-ST50A is indispensable for using STM-A series.

Connector Cable W-ST50A

Cable length : 1m

• Please contact distributors for cable length more than 1m.



Cable termination list

● Y-shaped terminal lug
W-ST50A-1000-Y3

● Miniature-thermocouple connector plug (CMP-01)
W-ST50A-1000-TM1

● Solder treatment
W-ST50A-1000-N
Solder

● Non-treatment
W-ST50A-1000-C

● Connector for DP-700
W-ST50A-1000-6C

● Connector for DP-350
W-ST50A-1000-3C

Indicator, Controller, Recorder

Temperature measuring instrument (Thermocouple K input type)

Handheld Thermometer

High Temperature Caution

Immediately after the temperature measurement, the measuring part of the sensor may be too hot. Do not touch the measuring part soon after the measurement.

Caution to magnetic

A strong magnet is embedded in this product. Too close contact of this product with such as wristwatches, credit cards, or etc, it causes them failure and broken.

CZ-200P
PG500
PCT-300

Resin pressure sensor : CZ-200P

Resin pressure indicator PG500

Output converter : PCT-300

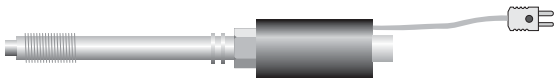
General Description

RKC's resin pressure measuring system is suitable for monitoring and control of resin pressure for extruders. The combination of resin pressure sensor (CZ-200P), the resin pressure indicator (PG500), the output converter (PCT-300) to the improvement of productivity and quality of products. The CZ-200P has new features such as built-in thermocouple while retaining high reliability of CZ-100P. The features of CZ-200P includes a wide selection of screw type, UNF, PF and M14/16 type screws, Low pressure type (0 to 0.5MPa, 0 to 1MPa), built-in thermocouple. A push-rod method is used in CZ-200P. There is no risk of mercury contamination in case of accident, so CZ-200P suits food processing application.

Features

Resin Pressure Sensor CZ-200P

☆The total loop accuracy of 0.5%
(combination with RKC converter PCT-300)
☆High reliability and stability
☆Wide selection of the range from 1MPa to 150MPa
☆Various screw types, UNF, PF and M14/16
☆Optional built-in thermocouple



Supports high temperatures

An Inconel, SPRON diaphragm with a maximum operating temperature of 550°C has been added to our lineup. Suitable for pressure measurement of high-function resins (high-temperature melted resins) such as polymer resins..

* 450°C when using a J-type thermocouple temperature sensor.

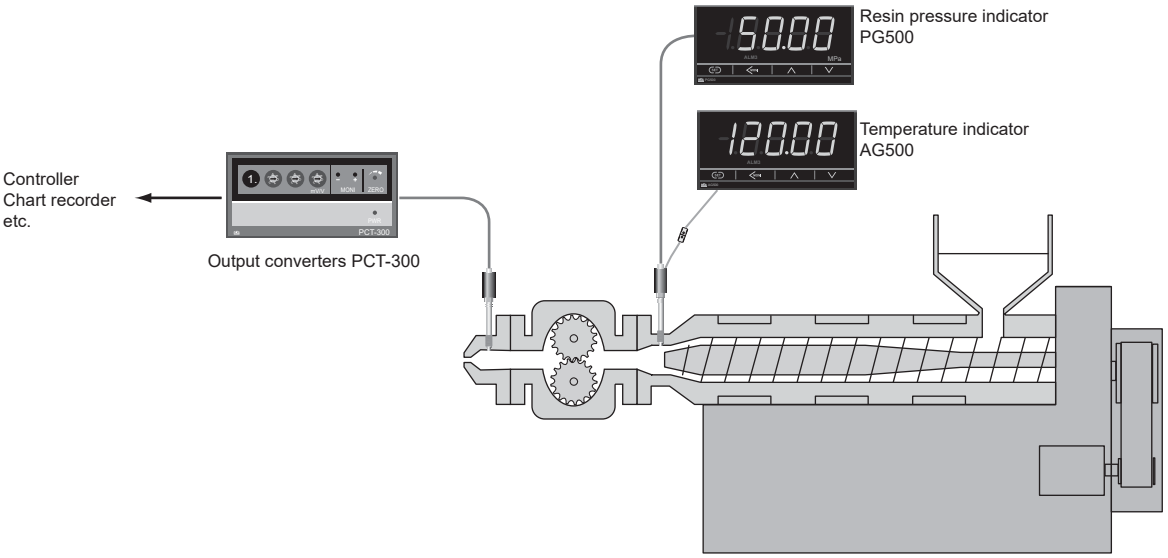
Max.550°C

Output Converter PCT-300

☆Signal converter for CZ-200P
☆Up to four analog outputs
☆Linearization function

Resin Pressure Indicator PG500

☆Easy-to-read large LED
☆100msec sampling cycle time
☆Optional communication (RS422A/RS-485), retransmission output, up to two alarms



Specifications

Resin Pressure Sensor CZ-200P

Construction
4 sides adhered strain gauge type wheatstone bridge

Rated Pressure
General specification: 0 to 10, 0 to 20, 0 to 35, 0 to 50, 0 to 70 MPa
0 to 100 MPa
High pressure type : 0 to 150 MPa (CZ-200P-H type only)
Low pressure type : 0 to 1, 0 to 5 MPa (CZ-200P-L type only)

Rated Output : 1.0 to 1.8mV/V
[At 150°C of diaphragm temperature] *1
• Inconel, SPRON type: At 250°C

Bridge Impressed Voltage : 10V DC (at PCT-300)
7.7V DC (at PG500, REX-PG410)

Accuracy :
SUS630 type
(At 150°C of diaphragm temperature)
Within ±1% of full scale
Within ±2% of full scale (Over 70 MPa)
Inconel, SPRON type:
Within ±1% of full scale
More than 480°C of 10,20MPa :Within ±2% of full scale
HASTELLOY C type : Contact to RKC

Linearity :
SUS630 type
(At 150°C of diaphragm temperature)
Within ±1% of full scale
Within ±2% of full scale (Over 70 MPa)
Inconel, SPRON type:
Within ±1% of full scale
More than 480°C of 10,20MPa :Within ±2% of full scale
HASTELLOY C type : Contact to RKC

Hysteresis :
SUS630 type
Within ±0.5% of full scale
Within ±1% of full scale (Over 50 MPa)
Within ±2% of full scale (Over 70 MPa)
Within ±0.2% of full scale (1MPa type)
Inconel, SPRON type:
Within ±1.0% of full scale
More than 480°C of 10,20MPa :
Within ±2.0% of full scale
HASTELLOY C type : Contact to RKC

Reproducibility :
Within ±0.2% of span
Inconel, SPRON type : More than 480°C of 10,20MPa :Within ±0.4% of full scale

Zero Balance : ±0.6mV/V (Within ±40% of span)

Bridge Resistance : 350Ω±5Ω (Input resistance)
350Ω±5Ω (Output resistance) *2

Allowable Maximum Temperature of the Diaphragm :
400°C (Inconel, SPRON type : 550°C

Allowable Maximum Temperature of the Strain Gauge : 200°C *3

Zero Point Temperature Effect (To the temperature of the diaphragm)
SUS630 type : ±0.2%/10°C
±0.3%/10°C (10MPa, 150MPa)
• Inconel type : ±0.3%/10°C
• SPRON type : 0.1±0.2%/10°C
HASTELLOY C type : Contact to RKC

Output Temperature Effect
Output temperature effect is an equal value as zero point.
• Inconel type : ±0.3%/10°C
• SPRON type : 0.15±0.2%/10°C

Effect of Wind (Without lead pipe cover)
Within ±1% of full scale (at wind of 4m/sec)

Allowable Overload :
Within 120% of rated pressure
Within 500% of rated pressure (1MPa type)
Within 1000% of rated pressure (0.5MPa type)

Marginal Overload :
Within 150% of rated pressure
Within 1000% of rated pressure (1MPa type)

Lead Pipe Cover material : SUS630

Recommended Tightening Torque :
Fixed nut type: 30 N•m (300 kgf•cm)
Loose nut type: 60 N•m (600 kg•cm)

Output effect of tightening torque :
Within ±0.2% of full scale (at recommended tightening torque)
• M14, PF1/4, 1/2-UNF screw type : ±1%

*1 The output of each sensor becomes a specific value within the range of 1.0 to 1.8 mV/V.
*2 As the input side of bridge resistance, the 374Ω±10Ω type is also available.
This type is interchangeable with the 350Ω±5Ω type.
*3 When the temperature at the bottom of outer tube (nut side) is more than 180°C, the temperature at the strain gauge exceed 200°C.
If the temperature at the strain gauge exceed 200°C, the performance cannot be assured. Therefore, cover the heat source with a heat insulating material so that the above temperature does not exceed 200°C.
The temperature at the strain gauge can be expected not to rise when:
• the long type of sensor is used or
• the sensor is installed a slant or transversely.
If any of the above measures can be taken, take it.

<Temperature Sensor Function>
Sensor type : Thermocouple : K or J (Ungrounded junction, Class2)
Maximum Temperature : 550°C (Thermocouple K), 450°C(Thermocouple J)
Response time : Approx. 90 sec
(room temperature to 100°C, 98 % response)
Cable length : 100mm (Standard, Maximum length 1 m)
Temperature detection position :
Internally 2mm from a diaphragm

Output Converter PCT-300

Input
RKC's resin pressure sensor CZ-200P (CZ-100P)

Gain Setting
Setting range : 10.00 to 19.99 mV/V
Setting accuracy : Within ±0.2% of full scale

Output
Number of points : Up to 4 points (standard : 2 points)

Output Signal
No.1 output : 0 to 10V DC (Load resistance : More than 2kΩ)
No.2 output : 0 to 10mV DC (Load resistance : More than 10kΩ)
No.3 output : 1 to 5V DC (Load resistance : More than 1kΩ)
No.4 output : 4 to 20mA DC (Load resistance : Less than 600Ω)

< General Specifications >

Supply Voltage
90 to 264V AC (Including supply voltage variation)
[Rating : 100 to 240V AC] (50/60Hz common use)

Power Consumption
Less than 12.5VA

Operating Environments
0 to 50°C [32 to 122°F] , 45 to 85% RH

Net Weight
Approx. 290g

External Dimensions (W x H x D)
96 x 48 x 100mm

Specifications

Resin Pressure Indicator PG500

Input
Strain gauge type pressure sensor
a) Pressure sensor gain setting range : 0.500 to 1.999mV/V
-6.0mV to 15.9mV (Including zero point adjustment range)
b) Pressure sensor gain setting range : 1.000 to 1.999mV/V
-9.8mV to 25.9mV (Including zero point adjustment range)
c) Pressure sensor gain setting range : 2.000 to 2.999mV/V
-12.3mV to 32.6mV (Including zero point adjustment range)
d) Pressure sensor gain setting range : 3.000 to 4.000mV/V
-16.1mV to 42.5mV (Including zero point adjustment range)

Gain Setting
a) Gain setting decimal point position:
Three decimal place, Four decimal place
b) Setting range: 0.500 to 4.000mV/V (Three decimal place)
0.5000 to 1.9999mV/V Four decimal place)

Shunt resistance output value
40.0 to 100.0% (Functions when a resistance for sensitivity adjustment built-in pressure sensor is used)

Input impedance : More than 1MΩ

Input break action : Up-scale/Down-scale (Selectable)

Sensor power supply : 7.7V DC±3% (Within 30mA DC)

Sampling Time : 0.1 sec.

Input adjustment
a) Zero point adjustment
1.Manual setting : -Input span to +Input span
2.Auto-zero function : -5.0 to +5.0mV (Input conversion)
b) Ratio setting
1. Manual setting (Gain adjustment setting) : 0.500 to 1.500
2. Automatic calibration function
Auto calibration is used to automatically set the PV ratio so that the measured value (PV) will be the pressure of the shunt resistance output value.
(Functions when a resistance for sensitivity adjustment built-in pressure sensor is used)
c) Linearize :
Use to correct the non-linear nature of pressure sensor CZ-100P/CZ-200P.
• Select the linearizing type symbol engraved on the rated nameplate attached to the CZ-100P or CZ-200P housing.
d) Digital filter : 0.0 to 100.0 sec (OFF when 0 is set.)

Input Accuracy : ± (0.1% of full scale + 1 digit)

Influence of ambient temperature
a) Input : ±0.006% of Input span/°C
b) Sensor power supply : ±0.013% of Output span/°C4

Display : 5-digits (The most significant digit : -1 or 1)

< Standard function >

Contact Input
Number of input : 3 points, Non-voltage contact input
(OPEN : 500kΩ or more, CLOSE : 10Ω or less)
Function : DI1 : Auto-zero DI2: Hold reset,
DI3 : Alarm interlock reset

Hold Function
Peak hold : Holds maximum pressure value
Bottom hold : Holds minimum pressure value
• The held values can be reset manually, by external contact signal or by communication after the confirmation by the operator.
• Data is not backed up when the instrument power supply is off.

< Optional function >

Analog Output
Number of point : 1 point (PV value)
Output signal : a) 0 to 1V DC, 0 to 5V DC, 1 to 5V DC, 0 to 10V DC
Load resistance : More than 1kΩ
Output impedance : Less than 0.1Ω
b) 0 to 10mV DC, 0 to 100mV DC
Load resistance : More than 20kΩ)
Output impedance : Less than 10Ω
c) 4 to 20mA DC, 0 to 20mA DC
Load resistance : Less than 600Ω
Output impedance : More than 1MΩ
Output accuracy : ± 0.1% of span
Output resolution : More than 12 bits

Alarm Output
Number of points : Up to 4 points
Alarm action : High or low alarm (Available for hold function)
Output : Relay output, Form A contact, 250V AC 0.5A (resistive load)
Other functions : a) Energized/de-energized action is configurable.
b) Delay timer : 0.0 to 600.0 sec)
c) Interlock (latch) function is configurable.

Digital Communications
Communication method : RS-422A (4-wire), RS-485 (2-wire)
a) ANSI X3.28 sub-category 2.5A4 (RKC standard)
b) MODBUS-RTU
• Selectable
Communication speed : 1200, 2400, 4800, 9600, 19200 BPS
Bit format : Start bit : 1
Data bit : 7 or 8 • MODBUS 8 bits only
Parity bit : Without, Odd or Even
Stop bit : 1 or 2
Maximum connection : 31 units

< General Specifications >

Waterproof/Dustproof
NEMA4X, IP66
• Waterproof/Dustproof protection only effective from the front in panel mounted installation.

Supply Voltage
a) 90 to 264V AC (Including supply voltage variation)
[Rating : 100 to 240V AC] (50/60Hz common use)
b) 21.6 to 26.4V AC (Including supply voltage variation)
[Rating : 24V AC] (50/60Hz common use)
c) 21.6 to 26.4V DC (Ripple rate 10% p-p or less)
[Rating : 24V DC]

Power Consumption
Less than 10VA (100 to 240V AC)
Less than 7.0VA (24V AC)
Less than 210mA (24V DC)

Rush Current
Less than 12A

Memory Backup
Backed up by non-volatile memory (FRAM)
• Data retaining period : Approx. 10 years
• Number of writing : Approx. 10,000,000,000 times.
(Depending on storage and operating conditions.)

Insulation resistance
More than 20MΩ (500V DC) between measured terminals and ground
More than 20MΩ (500V DC) between power terminals and ground

Dielectric voltage
1500V AC for one minute between measured terminals and ground
1500V AC for one minute between power terminals and ground

Operating Environments
-10 to +50°C [14 to 122°F] , 5 to 95% RH (Non condensing)

Net Weight
Approx. 200g

External Dimensions (W x H x D)
96 x 48 x 60mm

Intrinsic Safety

Intrinsically Safe Explosion Proof Construction Resin Pressure Meter (For Indoor, outdoor)

The qualification No. of the intrinsically safe Explosion Proof construction resin pressure meter obtained from the Ministry of Labor, Japan, is T55821 (For indoor use) T56658 (For outdoor use). The explosion class and ignition group of the objective gases and steam are i2G3. The qualified consists of the pressure sensor CZ-200P and safety barrier (RZB-001), but the output converter is not subject to qualification testing as a general sending/receiving instrument.
For indoor use, the standard connector or the waterproof connector can be selected. For outdoor use, the waterproof connector must be used.

Resin Pressure Sensor CZ-200P

Construction
4 sides adhered strain gauge type wheatstone bridge
Rated Pressure
General specification: 0 to 10, 0 to 20, 0 to 35, 0 to 50, 0 to 70 MPa
0 to 100 MPa
High pressure type : 0 to 150 MPa (CZ-200P-H type only)
Low pressure type : 0 to 1, 0 to 5 MPa (CZ-200P-L type only)
Rated Output : 1.0 to 1.8mV/V
[At 150°C of diaphragm temperature] *1
• Inconel, SPRON type: At 250°C
Bridge Impressed Voltage : 10V DC (at PCT-300)
7.7V DC (at PG500, REX-PG410)
Accuracy : SUS630 type
(At 150°C of diaphragm temperature)
Within ±1% of full scale
Within ±2% of full scale (Over 70 MPa)
Inconel, SPRON type:
Within ±1% of full scale
More than 480°C of 10,20MPa :Within ±2% of full scale
HASTELLOY C type : Contact to RKC
Linearity : SUS630 type
(At 150°C of diaphragm temperature)
Within ±1% of full scale
Within ±2% of full scale (Over 70 MPa)
Inconel, SPRON type:
Within ±1% of full scale
More than 480°C of 10,20MPa :Within ±2% of full scale
HASTELLOY C type : Contact to RKC
Hysteresis : SUS630 type
Within ±0.5% of full scale
Within ±1% of full scale (Over 50 MPa)
Within ±2% of full scale (Over 70 MPa)
Within ±0.2% of full scale (1MPa type)
Inconel, SPRON type:
Within ±1.0% of full scale
More than 480°C of 10,20MPa :
Within ±2.0% of full scale
HASTELLOY C type : Contact to RKC
Reproducibility : Within ±0.2% of span
Inconel, SPRON type : More than 480°C of 10,20MPa :Within ±0.4% of full scale
Zero Balance : ±0.6mV/V (Within ±40% of span)
Bridge Resistance : 350Ω±5Ω (Input resistance)
350Ω±5Ω (Output resistance) *2
Allowable Maximum Temperature of the Diaphragm :
400°C (Inconel, SPRON type : 550°C
Allowable Maximum Temperature of the Strain Gauge : 200°C *3
Zero Point Temperature Effect (To the temperature of the diaphragm)
SUS630 type : ±0.2%/10°C
±0.3%/10°C (10MPa, 150MPa)
• Inconel type : ±0.3%/10°C
• SPRON type : 0.1±0.2%/10°C
HASTELLOY C type : Contact to RKC
Output Temperature Effect
Output temperature effect is an equal value as zero point.
• Inconel type : ±0.3%/10°C
• SPRON type : 0.15±0.2%/10°C
Effect of Wind (Without lead pipe cover)
Within ±1% of full scale (at wind of 4m/sec)
Allowable Overload : Within 120% of rated pressure
Within 500% of rated pressure (1MPa type)
Within 1000% of rated pressure (0.5MPa type)
Marginal Overload : Within 150% of rated pressure
Within 1000% of rated pressure (1MPa type)
Lead Pipe Cover material : SUS630
Recommended Tightening Torque :
Fixed nut type: 30 N•m (300 kgf•cm)
Loose nut type: 60 N•m (600 kg•cm)
Output effect of tightening torque :
Within ±0.2% of full scale (at recommended tightening torque)
• M14, PF1/4, 1/2-UNF screw type : ±1%

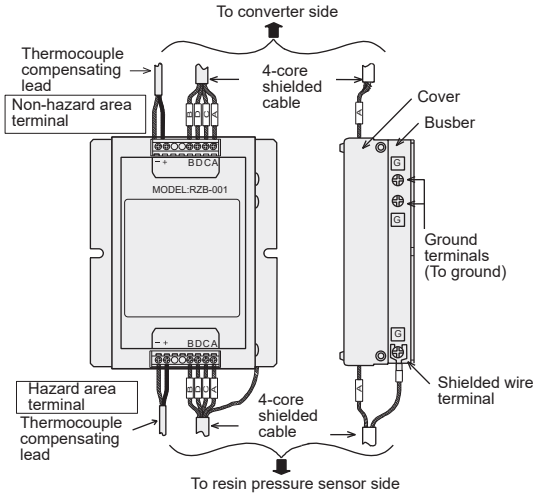
*1 The output of each sensor becomes a specific value within the range of 1.0 to 1.8 mV/V.
*2 As the input side of bridge resistance, the 374Ω±10Ω type is also available.
This type is interchangeable with the 350Ω±5Ω type.
*3 When the temperature at the bottom of outer tube (nut side) is more than 180°C, the temperature at the strain gauge exceed 200°C.
If the temperature at the strain gauge exceed 200°C, the performance cannot be assured. Therefore, cover the heat source with a heat insulating material so that the above temperature does not exceed 200°C.
The temperature at the strain gauge can be expected not to rise when:
• the long type of sensor is used or
• the sensor is installed a slant or transversely.
If any of the above measures can be taken, take it.

<Temperature Sensor Function>
Sensor type : Thermocouple : K or J (Ungrounded junction, Class2)
Maximum Temperature : 550°C (Thermocouple K), 450°C(Thermocouple J)
Response time : Approx. 90 sec (room temperature to 100°C, 98 % response)
Cable length : 100mm (Standard, Maximum length 1 m)
Temperature detection position :
Internally 2mm from a diaphragm

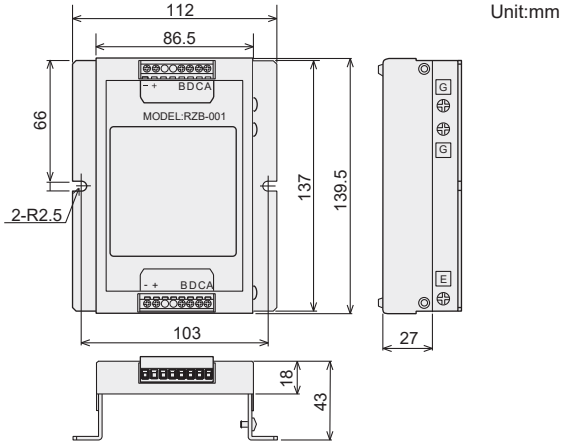
Safety Barrier Specifications (RZB-001)

Explosionproof construction	: Intrinsically safe Explosion Proof construction (i2G3)
Use rated	: Power supply circuit 9V 50mA, Signal circuit 6V 50mA, Thermocouple circuit 6V 50mA
Rating for maintaining safety	: 250V AC,50/60Hz,250V DC
Allowable inductance	: Wiring between the resin pressure sensor and safety barrier : 0.6 mH or less
Allowable capacitance	: Wiring between the resin pressure sensor and safety barrier : 0.1μF or less
Ambient temperature	: -10 to +40°C (14 to 104°F)
Ambient humidity	: 45 to 85% RH (Non condensing)
Cover	: Iron (Coating)
Busbar	: Brass (Nickel plating)
Ground requirement	: Ground this safety barrier so that its grounding resistance will be less than the grounding reference resistance value of shunt diode type safety barriers (e.g. less than 1Ω) conforming to each national standard. (Requirements)
Weight	: Approx. 850g

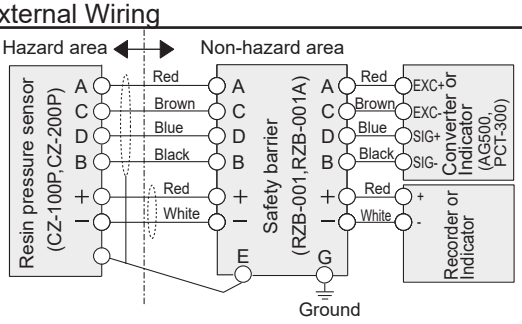
Terminal Configuration



External Dimensions



External Wiring



Model and Suffix Code

CZ-200P

Specifications	Model and Suffix Code *2	
	CZ-200P –	□ □–□ □ □–□□□□ *□ □ □–□ □□00
Screw type	Fixed nut type PF3/8 Tip diameter : 10mm	H
	Loose nut type PF3/4 Tip diameter : 18mm	L
	Fixed nut type 1/2-20UNF Tip diameter : 7.8mm *5	U
	Fixed nut type PF1/2 Tip diameter : 10mm	J
	Fixed nut type PF1/4 Tip diameter : 7.8mm *5	V
	Fixed nut type M14X1.5 Tip diameter : 10mm *5	W
Load-pipe length	Under nut : L=120mm • Not available for SPRON and Inconel type	A
	Under nut : L=150mm	B
	Under nut : L=180mm	C
	Under nut : L=210mm	D
Diaphragm material	SUS630 (Standard)	S
	Hastelloy C	H
	Inconel *5	C
	SPRON Only PF3/8, PF1/2, PF3/4 threads and pressure ranges of 10, 20, 35, 50MPa are available for production. For other threads and pressure ranges, please consult the distributor.	P
Diaphragm surface treatment	Standard	N
	Ceramic kanigen plating • Not available for SPRON and Inconel type	K
Intrinsically safe	Non-intrinsic safety (Standard)	N
	Intrinsic safety (For indoor use)	G
	Intrinsic safety (For outdoor use) • Not available for built-in sensor type	H
Pressure range	See Pressure Range Code Table	□□□□
Linearization function *1	Not supplied	N
	For PG500	G
	For PCT-300□–□ L (PCT-300 should have linearization function)	T
Lead-pipe cover *3	Not supplied • Not available for SPRON and Inconel and fixed nut type	N
	With lead-pipe cover	C
Cable connection connector *4	Standard connector type • Not available for SPRON and Inconel type	N
	Waterproof, connector type, equivalent to IP67 (Not available for built-in sensor type or SPRON and IInconel type)	P
	waterproof, direct connection type, equivalent to IP67	Q
Temperature sensor	Not supplied	N
	K type thermocouple (Not available for waterproof connector)	K
	J type thermocouple (Not available for waterproof connector)	J
Thermocouple lead length	Standard 100mm (Possible to specify by each 100mm. Maximum 2.5m.)	□□00

*1 : Linearization function is not available for pressure range of 0 - 70MPa or more, hastelloy C diaphragm .
*2 : The model code after " * " is not necessary if there is no option specified after " * ".
*3 : For a fixed nut type with a SPRON and Inconel diaphragm, the lead-pipe cover is always included.
*4 : For SUS630 and Hastelloy C diaphragms, they come with silicone-coated cables. The standard cable length is 3m, but 0.5m or 1m is available.
For SPRON and Inconel diaphragms, they come with flexible tube-coated cables. The standard cable length is 0.5m, but 1m or 3m is available.
*5 : For Inconel diaphragms, 1/2-20UNF threads, PF1/4 threads, and M14×1.5 threads are custom-made products. Please contact RKC agent.

Pressure Range Code Table

* ( ) : Range code

Specifications	Range
Fixed nut type	0 to 10MPa (010P), 0 to 20MPa (020P), 0 to 35MPa (035P), 0 to 50MPa (050P), 0 to 70MPa (070P), 0 to 100MPa (100P), 0 to 150MPa (150P)*1
Loose nut type	0 to 1MPa (001P), 0 to 2MPa (002P), 0 to 3MPa(003P), 0 to 5MPa (005P), 0 to 10MPa (010P), 0 to 20MPa (020P), 0 to 35MPa (030P), 0 to 50MPa (050P), 0 to 70MPa (070P), 0 to 100MPa (100P)

* The maximum pressure range for Hastelloy C diaphragms is 100MPa. The maximum pressure range for Inconel diaphragms is 50MPa.
Inconel diaphragms with 70MPa and 100MPa are custom-made products. Please contact RKC agent.
Loose nut type 0.5MPa (D05P) and fixed nut type 5MPa (005P) can be custom-made. Please contact RKC agent.
(Rated output of 0.5 to 0.9mV/V requires a dedicated amplifier and has different specifications.)
The minimum pressure range for Hastelloy C and Inconel diaphragms is 10MPa.

Cable for Thermocouple

Specifications			Model Code
Compensation wire (Stainless steel shielded cable)	CZ-200P ⟷ Temperature controller/Indicator (Length : 5m)	Type K	W-BL-K2EXA-TMA-Y3-5000
		Type J	W-BL-J2EXA-TMA-Y3-5000

Cable for Pressure

· For cables with specifications other than those below, please Please contact RKC agent.

Specifications			
Standard Type	CZ-200P ⟷ PG500 (Length : 5m) : Y-shaped terminal lugs (M3) PCT-300 (Length : 5m) : Y-shaped terminal lugs (M3)	Heat-resistant glass coated cable	W-AB-NG-PA-5000
		Silicon coated cable	W-AB-NS-PA-5000
	CZ-200P ⟷ CT-300 (Length : 5m) : Plug	Heat-resistant glass coated cable	W-AB-NG-PP-5000
		Silicon coated cable	W-AB-NS-PP-5000

The letter in the □ indicates the cable coating type. Select from the three types below.
G: Heat-resistant glass coated cable, V: Vinyl coated cable, S :Silicon coated cable

Safety Barrier : RZB-001

Specification	Model Code
Intrinsic Safety (For indoor)	RZB-001A1
Intrinsic Safety (Built-in thermocouple circuit, For indoor)	RZB-001N1
Intrinsic Safety (For outdoor)	RZB-001A2

Specification		Model Code
Connection cable	Intrinsically safe circuit side (Hazard area) CZ-200P ⟷ RZB-001 (5m)	W-AB-YG-PB-5000
	Non-intrinsically safe circuit side (Non hazard area) RZB-001 ⟷ AG500 (1m) or PCT-300(1m)	W-AB-NV-DA-1000

• This product has passed the qualification test of intrinsically safe explosion proof when combined with our resin pressure sensor (CZ-100P/CZ-200P).
Always combine and use this product with our resin pressure sensor.

Model and Suffix Code

■ PG500

No.	Specifications	Model and Suffix Code	Hardware coding only ①	②	③	④	⑤	⑥	Quick start code ⑦	⑧	⑨	⑩
		PG500	□	□	*	□	–	□	–	□	□	□	□
①	Input type	Standard type	A									
		Intrinsic safety type	B									
		Standard type (Loose Nut : 0.0 to 0.5MPa,Fixed Nut : 0 to 5MPa)	C									
		Intrinsic safety type (Loose Nut : 0.0 to 0.5MPa,Fixed Nut : 0 to 5MPa)	D									
		For 3.33mV/V output type	X									
②	Power supply	100 to 240V AC		4								
		24V AC/DC		3								
③	Alarm	Not supplied			N							
		Number of alarm output (Specify 1 to 4)			□							
④	Analog output	Not supplied				N						
		See Analog Output Signal Code Table, Code : 1 to 8)				□						
⑤	Communication	Not supplied					N					
		RS-422A					4					
		RS-485					5					
⑥	Initial setting	No quick start code (Default setting)						N				
		Specify quick start code						1				
⑦	Alarm 1	See Alarm Code Table							□			
⑧	Alarm 2	See Alarm Code Table								□		
⑨	Alarm 3	See Alarm Code Table									□	
⑩	Alarm 4	See Alarm Code Table										□

● Terminal cover (Sold separately)

Model Code : KFB400-58

● Analog Output Signal Code Table

1	0 - 10mV DC
2	0 - 100mV DC
3	0 - 1V DC
4	0 - 5V DC
5	0 - 10V DC
6	1 - 5V DC
7	0 - 20mA DC
8	4 - 20mA DC

● Alarm Code Table

N	No alarm
H	Process High
J	Process Low
K	Process High with Alarm Hold
L	Process Low with Alarm Hold

■ PCT-300

Specifications	Model and Suffix Code			
Model	PCT-300	N	–	□	□
Type	Standard type	N			
Number of output	2 outputs (0 to 10V DC, 0 to 10mV DC)		2		
	3 outputs (0 to 10V DC, 0 to 10mV DC, 1 to 5V DC)		3		
	4 outputs (0 to 10V DC, 0 to 10mV DC, 1 to 5V DC, 4 to 20mA DC)		4		
Option	Not supplied				N
	Gain change switch (x1 or x2)				G
	Linearization function				L

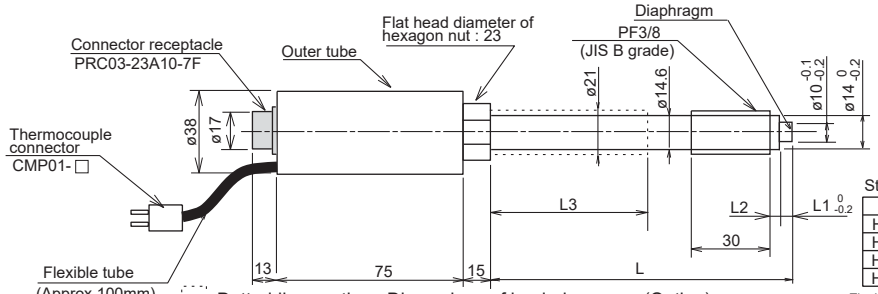
Supply Voltage

100 - 240V AC

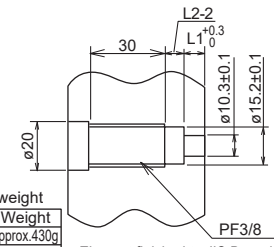
External Dimensions and Rear Terminals

(Unit : mm)

For fixed nut type (CZ-200P-H type)



Mounting hole (Unit : mm)



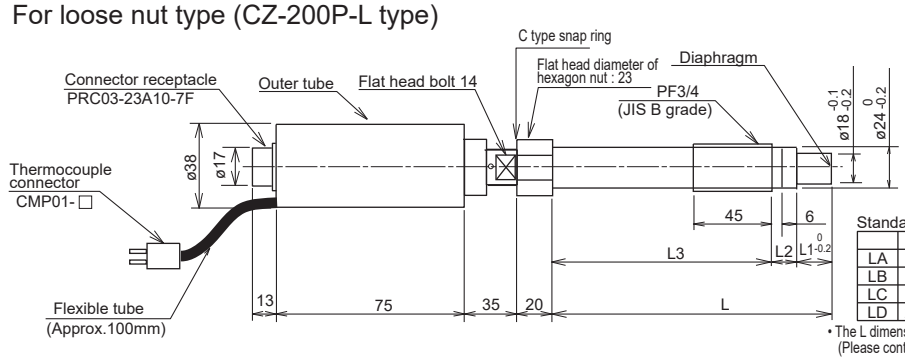
Standard dimensions and weight

	L	L1	L2	L3	Weight
HA	120	8	6	60	Approx.430g
HB	150	8	6	90	Approx.470g
HC	180	8	6	120	Approx.510g
HD	210	8	6	150	Approx.550g

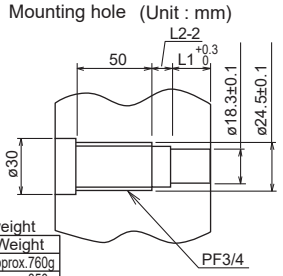
• The L dimension can be up to a maximum of 300 mm. (Please contact RKC agent)

• Element finished to JIS B grade. Install the sensor so that each screw is smoothly inserted.

For loose nut type (CZ-200P-L type)



Mounting hole (Unit : mm)



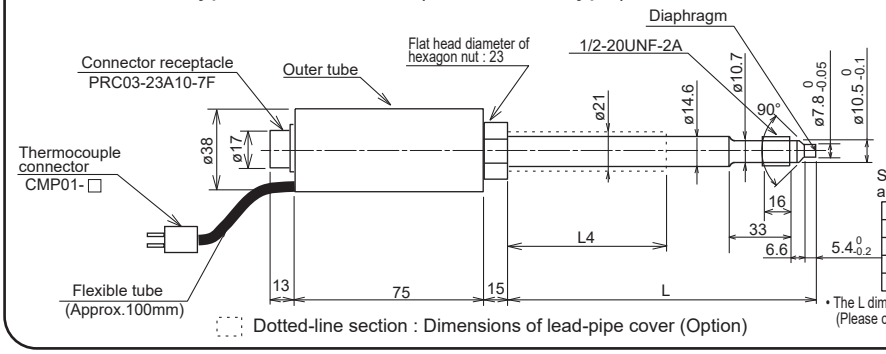
Standard dimensions and weight

	L	L1	L2	L3	Weight
LA	120	20	10	90	Approx.760g
LB	150	20	10	120	Approx.850g
LC	180	20	10	150	Approx.940g
LD	210	20	10	180	Approx.1030g

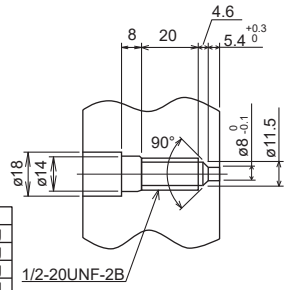
• The L dimension can be up to a maximum of 270mm. (Please contact RKC agent)

• Element finished to JIS B grade. Install the sensor so that each screw is smoothly inserted.

For fixed nut type unified thread (CZ-200P-U type)



Mounting hole (Unit : mm)



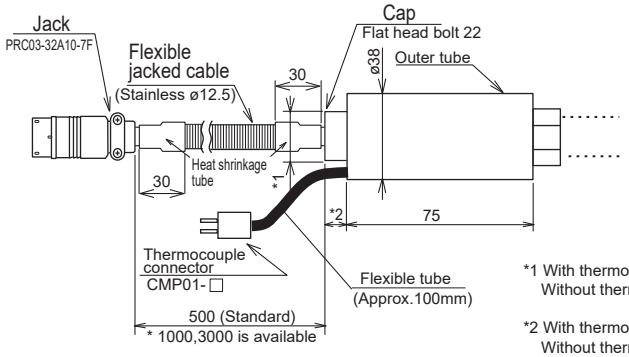
Standard dimensions and weight

	L	L4	Weight
UA	120	60	Approx.410g
UB	150	90	Approx.450g
UC	180	120	Approx.490g
UD	210	150	Approx.530g

• The L dimension can be up to a maximum of 300 mm. (Please contact RKC agent)

• Element finished to JIS B grade. Install the sensor so that each screw is smoothly inserted.

● When the diaphragm material is Inconel and SPRON, the cable type is direct connection.



• In the case of a loose nut type or fixed nut type unified screws, the outer tube and cable are as shown at left.

• Mounting hole dimensions are the same as on the standard product.

• Unit dimensions are the same as the dimensions of the standard product; however, the lead unit (L) dimension 120 mm (HA, LA, UA) is not possible.

• The fixed-nut type is only available with a lead-pipe cover.

*1 With thermocouple connector : ø20
Without thermocouple connector : ø26

*2 With thermocouple connector : 12
Without thermocouple connector : 15

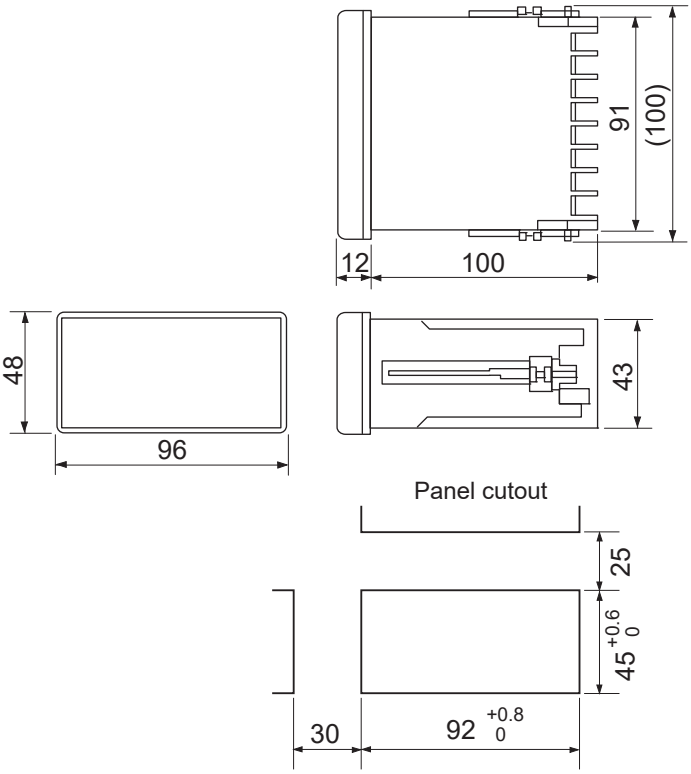
Reference : Screw dimension tolerances

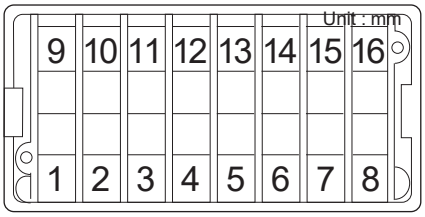
Class \ Screw type	PF1/4,PF3/8	PF1/2,PF3/4	M14 x 1.5, M16 x 1.5	1/2-20UNF
JIS B grade (Class 2, 2B) Inner diameter tolerances of female screw	0 to +0.445	0 to +0.541	0 to +0.300	0 to +0.278
JIS B grade (Class 2, 2B) Effective diameter tolerances of female screw	0 to +0.250	0 to +0.284	0 to +0.150	0 to +0.141

External Dimensions

PCT-300

Unit:mm



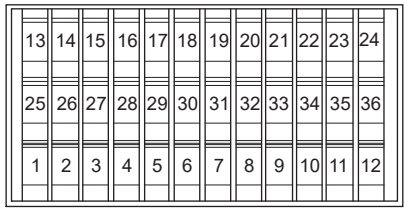


9	10	11	12	13	14	15	16
0-10mV DC / 0-10V DC			SHD	EXC+	EXC-	SIG+	SIG-
Analog output			Sensor input				

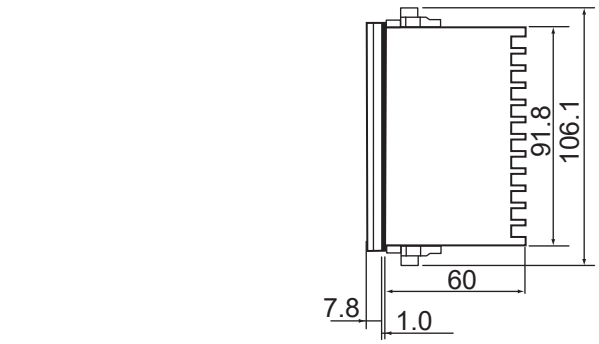
1	2	3	4	5	6	7	8
	100-240V AC			1-5V DC		4-20mA DC	
Ground	Power supply			Analog output		Analog output	

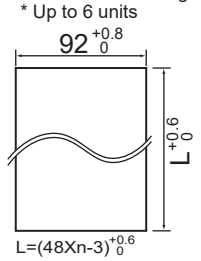
PG500

Unit:mm



• Use a solderless terminal for screw size M3X6.





• Waterproof/dustproof is not available for close horizontal mounting.

13	14	15	16	17	18	19	20	21	22	23	24
COM DI 1		DI 2	DI 3	SHD (Red)	EXC+ (Brown)	EXC- (Blue)	SIG+ (Blue)	SIG- (Black)			
Digital input				Sensor input							

CZ-200P
CZ-100P

25	26	27	28	29	30	31	32	33	34	35	36
SG	T(A)	T(B)	R(A)	R(B)						AO	
RS-422A											
SG	T/R(A)	T/R(B)									
RS-485											
Communication										Analog output	

1	2	3	4	5	6	7	8	9	10	11	12
AC 100 -240V / AC 24V / DC +24V -		COM	NO	NO	COM	NO	NO	CAL+	CAL-		
Power supply		Alarm 1, 2 output			Alarm 3, 4 output			Calibration output			

ALM1 ALM2
ALM3 ALM4
Relay contact output

LE100
LE110

General Description

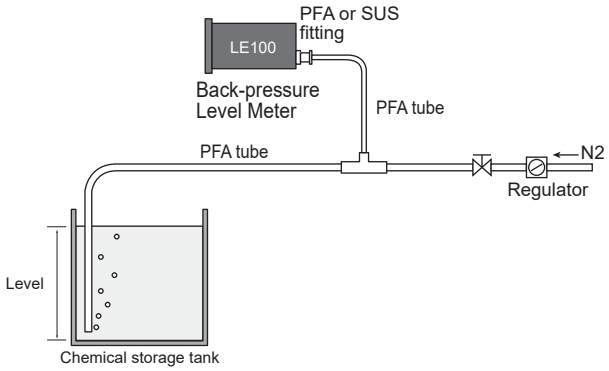
The LE100/110 is a microprocessor based level meter with many automatic features to simplify level measurements. Its features include high repeatability, accuracy, and capable of displaying level in a variety of measurement units.
The LE100/110's specific gravity compensation function eliminates the need to set liquid level with actual liquid and is easily accomplished during chemical change.

Features

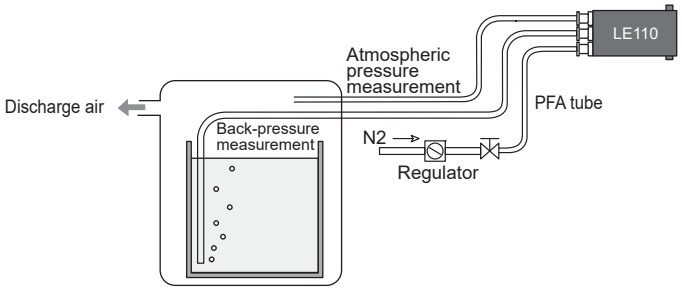
☆ Level settings 6 or 8 points
☆ Measuring range 0 to 1000 mm
☆ Selectable display units (mm, %, l, cc, Pa, KPa)
☆ High repeatability 0.3% full scale
☆ Specific gravity compensation
☆ One - touch empty and span adjustment
☆ Volume compensation
☆ Available for complex tank shapes
☆ Digital communication (Optional)
☆ Monitoring output (Optional)

Back-pressure Level Meter

● LE100
The LE100 measures liquid levels by supplying inactive gas at fixed pressure to the sensor tube installed in the storage tank. Back-pressure is determined by measuring the changing liquid level. The sensor tube pressure varies proportionately to changes in liquid level.



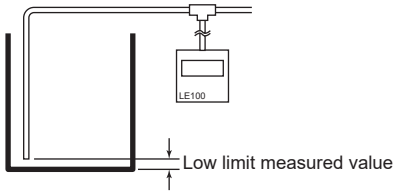
● LE110 (Differential pressure sensing type)
LE100 with differential pressure (Air opening and atmospheric pressure variation) sensor function.
It can also be used in semi-enclosed tanks whose internal pressure varies.



• Two kinds of special order are possible for the LE110.
Gauge pressure sensing type with orifice but without differential sensing function
: Special order code Z-1099
Differential pressure sensing type without orifice
: Special order code Z-1097
Standard type : Differential pressure sensing type with orifice.

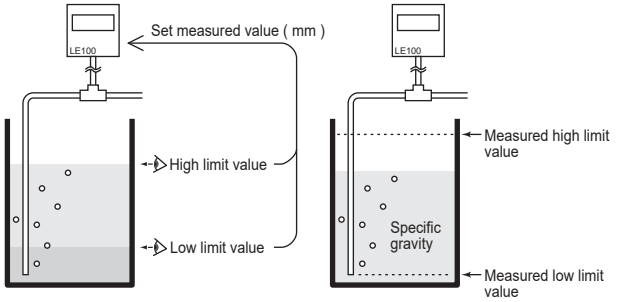
Empty Adjustment Function

Empty adjustment function can adjust the displayed low limit measured value to the purge pressure at the end of the sensor tube exposed to atmosphere.



Specific Gravity Compensation with Actual Liquid

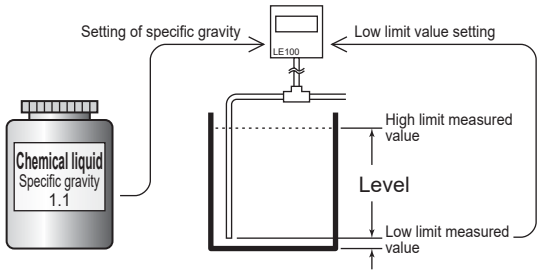
The specific gravity and high/low limit measured values are computed automatically and the liquid level (mm) is displayed linearly by inputting two optional points of actual liquid levels.



Features

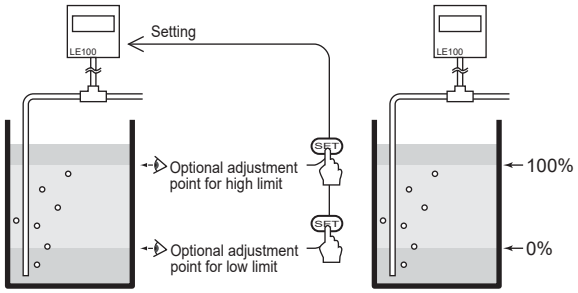
Specific Gravity Compensation

The high limit value is automatically computed and the liquid level is displayed linearly by setting the specific gravity of the liquid and the low limit measured value. If the specific gravity is known, the high limit measured value can be set without presence of actual liquid.



Span Adjustment Function

The percentage value display within a 0 to 100% range is achieved by setting the optional high and low limit adjustment points.



Liquid Volume Measurement

LE100/110 converts the change of back-pressure caused by the rise and fall of chemical liquid level into the actual chemical liquid volume for display in milliliters (ml) or liters (l).

- When specific gravity is known

Empty adjustment ⇒ Specific gravity compensation ⇒ Volume compensation ⇒ Measurement

- When specific gravity is unknown

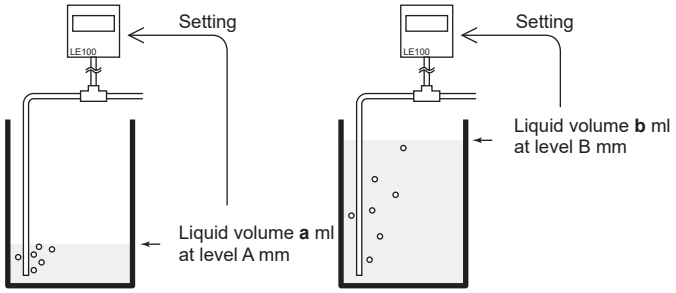
Empty adjustment ⇒ Specific gravity compensation with actual liquid ⇒ Volume compensation ⇒ Measurement

- When the tank has a simple shape

Liquid volume in a tank with simple shape changes linearly in relationship to liquid level. When the liquid volumes (ml/l) of optional high/low points are set, the liquid volume measurement is accurately displayed.

Low level A mm | Liquid volume **a** ml

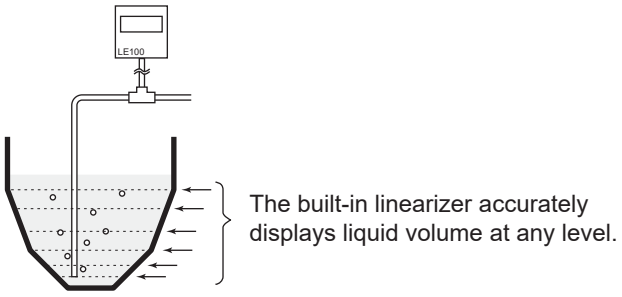
High level B mm | Liquid volume **b** ml



- When the tank has a complex shape

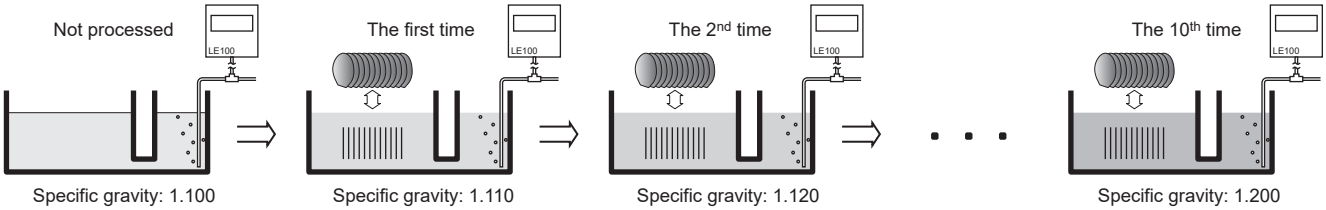
Liquid volume in a tank with a complex shape changes depending on variations of the tank shape. The LE100/110 has up to 11 adjustment points that compensate for these variations to linearize the displayed value throughout the measurement range.

The built-in linearizer has a maximum of 11 adjustment points.



Automatic Specific Gravity Compensation

The LE100/110 automatically compensates for specific gravity according to the number of times a semiconductor wafer is chemically-processed in the same tank liquid.



This illustration shows how the LE100/10 automatically adjusts specific gravity compensation between 1.10 to 1.20 through ten processing cycles. The counting of wafer processing cycles can be entered manually at the front keypad with contact input or digital communication.

Specifications

Inputs

Number of inputs : 1 point
Input medium : Non-corrosive gas
Input pressure range : a) LE100 : 0 to 9.807 kPa
b) LE110 : Supply pressure range : 10 to 30kPa
Guarantee withstanding pressure:
Supply pressure 100 kPa
Measurement pressure 10 kPa
Zero point revision range : ± 5.0% of full span
Sampling time : 0.2 sec
PV digital filter : 1 to 100 sec (No filter when setting 0)
(First order lag filter)

Level Setting

Number of set points : 6 points (8 points optional)
Setting range : Same as units and range.
Setting resolution : Same as PV. (See *Units and range* table)

Display

Input display : 7 segments LED (4 figures, green, height : 7.6 mm)
Set display : 7 segments LED (4 figures, orange, height : 7.6 mm)
Action display : Point LED (green, OUT1 to 8)
Unit display : Point LED (green, mm, %, l, ml, Pa, kPa)

Performance

Repeatability : ± 0.3 % of full span
Non-linear : ± 0.5 % of full span
Temperature characteristic : Zero output : ± 0.04 % of full span / °C
Span output : ± 0.04 % of full span / °C

Specific Gravity Compensation

Number of set points : 1 point
Setting range : 0.800 to 2.500
Setting resolution : 0.001

Empty Adjustment

Through the use of the empty adjustment, the tube tip can cancel an offset to an atmospheric open state.

Specific Gravity Compensation with Actual Liquid

Number of set points : 2 points
Setting range : Scaling low limit to high limit.
Setting resolution : 1

•A specific gravity compensation with actual liquid measurement determines the liquid's specific gravity and allows calculation of either high or low limit values.

Span Adjustment Function

Number of set points : 2 points

•The percentage value display within a 0 to 100% range is achieved by setting the optional high and low limit adjustment points.

Volume Compensation Function

Number of set points : 2 to 11 points
Setting range : Scaling low limit to high limit.
Setting resolution : Same as PV. (See *Units and range* table)

•Settable when unit is *l* or *ml*.
•Linearization setting allows the LE100/110 to display a liquid volume value.
•Measuring accuracy can not be guaranteed if the setting extends over the inflection point or if a 1mm level change is greater than 4.4% of the total volume.

Automatic Specific Gravity Compensation

•Automatic specific gravity compensation is achieved by defining initial and final specific gravity settings and the number of processing times. Output activation point then becomes constant despite varying specific gravity.

Level Setting with Actual Liquid

Number of set points : 1 to 6 points (1 to 8 points optional)
•Each output activation point can be set in relation to actual liquid level.

Outputs

Number of outputs : 1 to 6 points (1 to 8 points optional)
Output action : Process high, Process low, Deviation high, Deviation low
Setting range : Same as input range.
Deviation setting range : −50 to 50 mm
Differential gap : 0.0 to 10.0% of span
Output timer : 0 to 600 sec.
Hold action : ON / OFF settable (Independently for each channels)
Interlock : Settable independently for each output
Output type : Selectable for each output either for ON or OFF at operation
Output : Transistor output (Open collector output)
(sink type) (NPN) 24 V DC (31.2 V DC max.)
Maximum load current: 60 mA DC

Hold Function

Peak hold : Highest measured value is held
Bottom hold : Lowest measured value is held

•The Hold function is always operational.
•After the Hold function is confirmed by operator, it can be reset at the front panel keypad.
•When instrument power supply is OFF, Hold data is not backed up.

Contact Input (Optional)

Number of inputs : 1 point
•Auto-zero (empty adjustment) activation or incremental count of the number of processing times.
Input type : Non-voltage contact input
a) OPEN : 500kΩ or more
b) CLOSE : 10Ω or less
• Possible to be activated by open collector output.

Monitor Output (Optional)

Number of outputs : 1 point
Output : 0 to 2.5V DC (Load resistance : More than 1kΩ)
Input impedance : Less than 0.1Ω
Output data type : Process value
Output scaling : Available to high and low setting
Output accuracy : ±0.3% of span
Ripple of output : ±0.1% of span or less than 1 mV (resistive load)
Output resolution : More than 10 bit

Communications (Optional)

Communication method : Based on RS-485 (two-wire)
Synchronous method : Start-stop synchronous
Communication speed : 2400, 4800, 9600, 19200 BPS (Selectable)
Bit configuration : a) Start bit : 1
b) Data bit : 7 or 8
c) Parity bit : Without, Odd or Even
d) Stop bit : 1 or 2
Maximum connection : 31

General Specifications

Supply voltage : 21.6 to 26.4V DC (Rating 24V DC)
Power consumption : Less than 130 mA
Memory backup : Backed up by EEP-ROM
Data retaining period : Approx. 10 years
Number of writing : Approx. 100,000 times
Insulation resistance : More than 20MΩ (500V) between measured terminals and ground terminal (LE110 : Case)
More than 20MΩ (500V) between power terminals and ground terminal (LE110 : Case)
Dielectric voltage : 500V AC for one minute between measured terminals and ground terminal (LE110 : Case)
500V AC for one minute between power terminals and ground terminal (LE110 : Case)
Power failure : A power failure of 30 ms of less will not affect the control action.
Weight : LE100 : Approx. 150g, LE110 : Approx. 170g
Ambient temperature : 0 to 50°C (32 to 122°F)
Ambient humidity : 45 to 85% RH

Compliance with Standards

• CE Mark
• UL/cUL Recognized

Model and Suffix Code

Specifications	Model and Suffix Code
Model	LE100A- (Gauge pressure type) LE110A- (Differential pressure sensing type, Built-in orifice)
Output type	D Transistor output (sink type) (NPN) C Transistor output (source type) (PNP) (To be released soon)
Number of outputs	6 6 points 8 8 points
Power supply	6 24V DC
Contact input (DI)	N Not supplied 1 External contact input
Communication	N Not supplied 5 RS-485
Monitor output	N Not supplied 1 Monitor output
Waterproof/Dustproof	N Not supplied
Connector type [1]	1 10 pins type 2 16 pins type
Attached connector [2]	N Not supplied 1 For 10 pins type (Model code: W-BP-01-N or equivalent) 2 For 16 pins type (Model code: W-BP-02-N or equivalent)

[1] When 8 output points, contact input or communication functions are selected, only the 16 pin connector is available.
[2] When using a connector (W-BP-03-N or equivalent) intended for monitor use, AWG # 28 ~ 22 wire is required.

Units and Range

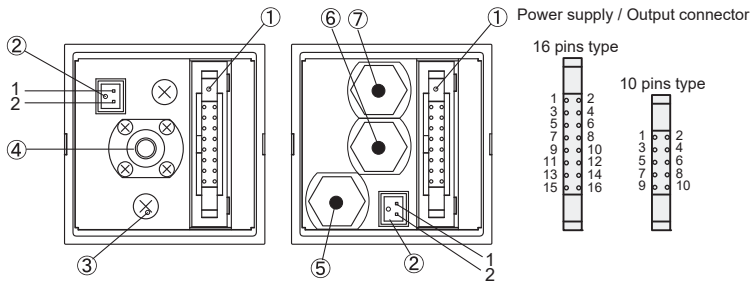
Set code	Unit	Range
0	mm	0 to 400 (1250) •High limit value is decided by the measurement of specific gravity.
1	%	0.0 to 100.0
2	l	0 to 360 •Decimal point is decided by the setting of decimal point position.
3	ml	0 to 360 •Decimal point is decided by the setting of decimal point position.
4	kPa	0 to 9.807
5	Pa	0 to 9807

Cable

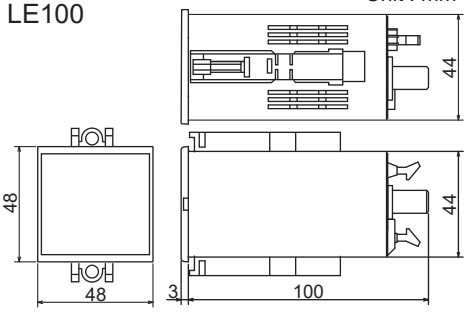
Specifications	Model and Suffix Code	
Cable name	W-BP-	□□-□000
Connector type	10 pins type, Power supply / Output connector	01
	16 pins type, Power supply / Output connector	02
	Monitor output connector	03
Cable length	Unit : mm (1,000 to 10,000 mm, Specify every 1000 mm units) No connector on open end.	□000

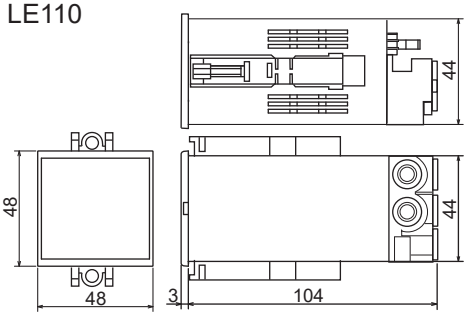
• Model code of connector without cable : For 10 pins type: W-BP-01-N, For 16 pins type: W-BP-02-N, For monitor: W-BP-03-N

External Dimensions and Rear Terminals



Unit : mm





① Power supply / Output connector

Pin number 16 pins	Pin number 10 pins	Description	
1	—	T/R(A)	Communications
2	—	T/R(B)	
3	—	SG/DI	Contact input
4	—	DI	
5	1	OUT1	Open collector output
6	2	OUT2	
7	3	OUT3	
8	4	OUT4	
9	5	OUT5	
10	6	OUT6	
11	—	OUT7	
12	—	OUT8	
13	7	COM(–)/ 24V DC	Power supply
14	8	COM(–)/ 24V DC	
15	9	+24V DC	
16	10	+24V DC	

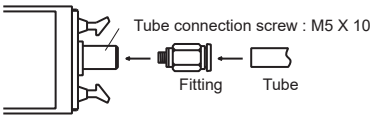
② Monitor output connector

Pin number	Description
1	+ Monitor output
2	–

③ Ground terminal Screw size : M3 X 6

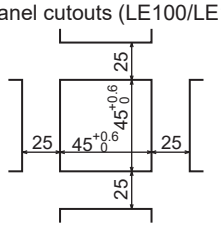
④⑤⑥⑦ Tube connection screw

⑤ Gas purge input
⑥ Level sensing
⑦ Atmospheric pressure measurement



Fitting : Recommended unit :
One-touch fitting PC6-M5SUS (NIHON PISCO CO., LTD)
Quick-action fitting TS6-M5-SUS (Koganei Corporation)
Tube : Fluorocarbon resin tube ϕ6 x ϕ4
•The fitting and tube shall be prepared separately.

• Panel cutouts (LE100/LE110)



Panel thickness : 1 to 9 mm

LT1

General Description

Perfect for upper limit/lower limit level sensing of liquids. It is a simple and compact level switch with built-in semiconductor back-pressure sensor and orifice.

Features

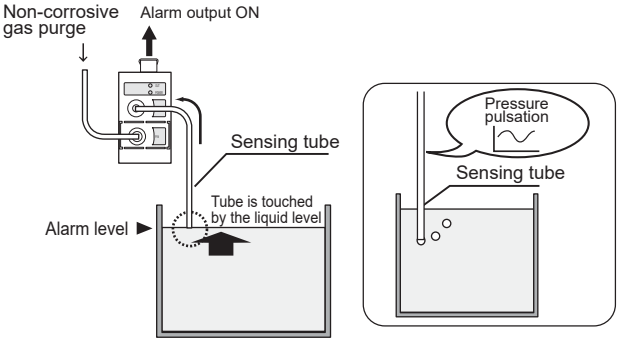
☆ Liquid level alarm point setting and sensing are possible with one tube

☆ No need to adjust

☆ Up to 5 units may be combined

Back-pressure level switch

When the liquid level touches the end of the tube, the tube, the tube internal pressure changes. When the tube is the liquid, bubbles are generated. An alarm will be ON as long as the tube internal pressure is sensing changes and pulsations.



High reliability

Semiconductor back-pressure sensor used at the sensing section. No mechanical moving parts to wear out means higher reliability.

No need to adjust

Simply set the length of the tube to an arbitrary length and preparations are complete. The end of the tube becomes the sensing point. An orifice is built into the unit for supplying 20±1kPa gas. Once the gas is supplied, it will automatically become the purge flow. When the liquid level reaches the end of the tube an alarm will be displayed.

Specifications

Inputs

Number of inputs :	1 point
Input medium :	Non-corrosive gas
Input pressure range :	0 to 49kPa
Input media pressure :	20 to 49kPa
Zero point revision range :	± 5.0% of full span
Sampling time :	0.2 sec
PV digital filter : (First order lag filter)	1 to 100 sec (No filter when setting 0)

Display

Power ON lamp :	Green LED
Output lamp :	Green LED

Performance

(At the standard purge gas pressure 20 kPa and the ambient temperature 23± 2°C)

Response time :	0.2 sec
Hysteresis time :	Within 3 sec
Input media consumption :	40 to 100 ml/min

Outputs

Number of outputs :	1 point
Output type :	Relay contact output, Form C contact, 250V AC 3A (Resistive load), 30V DC 3A Energized or De-energized (Specify when ordering)

General Specifications

Supply voltage :	21.6 to 26.4V DC (Rating 24V DC)
Power consumption :	Less than 45 mA
Insulation resistance :	More than 20MΩ (500V) between power terminals and output terminal
Dielectric voltage :	2300V AC for one minute between power terminals and output terminal
Measuring tube length :	Max.5m
Diameter of measuring tube :	ϕ4mm
Weight :	Approx. 170g
Ambient temperature :	0 to 50°C (32 to 122°F)
Ambient humidity :	35 to 85% RH Absolute humidity : MAX.W.C 29 g/m^3 dry air at 101.3 kPa

Compliance with Standards

- CE Mark
- UL/cUL Recognized

Caution

This instrument is for the level measurement of chemical liquids used for semiconductor washing machines. So far, it has been used for the following chemical liquids. In addition, Be careful that changes in liquid surface tension and specific gravity at the high or low temperature may result in incorrect level detection. This would also apply when using any liquid other than those listed below.

Relevant liquids	Surface tension (mN/m)	Gravity
Pure-water	72	1
Hydrochloric acid	72	1.19
Ethanol	22	0.79
Isopropyl alcohol (IPA)	21	0.79

This instrument detects a change in pressure within a measuring tube inserted into a measured liquid. Leakage of the gas thorough the tube connection may cause a detection error. Therefore, correctly connect the tube.

In addition, Be careful that incorrect detection may result if used in one of the following conditions:

- When there are rapid liquid level changes.
- When there are pressure changes and/or air stream in the measuring tank.
- When a closed tank is used for level measurement.

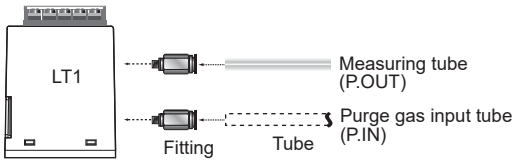
Model and Suffix Code

Specifications	Model and Suffix Code				
Model	LT1	— □	N N	/A	
Relay output type	Energized type	A			
	De-energized type	B			
Extremely small pressure detecting function	No function		N N		
Sensitivity specification	Standard sensitivity			A	

*1: Low sensitivity specification type : Specify code "B".

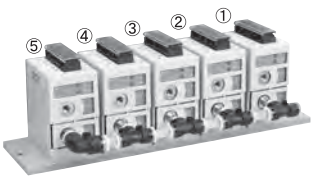
• Prepare the fitting and tube separately

Fitting : Recommended unit : One-touch fitting PC6-M5SUS (NIHON PISCO CO., LTD)
Quick-action fitting TS6-M5-SUS (Koganei Corporation)
Tube : Fluorocarbon resin tube (New PFA) ϕ6 x ϕ4 (Max.5m)



Combined type model code

Specifications	Model and Suffix Code
1 unit (With mounting bracket)	LT1 - 1M - □
2 units combined type	LT1 - 2M - □□
3 units combined type	LT1 - 3M - □□□
4 units combined type	LT1 - 4M - □□□□
5 units combined type	LT1 - 5M - □□□□□



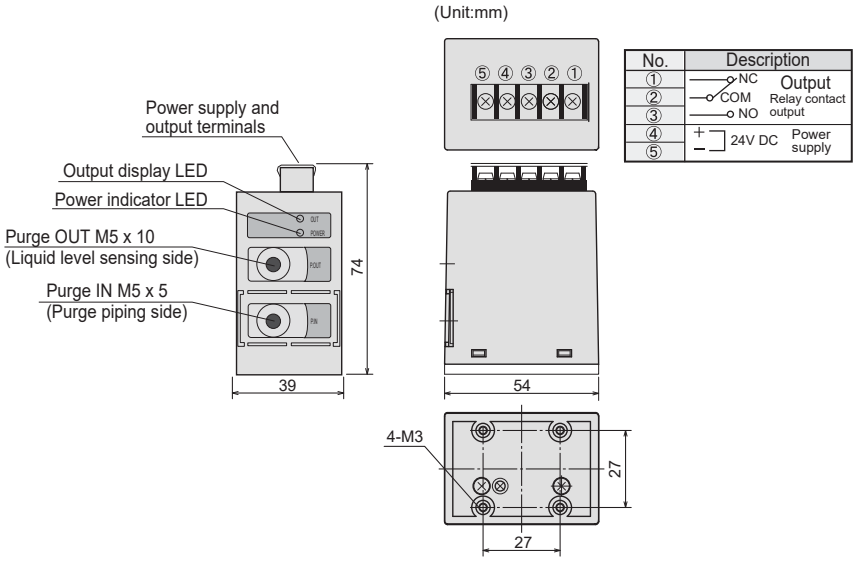
Type of LT1*1

A	Relay output, Energized type
B	Relay output, De-energized type

*1: Low sensitivity specification type :
Code "C" : Energized type
Code "D" : De-energized type

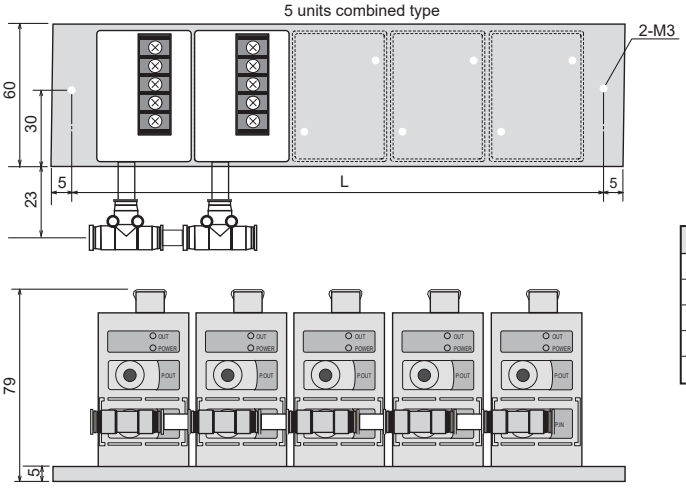
External Dimensions and Rear Terminals

(Unit:mm)



No.	Description	
①	NC	Output Relay contact output
②	COM	
③	NO	
④	+ 24V DC −	Power supply
⑤		

● Bracket for combine



Type	L	Weight
1 unit	79	320g
2 units combined type	120	580g
3 units combined type	161	860g
4 units combined type	202	1130g
5 units combined type	243	1410g

Designed for load current 20A to 200A

• CE marking : A specified noise filter must be used.

THV-10

General Description

Single-phase power controller has an LED display to show set values and input signals and front keys for easy setting and monitoring.
Optional features like heater break alarm and communication can improve system safety and establishment of a supervisory system.

Features

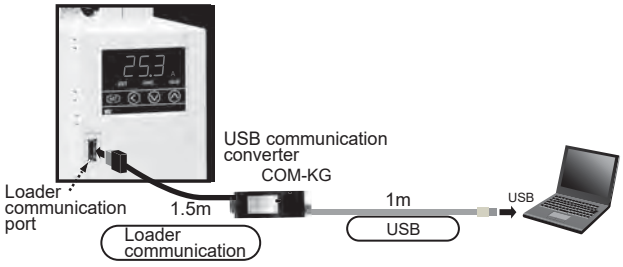
☆ Control type selection
(Phase-angle/continuous zero-cross/zero-cross)
☆ Loader communication function
☆ Detects heater break of non-linear load
☆ Ramp-up, Ramp-down
☆ Gradient setting
☆ Output Limiter High and Low
☆ Base-up Setting (output bias)
☆ Output mode selection
(Proportional electric power/voltage/phase angle)
☆ Digital input for Auto/manual

Easy and accurate setting

Single phase power controller THV-40 has an LED display to show set values and input signals, and front keys for easy setting and monitoring. Setting can also be made with an external setting unit (variable resistor).

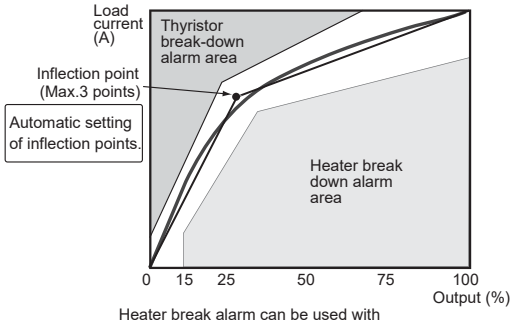
Loader communication

The THV-10 has a standard loader port to connect a PC USB port via COM-KG (USB communication converter).
Using PROTEM2 software on the PC, parameter setting can be easily done from a PC.



Detects heater break of non-linear load

Heater break alarm can be used at up to three inflection points in accordance with heater characteristics. The unit can be used with a load with large resistance changes by temperature (e.g. lamp heaters). There is no need of calculation for inflection points as automatic setting is possible.

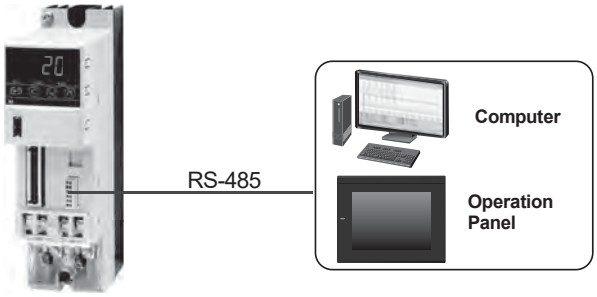


Heater break alarm can be used with a non-linear load.

Digital Communication Function

• Available for Load current 10 to 100A type

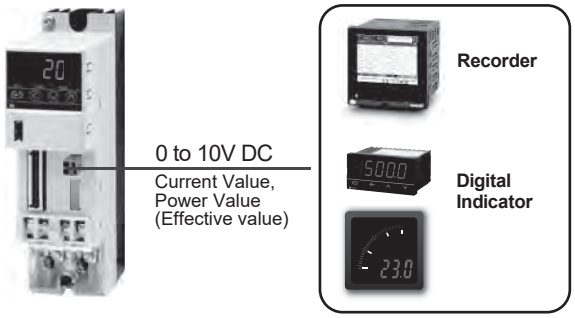
The THV-10 offers an optional RS-485 communications interface for networking to computers, PLCs and operation panel.



Analog Retransmission Output

• Available for Load current 10 to 100A type

An analog output is available so that the effective value can be retransmitted an analog signal to a remote instrument such as a recorder or data-logging equipment.



• Select either Digital Communication or Analog Retransmission Output.

Specifications

Maximum Load Current
20A, 30A, 45A, 60A, 100A, 150A, 200A AC

Control Method
Phase control, Zero-cross control (Selectable)

Applicable Load
Phase control : Linearity (R:Resistor) load, Control of primary side of a transformer (The magnetic flux density must be 1.25T [12,500 Gauss] or less when the protection function for control of primary side of a transformer is not provided.)
Zero-cross control : Linearity (R:Resistor) load

Input Signal
Current input 4 to 20mA DC (Input impedance : 50Ω)
Voltage input 1 to 5V DC (Input impedance : 30kΩ)
Voltage input 0 to 10V DC (Input impedance : 30kΩ)
Voltage pulse input 0/12V DC (Input impedance : 30kΩ)

Output mode
a) Proportional phase angle • Proportional voltage • Proportional square voltage
[when phase control is selected for linearity load (R: resistor)]
b) Constant current control, , Power proportional control (Available for rated current 20A, 30A, 45A, 60A, 80A, 100A AC type
• a) : Standard function, b): Optional function

Input sampling cycle
10ms at 50Hz, 8.33ms at 60HZ

Minimum Load Current
Rated current 20A AC : 0.6A
Rated current 30A, 45A, 60A, 80A, 100A AC :1A
(at 98% output of rated voltage)

Output Voltage Range
0 to 98% of rated voltage

Power OFF leakage current
Approx. 27mA AC (load voltage 200V rms, 60Hz, Ta=25ºC)

Power Supply Voltage
85 to 264V AC (Including power supply voltage variation)
[Rating : 100 to 240V AC]

Power Frequency
50/60Hz (Automatic discriminating)

Allowable Power Frequency Variation
Power supply voltage for load 50±1Hz, 60±1Hz
Power supply voltage for control 50±2Hz, 60±2Hz

Allowable Ambient Temperature
-15 to +55ºC (Operation guarantee range)

Operating ambient humidity
5 to 95%RH (Non-condensing)
Absolute humidity : MAX.W.C 29.3g/m^3 dry air at 101.3kPa

Cooling method
Rated current 20A, 30A, 45A, 60A, 80A, 100A AC : Natural convection
Rated current 150A, 200A AC : Cooling fan

Dielectric voltage
Between main circuit terminals and heat sink 2500V AC for one minute.
Between power terminals for control and heat sink 2000V AC for one minute.
Between main circuit terminals, heat sink and input terminals 2500V AC for one minute.
Between power terminals for control and input terminals 2300V AC for one minute.

Insulation resistance
Between main circuit terminals, power terminals for control and heat sink 20MΩ or more (500V DC)
Between main circuit terminals, heat sink and input terminals 20MΩ or more (500V DC)
Between power terminals for control and input terminals 20MΩ or more (500V DC)

Mounting Method
Vertical mounting

Weight
Approx. 0.45kg (20A, 30A), Approx. 1.2kg (45A, 60A)
Approx. 1.8kg (80A, 100A), Approx. 3.7kg(150A, 200A)

Power consumption
Rated current 20A, 30A, 45A, 60A, 80A, 100A AC
Less than 6VA (at 100V AC), Rush current 5.6A or less
Less than 8VA (at 240V AC), Rush current 13.3A or less
Rated current 20A, 30A, 45A, 60A, 80A, 100A AC
Less than 12.5VA (at 100V AC), Rush current 21A or less
Less than 22.0VA (at 240V AC), Rush current 55A or less

Self-diagnostic function
a) Data check, Back-up check, A/D converter check, Watch dog-timer, Power supply voltage check
b) Action at abnormality : Thyristor output OFF, FAIL output open

Output Setting Range

Gradient setting	: 0.0 to 200.0% [Front key], 0 to 100% [External setting unit]
Output limiter (High)	: 0.0 to 100.0% [Front key]
Output limiter (Low)	: 0.0 to 100.0% [Front key]
Output limiter at start-up (High)	: 0.0 to 100.0% [Front key]
Output limiter time at start-up (Low)	: 0 to 600 sec [Front key]
Base-up setting (Output bias)	: -9.9 to 100.0% [Front key]
Manual setting	: 0.0 to 100.0% [Front key] 0 to 100% [External setting unit]

Standard functions
• Auto/Manual selection (External manual setting unit is optional)
• Gradient setting (External setting unit is optional)
• Soft-up/Soft-down : 0.0 to 100.0sec
• Digital input (DI) : 1 points, Non-voltage contact input
(Phase control/Zero-cross control (Continuous proportional)
RUN/STOP, Auto/Manual, Heater break alarm : Use/Unuse,
Soft-up/Soft\down :Use/Unuse
Setting data lock : Use/Unuse, Over current alarm : Use/Unuse
(Selectable)
• Heat sink temperature abnormality
• ON/OFF control (External setting units are optional)
• Loader communication : ANSI/RKC standard protocol
Connection : COM-KG loader cable

Option function
• Alarm output : 1 point
Open collector output, Sink type
Maximum load current : 100mA,
Load voltage : Less than 30V DC
Energized/De-energized is selectable. (FAIL is de-energized only)
(Heater break alarm, Thyristor break alarm, Power frequency abnormal, Heat sink temperature abnormality, Over current alarm, FAIL)
* Selectable
• Heater break alarm
Current measuring accuracy :
Rated current 20A, 30A AC
: ±1.5 A (Current measurement 20A of less: ±1.2A,
Current measurement 10A or less: ±1.0A)
Rated current 45A, 60A, 80A, 100A, 150A, 200A AC
: ±5% of rated load current
• Load current limiter
Setting range : 20A, 30A AC : 0.0 to 32.0A, 45A AC : 0.0 to 55.0A
60A AC : 0.0 to 70A, 80A AC : 0 to 90A, 100A AC : 0.0 to 110A
150A AC : 0.0 to 165A, 200A AC : 0 to 220A
• Analog Retransmission Output (20A, 30A, 45A, 60A, 80A, 100A AC type)
Continuous voltage output : 0 to 10V DC
(Load resistance : More than 1kΩ)
• Communication Function (20A, 30A, 45A, 60A, 80A, 100A AC type)
Communication method : RS-485
Protocol : ANSI X3.28(1976) 2.5 A4
MODBUS-RTU
Communication speed : 2400, 4800, 9600, 19200, BPS
Bit format : Start bit : 1
Data bit : 7 or 8 • For MODBUS 8 bit only
Parity bit : Without, Odd or Even
Stop bit : 1 or 2

Compliance with Standards
Rated current 20A, 30A, 45A, 60A, 80A, 100A AC
UL : UL508 [File No. E177758]
cUL : C22.2 No.14 [File No. E177758]
CE marking : LVD : EN60947-4-3 (Form 4)
Rated insulation voltage : 690V
EMC : EN60947-4-3 (Form 4)
• A specified noise filter must be used
SOSHIN ELECTRIC CO., LTD
20A : NF3020C-SVB, Leakage current : 1.5mA
30A : NF3030C-SVB, Leakage current : 1.5mA
45A : NF3050C-SVB, Leakage current : 1.2mA
60A : NF3060C-SVB, Leakage current : 1.2mA
80A : HF3080C-SZC, Leakage current : 1.2mA
100A : HF3100C-SZC, Leakage current : 1.2mA
Rated current 150A, 200A AC
UL: UL60947-4-1 (file No. E177758), POLLUTION DEGREE 2
cUL: C22.2 No. 60947-4-1 (file No. E177758), POLLUTION DEGREE 2
CE marking : LVD : EN60947-4-3
POLLUTION DEGREE 2,
EMC : EN60947-4-3
• A specified noise filter must be used
SOSHIN ELECTRIC CO., LTD
150A : HF3150C-SZC, Leakage current : 7mA
200A : NF3200C-VZ, Leakage current : 10mA

● Table of Stability

Function	Operating condition	Stability
Constant current variation	Power supply variation : Within ±10% Load variation : 2 times	Within ±10% of rated current
Power control variation	Load variation : 2 times	Within ±10% of rated power (Load power voltage x max. rated current / 2

● Table of internal calorific value

Rated load current (A)	20	30	45	60	80	100
Internal calorific value (W)	30	43	63	84	112	140

Features

Three Types of Control Mode (Selectable)

● Phase control

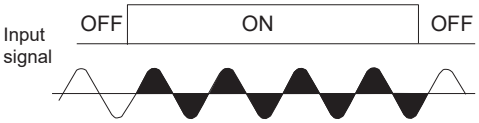
The wave form of the load power is switched at a desired phase angle q to provide smooth control.

● Zero-cross control (Continuous proportion)

Power is switched on and off when the supply voltage is at 0V. This system suppresses high frequency noise inherent to phase control.

● Zero-cross control (Input synchronization system)

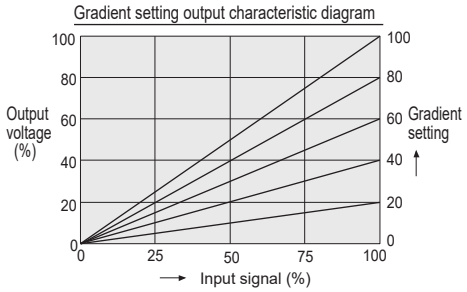
Supply voltage is switched on and off according to the voltage pulse and contact signals from a controller.



Gradient Setting

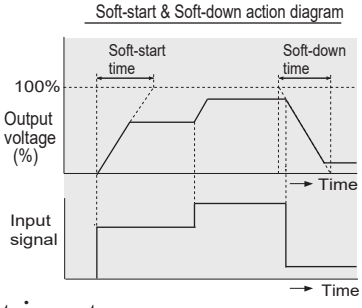
The relation between the setting input and the output voltage can be set. Gradient setting is possible via front keys or an external setter. Control characteristics may vary with the setting as follows.

1. Auto setting input X Internal gradient setting X External gradient setting
2. Auto setting input X Internal gradient setting
3. Manual setting X Internal gradient setting X External gradient setting



Ramp Function (Soft-start & Soft-down)

Even if setting input changes abruptly, output changes slowly to suppress inrush current. Ramp-up (Start-up) and ramp down (Start-Down) time can be set in the range of 0.1 to 99.9 sec via front keys.



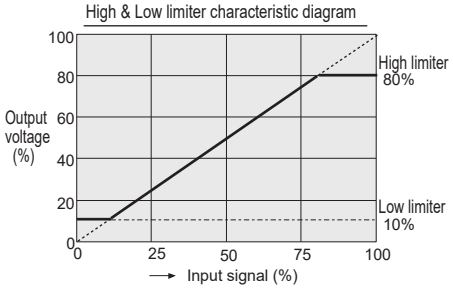
Event input

Functions can be assigned to three external contact inputs. Switching of functions can be made externally with contact signals.

Phase control/Zero-cross control (Continuous proportional)
RUN/STOP
Auto/Manual
External manual/Internal Manual
Heater break alarm : Use/Unuse
Soft-up/Soft\down :Use/Unuse
Setting data lock : Use/Unuse
Over current alarm : Use/Unuse

Output limiter (High & Low)

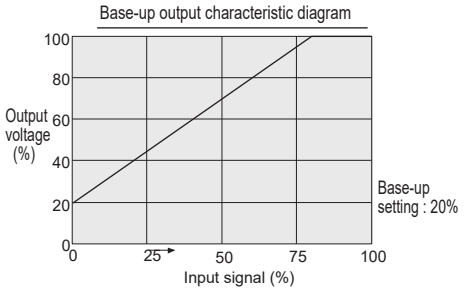
Highest and lowest output values can be set via front keys.



Base-up setting (Output bias)

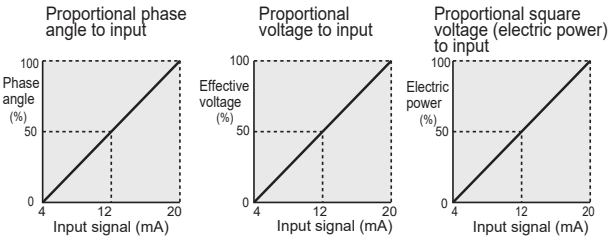
When the setting input is zero, the output can be set via front keys.

(Base-up setting is valid when output limiter low is set to 0.0)



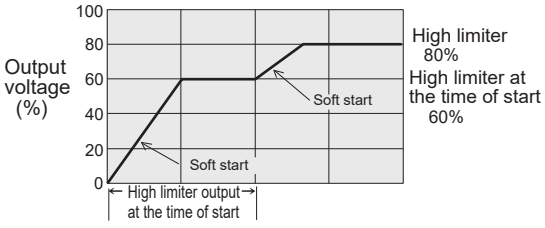
Output modes

When phase control is selected for linear load (R: resistor), output mode can be selected among Proportional phase angle to input, proportional voltage to input, proportional square voltage (electric power) to input, proportional square voltage feedback to input and constant voltage control.



Output limiter High at start-up

This function limits the highest output for the period of a preset time after power-ON and control mode change from Stop to Run. It makes the THV-A1 Series suitable for heaters which cause rush current flow, such as Halogen lamp, Tungsten, Platinum, and Molybdenum heaters.

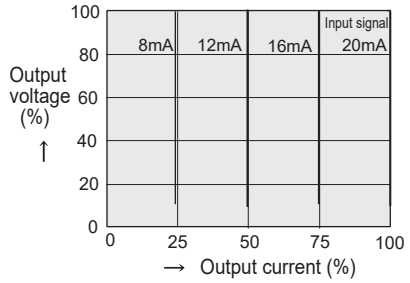


Features

Constant current control (For phase control only)

This function maintains the output current constant when a load or a power supply fluctuates. It makes the THW Series suitable for heaters of which resistance greatly changes by temperature change, such as Platinum, Molybdenum, Tungsten, and Kanthal heaters.

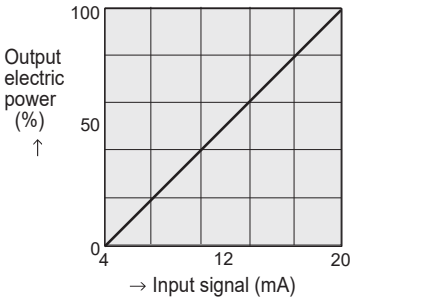
Constant current control characteristic diagram



Power proportional control (For phase control only)

This function controls the output to make its effective value power proportional to the input. It makes the THV Series suitable for heaters of which resistance gradually increases by temperature or time, such as silicon carbide type heater.

Power proportional control characteristic diagram

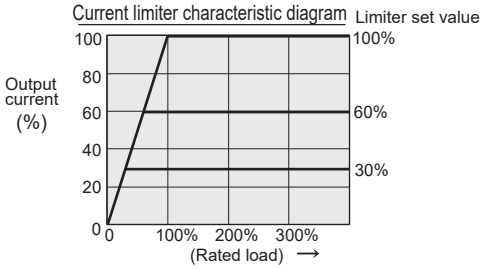


Load current limiter (For phase control only)

This function limits the load current value to the heater. The setting range is 30 to 100% of the rated current.

(Note) If the load has a large inrush current, use soft-start function along with this function to suppress the inrush current.
This function alone can not prevent the inrush current.

Current limiter characteristic diagram



Event input

Functions can be assigned to three external contact inputs. Switching of functions can be made externally with contact signals.

Phase control/Zero-cross control (Continuous proportional)
RUN/STOP
Auto/Manual
External manual/Internal Manual
Heater break alarm : Use/Unuse
Soft-up/Soft\down :Use/Unuse
Setting data lock : Use/Unuse
Over current alarm : Use/Unuse

Protection function for control of primary side of a transformer (Optional)

If momentary power failure occurs during execution of the control of primary side of a transformer, inrush current is generated. Protection function for control of primary side of a transformer is to protect the thyristor from the inrush current.

To control the primary side of the transformer, it is recommended to purchase a THV-10 with a protection functionfor control of primary side of a transformer.

Heater break alarm (Optional)

This function measures load current and compares it with a heater break alarm set value. Alarm will be activated if the load current goes into alarm ranges.

(Note) For phase control, heater break alarm does not work when the load current is less than 15% of maximum load current.

Over-current alarm (Optional)

The alarm goes on when the load current exceeds 120% of the rated current.

Alarm output (Optional)

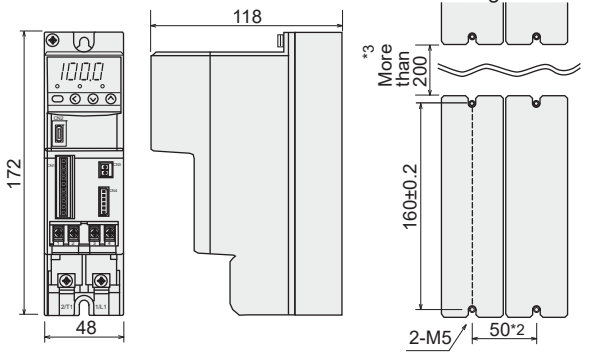
The alarm types are Power frequency abnormal, Fuse break alarm, Thyristor break alarm, Heater break alarm and FAIL. Alarm output will go on, when any of them goes in alarm status.

(Alarm output : 1 points, Energized/De-energized is selectable.
FAIL is De-energized (Fixed.)

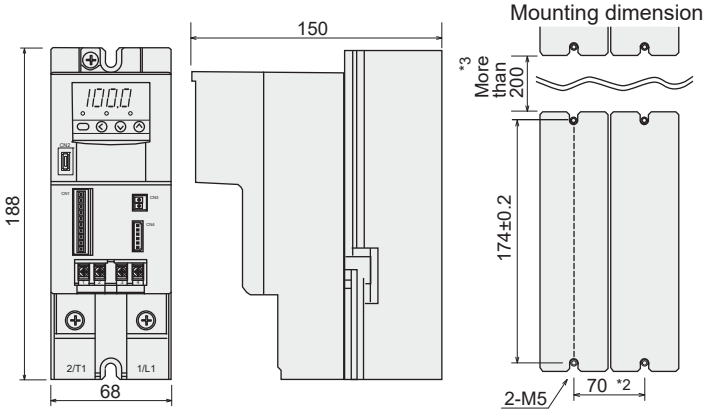
External Dimensions

Unit : mm

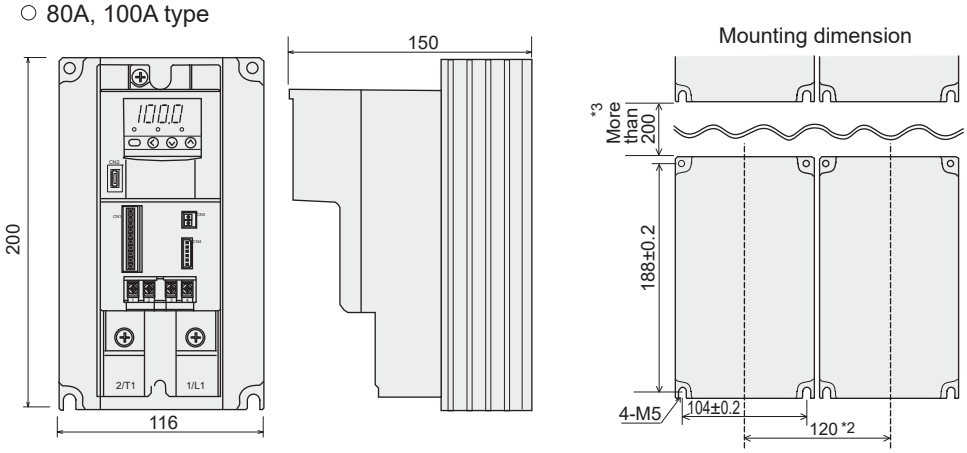
○ 20A, 30A type



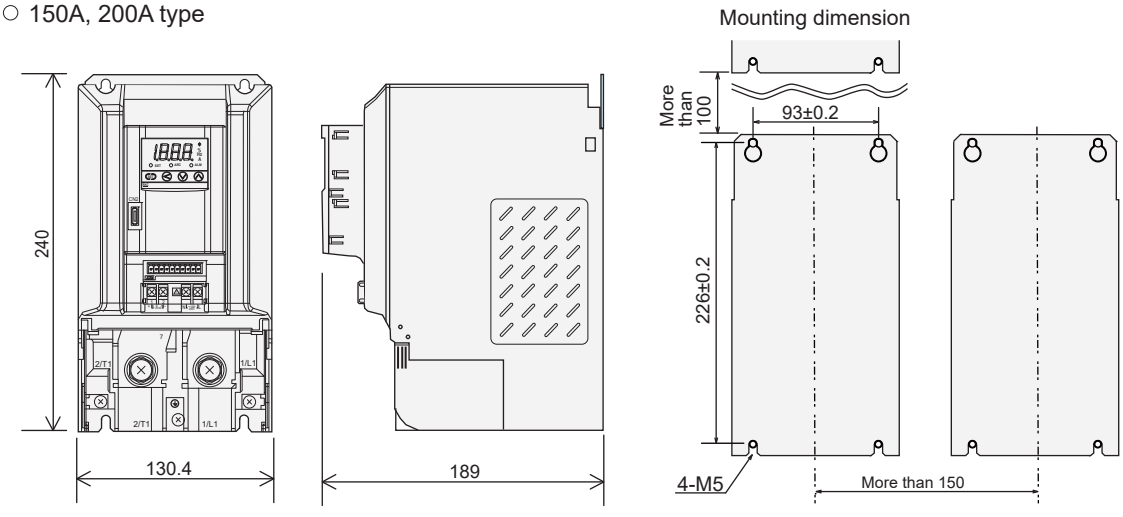
○ 45A, 60A type



○ 80A, 100A type

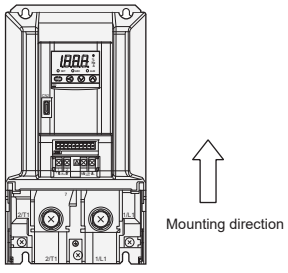


○ 150A, 200A type



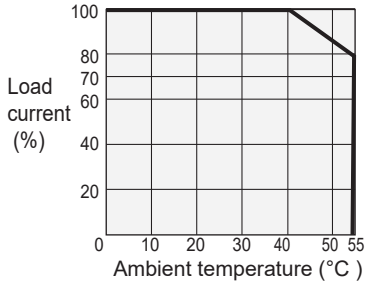
* The close mounting is not available.

• Install the instrument as illustrated in the drawing to increase the cooling effect.

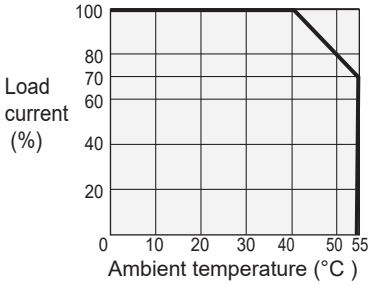


● Temperature characteristics of load current

○ 20A,30A,45A,60A,80A,100A Type

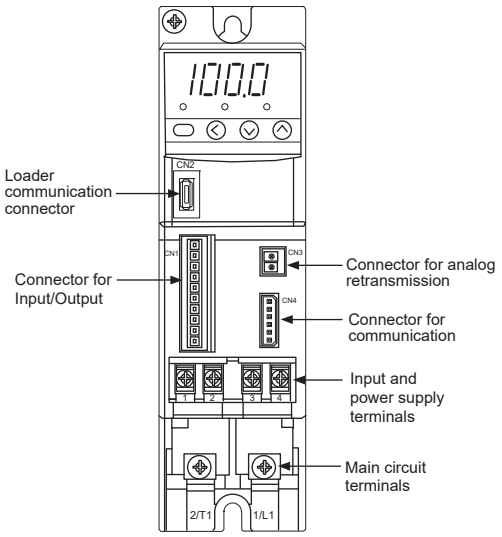


○ 150A,200A Type

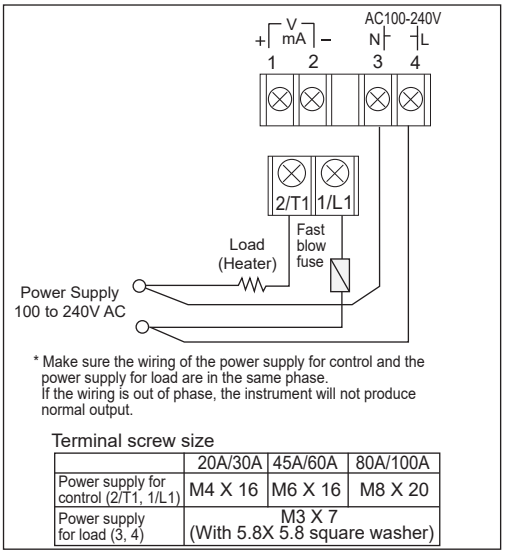


External Wiring

○ 20A, 30A, 45A, 80A, 100A type



Main circuit terminal



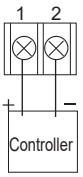
* Make sure the wiring of the power supply for control and the power supply for load are in the same phase. If the wiring is out of phase, the instrument will not produce normal output.

Terminal screw size

	20A/30A	45A/60A	80A/100A
Power supply for control (2/T1, 1/L1)	M4 X 16	M6 X 16	M8 X 20
Power supply for load (3, 4)	M3 X 7 (With 5.8X 5.8 square washer)		

Input signal

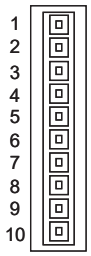
4 to 20mA DC, 1 to 5V DC
0 to 10V DC, 0/12V DC



Terminal screw size
M3X7 (With 5.8X 5.8 square washer)

☐ Connector

Connector for Input/Output



Pin No.	Contents
1	+5V (Gradient setting input)
2	Gradient setting input (0 to 5V input by gradient setter)
3	0V (Gradient setting input, Manual setting input)
4	Manual setting input (0 to 5.0V input by manual setter)
5	+5V (Manual setting input)
6	External contact input : DI +
7	0V (External contact input) : DI -
8	Unused
9	Transistor output (Alarm output) : DO (+)
10	Transistor output (Alarm output) : DO (-)

Connector for analog retransmission output

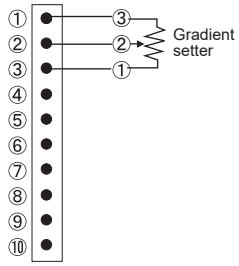
Pin No.	Contents
1	Analog retransmission output (+)
2	Analog retransmission output (-)

Connector for communication

Pin No.	Symbol	Signal name	
1	SG	Signal ground	Internal connection
2	SG	Signal ground	
3	T/R (A)	Send/Receive data	Internal connection
4	T/R (A)	Send/Receive data	
5	T/R (B)	Send/Receive data	Internal connection
6	T/R (B)	Send/Receive data	

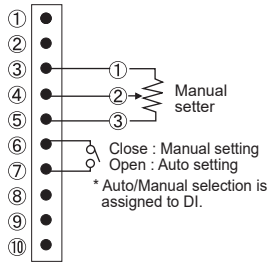
• Auto setting (With gradient setter)

Connnector for Input/Output



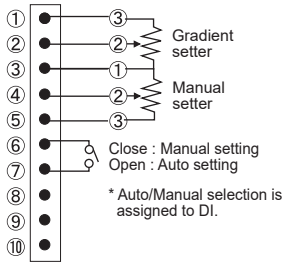
• Auto/Manual setting selection

Connnector for Input/Output



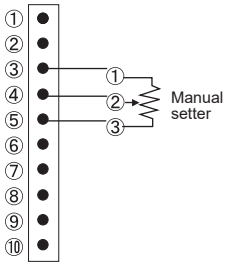
• Auto/Manual setting selection (With gradient setter)

Connnector for Input/Output



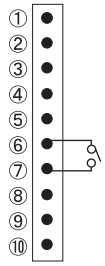
• Manual setting (With manual setter)

Connnector for Input/Output



• External contact input

Connnector for Input/Output

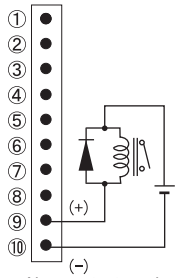


• External contact input can be assigned from function below.

Phase control/Zero-cross control (Continuous proportional)
RUN/STOP
Auto/Manual
External manual/Internal Manual
Heater break alarm : Use/Unuse
Soft-up/Soft\down :Use/Unuse
Setting data lock : Use/Unuse
Over current alarm : Use/Unuse

• Alarm output

Connnector for Input/Output

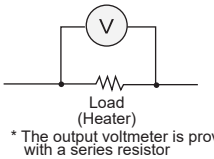


• Alarm output can be assigned from function below.

Heater break alarm 1
Heater break alarm 2
Power frequency abnormal
FAIL(De-energized (Fixed.))
Thyristor break alarm 1
Thyristor break alarm 2
Over current alarm

• Wiring of Output voltmeter

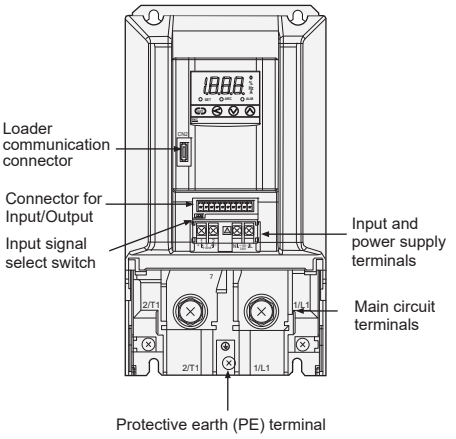
Output voltmeter



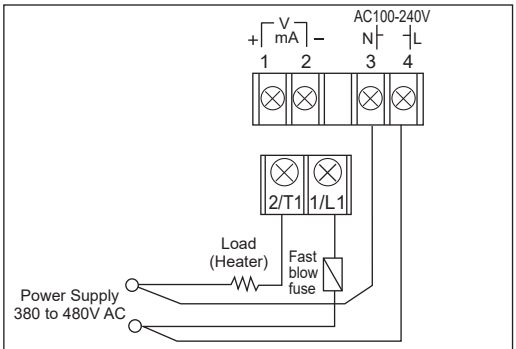
* The output voltmeter is provided with a series resistor

External Wiring

○ 150A, 200A type



Main circuit terminal



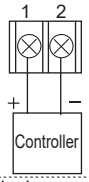
* Make sure the wiring of the power supply for control and the power supply for load are in the same phase. If the wiring is out of phase, the instrument will not produce normal output.

Terminal screw size

Power supply for control (2/T1, 1/L1)	M10 X 25
Power supply for load (3, 4)	M3 X 7 (With 5.8X 5.8 square washer)

Input signal

4 to 20mA DC, 1 to 5V DC
0 to 10V DC, 0/12V DC



Terminal screw size
M3X7 (With 5.8X 5.8 square washer)

Indication Lamp

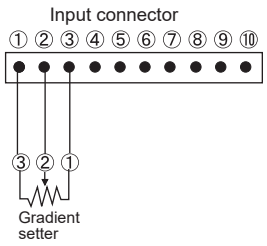
Lamp	Contents
SET	Setting mode lamp
ARC	Knee points calculation lamp. (When a Non-linear resistance heater break alarm is use.)
ALM	Alarm lamp

Connector

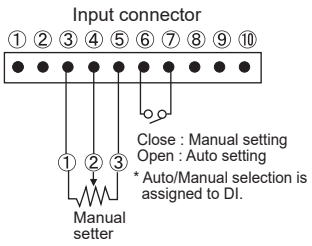
* Connector (Plug side) is optional.

Pin No.	Contents
1	+2.5V (Gradient setting input)
2	Gradient setting input (0 to 2.5V input by gradient setter)
3	0V (Gradient setting input, Manual setting input)
4	Manual setting input (0 to 2.5V input by manual setter)
5	+2.5V (Manual setting input)
6	External contact input : DI +
7	0V (External contact input) : DI -
8	Unused
9	Open collector output (Alarm output) : DO (+)
10	Open collector output (Alarm output) : DO (-)

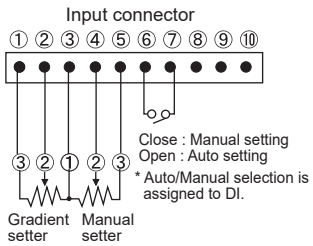
• Auto setting (With gradient setter)



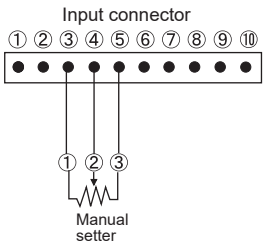
• Auto/Manual setting selection



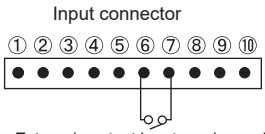
• Auto/Manual setting selection (With gradient setter)



• Manual setting (With manual setter)



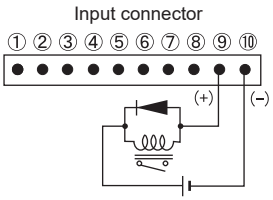
• External contact input



• External contact input can be assigned from function below.

Phase control/Zero-cross control (Continuous proportional)
RUN/STOP
Auto/Manual
External manual/Internal Manual
Heater break alarm : Use/Unuse
Soft-up/Soft\down :Use/Unuse
Setting data lock : Use/Unuse
Over current alarm : Use/Unuse

• Alarm output

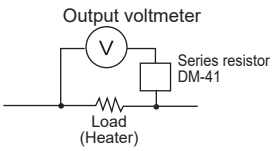


* When a relay is used, connect an external diode or use a relay with diode inside.

• Alarm output can be assigned from function below.

Heater break alarm 1
Heater break alarm 2
Power frequency abnormal
FAIL(De-energized (Fixed.))
Thyristor break alarm 1
Thyristor break alarm 2
Over current alarm

• Wiring of Output voltmeter



* The output voltmeter is provided with a series resistor

Model and Suffix Code

○ 20A, 30A, 45A, 80A, 100A type

Specifications	Model and Suffix Code								
Type	Single phase 100 to 240 AC THV-10	PZ □ – □ * □	□	□	– □				
Control method	Phase control/Zero-cross control (programmable, default: phase control)	PZ							
Rated load current	20A AC		020						
	30A AC		030						
	45A AC		045						
	60A AC		060						
	80A AC		080						
	100A AC		100						
*1 Input signal	0 to 10V DC			5					
	1 to 5V DC			6					
	4 to 20mA DC			8					
	Voltage pulse input 0/12V DC			V					
• Heater break alarm • Current limiter • Constant current control • Power proportional control • Protection function for control of primary side of a transformer	No function				N				
	Heater break alarm, Current limiter, Constant current control, Power proportional control, Protection function for control of primary side of a transformer				H				
	Non-linear resistance heater break alarm, Current limiter, Constant current control, Power proportional control, Protection function for control of primary side of a transformer				B				
Alarm output	No alarm output					N			
	Alarm output 1 point * Connector for Input/Output (Plug) is necessary.					A			
Analog retransmission output or communication function	No function						N		
	0 to 10V DC * With connector for analog retransmission output						A		
	RS-485 (ANSI/RKC standard protocol) * With connector for communication						B		
	RS-485 (MODBUS protocol) * With connector for communication						C		
*2 The plug connector for Input/Output	Not supplied							N	
	With the plug connector for Input/Output							1	

*1 : Input signal is programmable. When contact input is required, specify the connector for input/output as an accessory.
*2 : Setters are for external gradient setting, external manual setting, and external high/low setting for on/off control.

○ 150A, 200A type

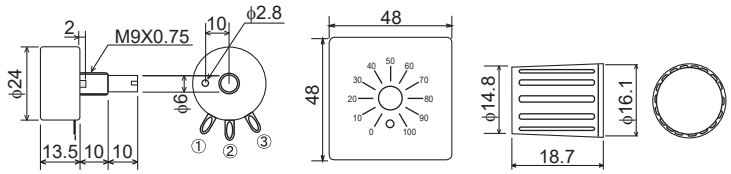
Specifications	Model and Suffix Code							
Type	Single phase 100 to 240V AC THV-10	PZ □ – □ *	□	□	□			
Control method	Phase control/Zero-cross control (programmable, default: phase control)	PZ						
Rated load current	150A AC		150					
	200A AC		200					
*1 Input signal	0 to 10V DC			5				
	1 to 5V DC			6				
	4 to 20mA DC			8				
	Voltage pulse input 0/12V DC			V				
• Heater break alarm • Current limiter • Constant current control	No function				N			
	Heater break alarm, Current limiter, Constant current control, Protection function for control of primary side of a transformer				H			
	Non-linear resistance heater break alarm, Current limiter, Constant current control, Protection function for control of primary side of a transformer				B			
Alarm output	No alarm output					N		
	Alarm output 1 point * Connector for Input/Output (Plug) is necessary, Specify accessories code (-9).					A		
*2,*3 Accessories	Setter (Volume, knob, Scale plate) 1 unit + Connector for Input/Output (Plug)							-1
	Setter (Volume, knob, Scale plate) 2 units + Connector for Input/Output (Plug)							-2
	UL type Fuse unit (Fast-blow fuse + Holder [1 circuit type])							-7
	Connector for Input/Output (Plug)							-9

*1 : Input signal is programmable. When contact input is required, specify the connector for input as an accessory (Either of -1, -2, or -9).
*2 : Setters are for external gradient setting, external manual setting, and external high/low setting for on/off control. Use two units of setter in the following cases;
• When external gradient setting and external manual setting are required.
• High/low setting for on/off control is used.
*3 : It is possible to specify more than one accessories by adding suffix code at the end.
Example: -1-7 : Setter + UL type Fuse unit.
-1-2-9 cannot be specified simultaneously.

Accessories

Unit : mm

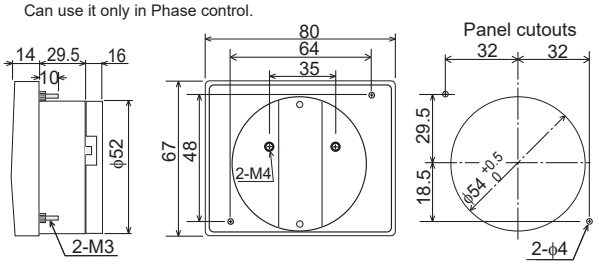
• Gradient setter, Manual setter, High/Low setter : THV1P-S01



Volume (Resistance:5kΩ,Type B) Scale plate Knob

• Output voltmeter : THVP-V01/V02

Can use it only in Phase control.



• Fuse Holder

● Fast-blow fuse [1 piece] + Holder [1 circuit type]

20A/30A/45A type

Model Code	Name
THVP-F22	Holder + 20A Fast-blow fuse (1 piece)
THVP-F32	Holder + 30A Fast-blow fuse (1 piece)
THVP-F42	Holder + 45A Fast-blow fuse (1 piece)
THVP-H02	Holder

60A/80A/100A type

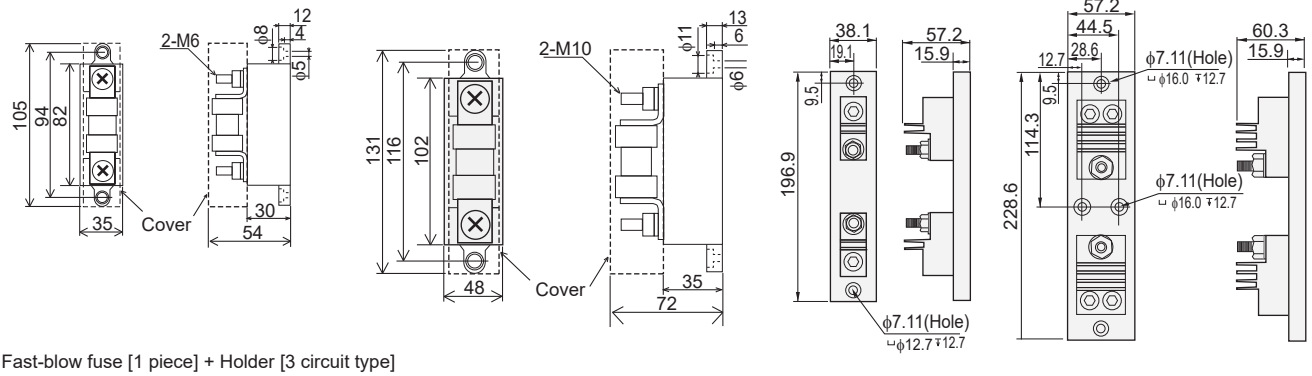
Model Code	Name
THVP-F62	Holder + 60A Fast-blow fuse (1 piece)
THVP-FA2	Holder + 80A Fast-blow fuse (1 piece)
	Holder + 100A Fast-blow fuse (1 piece)
THVP-H03	Holder

For THV4P-FBB (150A)

Model Code	Name
THVP-H06	Holder

For THV4P-FCB (200A)

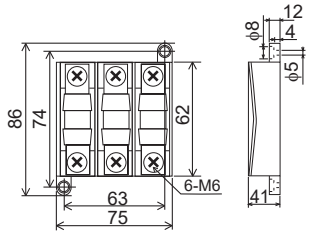
Model Code	Name
THVP-H07	Holder



● Fast-blow fuse [1 piece] + Holder [3 circuit type]

20A/30A type

Model Code	Name
THVP-F21	Holder + 20A Fast-blow fuse (1 piece)
THVP-F31	Holder + 30A Fast-blow fuse (1 piece)
THVP-H01	Holder



● UL/CE Marking type Fast-blow fuse [1 piece] + Holder [1 circuit type]

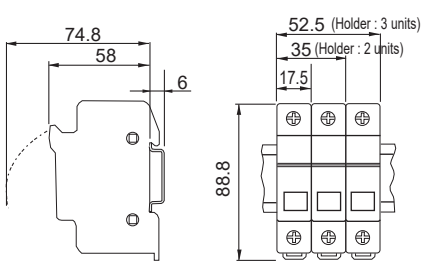
• Clamped input terminal type

20A/30A type

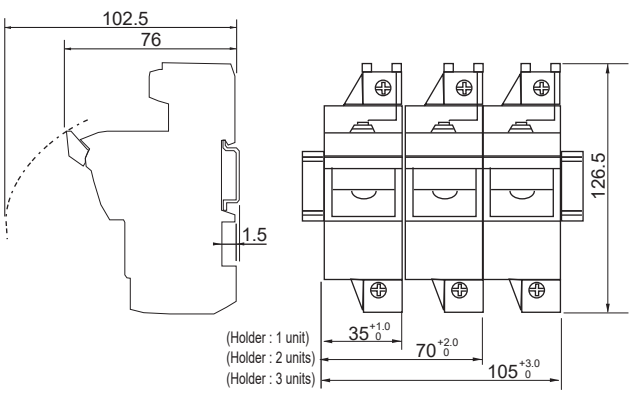
Model Code	Name
THVP-F23	Holder + 20A Fast-blow fuse (1 piece)
THVP-F33	Holder + 30A Fast-blow fuse (1 piece)
THVP-H04	Holder

45A/60A/80A/100A type

Model Code	Name
THVP-F43	Holder + 45A Fast-blow fuse (1 piece)
THVP-F63	Holder + 60A Fast-blow fuse (1 piece)
THVP-F83	Holder + 80A Fast-blow fuse (1 piece)
THVP-FA3	Holder + 100A Fast-blow fuse (1 piece)
THVP-H05	Holder



● UL/CE Marking type Fast-blow fuse and Fuse holder
: Manufactured by SIBA GmbH & Co.KG (Germany)



Model and Suffix Code

Name			Code	Note
Setter			THV1P-S01	
Connector (Plug)	20A, 30A 45A, 60A 80A, 100A	For input/output	THV1P-C01	
		For analog retransmission	THV1P-C02	
		For communication	THV1P-C03	
	150A, 200A	For input/output	THV4P-C01	
Fuse unit (Fast-blow fuse [1 piece] + Holder [1 circuit type])		20A	THVP-F22	CR6L-20/UL
		30A	THVP-F32	CR6L-30/UL
		45A	THVP-F42	CR6L-50/UL
		60A	THVP-F62	CR6L-75/UL
		80A	THVP-FA2	CR6L-100/UL
		100A		
Fast-blow fuse [1 piece] (For 1 ciruit type) *1		20A	THVP-F2A	CR6L-20/UL
		30A	THVP-F3A	CR6L-30/UL
		45A	THVP-F45	CR6L-50/UL
		60A	THVP-F60	CR6L-75/UL
		80A	THVP-FA0	CR6L-100/UL
		100A		
Fuse holder [1 circuit type]		20A	THVP-H02	
		30A		
		45A		
		60A	THVP-H03	
		80A		
		100A		
Fuse unit (Fast-blow fuse [1 piece] + Holder [3 circuit type])		20A	THVP-F21	CR2LS-20
		30A	THVP-F31	CR2LS-30
Fast-blow fuse [1 piece] (For 3 circuit type)		20A	THVP-F20	CR2LS-20
		30A	THVP-F30	CR2LS-30
Fuse holder [3 circuit type]		20A	THVP-H01	
		30A		

Name		Code	Note
UL/CE Marking type Fast-blow fuse unit (Fast-blow fuse [1 piece] + Holder [1 circuit type])	20A	THVP-F23	
	30A	THVP-F33	
	45A	THVP-F43	
	60A	THVP-F63	
	80A	THVP-F83	
	100A	THVP-FA3	
UL/CE Marking type Fast-blow fuse [1 piece] *2	20A	THVP-F2B	5017906(20A)
	30A	THVP-F3B	5017906(30A)
	45A	THVP-F4B	5014006(50A)
	60A	THVP-F6B	5014006(63A)
	80A	THVP-F8B	5014006(80A)
	100A	THVP-FAB	5014006(100A)
	150A	THV4P-FBB	JLLS200X (200A)
	200A	THV4P-FCB	JLLS250X (250A)
UL/CE Marking type Fuse holder [1 circuit type])	20A	THVP-H04	
	30A		
	45A	THVP-H05	
	60A		
	80A		
	100A		
	150A	THV4P-H06	LFT602001CS
	200A	THV4P-H07	LFT604001CS
Output Voltmeter	Span : 150V AC	THVP-V01	• Manufactured by Daiichi Electronics Co., Ltd. : LSK-8CH 150V
	Span : 300V AC	THVP-V02	• Manufactured by Daiichi Electronics Co., Ltd. : LSK-8CH 300V

*1:Fast-blow fuse and Fuse holder : Manufactured by HINODE Electric Co. Ltd.

*2 :UL/CE Marking type Fast-blow fuse and Fuse holder
: Manufactured by SIBA GmbH & Co.KG (Germany)

(CE marking is avilable 20A,30A,45A,60A,80A,100A type)

THV-A1

General Description

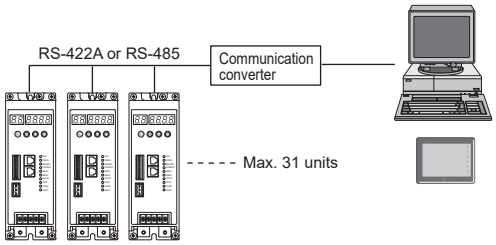
As the THV-A1 single phase power control unit can be used with control modes selectable from constant voltage, constant current and constant power, it can be used with such heaters as noble metals (Platinum and molybdenum), super Kanthal, and SiC (Silicon Carbide) that have changing resistance in accordance with temperature changes.
Optional features like heater break alarm and communication can improve system safety and establishment of a supervisory system.

Features

☆ Control type selection
(Phase-angle/continuous zero-cross/zero-cross)
☆ Communication function
☆ Detects heater break of non-linear load
☆ Ramp-up, Ramp-down
☆ Gradient setting
☆ Output Limiter High and Low
☆ Protection function for control of primary side of a transformer
☆ Base-up Setting (output bias)
☆ Output mode selection
(proportional electric power/voltage/phase angle)
☆ Digital input for Auto/manual

Communication

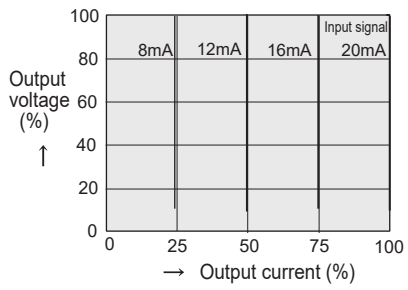
With the communication function, a connection to a host computer and an MMI is possible.
(Protocol: Modbus-RTU)



Constant current control (For phase control only)

This function maintains the output current constant when a load or a power supply fluctuates. It makes the THW Series suitable for heaters of which resistance greatly changes by temperature change, such as Platinum, Molybdenum, Tungsten, and Kanthal heaters.

Constant current control characteristic diagram

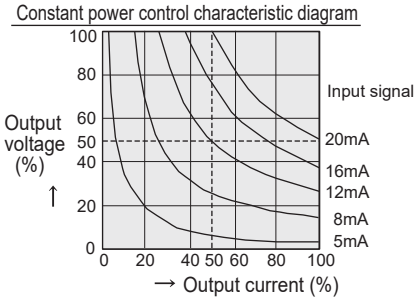


Constant power control (For phase control only)

This function controls the output to make its effective value power proportional to the input. It makes the THW Series suitable for heaters of which resistance gradually increases by temperature or time, such as silicon carbide type heater.
This function controls its effective value power at 50% of the rating shown in the diagram below.

• From the diagram below, constant power control is expressed as a curve obtained from a line between two points which is a 50% of the rating of the unit; a point at 100% voltage x 50% current and a point at 50% voltage x 100% current.

Constant power control characteristic diagram

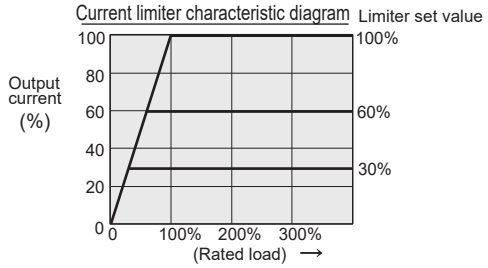


Load current limiter (For phase control only)

This function limits the load current value to the heater. The setting range is 30 to 100% of the rated current.

(Note) If the load has a large inrush current, use soft-start function along with this function to suppress the inrush current.
This function alone can not prevent the inrush current.

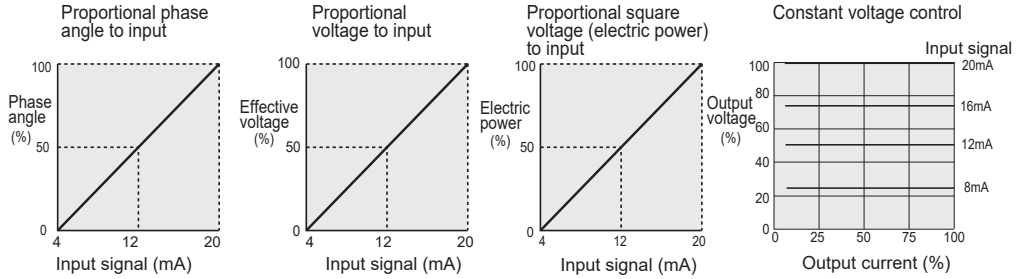
Current limiter characteristic diagram



Features

Output modes

When phase control is selected for linear load (R: resistor), output mode can be selected among Proportional phase angle to input, proportional voltage to input, proportional square voltage (electric power) to input, proportional square voltage feedback to input and constant voltage control.



Three Types of Control Mode (Selectable)

● Phase control

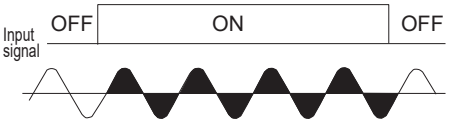
The wave form of the load power is switched at a desired phase angle q to provide smooth control.

● Zero-cross control (Continuous proportion)

Power is switched on and off when the supply voltage is at 0V. This system suppresses high frequency noise inherent to phase control.

● Zero-cross control (Input synchronization system)

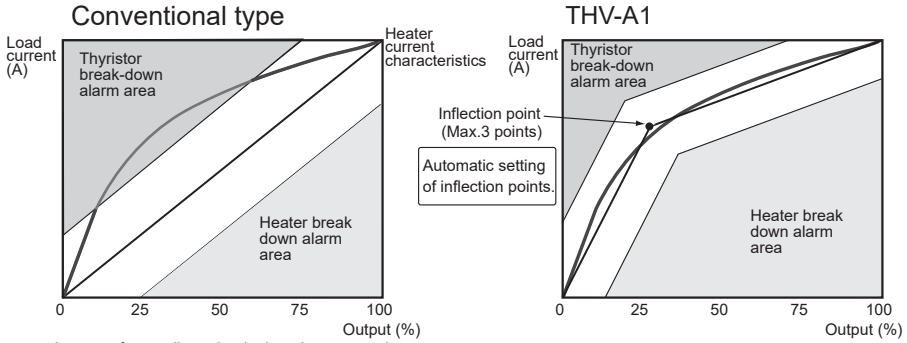
Supply voltage is switched on and off according to the voltage pulse and contact signals from a controller.



Detects heater break of non-linear load

Patent pending

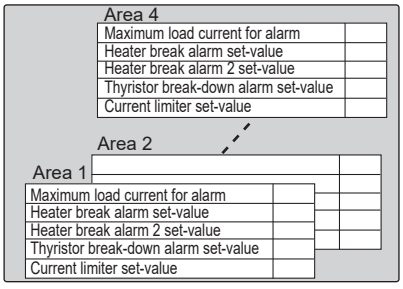
Heater break alarm can be used at up to three inflection points in accordance with heater characteristics. The unit can be used with a load with large resistance changes by temperature (e.g. lamp heaters). There is no need of calculation for inflection points as automatic setting is possible.



Memory area

The THV-A1 stores 4 patterns of heater break alarm settings and enables easy change of settings.

• Memory area is not available with heater break alarms for non-linear load.

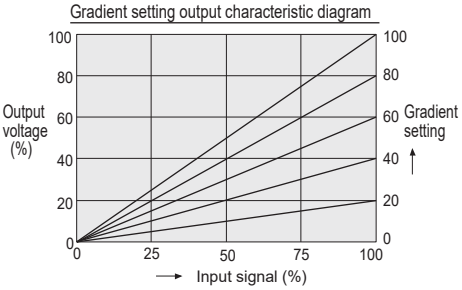


Gradient Setting

The relation between the setting input and the output voltage can be set. Gradient setting is possible via front keys or an external setter. Control characteristics may vary with the setting as follows.

1. Auto setting input X Internal gradient setting X External gradient setting
2. Auto setting input X Internal gradient setting
3. Manual setting X Internal gradient setting X External gradient setting

Gradient setting output characteristic diagram

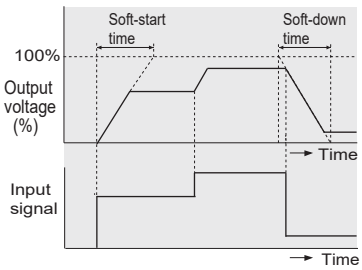


Features

Ramp Function (Soft-start & Soft-down)

Even if setting input changes abruptly, output changes slowly to suppress inrush current. Ramp-up (Start-up) and ramp down (Start-Down) time can be set in the range of 0.1 to 99.9 sec via front keys.

Soft-start & Soft-down action diagram

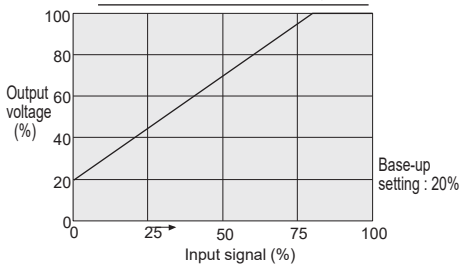


Base-up setting (Output bias)

When the setting input is zero, the output can be set via front keys.

(Base-up setting is valid when output limiter low is set to 0.0)

Base-up output characteristic diagram



Event input

Functions can be assigned to three external contact inputs. Switching of functions can be made externally with contact signals.

RUN/STOP
Auto/Manual
Alarm interlock reset
Heater break alarm : Use/Unuse
Soft-up/Soft\down :Use/Unuse
Key lock : Use/Unuse
Over current alarm : Use/Unuse
Multi-memory area selection (DI: 2 points)

• Heater break alarm, over current alarm and multi-memory area selection are optional.

Heater break alarm

This function measures load current and compares it with a heater break alarm set value. Alarm will be activated if the load current goes into alarm ranges. Maximum two alarm set points can be set for the heater break alarm, which could be used for heater-deterioration alarm and heater-break alarm.

(Note) For phase control, heater break alarm does not work when the load current is less than 15% of maximum load current.

Protection function for control of primary side of a transformer

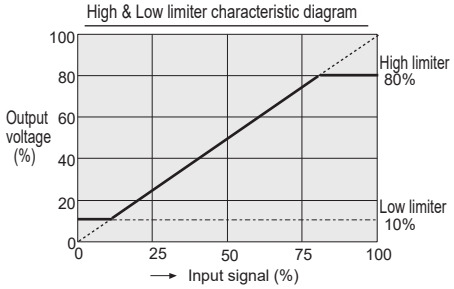
If momentary power failure occurs during execution of the control of primary side of a transformer, inrush current is generated. Protection function for control of primary side of a transformer is to protect the thyristor from the inrush current.

To control the primary side of the transformer, it is recommended to purchase a THV-1 with a protection functionfor control of primary side of a transformer.

Output limiter (High & Low)

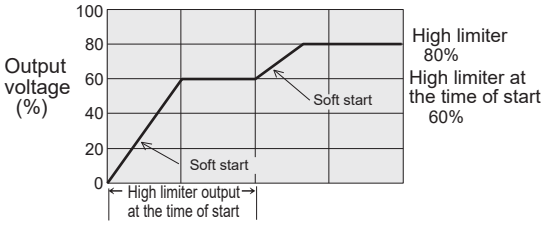
Highest and lowest output values can be set via front keys.

High & Low limiter characteristic diagram



Output limiter High at start-up

This function limits the highest output for the period of a preset time after power-ON and control mode change from Stop to Run. It makes the THV-A1 Series suitable for heaters which cause rush current flow, such as Halogen lamp, Tungsten, Platinum, and Molybdenum heaters.



Over-current alarm

The alarm goes on when the load current exceeds 120% of the rated current.

Alarm output

The alarm types are Power supply voltage abnormal, Power frequency abnormal, Board alarm, Over current alarm, Fuse break alarm, Thyristor break alarm, and Heater break alarm. Alarm output will go on, when any of them goes in alarm status.

(Alarm logic selection, Alarm output : 2 points)

Specifications

Maximum Load Current
20A AC, 30A AC, 45A AC, 60A AC, 80A AC, 100A AC, 150A AC, 200A AC
Control Method
Phase control, Zero-cross control (Selectable)
Applicable Load
Phase control : Linearity (R:Resistor) load, Control of primary side of a transformer (The magnetic flux density must be 1.25T [12,500 Gauss] or less when the protection function for control of primary side of a transformer is not provided.)
Zero-cross control : Linearity (R:Resistor) load
Input Signal
Group 1 (Field-programmable within Group)
Current input 4 to 20mA DC (Input impedance : 100Ω)
Current input 0 to 20mA DC (Input impedance : 100Ω)
Voltage input 0 to 5V DC (Input impedance : 30kΩ)
Voltage input 1 to 5V DC (Input impedance : 30kΩ)
Voltage pulse input 0/12V DC (Input impedance : 30kΩ)
Non-voltage contact input
Group 2 (Field-programmable within Group)
Voltage input 0 to 10V DC (Input impedance : 60kΩ)
Voltage pulse input 0/12V DC (Input impedance : 60kΩ)
Voltage pulse input 0/24V DC (Input impedance : 60kΩ)
Non-voltage contact input
a) Current input 4 to 20mA DC (Input impedance : 100 Ω)
b) Voltage input 1 to 5V DC (Input impedance : 30kΩ)
c) Voltage input 0 to 10V (Input impedance : 68kΩ)
d) Voltage pulse input 0/12V DC (Input impedance : 30kΩ)
e) Non-voltage contact input (Input impedance : 47Ω)
Output mode
a) Constant voltage control
b) Proportional phase angle • Proportional voltage • Proportional square voltage • Proportional square voltage feed back [when phase control is selected for linearity load (R: resistor)]
c) Constant current control
d) Constant power control
• a), b) : Standard function, c), d) : Optional function
Input sampling cycle
0.5 cycle of power cycle
Minimum Load Current
0.5A (at 98% output of rated voltage)
Output Voltage Range
0 to 98% of rated voltage
Power OFF leakage current
20A, 30A, 45A, 80A 100A AC type
27mA AC rms or less (load voltage 200V rms, 60Hz, Ta=25ºC)
150A, 200A AC type
90mA AC rms or less (load voltage 200V rms, 60Hz, Ta=25ºC)
Power Supply Voltage
90 to 264V AC (Including power supply voltage variation)
[Rating : 100 to 240V DC]
Power Frequency
50/60Hz (Automatic discriminating)
Allowable Power Frequency Variation
50Hz±1Hz, 60Hz±1Hz,(Performance guarantee range)
45 to 54.9Hz (50Hz), 55 to 64.9Hz (60Hz) (Operating guarantee range)
Allowable Ambient Temperature
Performance guarantee range: 0 to +50ºC (60A type : 0 to +45ºC)
Operating guarantee range: -15 to +55ºC (20A,30A,45A,60A,80A,100A type)
-10 to +55ºC (150A,200A type)
Operating ambient humidity
5 to 95%RH (Non-condensing)
Absolute humidity : MAX.W.C 29.3g/m^3 dry air at 101.3kPa
Cooling method
20A, 30A, 45A, 80A 100A AC type : Natural convection
150A, 200A AC type : Air cooling (Built-in cooling fan)
Dielectric voltage
Between main circuit terminals, power terminals and heat sink 2000V AC for one minute.
Between main circuit terminals, power terminals and input terminals 2000V AC for one minute.
Insulation resistance
Between main circuit terminals, power terminals and heat sink 20MΩ or more (500V DC)
Between main circuit terminals, power terminals and input terminals 20MΩ or more (500V DC)
Mounting Method
Vertical mounting
Weight
Approx. 1.4kg (20A, 30A), Approx. 1.6kg (45A, 60A)
Approx. 2.4kg (80A, 100A), Approx. 4.5kg (150A, 200A),
Power consumption
20A, 30A, 45A, 80A 100A AC type
Less than 6VA (at 100V AC), Rush current 10A or less
Less than 8VA (at 240V AC), Rush current 24A or less
150A, 200A AC type
Less than 14VA (at 100V AC), Rush current 22A or less
Less than 22VA (at 240V AC), Rush current 52A or less

Self-diagnostic function
Check item
a) Data check, Back-up check, Power frequency check, Main circuit power supply check, A/D converter check
b) Power supply voltage check, Watch dog-timer
Action at abnormality :
Check item a) : Control stop, Board abnormality lamp ON, Thyristor output OFF
Check item b) : Action stop, FAIL lamp ON, Thyristor output OFF
Output Setting Range
Gradient setting : 0.0 to 200.0% [Front key], 0 to 100% [External setting unit]
Output limiter (High) : 0.0 to 100.0% [Front key]
Output limiter (Low) : 0.0 to 100.0% [Front key]
Output limiter at start-up (High) : 0.0 to 100.0% [Front key]
Output limiter time at start-up (Low) : 0.0 to 600.0 sec [Front key]
Base-up setting (Output bias) : -10.0 to 100.0% [Front key]
Manual setting : 0.0 to 100% [Front key] 0 to 100% [External setting unit]
Standard functions
• Auto/Manual selection (External manual setting unit is optional)
• Gradient setting (External setting unit is optional)
• Soft-up/Soft-down : 0.0 to 100.0sec
• Digital input (DI) : 3 points, Non-voltage contact input
RUN/STOP, Auto/Manual, Alarm interlock reset
Heater break alarm : Use/Unuse,
Soft-up/Soft\down :Use/Unuse
Key lock : Use/Unuse,
Over current alarm : Use/Unuse
Multi-memory area selection (For heater break alarm) (Selectable)
• ON/OFF control (External setting units are optional)
Option function
• Alarm output : 2 points
Open collector output, 250V AC, 1A (Resistive loaf)
Energized/De-energized is selectable.
(Heater break alarm, Thyristor break alarm, Fuse break alarm, Power supply voltage abnormal, Power frequency abnormal, Over current alarm, Board alarm)
* Selectable
• Heater break alarm
Current measuring accuracy : ±2% of rated load current
Number of alarm delay times : 0 to 99 times
Memory area : 4 areas
• Load current limiter
Setting range :
0.0 to 22.0A (20A type), 0.0 to 33.0A (30A type)
0.0 to 50.0A (45A type), 0.0 to 66.0A (60A type)
0.0 to 88.0A (80A type), 0.0 to 110.0A (100A type)
0.0 to 165.0A (150A type), 0.0 to 220.0A (200A type)
• Heat sink temperature abnormality
* 150A, 200A type: Standard function
• Communication function
Communication method : RS-485 (2-wire, half-duplex)
RS-422A (4-wire, half-duplex)
Synchronous method : Start-stop synchronous type
Communication speed : 9600 bps
Protocol : Modbus-RTU
Data format : Start bit : 1, Data bit : 8, Parity bit : None
Stop bit : 1
Maximum connection : 31 units
Compliance with Standards
• 20A, 30A, 45A, 60A, 80A, 100A AC Type
UL : UL61010-1, cUL : CAN/CSA-C22.2 No.61010-1
CE marking : LVD : EN61010-1
OVERVOLTAGE CATEGORYII,
POLLUTION DEGREE 2,
EMC : EN60947-4-3
• A specified noise filter must be used
SOSHIN ELECTRIC CO., LTD
HF2030A-UP (20A,30A), HF2050A-UP (45A)
HF2060A-UP (60A), HF2080A-UP (80A)
HF2100A-UP (100A)
• 150A, 200A AC Type
UL : UL508, cUL:C22.2 No.14

● Table of Stability

Function	Operating condition	Stability
Constant voltage variation	Power supply variation : Within ±10% Load variation : 2 times	Within ±2% of input voltage
Constant current variation	Power supply variation : Within ±10% Load variation : 2 times	Within ±2% of input voltage
Constant power variation	Power supply variation: Within ±10% Load variation : 2 times	Within ±4% of input voltage

● Table of internal calorific value

Rated load current (A)	20	30	45	60	80	100	150	200
Internal calorific value (W)	23	34	56	72	95	116	190	245

Model and Suffix Code

● Rated load current : 20A,30A,45A,60A,80A,100A AC

Specifications	Model and Suffix Code										
Type	THV-A	1	PZ	□	−□	*	□	□	□	□	□
Power supply	Single phase 100 to 240V AC	1									
Control method	Phase control/Zero-cross control (programmable, default: phase control)		PZ								
Rated load current	20A AC			020							
	30A AC			030							
	45A AC			045							
	60A AC			060							
	80A AC			080							
	100A AC			100							
Input signal *1	0 to 5V DC				4						
	0 to 10V DC				5						
	1 to 5V DC				6						
	0 to 20mA DC				7						
	4 to 20mA DC				8						
Output mode *2	Standard + Constant voltage control					6					
	Standard + Constant voltage control + Constant current control (with heater break alarm, thyristor break down alarm, memory area, load current limiter, over current alarm and protection function for control of primary side of a transformer)					E					
	Standard + Constant voltage control + Constant power control (with heater break alarm, thyristor break down alarm, memory area, load current limiter, over current alarm and protection function for control of primary side of a transformer)					W					
Fast-blow fuse	No fast-blow fuse						N				
	With fast-blow fuse						F				
Alarm output	No alarm output							N			
	Alarm output 2 points							A			
Heat sink temperature detection function/ Non-linear resistance heater break alarm (ARC-HBA)	No function								N		
	Heat sink temperature detection function								A		
	Non-linear resistance heater break alarm • When the output mode is specified to E or W code, this alarm can be selected.								B		
	Heat sink temperature detection function + Non-linear resistance heater break alarm • When the output mode is specified to E or W code, this alarm can be selected.								C		
Communication	No communication									N	
	RS-422A									4	
	RS-485									5	
Accessories *3,*4	Setter (Volume, knob, Scale plate) 1 unit + Connector for input (Plug)										-1
	Setter (Volume, knob, Scale plate) 2 units + Connector for input(Plug)										-2
	Connector for input (Plug)										-9
	Connector for alarm output (Plug)										-B

● Rated load current : 150A,200A AC

Specifications	Model and Suffix Code										
Type	THV-A	1	PZ	□	−□	*	□	□	□	□	□
Power supply	Single phase 100 to 240V AC	1									
Control method	Phase control/Zero-cross control (programmable, default: phase control)		PZ								
Rated load current	150A AC			150							
	200A AC			200							
Input signal *1	0 to 5V DC				4						
	0 to 10V DC				5						
	1 to 5V DC				6						
	0 to 20mA DC				7						
	4 to 20mA DC				8						
Output mode *2	Standard + Constant voltage control					6					
	Standard + Constant voltage control + Constant current control (with heater break alarm, thyristor break down alarm, memory area, load current limiter, over current alarm and protection function for control of primary side of a transformer)					E					
	Standard + Constant voltage control + Constant power control (with heater break alarm, thyristor break down alarm, memory area, load current limiter, over current alarm and protection function for control of primary side of a transformer)					W					
Fast-blow fuse	No fast-blow fuse						N				
	With fast-blow fuse						F				
Alarm output	No alarm output							N			
	Alarm output 2 points							A			
Heat sink temperature detection function/ Non-linear resistance heater break alarm (ARC-HBA)	Heat sink temperature detection function								A		
	Heat sink temperature detection function + Non-linear resistance heater break alarm • When the output mode is specified to E or W code, this alarm can be selected.								C		
Communication	No communication									N	
	RS-422A									4	
	RS-485									5	
Accessories *3,*4	Setter (Volume, knob, Scale plate) 1 unit + Connector for input (Plug)										-1
	Setter (Volume, knob, Scale plate) 2 units + Connector for input(Plug)										-2
	Connector for input (Plug)										-9
	Connector for alarm output (Plug)										-B

*1 : Input signal is programmable within group. When contact input is required, specify the connector for input as an accessory (Either of -1, -2, or -9).

Group 1	0 to 20mA DC	4 to 20mA DC	0 to 5V DC	1 to 5V DC	Voltage pulse 0/12V DC	Non-voltage contact
Group 2	0 to 10V DC	Voltage pulse 0/12V DC	Voltage pulse 0/24V DC	Non-voltage contact		

*2 : Standard output mode : Proportional phase angle • Proportional voltage • Proportional square voltage.

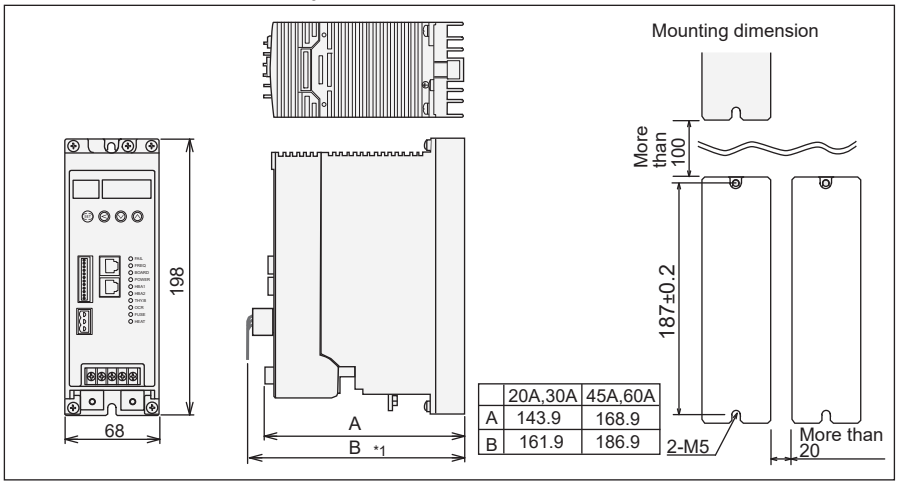
*3 : Setters are for external gradient setting, external manual setting, and external high/low setting for on/off control. Use two units of setter in the following cases;
- When external gradient setting and external manual setting are required.
- High/low setting for on/off control is used.

*4 : It is possible to specify more than one accessories by adding suffix code at the end.
Example: -1-B : Setter (Volume, knob, Scale plate) 1 unit + Connector for input (Plug) + Connector for alarm output (Plug)
-1-2-9 and -4-5 cannot be specified simultaneously.

External Dimensions

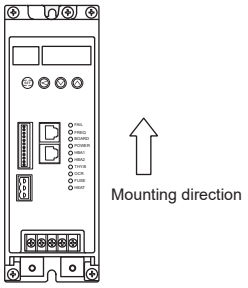
Unit : mm

○ 20A, 30A, 45A, 60A type

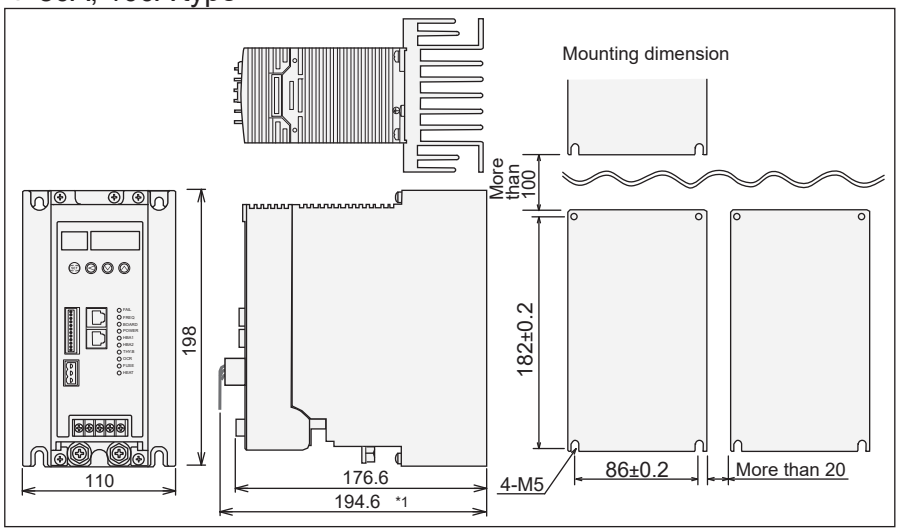


	20A,30A	45A,60A
A	143.9	168.9
B	161.9	186.9

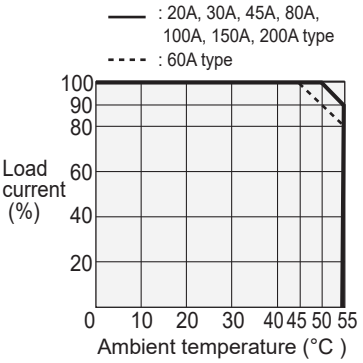
• Install the instrument as illustrated in the drawing to increase the cooling effect.



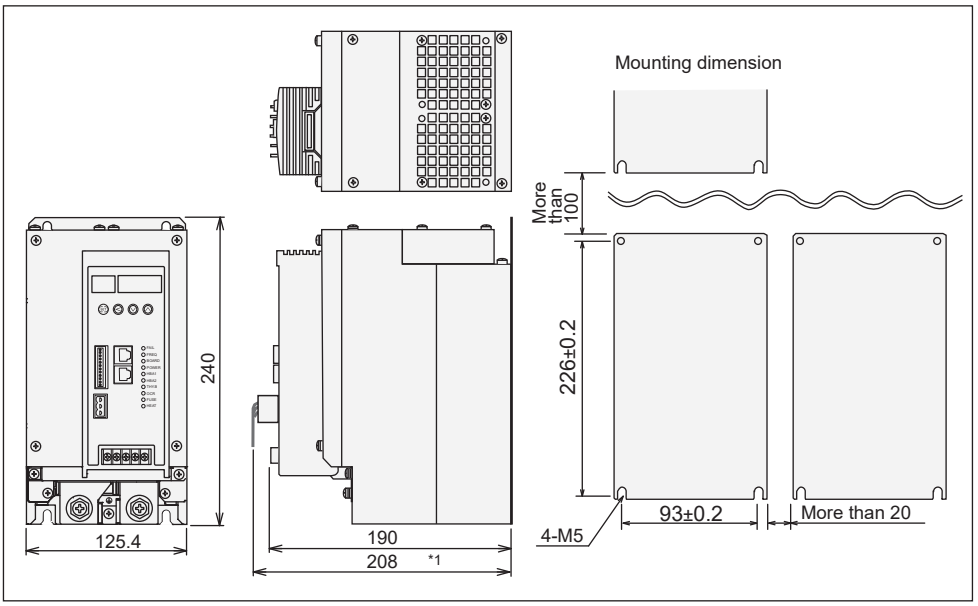
○ 80A, 100A type



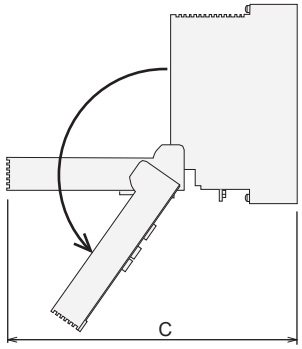
• Temperature characteristics of load current



○ 150A, 200A type



• The front of the instrument can be opened to allow replacement of the fast-blow fuse.
When installing the instrument, leave enough space to allow the cover to be opened.

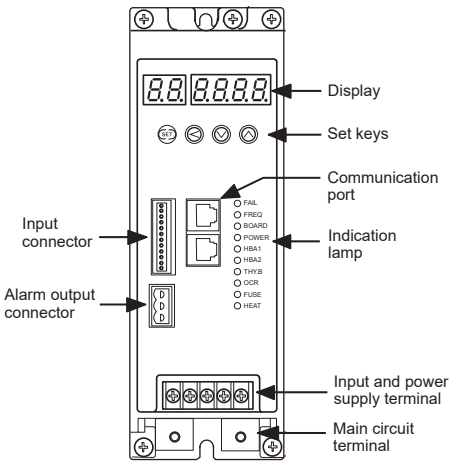


C

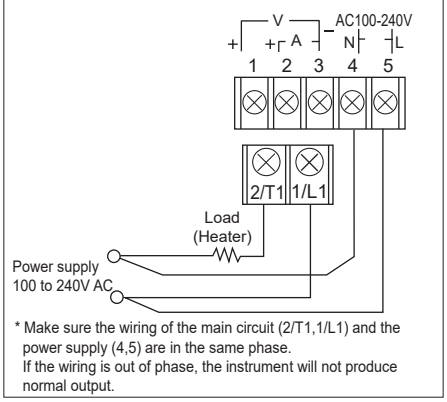
20A,30A	45A,60A	80A,100A	150A,200A
276	301	311	322

*1 : Length includes that of an optional connector, but space for wiring to connector is not included.

External Wiring

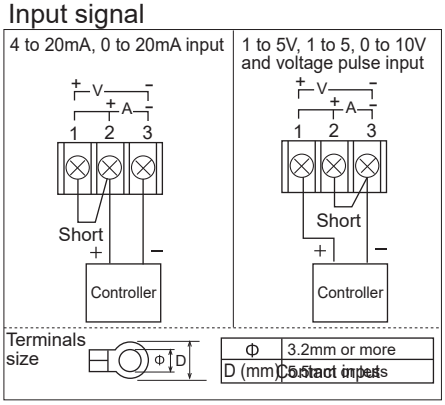


Main circuit terminal

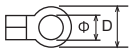


* Make sure the wiring of the main circuit (2/T1,1/L1) and the power supply (4,5) are in the same phase.
If the wiring is out of phase, the instrument will not produce normal output.

Input signal



Terminals size



Item \ No.	T1,L1			1 to 5
	20A/30A	45A/60A	80A/100A	
Φ	4.3mm or more	6.4mm or more	8.4mm or more	3.2mm or more
D (mm)	9.5mm or less	13.2mm or less	22.6mm or less	5.5mm or less

Indication Lamp

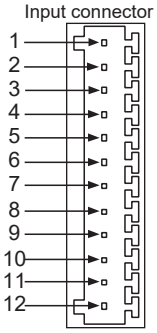
INDICATION LAMP
- FAIL
- FREQ
- BOARD
- POWER
- HBA1
- HBA2
- THY.B
- OCR
- FUSE
- HEAT

Lamp	Contents
FAIL	FAIL(Self-diagnostic abnormality)
FREQ	Power frequency abnormality
BOARD	Board abnormality
POWER	Power supply voltage abnormality
HBA1	Heater break alarm SV1
HBA2	Heater break alarm SV2
THY_B	Thyristor break alarm
OCR	Over current alarm
FUSE	Fuse break alarm
HEAT	Heat sink temperature abnormality

* Up to two alarm set points can be set for the heater break alarm.
* Fuse break alarm lamp is available when a fast blow fuse with fuse break alarm output is used.

Connector

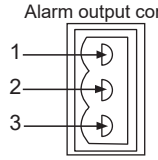
Input connector



* Connector (Plug side) is optional.

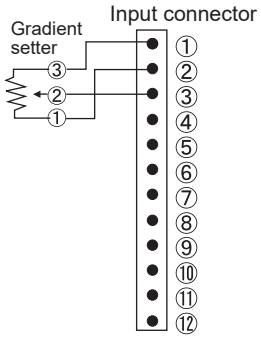
Pin No.	Contents	
1	+5V (Gradient setting input)	
2	0V (Gradient setting input)	
3	Gradient setting input (0 to 5V input by gradient setter)	
4	+5V (Manual setting input)	
5	0V (Manual setting input)	
6	Manual setting input (0 to 5V input by manual setter)	
7	External contact input 1 (DI1)	
8	External contact input 2 (DI2)	
9	External contact input 3 (DI3)	
10	0V (External input)	• Pins 10-12 are internally connected.
11	0V (External input)	
12	0V (External input)	

Alarm output connector

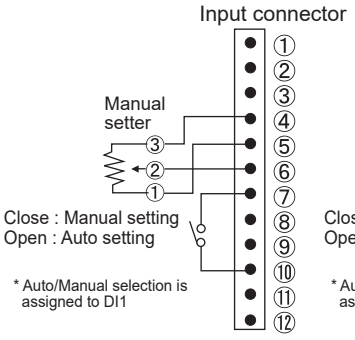


Pin No	Contents
1	Digital output 1 (DO1) : Relay contact output
2	Digital output 2 (DO2) : Relay contact output
3	COM : Common

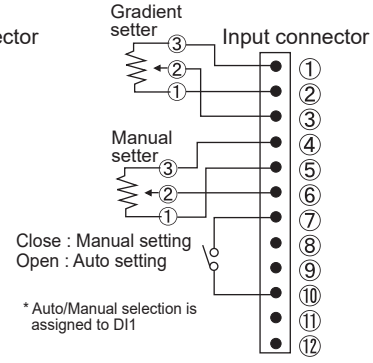
• Auto setting (With gradient setter)



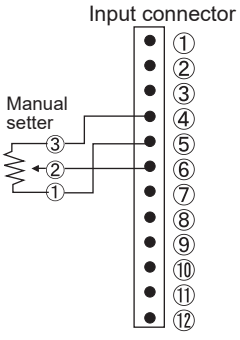
• Auto/Manual setting selection



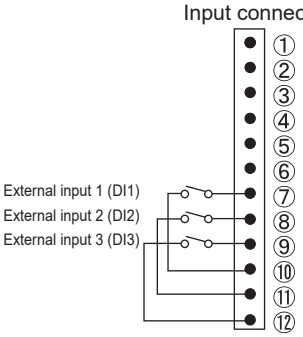
• Auto/Manual setting selection (With gradient setter)



• Manual setting (With manual setter)



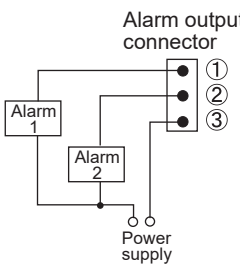
• External contact input



• External contact input can be assigned from function below.

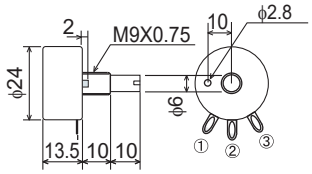
RUN/STOP
Auto/Manual
Alarm interlock reset
Heater break alarm function : Use/Unuse
Soft start : Use/Unuse
Key lock : Use/Unuse
Over current alarm : Use/Unuse
Memory area selection (DI 2 points)

• Alarm output

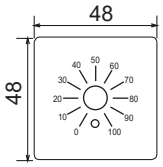


Accessories

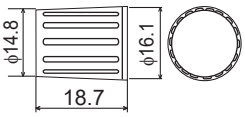
• Gradient setter, Manual setter, High/Low setter : THV1P-S01 Unit : mm



Volume (Resistance:5kΩ,B)



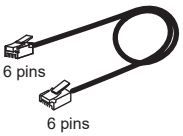
Scale plate

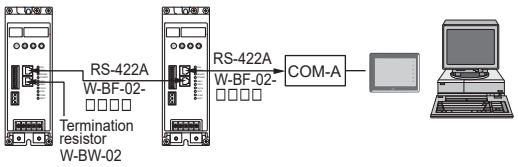


Knob

• RS-422A Communication cable

Model Code :
W-BF-02-500 (0.5m)
W-BF-02-1000 (1m)
W-BF-02-3000 (3m)





• Termination resistor connector

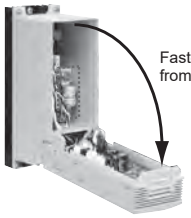
Model : W-BW-01
(For RS-485)
Model : W-BW-02
(For RS-422A)

• Model code * Please refer to the following codes to order accessories.

Name	Model Code
Setter	THV1P-S01
Input connector (plug)	THWP-C01
Alarm output connector (plug)	THVAP-C01

Name		Model Code
Fast-blow fuse	20A	THVAP-F20
	30A	THVAP-F30
	45A	THVAP-F45
	60A	THVAP-F60
	80A *1	THVAP-F45 (2 pieces)
	100A *1	THVAP-F60 (2 pieces)
	150A *1	THVAP-FB0 (2 pieces)
	200A *1	THVAP-FC0 (2 pieces)

*1 : A fast-blow fuse for 80A uses two 45A rapid blow fuses (THVAP-F45).
A fast-blow fuse for 100A uses two 60A rapid blow fuses (THVAP-F60).
A fast-blow fuse for 150A, 200A uses two rapid blow fuses
(150A:THVAP-FB0, 200A:THVAP-FC3).



Designed for load voltage 380 to 480V AC

• CE marking : A specified noise filter must be used.

THV-40

General Description

As the THV-40 single phase power control unit can be used with control modes selectable from constant voltage, constant current and constant power, it can be used with such heaters as noble metals (Platinum and molybdenum), super Kanthal, and SiC (Silicon Carbide) that have changing resistance in accordance with temperature changes.
Optional features like heater break alarm and communication can improve system safety and establishment of a supervisory system.

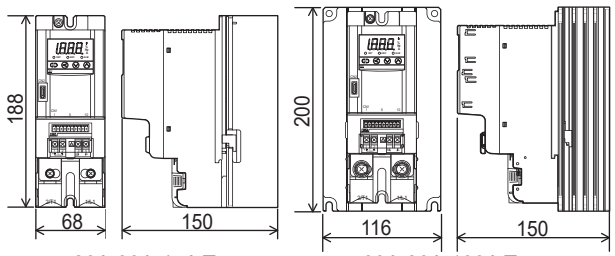
Features

- ☆ Control type selection (Phase-angle/continuous zero-cross/zero-cross)
- ☆ Loader communication function
- ☆ Detects heater break of non-linear load
- ☆ Ramp-up, Ramp-down
- ☆ Gradient setting
- ☆ Output Limiter High and Low
- ☆ Base-up Setting (output bias)
- ☆ Output mode selection (Proportional electric power/voltage/phase angle)
- ☆ Digital input for Auto/manual

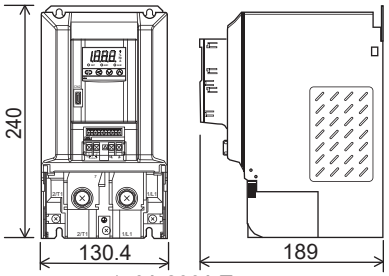
Output Device

Compact Size

(Unit : mm)



20A,30A,45A Type　　60A,80A,100A Type

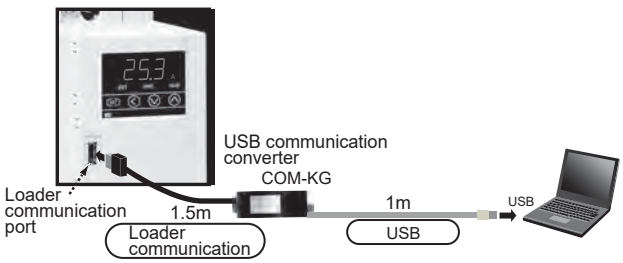


150A,200A Type

• The height of connector installed on the instrument is lower than the front panel.

Loader communication

The THV-40 has a standard loader port to connect a PC USB port via COM-KG (USB communication converter).
Using PROTEM2 software on the PC, parameter setting can be easily done from a PC.



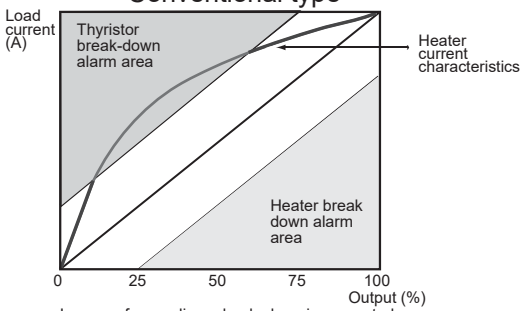
Easy and accurate setting

Single phase power controller THV-40 has an LED display to show set values and input signals, and front keys for easy setting and monitoring. Setting can also be made with an external setting unit (variable resistor).

Detects heater break of non-linear load

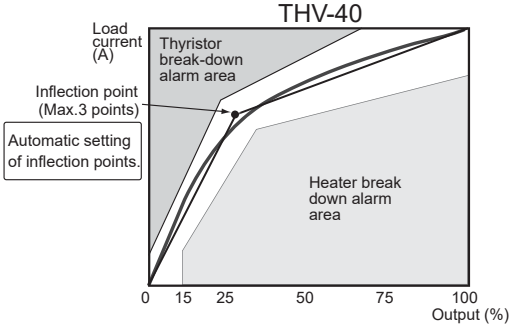
Heater break alarm can be used at up to three inflection points in accordance with heater characteristics. The unit can be used with a load with large resistance changes by temperature (e.g. lamp heaters). There is no need of calculation for inflection points as automatic setting is possible.

Conventional type



In case of a non-linear load, alarm is generated even in the normal state.

THV-40



Heater break alarm can be used with a non-linear load.

Specifications

Maximum Load Current
20A AC, 30A AC, 45A AC, 60A AC, 80A AC, 100A AC, 150A AC, 200A AC

Control Method
Phase control, Zero-cross control (Selectable)

Applicable Load
Phase control : Linearity (R:Resistor) load, CControl of primary side of a transformer (The magnetic flux density must be 1.25T [12,500 Gauss] or less when the protection function for control of primary side of a transformer is not provided.) *1
Zero-cross control : Linearity (R:Resistor) load

Input Signal
Current input 4 to 20mA DC (Input impedance : 50Ω)
Voltage input 1 to 5V DC (Input impedance : 30kΩ)
Voltage input 0 to 10V DC (Input impedance : 30kΩ)
Voltage pulse input 0/12V DC (Input impedance : 30kΩ)

Output mode
a) Proportional phase angle • Proportional voltage • Proportional square voltage
[when phase control is selected for linearity load (R: resistor)]
b) Constant current control
• a) : Standard function, b): Optional function

Input sampling cycle
0.5 cycle of power cycle

Minimum Load Current
20A : 0.6A (at 98% output of rated voltage)
30A or more : 1A (at 98% output of rated voltage)

Output Voltage Range
0 to 98% of rated voltage

Power OFF leakage current
Approx. 30mA AC (load voltage 480V rms, 60Hz, Ta=25ºC)

Power Supply Voltage
For load : 323 to 528V AC (Including power supply voltage variation)
[Rating : 380 to 480V AC]
For control : 85 to 264V AC (Including power supply voltage variation)
[Rating : 100 to 240V AC]

Power Frequency
50/60Hz (Automatic discriminating)

Allowable Power Frequency Variation
Power supply voltage for load 50±1Hz, 60±1Hz
Power supply voltage for control 50±2Hz, 60±2Hz

Allowable Ambient Temperature
-15 to +55ºC (Operation guarantee range)

Operating ambient humidity
5 to 95%RH (Non-condensing)
Absolute humidity : MAX.W.C 29.3g/m^3 dry air at 101.3kPa

Cooling method
20A,30A,45A,60A,100A type : Natural convection
150A,200A type : Air cooling (Built-in cooling fan)

Dielectric voltage
Between main circuit terminals, power terminals for control and heat sink 2500V AC for one minute.
Between main circuit terminals, heat sink and input terminals 2500V AC for one minute.
Between power terminals for control and input terminals 2300V AC for one minute.

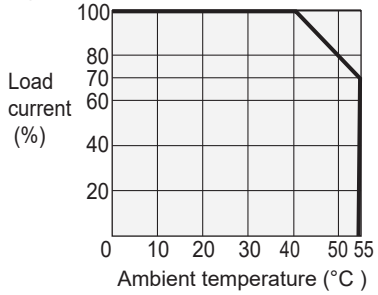
Insulation resistance
Between main circuit terminals, power terminals for control and heat sink 20MΩ or more (500V DC)
Between main circuit terminals, heat sink and input terminals 20MΩ or more (500V DC)
Between power terminals for control and input terminals 20MΩ or more (500V DC)

Mounting Method
Vertical mounting

Weight
Approx. 1.3kg (20A, 30A, 45A), Approx. 1.8kg (60A, 80A, 100A)
Approx. 3.7kg (150A,200A)

Power consumption
20A,30A,45A,60A,100A type
Less than 5VA (at 100V AC), Rush current 5.6A or less
Less than 8VA (at 240V AC), Rush current 13.3A or less
150A,200A type
Less than 12.5VA (at 100V AC), Rush current 21A or less
Less than 22.0VA (at 240V AC), Rush current 55A or less

● Temperature characteristics of load current



Self-diagnostic function
a) Data check, Back-up check, A/D converter check, Watch dog-timer, Power supply voltage check
b) Action at abnormality : Thyristor output OFF, FAIL output open

Output Setting Range
Gradient setting : 0.0 to 200.0% [Front key], 0 to 100% [External setting unit]
Output limiter (High) : 0.0 to 100.0% [Front key]
Output limiter (Low) : 0.0 to 100.0% [Front key]
Output limiter at start-up (High) : 0.0 to 100.0% [Front key]
Output limiter time at start-up (Low) : 0 to 600 sec [Front key]
Base-up setting (Output bias) : -9.9 to 100.0% [Front key]
Manual setting : 0.0 to 100% [Front key], 0 to 100% [External setting unit]

Standard functions
• Auto/Manual selection (External manual setting unit is optional)
• Gradient setting (External setting unit is optional)
• Soft-up/Soft-down : 0.0 to 100.0sec
• Digital input (DI) : 1 points, Non-voltage contact input
(Phase control/Zero-cross control (Continuous proportional)
RUN/STOP, Auto/Manual, Heater break alarm : Use/Unuse,
Soft-up/Soft\down :Use/Unuse
Setting data lock : Use/Unuse, Over current alarm : Use/Unuse
(Selectable)
• Heat sink temperature abnromality (150A, 200A type)
• ON/OFF control (External setting units are optional)
• Loader communication : ANSI/RKC standard protocol
Connection : COM-K loader cable

Option function
• Alarm output : 1 point
Open collector output, Sink type
Maximum load current : 100mA,
Load voltage : Less than 30V DC
Energized/De-energized is selectable. (FAIL is de-energized only)
(Heater break alarm, Thyristor break alarm, Power frequency abnormal, Over current alarm, Heat sink temperature abnromality, FAIL)
* Selectable
• Heater break alarm
Current measuring accuracy : ±5% of rated load current or ±2A (Whichever is larger)
• Load current limiter
Setting range : 0.0 to 22.0A (20A type)
0.0 to 33.0A (30A type)
0.0 to 50.0A (45A type)
0.0 to 66.0A (60A type)
0.0 to 88.0A (80A type)
0.0 to 110.0A (100A type)
0.0 to 165.0A (150A type)
0.0 to 220.0A (200A type)

Compliance with Standards
UL : 20A,30A,45A,60A,100A type
UL508 [POLLUTION DEGREE 2]
150A,200A type
UL60947-4-1A [POLLUTION DEGREE 2]
cUL : 20A,30A,45A,60A,100A type
CAN/CSA-C22.2 No.14 [POLLUTION DEGREE 2]
150A,200A type
CAN/CSA-C22.2 No.60947-4-1 [POLLUTION DEGREE 2]
CE marking : LVD : EN60947-4-3
POLLUTION DEGREE 2,
EMC : EN60947-4-3
• A specified noise filter must be used
SOSHIN ELECTRIC CO., LTD
NF3020C-SVB (20A), NF3030C-SVB (30A)
NF3050C-SVB (45A), NF3060C-SVB (60A)
HF3080C-SZC (80A), HF3100C-SZC (100A)
HF3150C-SZC (150A), NF3200C-VZ (200A)

*1 : If momentary power failure occurs during execution of the control of primary side of a transformer, inrush current is generated.
Protection function for control of primary side of a transformer is to protect the thyristor from the inrush current.

● Table of Stability

Function	Operating condition	Stability
Constant current variation	Power supply variation : Within ±10% Load variation : 2 times	Within ±10% of rated current

● Table of internal calorific value

Rated load current (A)	20	30	45	60	80	100	150	200
Internal calorific value (W)	30	43	63	84	112	140	200	250

Features

Three Types of Control Mode (Selectable)

● Phase control

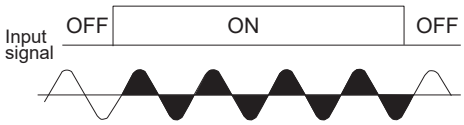
The wave form of the load power is switched at a desired phase angle q to provide smooth control.

● Zero-cross control (Continuous proportion)

Power is switched on and off when the supply voltage is at 0V. This system suppresses high frequency noise inherent to phase control.

● Zero-cross control (Input synchronization system)

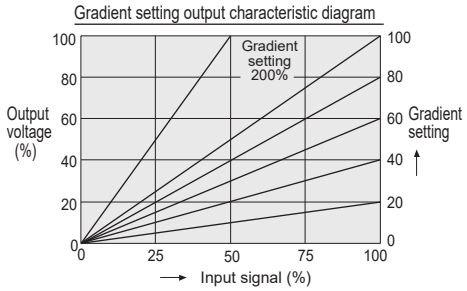
Supply voltage is switched on and off according to the voltage pulse and contact signals from a controller.



Gradient Setting

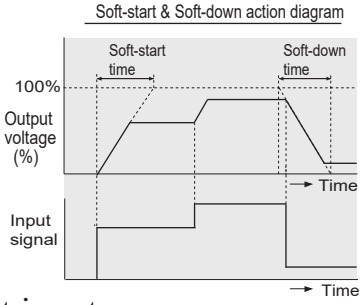
The relation between the setting input and the output voltage can be set. Gradient setting is possible via front keys or an external setter. Control characteristics may vary with the setting as follows.

1. Auto setting input X Internal gradient setting X External gradient setting
2. Auto setting input X Internal gradient setting
3. Manual setting X Internal gradient setting X External gradient setting



Ramp Function (Soft-start & Soft-down)

Even if setting input changes abruptly, output changes slowly to suppress inrush current. Ramp-up (Start-up) and ramp down (Start-Down) time can be set in the range of 0.1 to 99.9 sec via front keys.



Event input

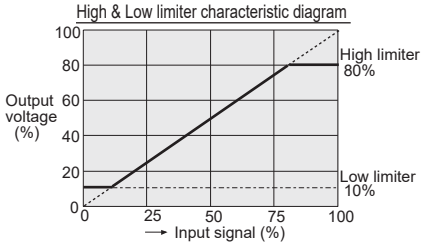
Functions can be assigned to one external contact inputs. Switching of functions can be made externally with contact signals.

Phase control/Zero-cross control (Continuous proportional)
RUN/STOP
Auto/Manual
External manual/Internal Manual
Heater break alarm : Use/Unuse
Soft-up/Soft\down :Use/Unuse
Setting data lock : Use/Unuse
Over current alarm : Use/Unuse

• Heater break alarm and over current alarm selection are optional.

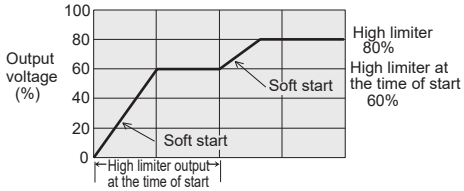
Output limiter (High & Low)

Highest and lowest output values can be set via front keys.



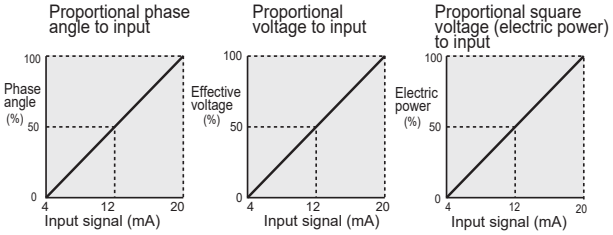
Output limiter High at start-up

This function limits the highest output for the period of a preset time after power-ON and control mode change from Stop to Run. It makes the THV-A1 Series suitable for heaters which cause rush current flow, such as Halogen lamp, Tungsten, Platinum, and Molybdenum heaters.



Output modes

When phase control is selected for linear load (R: resistor), output mode can be selected among Proportional phase angle to input, proportional voltage to input and proportional square voltage (electric power) to input.



Protection function for control of primary side of a transformer (Optional)

If momentary power failure occurs during execution of the control of primary side of a transformer, inrush current is generated. Protection function for control of primary side of a transformer is to protect the thyristor from the inrush current.

To control the primary side of the transformer, it is recommended to purchase a THV-40 with a protection functionfor control of primary side of a transformer.

Heater break alarm (Optional)

This function measures load current and compares it with a heater break alarm set value. Alarm will be activated if the load current goes into alarm ranges.

(Note) For phase control, heater break alarm does not work when the load current is less than 15% of maximum load current.

Load current limiter (Optional) (For phase control only)

This function limits the load current value to the heater. The setting range is 30 to 100% of the rated current.

(Note) If the load has a large inrush current, use soft-start function along with this function to suppress the inrush current. This function alone can not prevent the inrush current.

Constant current control (Optional) (For phase control only)

This function maintains the output current constant when a load or a power supply fluctuates. It makes the THV Series suitable for heaters of which resistance greatly changes by temperature change, such as Platinum, Molybdenum, Tungsten, and Kanthal heaters.

Alarm output (Optional)

The alarm types are Power frequency abnormal, Fuse break alarm, Thyristor break alarm, Heater break alarm and FAIL. Alarm output will go on, when any of them goes in alarm status.

(Alarm output : 1 points, Energized/De-energized is selectable. FAIL is De-energized (Fixed.)

Model and Suffix Code

Specifications	Model and Suffix Code						
Type	Single phase 380 to 480V AC THV-40	PZ □ − □ ∗ □	□	□	□		
Control method	Phase control/Zero-cross control (programmable, default: phase control)	PZ					
Rated load current	20A AC		020				
	30A AC		030				
	45A AC		045				
	60A AC		060				
	80A AC		080				
	100A AC		100				
	150A AC		150				
	200A AC		200				
*1 Input signal	0 to 10V DC			5			
	1 to 5V DC			6			
	4 to 20mA DC			8			
	Voltage pulse input 0/12V DC			V			
• Heater break alarm • Current limiter • Constant current control	No function				N		
	Heater break alarm, Current limiter, Constant current control, Protection function for control of primary side of a transformer				H		
	Non-linear resistance heater break alarm, Current limiter, Constant current control, Protection function for control of primary side of a transformer				B		
Alarm output	No alarm output					N	
	Alarm output 1 point * Connector for Input/Output (Plug) is necessary, Specify accessories code (-9).					A	
*2,*3 Accessories	Setter (Volume, knob, Scale plate) 1 unit + Connector for Input/Output (Plug)						-1
	Setter (Volume, knob, Scale plate) 2 units + Connector for Input/Output (Plug)						-2
	Fuse unit (Fast-blow fuse + Holder [1 circuit type] * Only for 20A,30A,45A,60A,80A,100A type						-6
	UL type Fuse unit (Fast-blow fuse + Holder [1 circuit type]) Clamped input terminal type						-7
	Connector for Input/Output (Plug)						-9

*1 : Input signal is programmable. When contact input is required, specify the connector for input as an accessory (Either of -1, -2, or -9).
*2 : Setters are for external gradient setting, external manual setting, and external high/low setting for on/off control. Use two units of setter in the following cases;
• When external gradient setting and external manual setting are required.
• High/low setting for on/off control is used.
*3 : It is possible to specify more than one accessories by adding suffix code at the end.
Example: -1-6 : Setter (Volume, knob, Scale plate) 1 unit + Connector for input/output (Plug)
-1-2-9 cannot be specified simultaneously.

CAUTION
The supply voltage to the THV-40 is 100 to 240V AC.
If you need a stepdown transformer, we are ready to supply such a transformer.

● Step-down transformer (Sold separately)

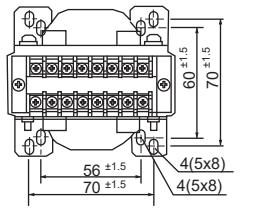
Model Code
CH1-4H381-006

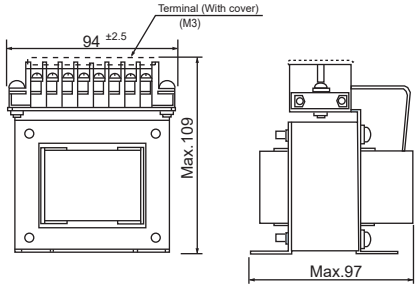
• Manufactured by CHUO ELECTRIC INDUSTRY Co.,Ltd

External Dimensions

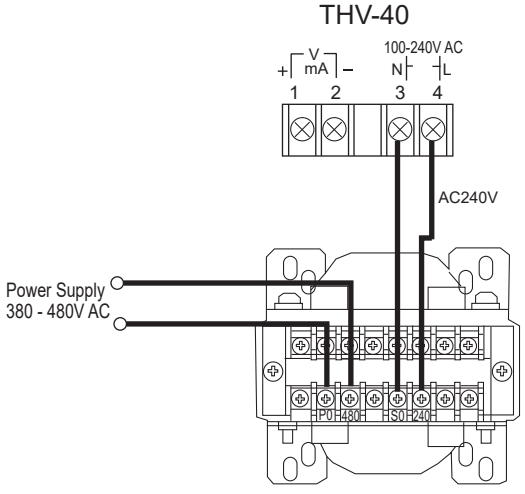
Unit : mm

Weight : Approx.1.8kg





External Wiring

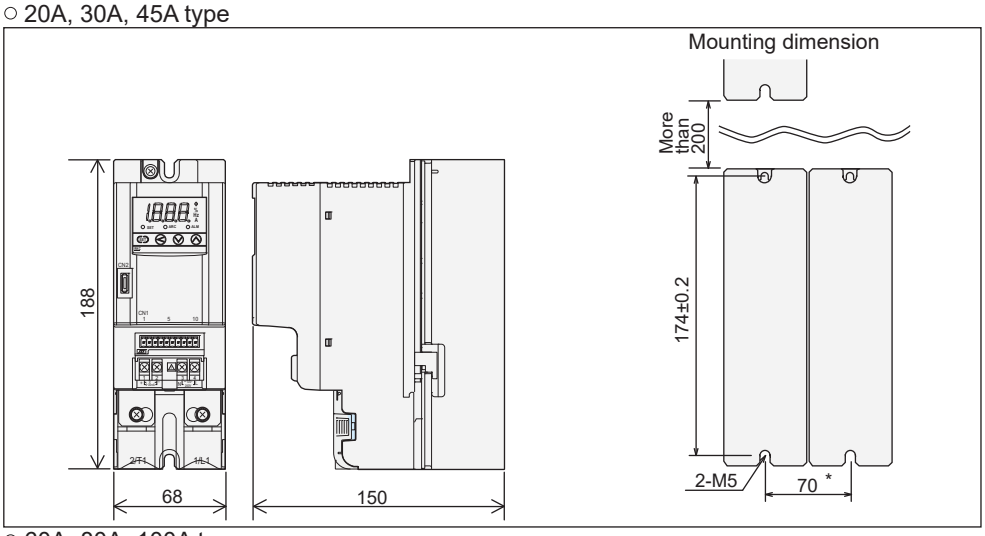


Output Device

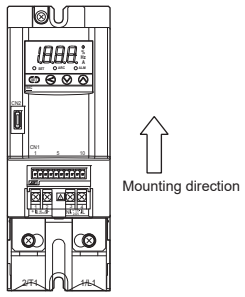
External Dimensions

Unit : mm

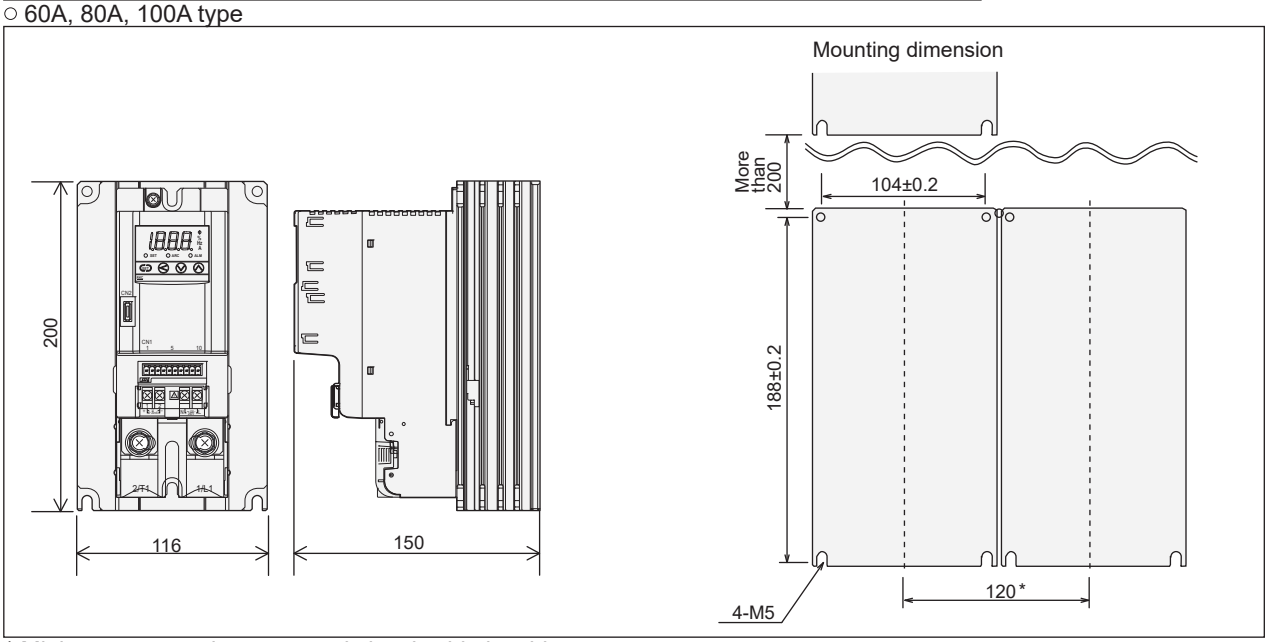
○ 20A, 30A, 45A type



• Install the instrument as illustrated in the drawing to increase the cooling effect.

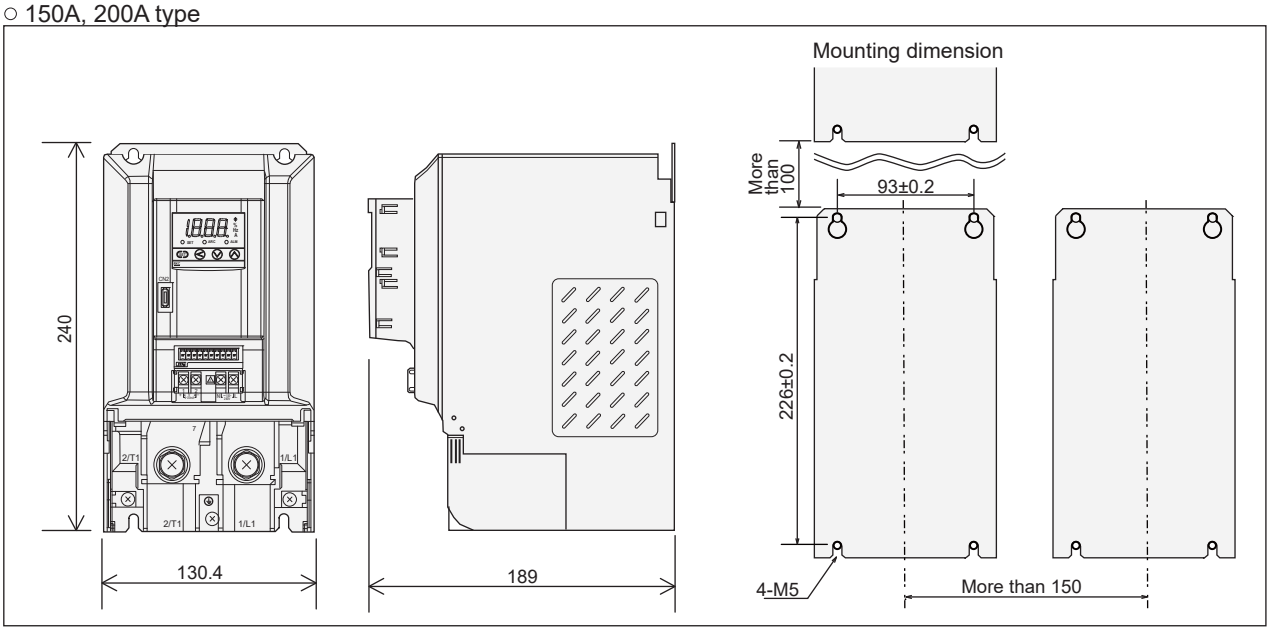


○ 60A, 80A type



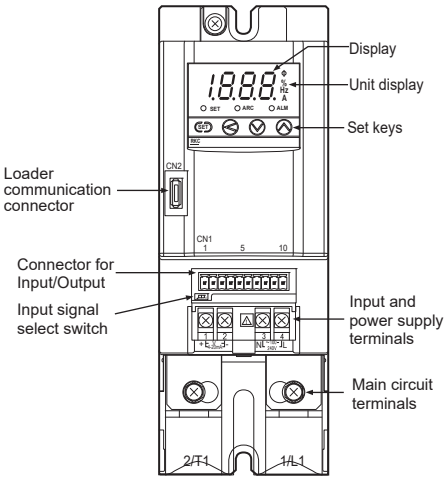
* Minimum space when mounted closely side by side.

○ 150A, 200A type

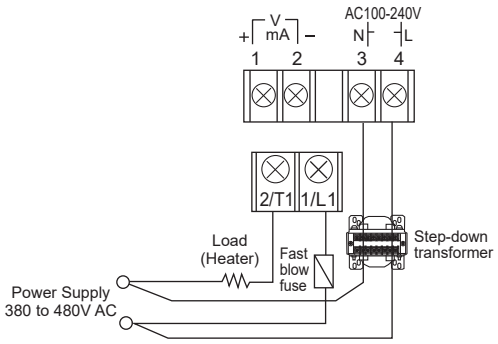


* 150A/200A type is not available for close mounting.

External Wiring



Main circuit terminal



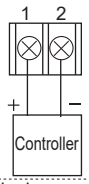
* Make sure the wiring of the power supply for control and the power supply for load are in the same phase. If the wiring is out of phase, the instrument will not produce normal output.

Terminal screw size

	20A/30A	45A/60A	80A/100A	150A/200A
Power supply for control (2/T1, 1/L1)	M4 X 16	M6 X 16	M8 X 20	M10 X 25
Power supply for load (3, 4)	M3 X 7 (With 5.8X 5.8 square washer)			

Input signal

4 to 20mA DC, 1 to 5V DC
0 to 10V DC, 0/12V DC



Terminal screw size
M3X7 (With 5.8X 5.8 square washer)

Indication Lamp

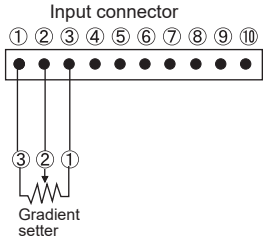
Lamp	Contents
SET	Setting mode lamp
ARC	Knee points calculation lamp. (When a Non-linear resistance heater break alarm is use.)
ALM	Alarm lamp

Connector

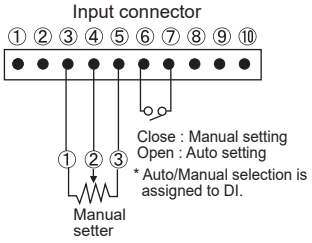
* Connector (Plug side) is optional.

Pin No.	Contents
1	+2.5V (Gradient setting input)
2	Gradient setting input (0 to 2.5V input by gradient setter)
3	0V (Gradient setting input, Manual setting input)
4	Manual setting input (0 to 2.5V input by manual setter)
5	+2.5V (Manual setting input)
6	External contact input : DI +
7	0V (External contact input) : DI -
8	Unused
9	Open collector output (Alarm output) : DO (+)
10	Open collector output (Alarm output) : DO (-)

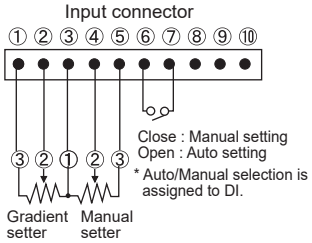
• Auto setting (With gradient setter)



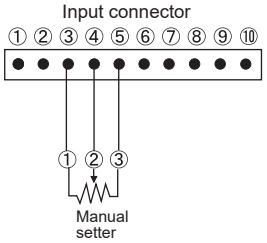
• Auto/Manual setting selection



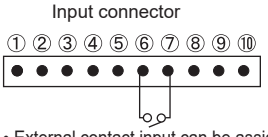
• Auto/Manual setting selection (With gradient setter)



• Manual setting (With manual setter)



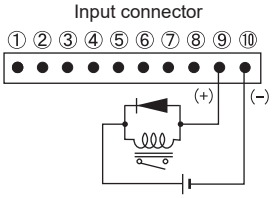
• External contact input



• External contact input can be assigned from function below.

Phase control/Zero-cross control (Continuous proportional)
RUN/STOP
Auto/Manual
External manual/Internal Manual
Heater break alarm : Use/Unuse
Soft-up/Soft\down :Use/Unuse
Setting data lock : Use/Unuse
Over current alarm : Use/Unuse

• Alarm output

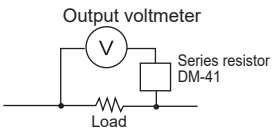


* When a relay is used, connect an external diode or use a relay with diode inside.

• Alarm output can be assigned from function below.

Heater break alarm 1
Heater break alarm 2
Power frequency abnormal
FAIL(De-energized (Fixed.))
Thyristor break alarm 1
Thyristor break alarm 2
Over current alarm

• Wiring of Output voltmeter

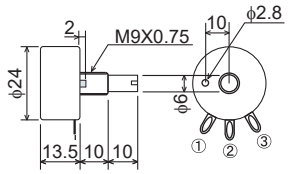


* The output voltmeter is provided with a series resistor

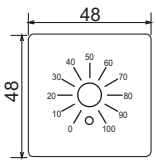
Accessories

Unit : mm

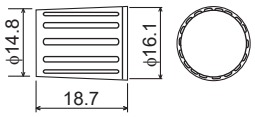
• Gradient setter, Manual setter, High/Low setter : THV1P-S01



Volume (Resistance:5kΩ,Type B)



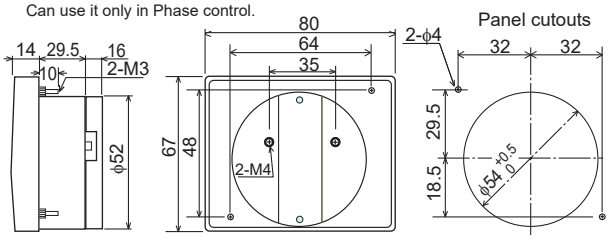
Scale plate



Knob

• Output voltmeter : THV4P-V03

Can use it only in Phase control.

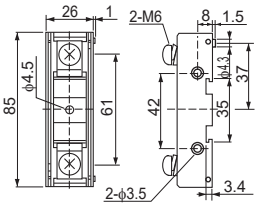


*The output voltmeter is provided with a series resistor (DM-41).

• Fuse Holder

•Holder for THV4P-F20/F30/F45/F60/F80/FA0 (UL Not available) Screw Mounting or DIN rail mounting

Model Code	Name
THV4P-H01	Holder



•Holder for THVP-F2B/F3B/F4B/F6B/F8B/FAB (UL type) DIN rail mounting

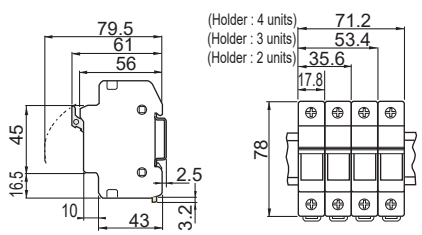
• Clamped input terminal type

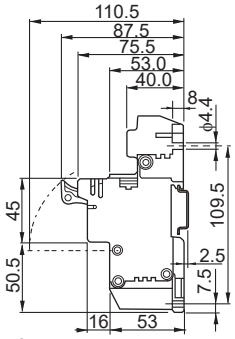
For THVP-F2B/F3B (20A/30A type)

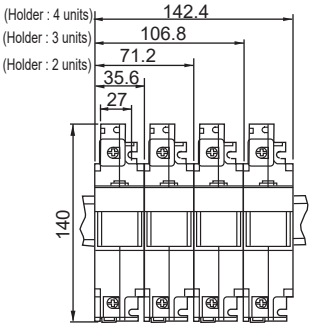
Model Code	Name
THVP-H04	UL type Holder

For THVP-F4B/F6B/F8B/FAB (45A/60A/80A/100A type)

Model Code	Name
THVP-H05	UL type Holder





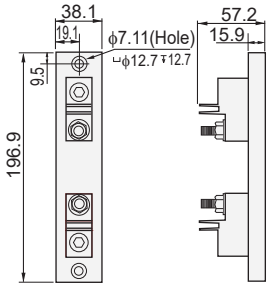


• UL type Fast-blow fuse and Fuse holder
: Manufactured by SIBA GmbH & Co.KG (Germany)

• Holder for THV4P-FBB/FCB (UL Type) Screw Mounting

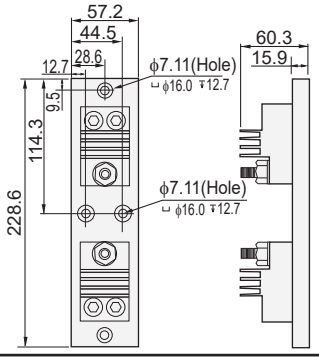
For THV4P-FBB(150A)

Model Code	Name
THVP-H06	UL type Holder



For THV4P-FCB(200A)

Model Code	Name
THVP-H07	UL type Holder



• UL type Fast-blow fuse and Fuse holder
: Manufactured by Littelfuse, Inc. (America)

• Model Code

• Please refer to the following codes to order accessories.
• The rating of the fast-blow fuse may be different from the current rating of the THV-40 main unit.

Name		Code	Note
Setter		THV1P-S01	
Output voltmeter		THV4P-V03	• Manufactured by Daiichi Electronics Co., Ltd. : LSK-8CH
Connector for Input/Output (Plug)		THV4P-C01	
*1 Fast-blow fuse	20A	THV4P-F20	660GH-25UL
	30A	THV4P-F30	660GH-40UL
	45A	THV4P-F40	660GH-63UL
	60A	THV4P-F60	660GH-80UL
	80A	THV4P-F80	660GH-100UL
	100A	THV4P-FA0	660GHX-125
Fuse holder (For THV4P-F20/F30/F45/F60/F80/FA0)		THV4P-H01	HT6017
Step-down transformer		CH1-4H381-006	• Manufactured by CHUO ELECTRIC INDUSTRY Co.,Ltd

*1:Fast-blow fuse and Fuse holder : Manufactured by HINODE Electric Co. Ltd.

Name		Code	Note
*2 UL/CE Marking type Fast-blow fuse	20A	THVP-F2B	5017906(20A)
	30A	THVP-F3B	5017906(30A)
	45A	THVP-F4B	5014006(50A)
	60A	THVP-F6B	5014006(63A)
	80A	THVP-F8B	5014006(80A)
	100A	THVP-FAB	5014006(100A)
	150A	THV4P-FBB	JLLS200X (200A)
	200A	THV4P-FCB	JLLS250X (250A)
UL/CE Marking type Fuse holder	20,30A	THVP-H04	5106305.1
	45,60,80,100A	THVP-H05	5106004
	150A	THV4P-H06	LFT602001CS
	200A	THV4P-H07	LFT604001CS

*2 :UL/CE Marking type Fast-blow fuse and Fuse holder
: Manufactured by SIBA GmbH & Co.KG (Germany)
*1 :UL type Fast-blow fuse and Fuse holder
: Manufactured by Littelfuse, Inc. (America)

MEMO

SSNP
SSNZ

Features

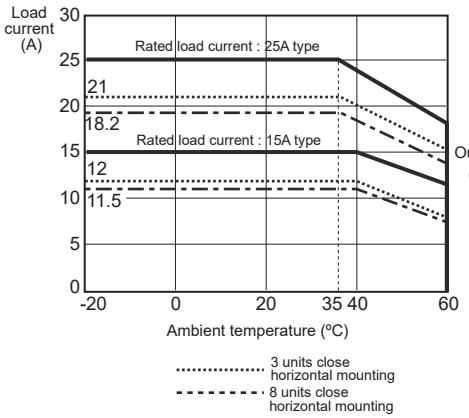
☆ Compact size, even with a heatsink
☆ Easily mounted on a DIN-rail
☆ Dimensions: 21.5 x 100 x 136.5 mm (WxHxD) or 0.85 x 3.9 x 5.3 inches
☆ Close mounting on DIN rail. 172mm wide (6.8 inches wide) for 8 units *1
*1 Maximum load current will vary depending on number of close mounted units.

Specifications

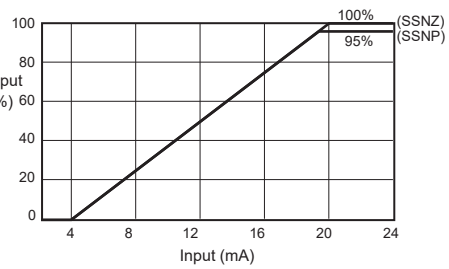
Control Method
Phase control (SSNP), Zero-cross control (SSNZ)
Rated Load Current
15A AC, 25A AC
Applicable Load
Linearity (R : Resistive) load
Input Signal
4 to 20mA (Input impedance : 250Ω)
Min. Load Current
100mA AC *1
Power OFF leakage current
9mA AC rms or less (load voltage 200V rms, 60Hz)
Output Voltage Range
0 to 95% of rated voltage (SSNP)
0 to 100% of rated voltage (SSNZ)
Response Time
1 cycle or less (without soft start) *2
Peak 1 Cycle Surge Current
15A type : 146A (50Hz)
25A type : 250A (50Hz)
Cooling Method
Natural convection
Power Supply Voltage
85 to 264V AC (Including power supply voltage variation)
[Rating : 100 to 240V AC]
Power Frequency
50/60Hz (Automatic discriminating)
Allowable Ambient Temperature
-20 to +60ºC
Allowable Ambient Humidity
5 to 95%RH (Non-condensing)
Dielectric resistance
Between input/volume, output terminals and case :
100MΩ or more (500V DC)
Dielectric Voltage
Between input/volume, output terminals and case :
1500V AC for one minute
Mounting direction
Vertical direction or horizontal direction *3
Mounting method
DIN rail or screw mounting
Net Weight
Approx. 260g
Standard Functions
Soft-start/Soft-down : Approx 0.5 to 13 sec (SSNP) *2
Approx 0.5 to 40 sec (SSNZ) *2
External volume (Manual control) 9mA, 240V AC
Compliance with Standards
• UL Recognized
• cUL Recognized

*1 Continuity angle tend to be narrower when the load with minute current applied. Please allow your time to pre-check the function.
*2 When using RKC's Potentiometer (Volume Setter) maximum output setting can reached when turned fully clockwise and minimum output when turned fully counter-clockwise. The ratings of approx.0.5 to 13sec (0.5 to 40 sec) shows changing time of the power from 0 to 100 or 100 to 0.
*3 When mounted is horizontal, please de-rate the load current by 70% of the specified ratings.

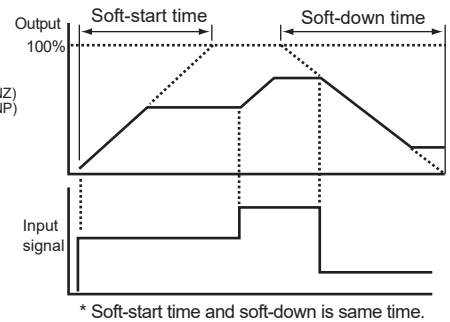
Temperature characteristics of load current



Input - Output characteristics



Soft-start/Soft-down



* Soft-start time and soft-down is same time.

Model and Suffix Code

Phase control

SSNP-15F
Rated load current : 15A

SSNP-25F
Rated load current : 25A

● Phase control (SSNP series)

The waveform of the load power is switched at a desired phase angle θ to provide smooth control.

Zero-cross control

SSNZ-15F
Rated load current : 15A

SSNZ-25F
Rated load current : 25A

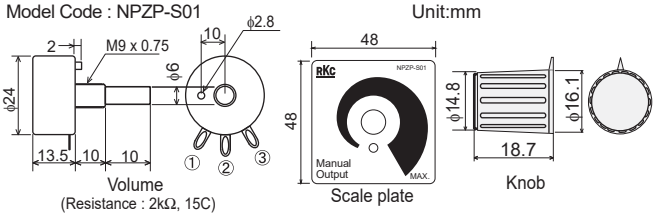
● Zero-cross control (SSNZ series)

Power is switched on and off when the supply voltage is at 0V. This system suppresses high frequency noise inherent to phase control.

Accessories

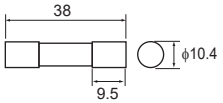
● Volume Setter (Potentiometer for Manual Setting)

Model Code : NPZP-S01 Unit:mm



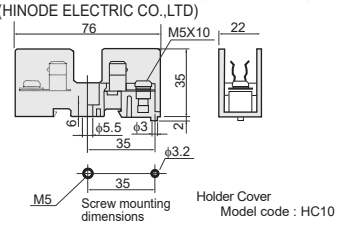
● Recommended fuse

Fast blow fuse (UL Recognized)
Model Code : 660CF15UL (For 15A)
Model Code : 660CF25UL (For 25A)
(HINODE ELECTRIC CO.,LTD)



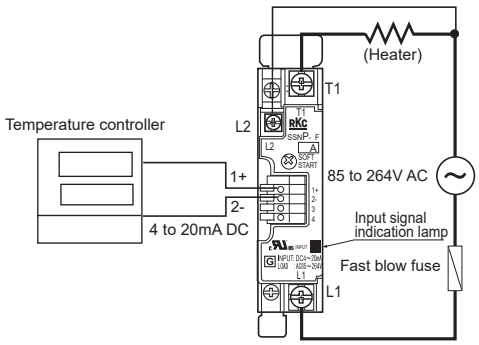
* Same dimension for 15 and 25A types.

Fuse holder
(UL Recognized, DIN rail or Screw mounting)
Model Code : HK1038UL (For 15A/25A)
(HINODE ELECTRIC CO.,LTD)

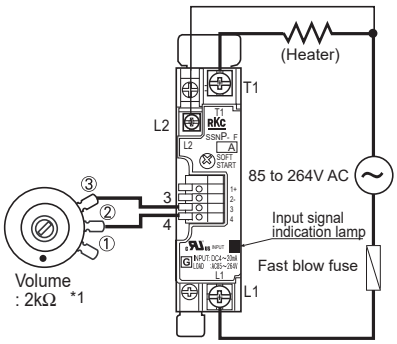


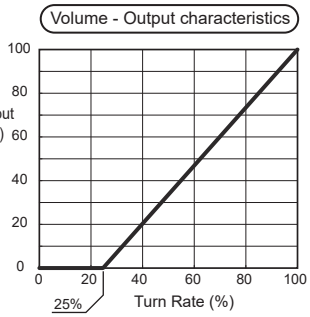
External Wiring

● Example of connection with temperature controller



● Example of manual control using external volume setter





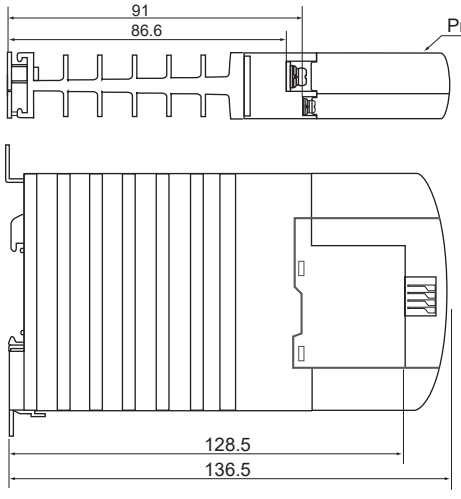
• A Temperature Controller can not be combined in this drawing. The SSN[ ] does not have a gradient setting function. Please see RKC's THV for this function.

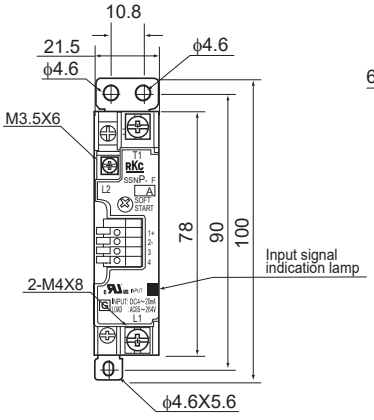
*1 Please purchase Volume Setter, NPZP-S01 separately.

External Dimensions

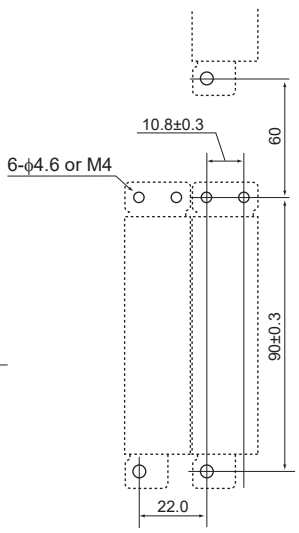
* Same dimension for 15 and 25A types.

(Unit:mm)





Screw mounting dimensions



THYCO-10

Thyristor unit

Solid state relay
for three phase
(SST)

Features

Power Controller (Phase angle control type)

Phase Angle Control

Model PHB of the THYCO-10 series is a SCR power controller with phase angle control.
Phase angle control provides accuracy through cutting part of the sine wave to control the power supply to the load.

Available in Ratings from 20 to 200 Amps

Model PHB is available in load current ratings from 20 to 200 amps, and in power supply voltage from 100 to 440VAC.

Wide Variety of Functions

Soft-start function is standard for all models.
As optional functions, Auto/manual transfer, output v.s. input signal ratio setting, fast-blow fuse, and fast-blow fuse break alarm are available.

Solid State Relay

Zero-Cross Control

Model SST are solid state relays with zero-cross control.

Available in Ratings from 10 to 30 Amps

Model SST is available in load current ratings from 10 to 30 amps.

Variety of Functions

The input lamp enables you to check the input signal from the controller.
The input side and the output side are completely isolated.
Optional solid-state element failure detecting function allows you to find the place of failure.

Model and Suffix Code

Power controller (Phase angle control)

Specifications	Model and Suffix Code							
Model		□	□	PHB–	□	□	□	
Phase type	Single phase Three phases	1 3						
Supply voltage	100V AC, 110V AC (Specify either) • Single-phase type only. 200V AC, 220V AC (Specify either) 380V AC 400V AC, 440V AC (Specify either)		1 2 3 4					
Control type	Phase control type			PHB				
Rated current	20A AC Maximum 30A AC Maximum 50A AC Maximum 70A AC Maximum 100A AC Maximum 150A AC Maximum 200A AC Maximum				020 030 050 070 100 150 200			
Load type	Linear (Resistive) load Inductive (L) load					R L		
Input signal	1 to 5V DC 4 to 20mA DC						6 8	
Options & nonstandard supply voltage	Auto/manual transfer, output v.s. input signal ratio setting Fuse break alarm (Available with fast-blow fuse function) High / Low control With fast-blow fuse Customized power supply voltage (Specify the voltage when ordering)							- 1 - 4 - 5 - F - T

SSR Unit

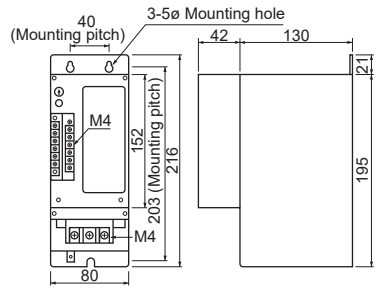
Specifications	Model and Suffix Code				
Model	Three phases SSR	SST–	□	F	□
Rated current	10A AC 20A AC 30A AC		10 20 30	F	
Function	No function Solid-state element break detect function				N A

External Dimensions

Unit:mm

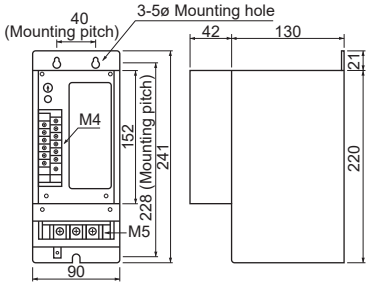
Single-phase power controller:1□PHB

20A, 30A type



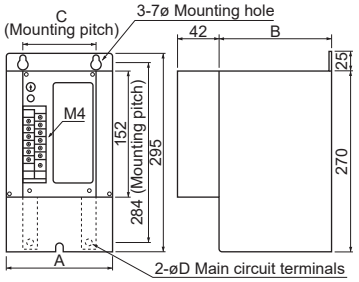
Net weight (kg)	
20A	1.9
30A	2.1

50A type



Net weight (kg)	
50A	2.7

70A, 100A, 150A, 200A type

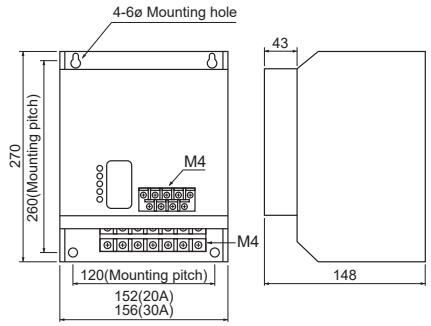


	70A,100A	150A,200A
A	120	140
B	177	222
C	60	80
øD	8.5	10.5

Net weight (kg)	
70A	4.2
100A	5.0
150A	7.4
200A	7.4

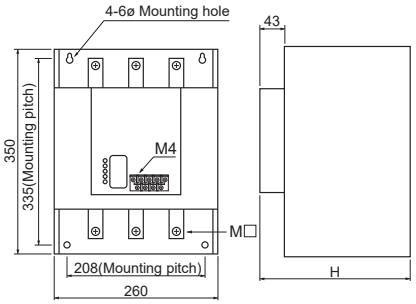
Three-phase power controller: 3□PHB

20A, 30A type



Net weight (kg)	
20A	3.0
30A	3.6

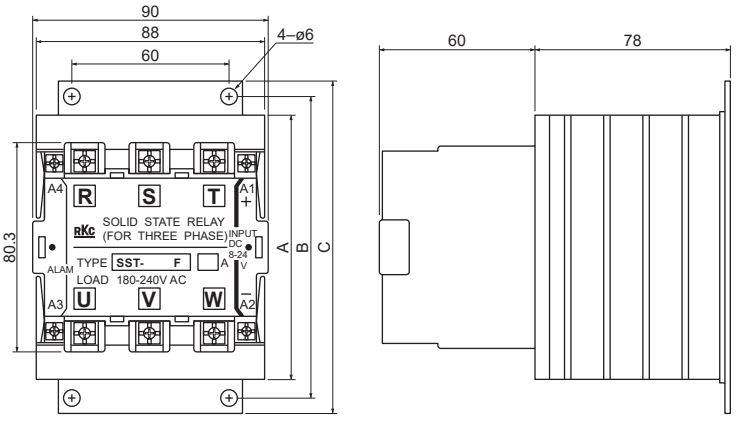
50A, 70A, 100A, 150A, 200A type



50A	H=193	M8
70A,100A	H=233	M8
150A,200A	H=253	M10

Net weight (kg)	
50A	8.8
70A	10.8
100A	11.4
150A	14.3
200A	19.3

Three-phase SSR unit: SST



	A	B	C
SST-10F□	80	92	104
SST-20F□	100	113	125
SST-30F□	145	158	170

THW-A

General Description

Three phase power controller has an LED display to show set values and input signals and front keys for easy setting and monitoring. Loaded with versatile standard functions, the THW operates at 100 up to 240V AC and automatically selects power supply frequency 50 or 60Hz.

The THW three phase power control unit can be used with control modes selectable from constant voltage, constant current and constant power, it can be used with such heaters as noble metals (Platinum and molybdenum), super Kanthal, and SiC (Silicon Carbide) that have changing resistance in accordance with temperature changes.

Features

☆ Control type selection
(Phase-angle/continuous zero-cross/zero-cross)
☆ Ramp-up, Ramp-down
☆ Gradient setting
☆ Output Limiter High and Low
☆ Base-up Setting (output bias)
☆ Output mode selection
(proportional electric power/voltage/phase angle)
☆ Digital input for Auto/manual

Three Types of Control Mode (Selectable)

● Phase control

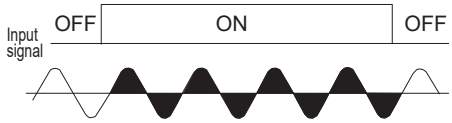
The wave form of the load power is switched at a desired phase angle q to provide smooth control.

● Zero-cross control (Continuous proportion)

Power is switched on and off when the supply voltage is at 0V. This system suppresses high frequency noise inherent to phase control.

● Zero-cross control (Input synchronization system)

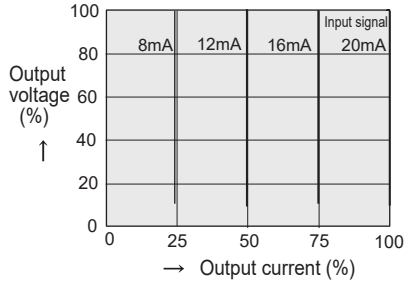
Supply voltage is switched on and off according to the voltage pulse and contact signals from a controller.



Constant current control (For phase control only)

This function maintains the output current constant when a load or a power supply fluctuates. It makes the THW Series suitable for heaters of which resistance greatly changes by temperature change, such as Platinum, Molybdenum, Tungsten, and Kanthal heaters.

Constant current control characteristic diagram



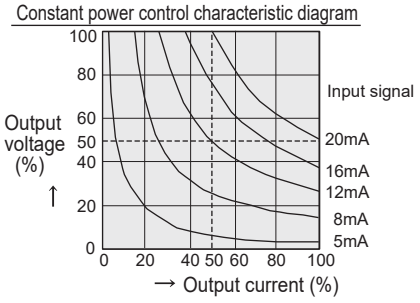
Constant power control (For phase control only)

This function controls the output to make its effective value power proportional to the input. It makes the THW Series suitable for heaters of which resistance gradually increases by temperature or time, such as silicon carbide type heater.

This function controls its effective value power at 50% of the rating shown in the diagram below.

• From the diagram below, constant power control is expressed as a curve obtained from a line between two points which is a 50% of the rating of the unit; a point at 100% voltage x 50% current and a point at 50% voltage x 100% current.

Constant power control characteristic diagram

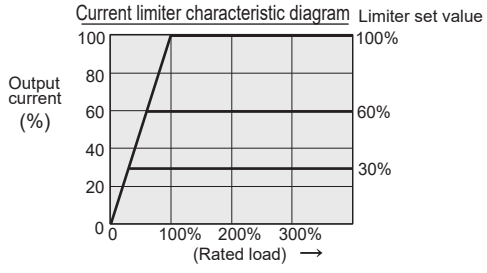


Load current limiter (For phase control only)

This function limits the load current value to the heater. The setting range is 30 to 100% of the rated current.

(Note) If the load has a large inrush current, use soft-start function along with this function to suppress the inrush current.
This function alone can not prevent the inrush current.

Current limiter characteristic diagram

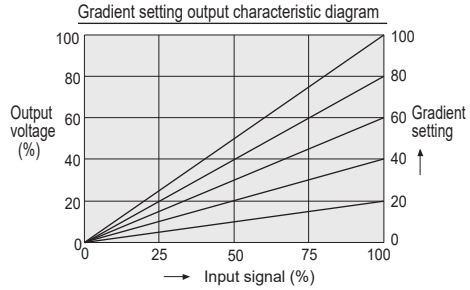


Features

Gradient Setting

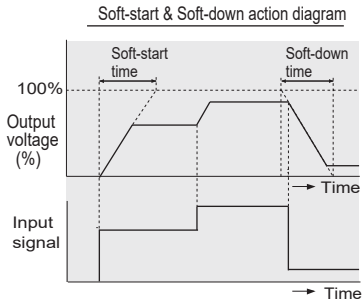
The relation between the setting input and the output voltage can be set. Gradient setting is possible via front keys or an external setter. Control characteristics may vary with the setting as follows.

1. Auto setting input X Internal gradient setting X External gradient setting
2. Auto setting input X Internal gradient setting
3. Manual setting X Internal gradient setting X External gradient setting



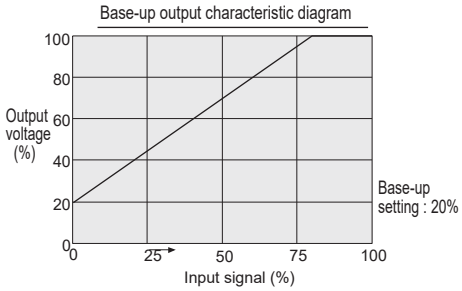
Ramp Function (Soft-start & Soft-down)

Even if setting input changes abruptly, output changes slowly to suppress inrush current. Ramp-up (Start-up) and ramp down (Start-Down) time can be set in the range of 0.1 to 99.9 sec via front keys.



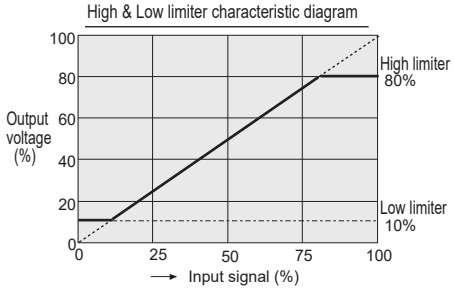
Base-up setting (Output bias)

When the setting input is zero, the output can be set via front keys.
(Base-up setting is valid when output limiter low is set to 0.0)



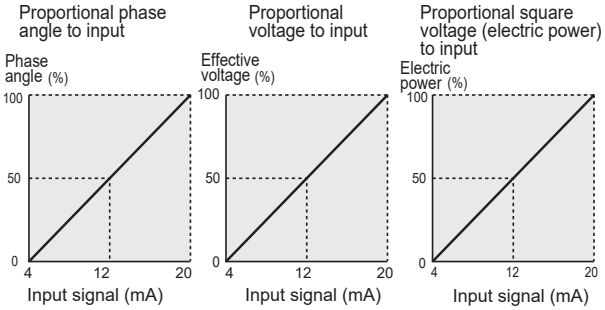
Output limiter (High & Low)

Highest and lowest output values can be set via front keys.



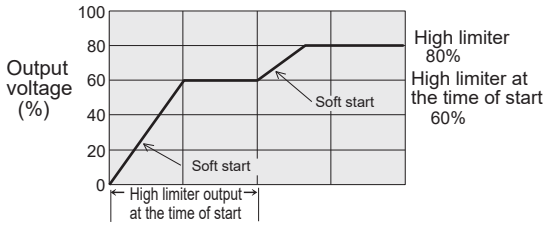
Output modes

When phase control is selected for linear load (R: resistor), output mode can be selected from Proportional phase angle to input, proportional voltage to input, and proportional square voltage (electric power) to input.



Output limiter High at start-up

This function limits the highest output for the period of a preset time after power-ON and control mode change from Stop to Run. It makes the THV-A1 Series suitable for heaters which cause rush current flow, such as Halogen lamp, Tungsten, Platinum, and Molybdenum heaters.



Heater break alarm

This function measures load current and compares it with a heater break alarm set value. Alarm will be activated if the load current goes into alarm ranges. Maximum two alarm set points can be set for the heater break alarm, which could be used for heater-deterioration alarm and heater-break alarm.

(Note) For phase control, heater break alarm does not work when the load current is less than 15% of maximum load current.

Over-current alarm

The alarm goes on when the load current exceeds 120% of the rated current.

Fuse break alarm

The alarm goes on when a fast blown fuse is blown. The fuse with alarm output function must be used to use this function.

Event input and alarm function

The contact input can be configured to Run/Stop, Auto/Manual or alarm interlock reset. The alarm types are reverse phase detection, power frequency abnormal, and FAIL. Alarm output will go on, when any of them goes in alarm status. Optional heater break alarm and over-current alarm can be also configured as an output (alarm logic selection).

Specifications

Maximum Load Current
20A AC, 30A AC, 45A AC, 60A AC, 80A AC, 100A AC

Control Method
Phase control, Zero-cross control (Selectable)

Applicable Load
Phase control : Linearity (R:Resistor) load, Control of primary side of a transformer (magnetic field density 8,000 gauss or less)
Zero-cross control : Linearity (R:Resistor) load

Input Signal
Group 1 (Field-programmable within Group)
Current input 4 to 20mA DC (Input impedance : 100Ω)
Current input 0 to 20mA DC (Input impedance : 100Ω)
Voltage input 0 to 5V DC (Input impedance : 30kΩ)
Voltage input 1 to 5V DC (Input impedance : 30kΩ)
Voltage pulse input 0/12V DC (Input impedance : 30kΩ)
Non-voltage contact input
Group 2 (Field-programmable within Group)
Voltage input 0 to 10V DC (Input impedance : 68kΩ)
Voltage pulse input 0/12V DC (Input impedance : 68kΩ)
Voltage pulse input 0/24V DC (Input impedance : 68kΩ)
Non-voltage contact input

Output mode
When phase control is selected for linearity load (R: resistor), output mode can be selected from Proportional phase angle to input, proportional voltage to input, and proportional square voltage (electric power) to input.)

Minimum Load Current
1A

Output Voltage Range
0 to 98% of rated voltage

Power Supply Voltage
a) 90 to 264V AC (Including power supply voltage variation)
Rating : 200 to 240V AC
b) 360 to 484V (Including power supply voltage variation)
Rating : 400 to 440V AC
• Power supply voltage for control circuit voltage is 180 to 264VAC. A step-down transformer is supplied with the main unit (Including power supply voltage variation)

Power Frequency
50/60Hz (Automatic discriminating)

Allowable Power Frequency Variation
50Hz±1Hz, 60Hz±1Hz,(Performance guarantee range)
45 to 54.9Hz (50Hz), 55 to 64.9Hz (60Hz) (Operating guarantee range)

Allowable Ambient Temperature
Performance guarantee range: 0 to +40ºC
Operating guarantee range: -15 to +55ºC

Operating ambient humidity
5 to 95%RH (Non-condensing)
Absolute humidity : MAX.W.C 29.3g/m^3 dry air at 101.3kPa

Cooling method
Natural convection

Dielectric voltage
Between main circuit terminals, power terminals and heat sink 2000V AC for one minute.

Insulation resistance
Between main circuit terminals, power terminals and heat sink 20MΩ or more (500V DC)

Mounting Method
Vertical mounting

Weight
Approx. 5.8kg (20 to 60A, 200V), Approx. 10.3kg (20 to 60A, 400V), Approx. 13.6kg (80A,100A, 200V and 400V)

Power consumption
Less than 17VA (200V type), Less than 21VA (200V AC type)

Self-diagnostic function
Check item
Board check, EEPROM check, Adjustment data check, Set value range check
Action at abnormality :
FAIL lamp ON, Thyristor output OFF
(The alarm output can be output from the alarm terminals.)

Output Setting Range

Gradient setting	: 0.0 to 100.0% [Front key], 0 to 100% [External setting unit]
Output limiter (High)	: 0.0 to 100.0% [Front key]
Output limiter (Low)	: 0.0 to 100.0% [Front key]
Output limiter at start-up (High)	: 0.0 to 100.0% [Front key]
Output limiter time at start-up (Low)	: 0.0 to 600.0 sec [Front key]
Base-up setting (Output bias)	: -10.0 to 100.0% [Front key]
Manual setting	: 0.0 to 100% [Front key] 0 to 100% [External setting unit]

Standard functions
• Digital input (DI) : 3 points, Non-voltage contact input
RUN/STOP, Auto/Manual, Alarm interlock reset
• Gradient setting (External setting unit is optional)
• Soft-up/Soft-down : 0.0 to 99.9sec
• Alarm output : 2 points
Open collector output, 24V DC, Max.100mA
Energized/De-energized is selectable.
Output logic selection function
1. Heater break alarm *1
2. Thyristor break alarm *1
3. OR logic of heater break alarm *1 and thyristor break alarm *1
4. OR logic of FAIL, power frequency abnormal, reverse phase detection, over-current alarm *1, fuse break down *1
5. OR logic of all alarm
*1: Optional alarm type
• ON/OFF control (External setting units are optional)

Option function
• Heater break alarm
Current measuring accuracy : ±2A (20A, 30A type)
±10% of Max. load current (45A, 60A, 80A, 100A type)
Number of alarm delay times : 0 to 99 times
• Load current limiter
Setting range : 0 to 22A (20A type), 0 to 33A (30A type)
0 to 50A (45A type), 0 to 66A (60A type)
0 to 88A (80A type), 0 to 110A (100A type)

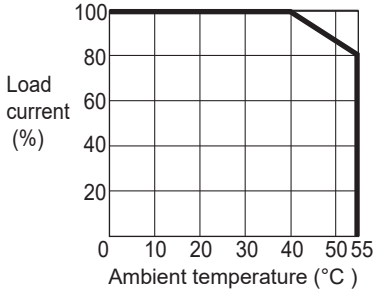
● Table of Stability

Function	Operating condition	Stability
Constant voltage variation	Power supply variation : Within ±10% Load variation : 2 times	Within ±2% of full scale
Constant current variation	Power supply variation : Within ±10% Load variation : 2 times	Within ±2% of full scale
Constant power variation	Power supply variation: Within ±10% Load variation : 2 times	Within ±4% of full scale

● Table of internal calorific value

Rated load current (A)	20	30	45	60	80	100
Internal calorific value (W)	82	118	172	226	298	370

● Temperature characteristics of load current



Model and Suffix Code

Specifications	Model and Suffix Code									
Type	Three Phase Thyristor Unit	THW-A	□	PZ	□	−□	∗□	□	N	□
Power supply *1	200 to 240V AC		1							
	400 to 440V AC		4							
Control method	Phase control/Zero-cross control (programmable, default: phase control)			PZ						
Max. load current	20A AC				020					
	30A AC				030					
	45A AC				045					
	60A AC				060					
	80A AC				080					
	100A AC				100					
Input signal *2	0 to 5V DC					4				
	0 to 10V DC					5				
	1 to 5V DC					6				
	0 to 20mA DC					7				
	4 to 20mA DC					8				
Output mode *3,*4	Standard (Proportional phase angle • Proportional voltage • Proportional square voltage)						N			
	Standard + Constant voltage control						6			
	Standard + Constant voltage control (with heater break alarm and load current limiter)						V			
	Standard + Constant current control (with heater break alarm and load current limiter)						E			
	Standard + Constant power control (with heater break alarm and load current limiter)						W			
Fast-blow fuse *3	No fast-blow fuse							N		
	With fast-blow fuse (No fuse break alarm output)							F		
	With fast-blow fuse (With fuse break alarm output)							S		
Optional function	No optional function								N	
Accessories *4,*5,*6	Setter (Volume, knob, Scale plate) 1 unit + Connector (Plug)									-1
	Setter (Volume, knob, Scale plate) 2 units + Connector (Plug)									-2
	Connector (Plug)									-9

*1 : When 400 to 440VAC is selected as power supply, a step-down transformer for the THW unit power supply is supplied as standard.

*2 : Input signal is programmable within group.

Group 1	0 to 20mA DC	4 to 20mA DC	0 to 5V DC	1 to 5V DC	Voltage pulse 0/12V DC	Non-voltage contact
Group 2	0 to 10V DC	Voltage pulse 0/12V DC	Voltage pulse 0/24V DC	Non-voltage contact		

*3: When optional heater break alarm and load current limiter are specified, over-current alarm and thyristor break alarm are also supplied.

*4: When contact input or/and alarm output is required, specify the connector as an accessory.

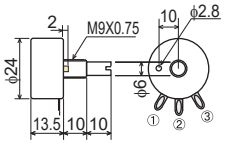
*5: Setters are for external gradient setting, external manual setting, and external high/low setting for on/off control. Use two units of setter in the following cases;
- When external gradient setting and external manual setting are required.
- High/low setting for on/off control is used.

*6: It is possible to specify more than one accessories by adding suffix code at the end. (Example: -1-9)

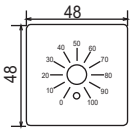
Accessories

• Gradient setter, Manual setter, High/Low setter : THV1P-S01

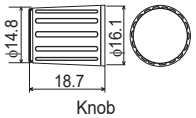
Unit : mm



Volume (Resistance:5kΩ,B)



Scale plate



Knob

• Model code * Please refer to the following codes to order accessories.

Name	Model Code
Setter	THV1P-S01
Connector (plug)	THWP-C01
Voltage down transformer	THWP-T01

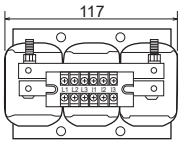
Name		Model Code
Terminal cover (For main circuit terminal)	20A, 30A, 45A, 60A	THWP-A11
	80A,100A	THWP-A12

• The terminal cover is a standard attachment. It is spare accessories.

Name			Model Code
Fast-blow fuse (Unit : 1 piece)	200V	20A	THWP-F20
		30A	THWP-F30
		45A/60A	THWP-F40
		80A	THWP-F80
		100A	THWP-FA0
	400V	20A	THWP-F22
		30A	THWP-F32
		45A/60A	THWP-F42
		80A	THWP-F82
		100A	THWP-FA2

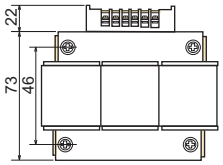
Name			Model Code
Fast-blow fuse with fuse break alarm (Unit : 1 piece)	200V	20A	THWP-F21
		30A	THWP-F31
		45A/60A	THWP-F41
		80A	THWP-F81
		100A	THWP-FA1
	400V	20A	THWP-F23
		30A	THWP-F33
		45A/60A	THWP-F43
		80A	THWP-F83
		100A	THWP-FA3

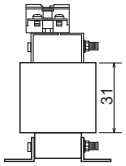
• Step-down transformer : THVP-T01

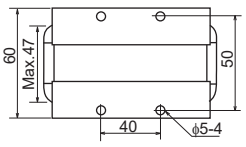


Unit : mm

* When 400V to 440VAC is selected as power supply, step-down transformer (For instrument power supply) is supplied.

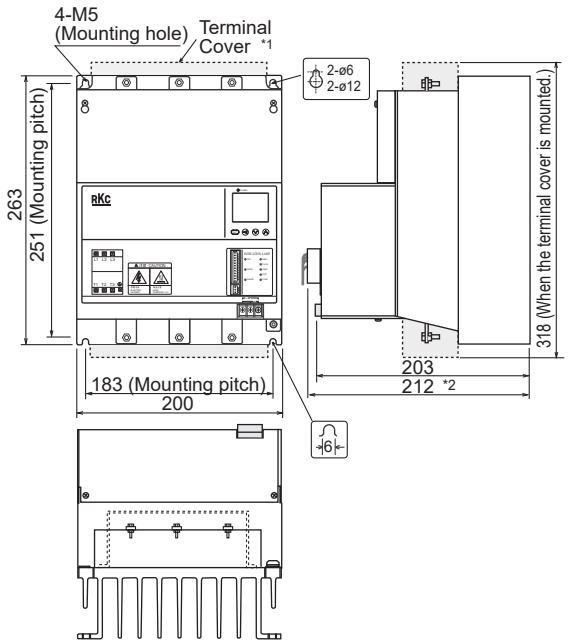




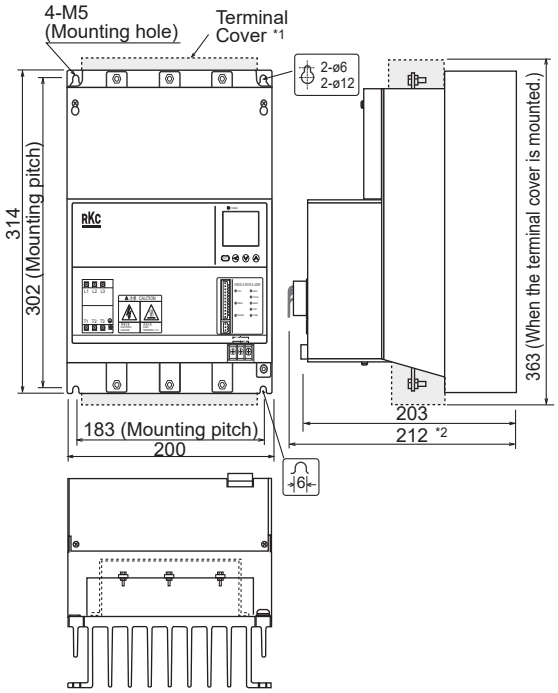


External Dimensions

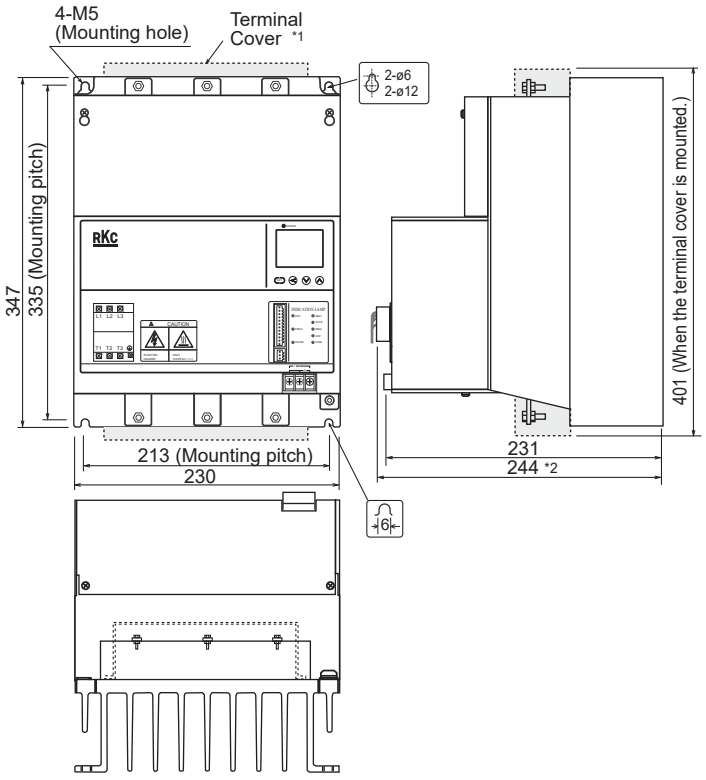
○ 200V : 20A, 30A, 45A, 60A



○ 400V : 20A, 30A, 45A, 60A

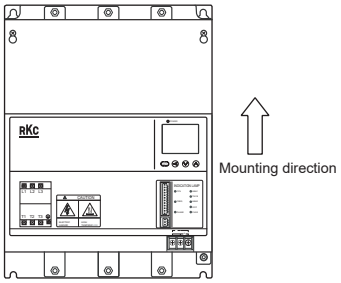


○ 200V : 80A,100A
400V : 80A,100A

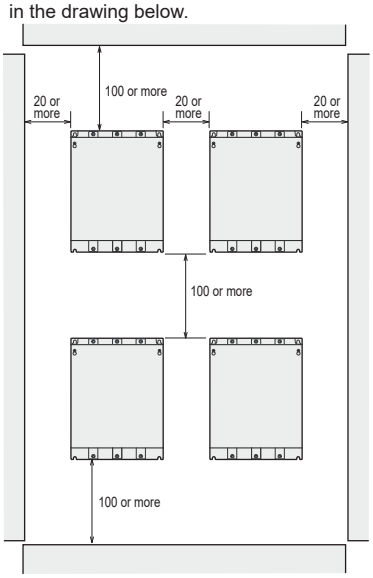


*1 The terminal cover is a standard attachment.
*2 Length includes that of an optional connector, but space for wiring to connector is not included.

• Install the instrument as illustrated in the drawing to increase the cooling effect.

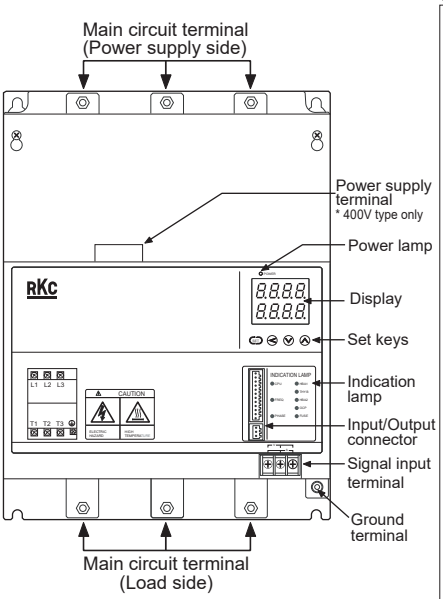


• When multiple units are installed, space between units must satisfy the rules shown in the drawing below.

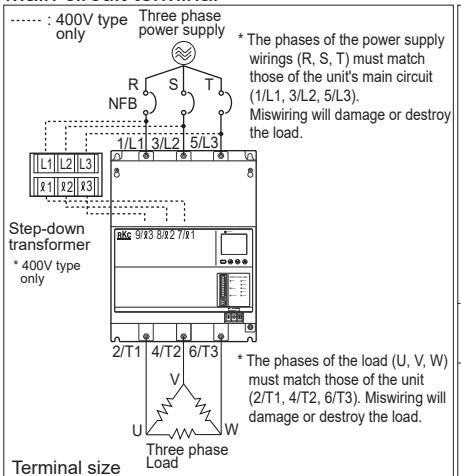


CAUTION
• Prevent metal fragments or load wire scraps from falling inside instrument to avoid electric shock, fire or malfunction.
• All wiring must be completed before power is turned on to prevent electric shock, fire or incorrect action.

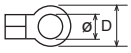
External Wiring



Main circuit terminal

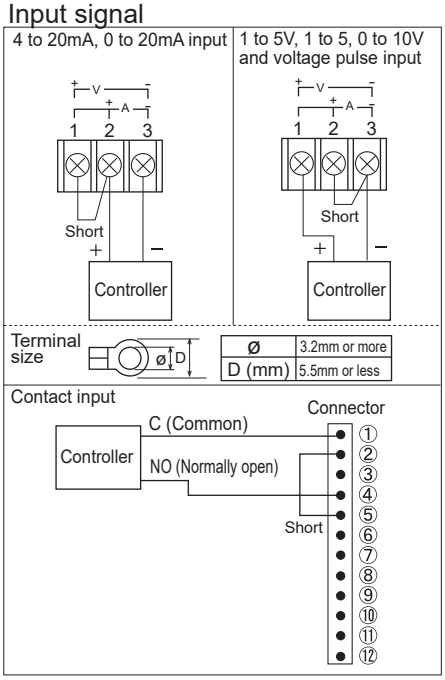


Terminal size

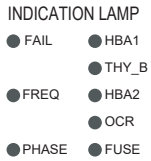


No. / Item	1/L1,3/L2,5/L3, 2/T1,4/T2,6/T3 20A/30A	45A/60A	80A/100A	7/ℓ1, 8/ℓ2, 9/ℓ3,
ø	4.3mm or more	6.4mm or more	8.4mm or more	3.2mm or more
D (mm)	9.5mm or less	12.0mm or less	22.0mm or less	5.5mm or less

Input signal



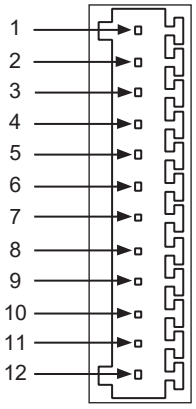
Indication Lamp



Lamp	Contents
FAIL	FAIL(Self-diagnostic abnormality)
FREQ	Power frequency abnormality
PHASE	Reverse phase detection
HBA1	Heater break alarm SV1
THY_B	Thyristor break alarm
HBA2	Heater break alarm SV2
OCR	Over current alarm
FUSE	Fuse break alarm

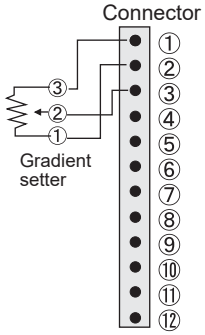
* Up to two alarm set points can be set for the heater break alarm.
* Fuse break alarm lamp is available when a fast blow fuse with fuse break alarm output is used.

Connector

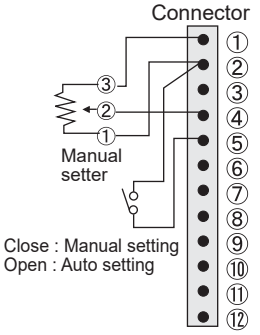


Pin No.	Contents
1	+5V output
2	0V (GND)
3	Gradient setting input (0 to 5V input by gradient setter)
4	Manual setting input (0 to 5V input by manual setter)
5	External contact input (Auto/manual setting selection) Pin No.2 - No.5, Open : Auto setting mode Pin No.2 - No.5, Close : Manual setting mode.
6	External contact input (RUN/STOP selection) Pin No.2 - No.6, Open : Stop mode Pin No.2 - No.6, Close : Run mode.
7	External contact input (Alarm interlock reset) Pin No.2 - No.6, Close : Alarm interlock reset
8	Unused
9	DC24V (+)
10	Open collector output (+) : Alarm 1 output
11	Open collector output (+) : Alarm 2 output
12	0V

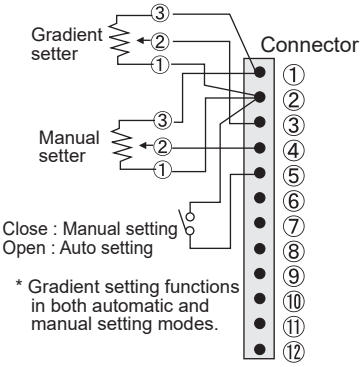
• Auto setting (With gradient setter)



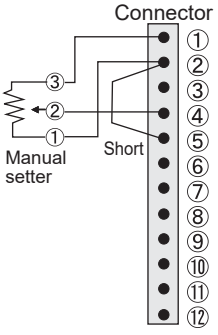
• Auto/Manual setting selection



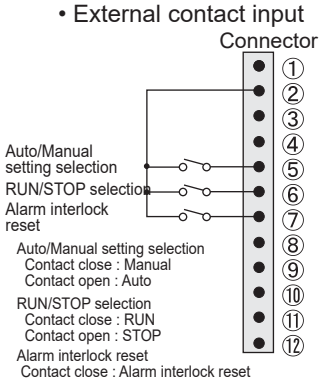
• Auto/Manual setting selection (With gradient setter)



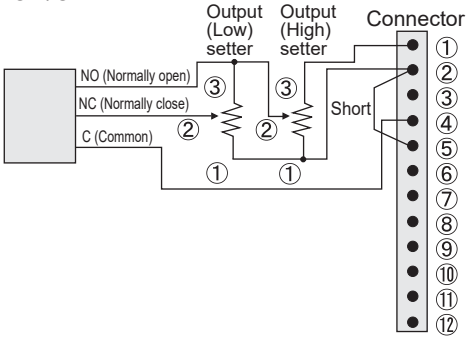
• Manual setting (With manual setter)



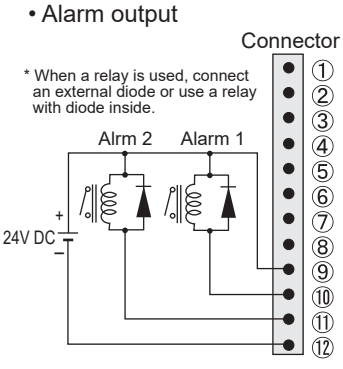
• External contact input



• ON/OFF control



• Alarm output



SSL
SSN

Features

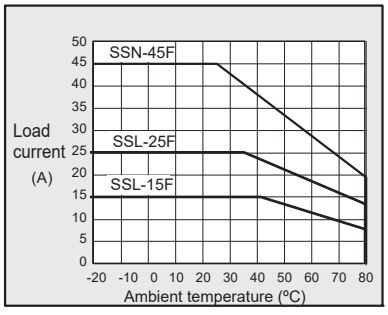
☆ DIN rail mounted compact SSR unit including heat-sink
☆ Dimensions: 21.5 x 100 x 100 mm (WxHxD) or 0.85 x 3.9 x 3.9 inches (15A,25A type)
41 x 100 x 100 mm (WxHxD) or 159 x 3.9 x 3.9 inches (45A type)
☆ Close mounting on DIN rail. 172mm wide (6.8 inches wide) for 8 SSRs *1
☆ CE, UL/c-UL approved
*1 Maximum load current will vary depending on number of close mounted units.

Specifications

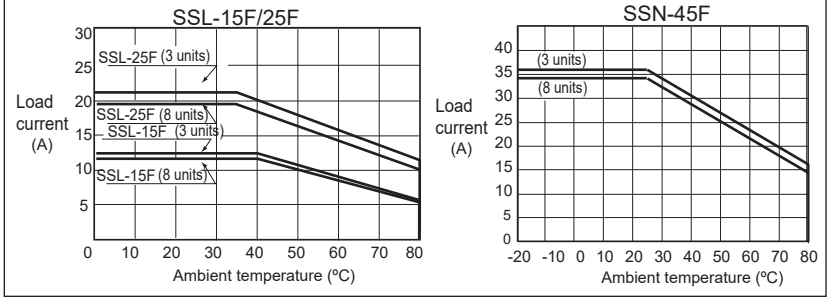
Max. Load Current
15A AC, 25A AC, 45A AC
Min. Load Current
SSL-15F/25F : 100mA AC, SSN-45F : 500mA AC
Peak 1 Cycle Surge Current
15A type : 150A (50Hz)
25A type : 250A (50Hz)
45A type : 450A (50Hz)
Input Signal
DC voltage pulse input, LOW(OFF) : 0V, HIGH (ON) : 4.5 to 30V
• Input impedance : 450 to 3.0kΩ (Built-in fixed current circuit : 10mA)
Response Time
0.5cycle or less
On State Voltage Drop
Less than 1.6V (200V AC)
Load Voltage
60 to 280V AC

Insulation Resistance
More than 100MΩ (500V DC)
Dielectric Strength
2500V AC for one minute between input and output terminals
Net Weight
Approx. 220g
Off State Leakage Current
9mA, 240V AC
Compliance with Standards
• CE Mark
• UL Recognized
• cUL Recognized
• TUV Recognized

Temperature characteristics of load current



* Temperature characteristics of load current with close horizontal mounting

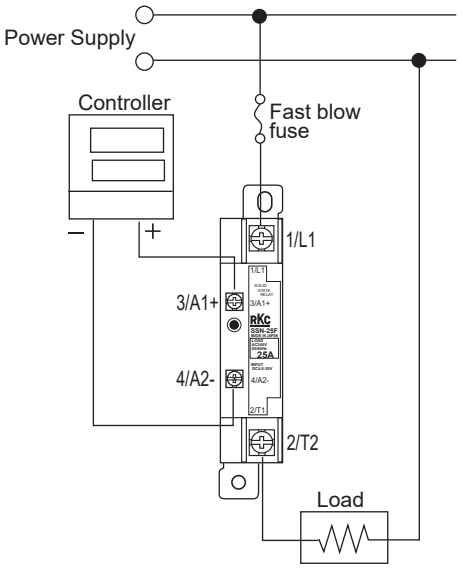


Model and Suffix Code

Specifications	Model and Suffix Code		
Model	SSL	– □	□
Max. Load current	15A	15	
	25A	25	
Radiation fin	With fin		F

Specifications	Model and Suffix Code		
Model	SSN	– □	□
Max. Load current	45A	45	
Radiation fin	With fin		F

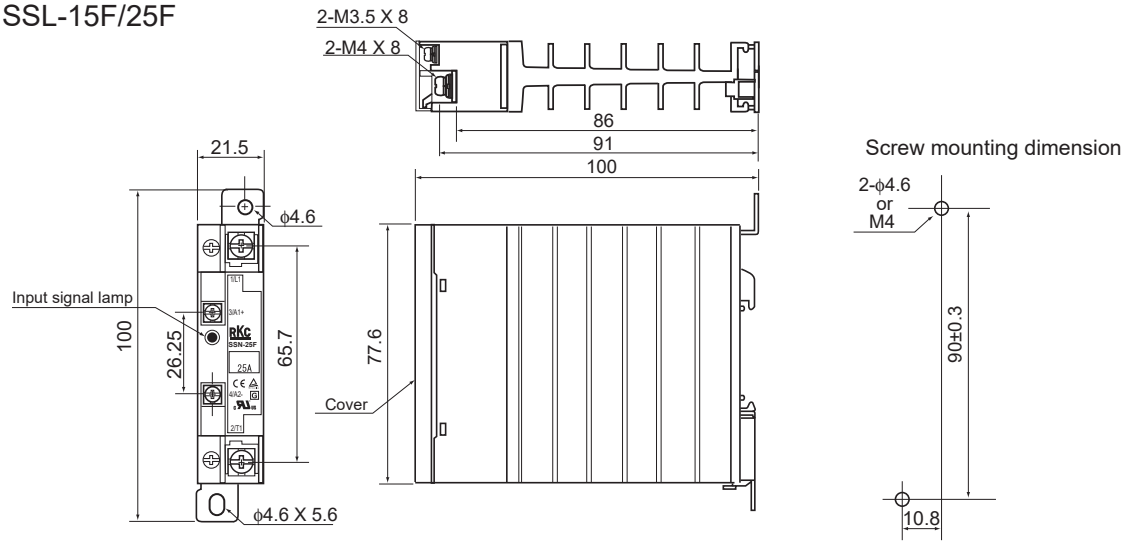
External Wiring



External Dimensions

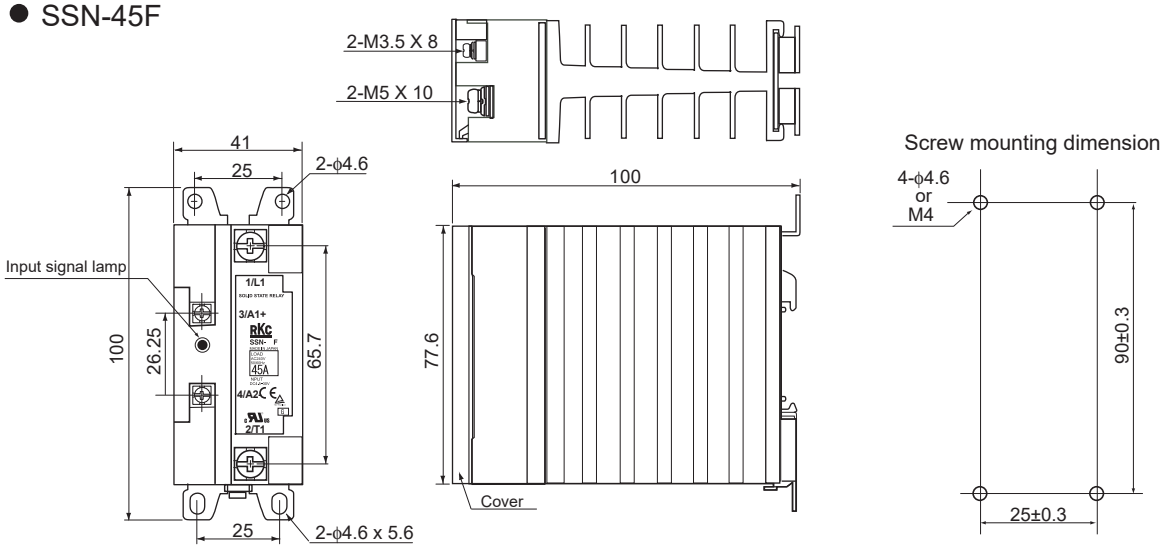
unit:mm

● SSL-15F/25F



Screw mounting dimension

● SSN-45F



Screw mounting dimension

SSJ

Features

- ☆ Screw mount SSR
- ☆ Dimensions: 60 x 41 x 30 mm or 2.4 x 1.6 x 1.2 inches
- ☆ Economical series
- ☆ CE, UL/c-UL, VDE approved

Specifications

Max. Load Current
15A AC, 25A AC, 45A AC

Min. Load Current
100mA AC

Peak 1 Cycle Surge Current
15A type : 150A (60Hz)
25A type : 225A (60Hz)
25A type : 440A (60Hz)

Input Signal
DC voltage pulse input, LOW(OFF) : 0V, HIGH (ON) : 3.5 to 30V
• Built-in fixed current circuit : 10mA

Response Time
0.5cycle + 1msec

On State Voltage Drop
1.5V (RMS), 200V AC

Load Voltage
35 to 264V AC (50/60Hz)

Insulation Resistance
More than 100MΩ (500V DC)

Dielectric Strength
3000V AC for one minute

Net Weight
Approx. 60g

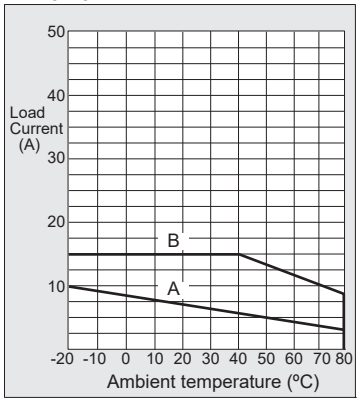
Net Weight of Heatsink
RF-060 : Approx. 160g, RF-120 : Approx. 330g, RF-200 : Approx. 760g

Off State Leakage Current
12mA, 200V AC

Compliance with Standards
• CE Mark
• UL Recognized
• cUL Recognized
• VDE Recognized

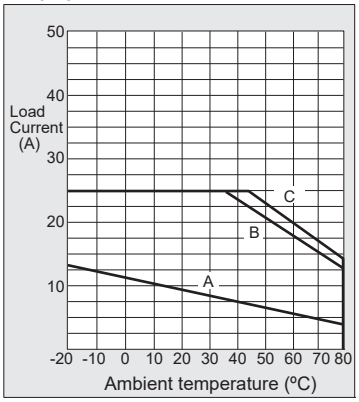
Temperature characteristics of load current

• SSJ-15



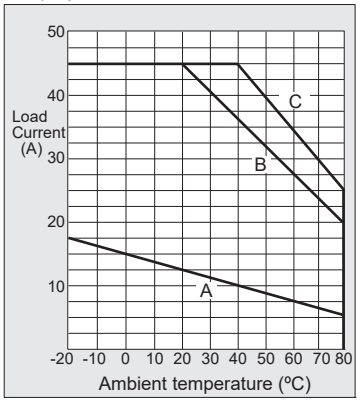
A. Without Heatsink
B. With Heatsink (RF-060)

• SSJ-25



A. Without Heatsink
B. With Heatsink (RF-120)
C. With Heatsink (RF-200)

• SSJ-45



A. Without Heatsink
B. With Heatsink (RF-120)
C. With Heatsink (RF-200)

Model and Suffix Code

Specifications	Model and Suffix Code	
Model	SSJ	– □
Max. Load current	Max. 15A	15
	Max. 25A	25
	Max.45A	45

• The heatsink is not included.

Model code when main unit + heatsink are combined

SSJ-15 + RF-060	SSJ-15F1
SSJ-25 + RF-120	SSJ-25F2
SSJ-25 + RF-200	SSJ-25F3
SSJ-45 + RF-120	SSJ-45F2
SSJ-45 + RF-200	SSJ-45F3

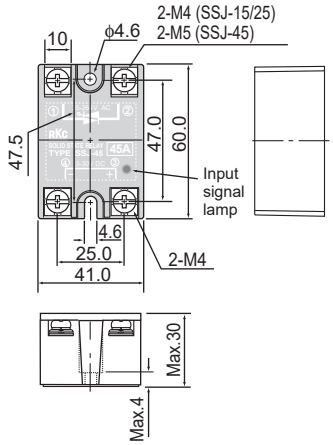
Heatsink Model Code

Heatsink for SSJ-15	RF-060
Heatsink for SSJ-25/SSJ-45	RF-120
Heatsink for SSJ-25/SSJ-45	RF-200

External Dimensions and External Wiring

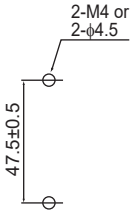
(Unit:mm)

SSJ-15
SSJ-25
SSJ-45

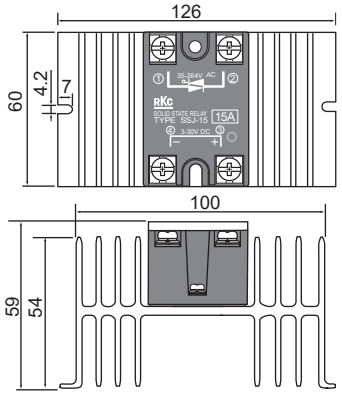


Screw mounting dimensions

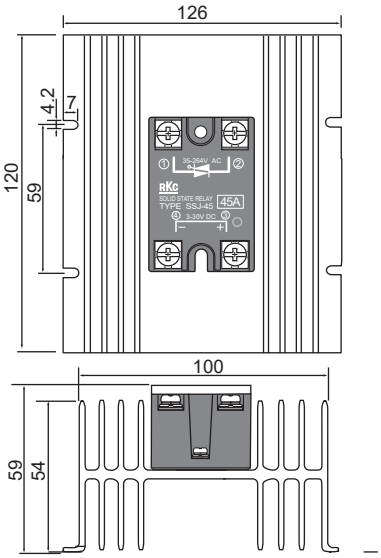
* Without fin



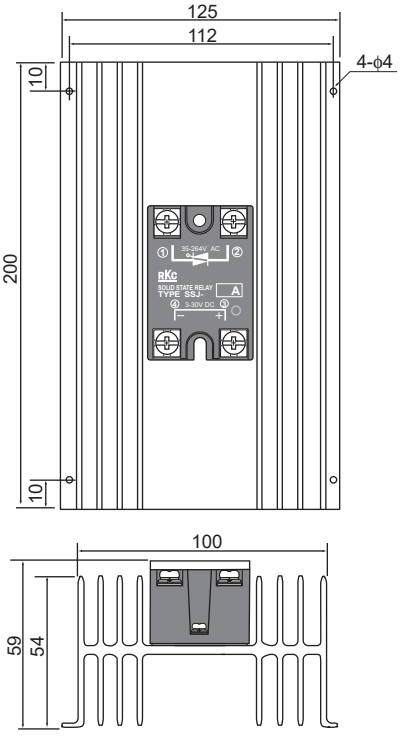
With heatsink RF-060



With heatsink RF-120

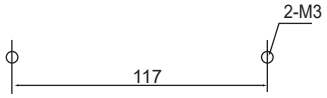


With heatsink RF-200

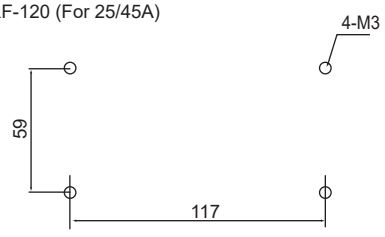


Heatsink mounting dimension

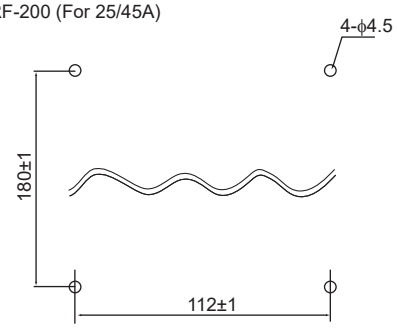
RF-060 (For 15A)



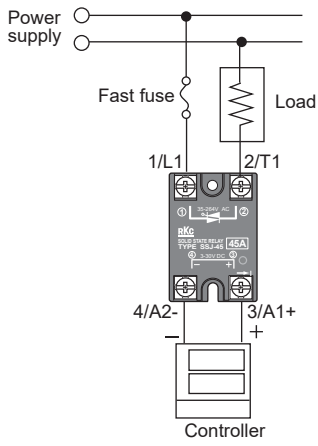
RF-120 (For 25/45A)



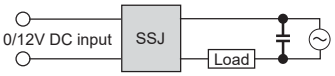
RF-200 (For 25/45A)



External Wiring



* Conforming to EN55011 (noise terminal voltage) with a capacitor connected as shown below.



Recommendable capacitance : ECQU2A225KL (2.2μF)
(Matsushita Electronic Components Co.Ltd.)

Ethernet [MODBUS/TCP]
Communication Converter
COM-ME-1
EtherNet/IP
Communication Converter
COM-ME-2
EtherCAT
Communication Converter
COM-ME-3
Ethernet
Communication Converter
[Ethernet MAPMAN] *1
COM-ME-6

Available for COM-ME-2.

COM-ME-1 COM-ME-2 COM-ME-3 COM-ME-6

SRZ
(Z-TIO / Z-DIO / Z-CT)

FZ110 / FZ400 / FZ900 GZ400 / GZ900

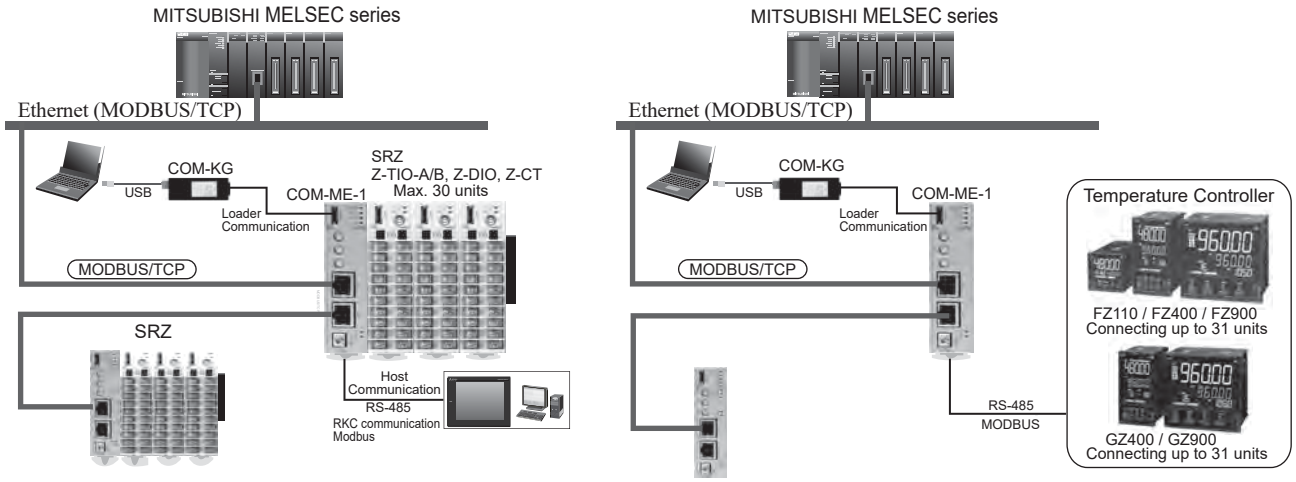
*1 : A PLC special protocol (MAPMAN) function becomes a Master Unit to PLC, and automatically stores temperature data into registers in a PLC.
This enables easy handling of temperature control system to the exiting PLC system is available.

Typical Configuration

COM-ME-1

COM-ME-1 is communication converter to connect the RKC controller to the Ethernet [Modbus/TCP].

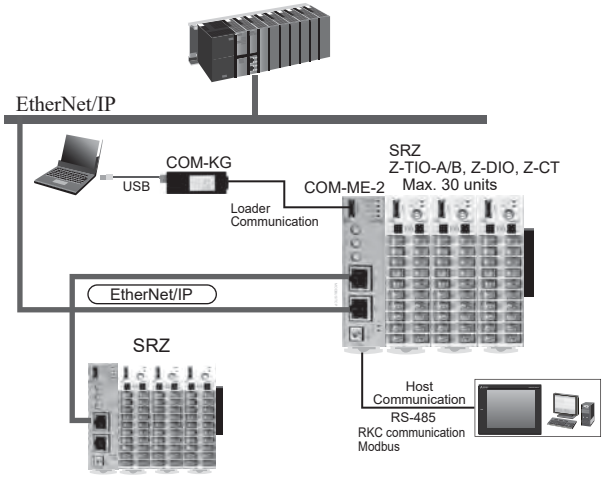
Available Controller	SRZ (Z-TIO-A/B, Z-DIO, Z-CT), FZ110 / FZ400 / FZ900, GZ400 / GZ900



COM-ME-2

COM-ME-2 is communication converter to connect the RKC controller to the EtherNet/IP.

Available Controller	SRZ (Z-TIO-A/B, Z-DIO, Z-CT)



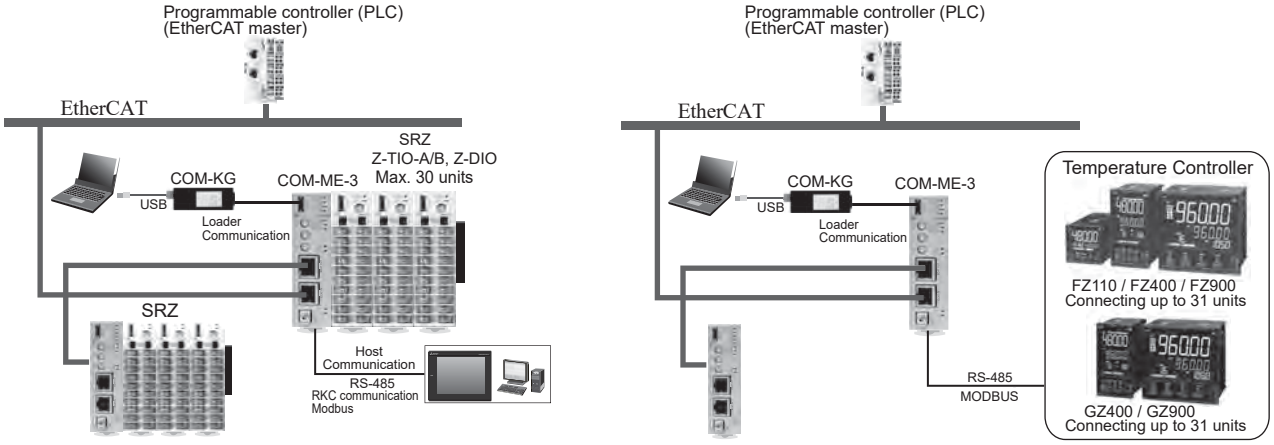
Accessories

Typical Configuration

COM-ME-3

COM-ME-3 is communication converter to connect the RKC controller to the EtherCAT.

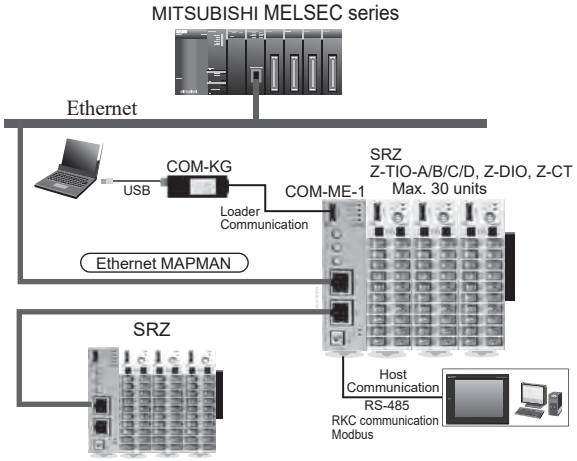
Available Controller	SRZ (Z-TIO-A/B, Z-DIO, Z-CT), FZ110 / FZ400 / FZ900, GZ400 / GZ900



COM-ME-6

COM-ME-6 connects SRZ modules seamlessly to your Ethernet network. Dedicated PLC communication protocol (MAPMAN) allows SRZ to connect to Mitsubishi PLC without programming (Programless).

Available Controller	SRZ (Z-TIO-A/B/C/D, Z-DIO, Z-CT)



Specifications

● Ethernet Communication Converter [MODBUS/TCP] : COM-ME-1

Ethernet communication

1. Modbus/TCP

Physical layer:	100BASE-TX
User layer:	Modbus/TCP
Connector type:	RJ-45 (2 ports)

Host communication or controller communication

SRZ : Host communication
FZ110 / FZ400 / FZ900, GZ400 / GZ900 : Controller communication

Interface:	RS-485
Communication speed:	9600 bps, 19200 bps, 38400 bps, 57600 bps
Data bit configuration:	Start bit: 1 Data bit: 7 or 8 (MODBUS 8 bit only) Parity bit: Without, Odd or Even Stop bit: 1
Protocol:	ANSI X3.28-1976 subcategories 2.5 and B1 MODBUS-RTU
Interval time:	0 to 250 ms
Maximum connections:	SRZ: Maximum 30 modules in a combination of Z-TIO + Z-DIO + Z-CT; the module number of Z-DIO and Z-CT varies depending on the total number of Z-TIO modules (maximum 16 Z-TIO modules per connection). FZ100 / FZ400 / FZ900, GZ400 / GZ900: Maximum 31 units. Maximum connections
Termination resistor:	External connection is necessary (Example: 120Ω, 1/2 W)

Loader communication

Connection with a loader communication cable for our USB converter COM-KG (sold separately).

Protocol:	ANSI X3.28-1976 subcategories 2.5 and B1
Communication speed:	38400 bps
Maximum connections:	1 unit

General specifications

Power supply voltage :	21.6 to 26.4V DC [Rating : 24V DC]
Current consumption:	150 mA max. Rush current : Less than 15A
Allowable ambient temperature:	-10 to +55°C
Allowable ambient humidity :	5 to 95 %RH (Absolute humidity: MAX.W.C 29.3 g/m³ dry air at 101.3 kPa)
Weight :	Approx. 150 g

● EtherCAT Communication Converter : COM-ME-3

Ethernet communication

Device type:	No profile
Physical layer:	100BASE-TX
User layer:	EtherCAT
Corresponding protocol:	CAN application protocol over EtherCAT (CoE)
Communication object:	Service data objects (SDO), Process data objects (PDO)
PDO data length:	Max. 1024byte, Both RxPDO (Output) and TxPDO (Input)
Synchronous mode:	Free Run
Connector type:	RJ-45 × 2 ports

Host communication or controller communication

SRZ : Host communication
FZ110 / FZ400 / FZ900, GZ400 / GZ900 : Controller communication

Interface:	RS-485
Communication speed:	9600 bps, 19200 bps, 38400 bps, 57600 bps
Data bit configuration:	Start bit: 1 Data bit: 7 or 8 (MODBUS 8 bit only) Parity bit: Without, Odd or Even Stop bit: 1
Protocol:	ANSI X3.28-1976 subcategories 2.5 and B1 MODBUS-RTU
Interval time:	0 to 250 ms
Maximum connections:	SRZ: Maximum 30 modules in a combination of Z-TIO + Z-DIO + Z-CT; the module number of Z-DIO and Z-CT varies depending on the total number of Z-TIO modules (maximum 16 Z-TIO modules per connection). FZ100 / FZ400 / FZ900, GZ400 / GZ900: Maximum 31 units. Maximum connections
Termination resistor:	External connection is necessary (Example: 120Ω, 1/2 W)

Loader communication

Connection with a loader communication cable for our USB converter COM-KG (sold separately).

Protocol:	ANSI X3.28-1976 subcategories 2.5 and B1
Communication speed:	38400 bps
Maximum connections:	1 unit

General specifications

Power supply voltage :	21.6 to 26.4V DC [Rating : 24V DC]
Current consumption:	150 mA max. Rush current : Less than 15A
Allowable ambient temperature:	-10 to +55°C
Allowable ambient humidity :	5 to 95 %RH (Absolute humidity: MAX.W.C 29.3 g/m³ dry air at 101.3 kPa)
Weight :	Approx. 150 g

● EtherNet/IP Communication Converter : COM-ME-2

EthernNet/IP communication

Physical layer:	10BASE-T/100BASE-TX Automatic recognition *Only 100BASE-TX can be used under Daisy Chain network
User layer:	EtherNet/IP
Connector type:	RJ-45 × 2 ports

Host communication or controller communication

Interface:	RS-485
Communication speed:	9600 bps, 19200 bps, 38400 bps, 57600 bps
Data bit configuration:	Start bit: 1 Data bit: 7 or 8 (MODBUS 8 bit only) Parity bit: Without, Odd or Even Stop bit: 1
Protocol:	ANSI X3.28-1976 subcategories 2.5 and B1 MODBUS-RTU
Interval time:	0 to 250 ms
Maximum connections:	Maximum 30 modules in a combination of Z-TIO + Z-DIO + Z-CT; the module number of Z-DIO and Z-CT varies depending on the total number of Z-TIO modules (maximum 16 Z-TIO modules per connection).
Termination resistor:	External connection is necessary (Example: 120Ω, 1/2 W)

Loader communication

Connection with a loader communication cable for our USB converter COM-KG (sold separately).

Protocol:	ANSI X3.28-1976 subcategories 2.5 and B1
Communication speed:	38400 bps
Maximum connections:	1 unit

General specifications

Power supply voltage :	21.6 to 26.4V DC [Rating : 24V DC]
Current consumption:	150 mA max. Rush current : Less than 15A
Allowable ambient temperature:	-10 to +55°C
Allowable ambient humidity :	5 to 95 %RH (Absolute humidity: MAX.W.C 29.3 g/m³ dry air at 101.3 kPa)
Weight :	Approx. 150 g

● Ethernet Communication Converter [MODBUS/TCP] : COM-ME-6

Ethernet MAPMAN communication

Physical layer:	10BASE-T/100BASE-TX Automatic recognition *Only 100BASE-TX can be used under Daisy Chain network
User layer:	TCP/IP, Dedicated Mitsubishi PLC protocol
Connector type:	RJ-45 (2 ports)

Host communication

Interface:	RS-485
Communication speed:	9600 bps, 19200 bps, 38400 bps, 57600 bps
Data bit configuration:	Start bit: 1 Data bit: 7 or 8 (MODBUS 8 bit only) Parity bit: Without, Odd or Even Stop bit: 1
Protocol:	ANSI X3.28-1976 subcategories 2.5 and B1 MODBUS-RTU
Interval time:	0 to 250 ms
Maximum connections:	Maximum 30 modules in a combination of Z-TIO + Z-DIO + Z-CT; the module number of Z-DIO and Z-CT varies depending on the total number of Z-TIO modules (maximum 16 Z-TIO modules per connection).
Termination resistor:	External connection is necessary (Example: 120Ω, 1/2 W)

Loader communication

Connection with a loader communication cable for our USB converter COM-KG (sold separately).

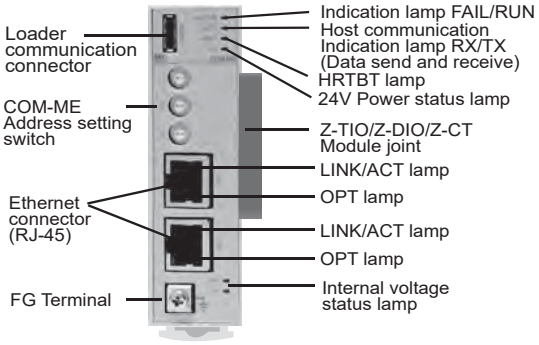
Protocol:	ANSI X3.28-1976 subcategories 2.5 and B1
Communication speed:	38400 bps
Maximum connections:	1 unit

General specifications

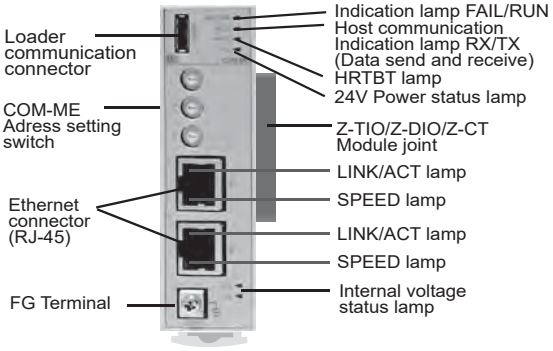
Power supply voltage :	21.6 to 26.4V DC [Rating : 24V DC]
Current consumption:	150 mA max. Rush current : Less than 15A
Allowable ambient temperature:	-10 to +55°C
Allowable ambient humidity :	5 to 95 %RH (Absolute humidity: MAX.W.C 29.3 g/m³ dry air at 101.3 kPa)
Weight :	Approx. 150 g

Front Explanations

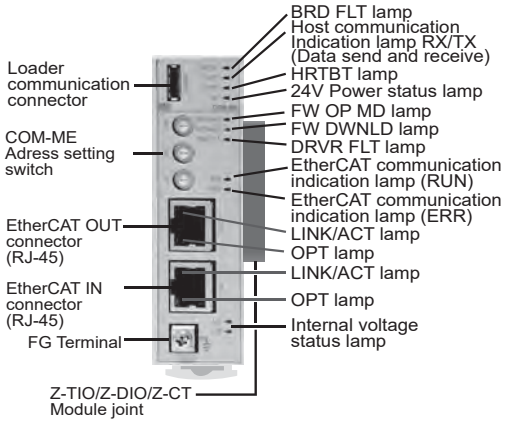
● Ethernet Communication Converter [MODBUS/TCP] : COM-ME-1



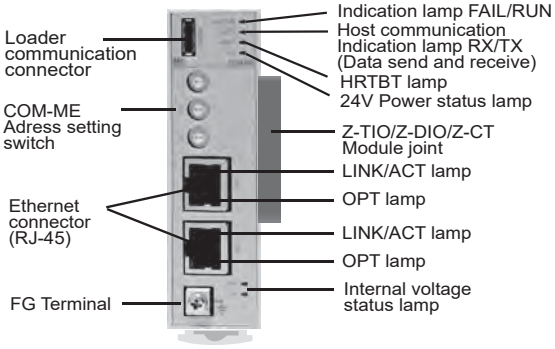
● EtherNet/IP Communication Converter : COM-ME-2



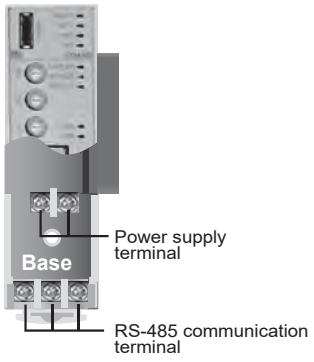
● EtherCAT Communication Converter : COM-ME-3



● Ethernet Communication Converter [Ethernet MAPMAN] : COM-ME-6



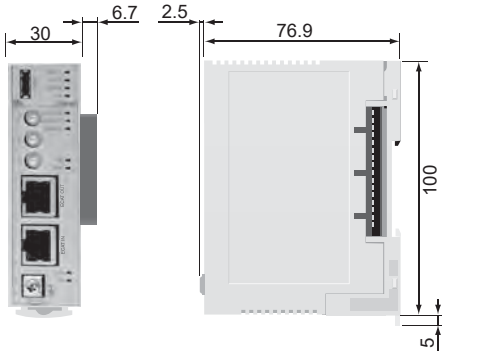
Base (COM-ME-1, COM-ME-3, COM-ME-6)



External Dimensions

COM-ME-1 / 2 / 3 / 6

unit:mm



Model and Suffix Code

● MODBUS/TCP Communication Converter : COM-ME-1
Compatible models : SRZ (Z-TIO / Z-DIO / Z-CT)

Specifications		Model and Suffix Code							
		COM-ME	Mandatory			Option			
			-1	5 ∗	02	/ □	□	□	
Mandatory	Network	Ethernet [MODBUS/TCP]	1						
	Host communication	RS-485		5					
	Supported Controller	SRZ(Z-TIO /Z-DIO /Z-CT)			02				
Option	Factory Setting (Communication protocol)	None (Communication protocol is not specified.)				No code			
		Specified (Specify communication protocol)				1			
Option *1	Host Communication Protocol	None (Communication protocol is not specified.)					No code		
		RKC Communication					1		
		MODBUS Communication					2		

*1 : If factory setting is not specified, the followings are set as default.
- Host communication protocol : RKC Communication.

Compatible models : FZ110 / FZ400 / FZ900, GZ400 / GZ900

Specifications	Model and Suffix Code			
	COM-ME	-1	5 ∗	07
Network	Ethernet [MODBUS/TCP]	1		
Controller Communication	RS-485		5	
Supported Controller	FZ110 / FZ400 / FZ900, GZ400 / GZ900			07

● EtherNet/IP Communication Converter : COM-ME-2

Specifications		Model and Suffix Code							
		COM-ME	Mandatory			Option			
			-2	5 ∗	02	/ □	□	□	
Mandatory	Network	EtherNet/IP	2						
	Host communication	RS-485		5					
	Supported Controller	SRZ(Z-TO-A/Z-TIO-B, Z-DIO, Z-CT)			02				
Option	Factory Setting (Communication protocol)	None (Communication protocol is not specified.)				No code			
		Specified (Specify communication protocol)				1			
Option *1	Host Communication Protocol	None (Communication protocol is not specified.)					No code		
		RKC Communication					1		
		MODBUS Communication					2		

*1 : If factory setting is not specified, the followings are set as default.
- Host communication protocol : RKC Communication.

● EtherCAT Communication Converter : COM-ME-3
Compatible models : SRZ (Z-TIO / Z-DIO / Z-CT)

Specifications	Model and Suffix Code			
	COM-ME	-3	5∗	02
Network	EtherCAT	3		
Host communication	RS-485		5	
Supported Controller	SRZ(Z-TO-A/Z-TIO-B, Z-DIO, Z-CT)			02

Compatible models : FZ110 / FZ400 / FZ900, GZ400 / GZ900

Specifications		Model and Suffix Code							
		COM-ME	Mandatory			Option			
			-3	5∗	07	/ □	□		
Mandatory	Network	EtherCAT	3						
	Host communication	RS-485		5					
	Supported Controller	FZ110 / FZ400 / FZ900, GZ400 / GZ900			07				
	Factory Setting (Communication mode)	None (Communication mode is not specified. Singe word)				No code			
		Specify the communication mode				1			
Option *1	Supported Communication Mode	None (Communication mode is not specified. Singe word)					No code		
		Single word mode					1		
		FZ Series double word mode (Order of data transfer: upper word to lower word)					2		
		FZ Series double word mode (Order of data transfer: lower word to upper word)					3		
		GZ Series double word mode (Order of data transfer: upper word to lower word)					4		
		GZ Series double word mode (Order of data transfer: lower word to upper word)					5		
		GZ Series, HA Series mode (Order of data transfer: upper word to lower word)					6		
		GZ Series, HA Series mode (Order of data transfer: lower word to upper word)					7		

*1 If communication mode is not specified, the "single word mode" is set by default.

Model and Suffix Code

● Ethernet MAPMAN Communication Converter : COM-ME-6
Compatible models : SRZ (Z-TIO / Z-DIO / Z-CT)

Specifications		Model and Suffix Code									
		COM-ME	Mandatory			Option					
			-6	5	∗02	/ □	□	□	□		
Mandatory	Network	Ethernet[Ethernet MAPMAN]	6								
	Host communication	RS-485		5							
	Supported Controller	SRZ			02						
Option ∗1	Factory Setting (Communication protocol)	None (Communication protocol is not specified.)				No code					
		Specified (Specify communication protocol)				1					
	Host communication protocol	None (Communication protocol is not specified.)					No code				
		RKC Communication					1				
		MODBUS Communication					2				
	Network communication protocol	None (Communication protocol is not specified.)						No code			
		MAPMAN (MITSUBISHI PLC: QnA-compatible 3E fame/SLMP ASCII)						5			
		MAPMAN (MITSUBISHI PLC: QnA-compatible 3E fame /SLMP binary)						6			
	The number of the correspondence channels	None (Number of channels is not specified.)							No code		
		16 channels							A		
		32 channels							B		
		48 channels							C		
		64 channels							D		

*1 : If factory setting is not specified, the followings are set as default.
- Host communication protocol : RKC Communication.
- Network communication protocol : MAPMAN (MITSUBISHI PLC: QnA-compatible 3E fame /SLMP binary.
- Supported number of channels : 64 channels.
(equivalent to code " /116D")

COM-MC

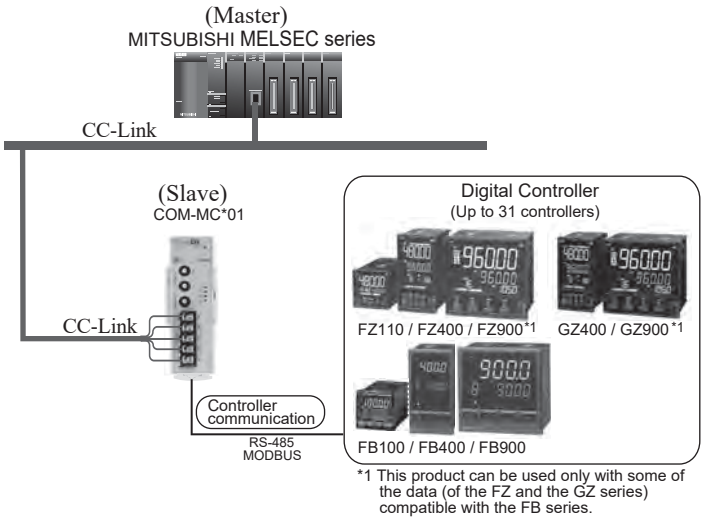
FZ110 / FZ400 / FZ900　　GZ400 / GZ900

FB100 / FB400 / FB900

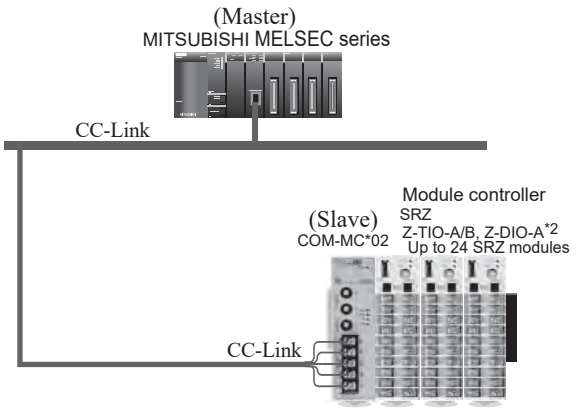
SRZ
(Z-TIO / Z-DIO)

Typical Configuration

Converter for connecting SRZ series (Z-TIOA/B, Z-DIO-A), FZ series (FZ110/FZ400/FZ900), GZ series (GZ400/GZ900) and FB series (FB100/FB400/FB900) to CC-Link.



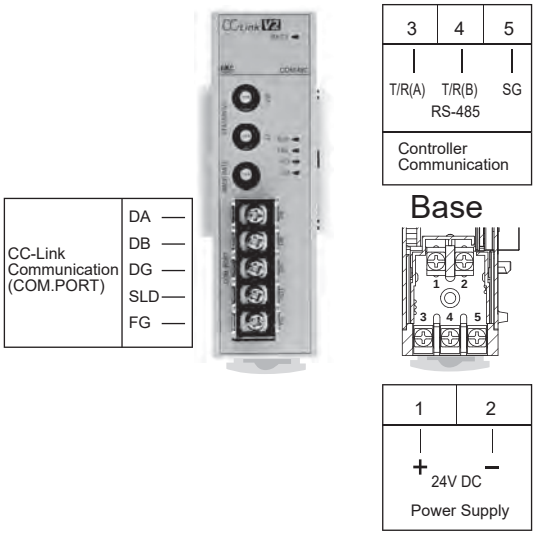
*1 This product can be used only with some of the data (of the FZ and the GZ series) compatible with the FB series.



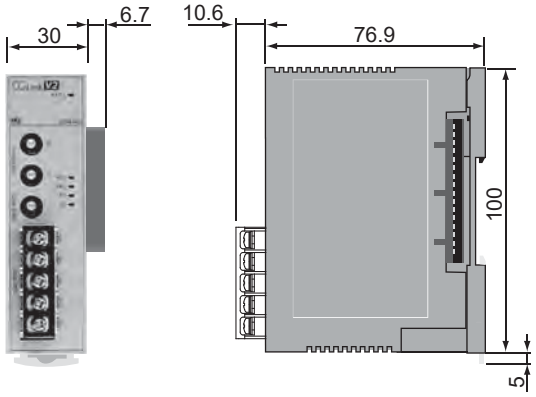
*2 Connectable modules:
Z-TIO-A/B module (Up to 16 modules)
Z-DIO-A module (Up to 8 modules)

Terminals and External Dimensions

Terminals



External Dimensions



Accessories

Specifications

CC-Link Communication

Protocol : CC-Link Ver. 2.00/Ver. 1.10
Communication speed : 156 kbps, 625 kbps, 2.5 Mbps, 5 Mbps, 10 Mbps
Communication data length (SRZ series):

Number of occupied station/Extended cyclic	Remote Input/Output (RX/RY)	Remote register (RWr/RWw)	Number of CC-Link assignment channels
4 stations occupied 1 time	Input: 128 bits Output: 128 bits	RWr: 16 words RWw: 16 words	8 channels or 16 channels
4 stations occupied 2 times	Input: 224 bits Output: 224 bits	RWr: 32 words RWw: 32 words	16 channels or 32 channels
4 stations occupied 4 times	Input: 448 bits Output: 448 bits	RWr: 64 words RWw: 64 words	32 channels or 64 channels
1 station occupied 1 time	Input: 32 bits Output: 32 bits	RWr: 4 words RWw: 4 words	1 channel or 2 channels

Communication data length (FZ series, GZ series, FB series):

Number of occupied station/Extended cyclic	Remote Input/Output (RX/RY)	Remote register (RWr/RWw)	Number of CC-Link assignment channels
4 stations occupied 1 time	Input: 128 bits Output: 128 bits	RWr: 16 words RWw: 16 words	8 channels or 16 channels
4 stations occupied 2 times	Input: 224 bits Output: 224 bits	RWr: 32 words RWw: 32 words	16 channels or 32 channels
1 station occupied 1 time	Input: 32 bits Output: 32 bits	RWr: 4 words RWw: 4 words	1 channel or 2 channels

Communication distance:

Communication speed	Maximum network length
10Mbps	100m
5Mbps	200m
2.5Mbps	400m
625kbps	900m
156kbps	1200m

Station number : 1 to 61 (4 stations occupied 1 time, 4 stations occupied 2 times, 4 stations occupied 4 times)
1 to 64 (1 station occupied 1 time)
Number of occupied station/extended cyclic and CC-Link version:
CC-Link Ver. 1.10: 1 station occupied 1 time, 4 stations occupied 1 time
CC-Link Ver. 2.00: 4 stations occupied 2 times, 4 stations occupied 4 times
Termination resistor: External installation is necessary
(Between the DA and DB terminals: 110Ω± 5 % 1/2 W)

Controller communication

Available Controller : SRZ series (Z-TIO-A / Z-TIO-B / Z-DIO-A)
FZ110 / FZ400 / FZ900、GZ400 /GZ900、
FB100 / FB400 / FB900
nterface: Base on RS-485, EIA standard (Multi-drop connection is available.)
Protocol: Modbus-RTU
Communication speed:9600 bps, 19200 bps, 38400 bps, 57600 bps
*57600 bps: available only FZ/GZ series
Data bit configuration: Start 1 bit,
Data 8 bits, non parity,
Stop 1 bit
Maximum connections: SRZ series:
24 units* [Device address setting: 1 to 99]
*Z-TIO modules: Max.16units, and Z-DIO modules: Max.16units
FZ/GZ/FB series:
Max. 31 units [Device address setting: 1 to 99]
Termination resistor: Externally terminal connected (120 Ω 1/2 W)

General specifications

Power supply voltage : 21.6 to 26.4V DC [Rating : 24V DC]
Current consumption: 45 mA max. Rush current : Less than 15A
Power failure: A power failure of 5 ms or less will not affect the control action.
(Rating 24 V DC)
Memory backup: Backed up by non-volatile memory
Number of writing: Approx. 100,000 times (EEP-ROM)
Data storage period: Approx. 10 years (EEP-ROM)
Allowable ambient temperature: 0 to +55°C
Allowable ambient humidity : 5 to 95 %RH
(Absolute humidity: MAX.W.C 29.3 g/m^3 dry air at 101.3 kPa)
Weight : Approx. 130 g
Standard: Safety standard: UL: UL61010-1
cUL: CAN/CSA-C22.2 No. 61010-1
CE marking: LVD: EN61010-1
EMC: EN61326-1
RoHS: EN IEC 63000
RCM: EN55011
KC Mark: Radio Waves Act: KS C 9610-6-2
KS C 9610-6-4

Model and Suffix Code

Specifications	Model and Suffix Code		
	COM-MC	*□□-□	
Available controller	FB Series, FZ/GZ Series (FB Series compatible settings) SRZ Series (Z-TIO-A/Z-TIO-B/Z-DIO)	01 02	
RUN/STOP Logic Selection	0:RUN 1:STOP 0:STOP 1:RUN		1 2

COM-KG

Support OS
Windows 11 / 10 / 7

Features

Communication with a PC via USB port (Loader communication)

RS-485 / RS-422A communication is converted to USB

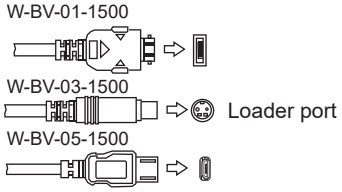
Model and Suffix Code

Specification	Model and Suffix Code		Specification
	COM-KG	–□ N	
Loader communication cable	None	N	
	W-BV-01 cable (1.5 m) for loader communication	1	Cable for RZ100/400, FB100/400/900, RB100/400/500/700/900, SRZ, AG500/PG500, COM-ME, COM-ML, THV-10, THV-40
	W-BV-03 cable (1.5 m) for loader communication	3	Cable for PF900
	W-BV-05 cable (1.5 m) for loader communication	4	Cable for FZ110/400/900, GZ400/900, PZ400/900

• Loader communication cable depends on the model of the controller.

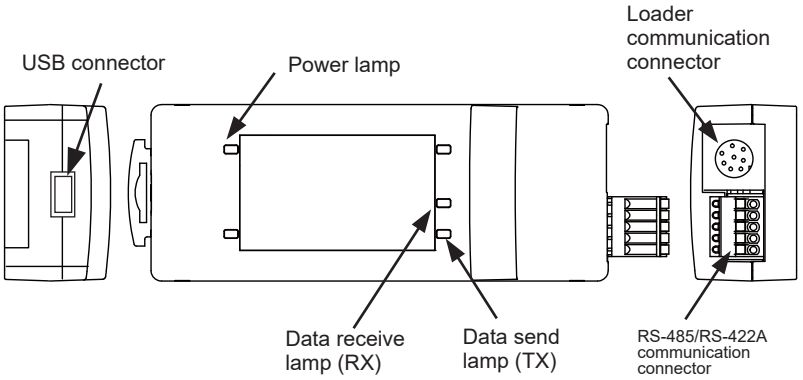
Loader communication cable

Specification	Model and Suffix Code
Cable (1.5m) for FB100/400/900, RB100/400/500/700/900, SRZ, AG500/PG500 COM-ME, COM-ML, THV-10, THV-40	W-BV-01-1500
Cable (1.5m) for PF900	W-BV-03-1500
Cable (1.5m) for FZ110/400/900, GZ400/900, PZ400/900	W-BV-05-1500

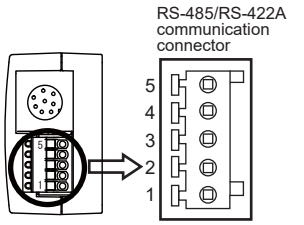


USB Communication Converter COM-KG

Parts Description and Connector Description



Connector pin configuration



RS-485

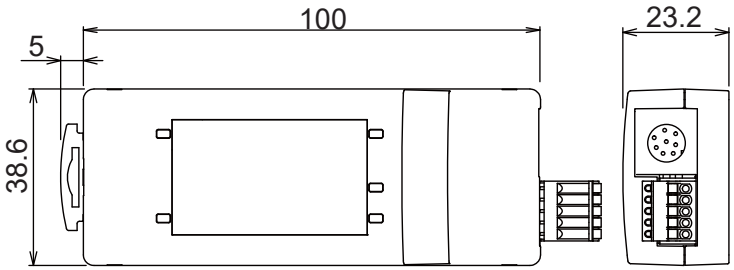
Pin No.	Signal name	Symbol
5	Unused	——
4	Unused	——
3	Send/Receive data	T/R(B)
2	Send/Receive data	T/R(A)
1	Signal ground	SG

RS-422A

Pin No.	Signal name	Symbol
5	Receive data	R(B)
4	Receive data	R(A)
3	Send data	T(B)
2	Send data	T(A)
1	Signal ground	SG

External Dimensions

Unit:mm



Specifications

USB Communication	
Interface :	Based on USB Ver.2.0
Communication speed:	Full speed (12Mbps)
Connection :	Connected by universal USB (Mini-B connector)
Power source method :	Bus power (The power is supplied from the USB port on the personal computer side)
Support OS :	Windows 11 / 10 / 7

Communicatio Function	
Interface :	EIA standard Based on RS-485/RS-422A
Connection:	RS-485:2-wire system,half-duplex multi-drop connection RS-422A:4-wire system,half-duplex multi-drop connection
Synchronous method:	Half-duplex start-stop synchronous type
Communication speed:	2400bps,4800bps,9600bps,19200bps,38400bps 57600bps, 115200bps
Data bit configuration:	Start bit:1, Data bit:7 or 8 Parity bit:Without, Odd or Even Stop bit:1 or 2
Protocol:	Protocol depends on application of the personal computer side
Maximum connection :	Maximum 31 units (RS-485/422A)
Termination resistor:	Built-in termination resistor (120Ω)

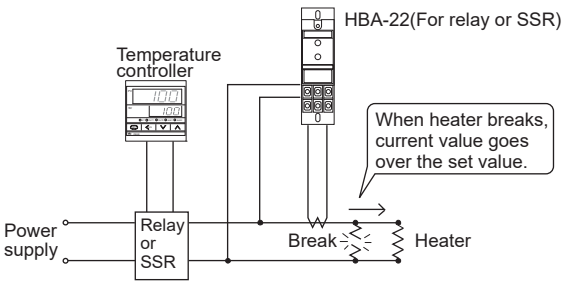
General specifications	
Power supply voltage:	5V DC ±5% (Supplied by USB bus cable)
Current consumption:	200mA max. (Loader communication) 100mA max. (RS-485/RS-422A communication)
Ambient temperature:	-10 to +50°C
Ambient humidity:	5 to 95 %RH (Non condensing) • Absolute humidity : MAX.W.C29.3g/m^3 dry air at 101.3kPa
Weight:	Approx. 50g (Instrument only)

HBA-22
HBA-T22/T32
HBA-T23/T33
HBA-T120/T130

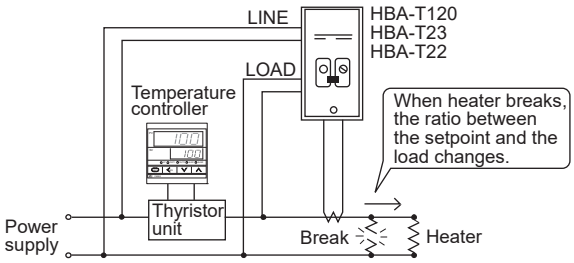
General Description

The heater break alarm is a contact output device that monitors the heater current and activates the alarm when the current falls below the set value.

• HBA-22



• HBA-T120/23/22



Products List

Model	Output Device	Mounting	CT type	Remarks
HBA-22	Relay, SSR	Wall mounting	CTL-6-P- □ (Max 30A) CTL-18S- □ (Max 100A)	Suitable when controller's output cycle time is 2 seconds or longer. Use two units for three-phase load.
HBA-T22	Single-phase SCR power controller, SSR, Relay	Panel mounting	CTL-6-P-N	Suitable for phase control and zero-cross control by SCR power control device.
HBA-T32	Three-phase SCR power controller, SSR, Relay	Panel mounting	CTL-6-P-N (2 piece/unit)	Suitable for phase control and zero-cross control by SCR power control device.
HBA-T23	Single-phase SCR power controller, SSR, Relay	Panel mounting	CTL-18S-N	Suitable for phase control and zero-cross control by SCR power control device.
HBA-T33	Three-phase SCR power controller, SSR, Relay	Panel mounting	CTL-18S-N (2 piece/unit)	Suitable for phase control and zero-cross control by SCR power control device.
HBA-T120	Single-phase SCR power controller, SSR, Relay	DIN-rail mounting and wall mounting	MCTL-6-P-N (Max 30A) MCTL-12-S56-10L-N (Max 100A)	Built-in MCU makes the load setting easy using automatic calculation function. Suitable for phase control and zero-cross control by SCR power control device.
HBA-T130	Three-phase SCR power controller, SSR, Relay	DIN-rail mounting and wall mounting	MCTL-6-P-N (Max 30A) MCTL-12-S56-10L-N (Max 100A) (2 pieces/unit)	Built-in MCU makes the load setting easy using automatic calculation function.Suitable for phase control and zero-cross control by SCR power control device.

Model and Suffix Code

• HBA-22

Specifications	Model and Suffix Code
Model	HBA–22 (for relay contact and SSR control)

Power Supply : 100/110V AC, 200/220V AC

• HBA-T22,T32

Specifications	Model and Suffix Code		
Model	HBA–T22 (Single phase type) HBA–T32 (Three phase type)	□ – □	
Control type	Phase angle control Zero-crossing control	P Z	
Load current	5A 10A 20A 30A		5 10 20 30

• HBA-T23,T33

Specifications	Model and Suffix Code		
Model	HBA–T23 (Single phase type) HBA–T33 (Three phase type)	□ – □	
Control type	Phase angle control Zero-crossing control	P Z	
Load current	30A 100A		30 100

• HBA-T120,T130

Specifications	Model and Suffix Code		
Model	HBA–T120 (Single phase type) HBA–T130 (Three phase type)	□ – □	
Control type	Phase angle control Zero-crossing control	P Z	
Load current	5A (1 to 5A) 30A (6 to 30A) 100A (20 to 100A)		5 30 100

• CT (Current transformer)

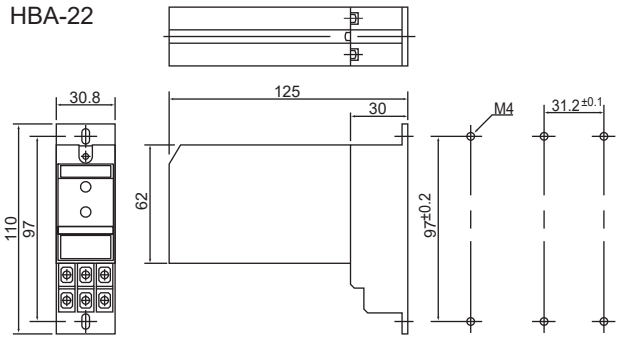
Model	Max.Load Current	Applicable products
CTL-6-P-5	5A	HBA-22
CTL-6-P-10	10A	
CTL-6-P-20	20A	
CTL-6-P-30	30A	
CTL-18S-30	30A	
CTL-18S-30-C	30A	
CTL-18S-100	100A	
CTL-18S-100-C	100A	
CTL-6-P-N	According to HBA module	HBA-T22, T32 *1
CTL-18S-N	According to HBA module	HBA-T23, T33 *1
MCTL-6-P-N	According to HBA module	HBA-T120-5/30,HBA-T130-5/30 *1
MCTL-12-S56-10L-N	According to HBA module	HBA-T120-100,HBA-T130-100 *1

*1 HBA-T32, T33 and T130 require 2 CTs per unit.

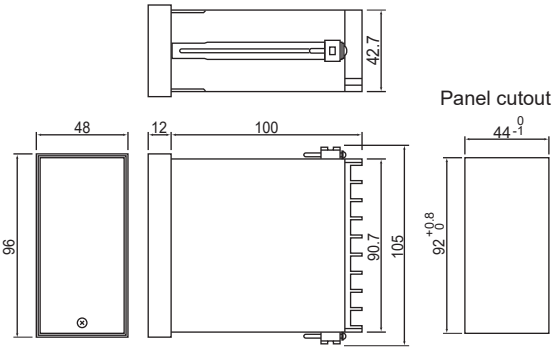
External Dimensions

Units : mm

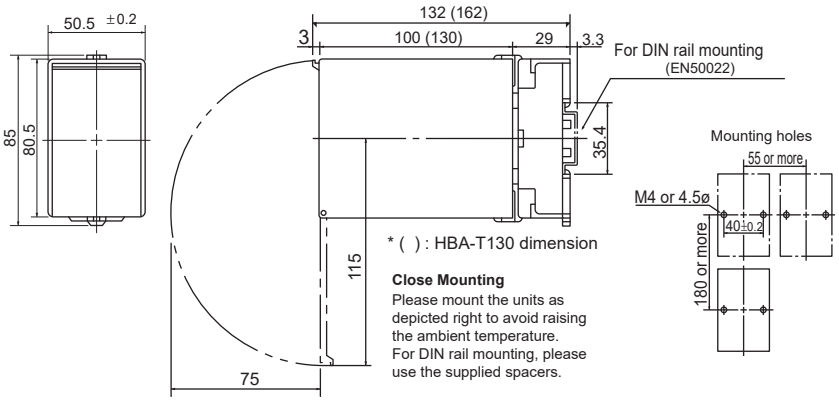
HBA-22



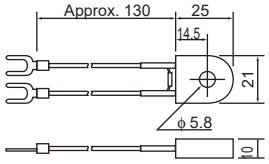
HBA-T22, T23, T32, T33



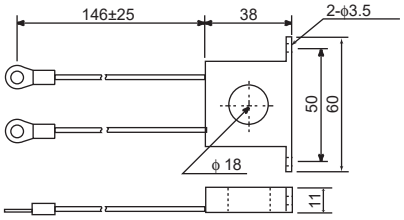
HBA-T120,T130



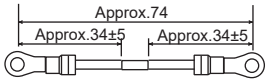
CTL-6-P



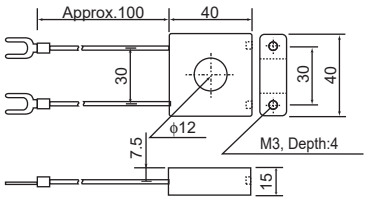
CTL-18S



Shunt Resistor (Accessory)



MCTL-12-S56-10L-N



CONTROL

Control action is classified into three types; ON/OFF, Proportional and PID actions. Each actionhas its own advantages and disadvantages, and it cannot be said which action is the best. Your control requirements will dictate the best control action for your application.

ON/OFF Control

ON/OFF control is the simplest and least expensive form of control available. The output signal from a controller is either FULL ON or FULL OFF depending on the direction of the deviation from a set point.

Figure 1 shows the characteristics of ON/OFF action.

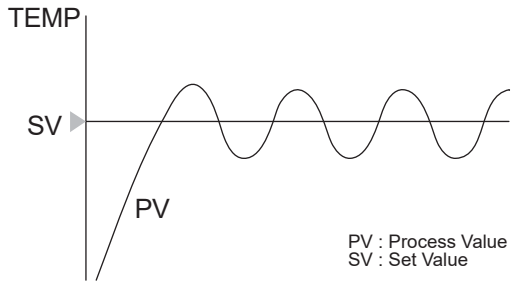


Fig 1.

ON/OFF action takes place if any deviation occurs from set point. This action responds quickly but is sensitive to input noise which causes chattering (ON/OFF switching at short intervals).

Therefore, in actual use, ON/OFF action has some hysteresis which is named dead band or control sensitivity.

Proportional Action

Proportional action is referred to as P or gain. With proportional action, the controlled object no longer switches as a direct result of the set value (SV). The RKC instrument compares the difference between the set value and the process variable, then controls the output proportional to the deviation.

This proportional action is active within user-definable zone around the set point called the proportional band (Pb). When the temperature (PV) enters the proportional band, the output becomes gradually smaller and the temperature stabilizes somewhere within the proportional band.

Proper adjustment of the proportional band will result in smooth control. However, it is seldom that the actual temperature stabilizes exactly on the set point, and it usually becomes stable with some deviation called offset. RKC instruments have an adjustable proportional band to meet your process requirements.

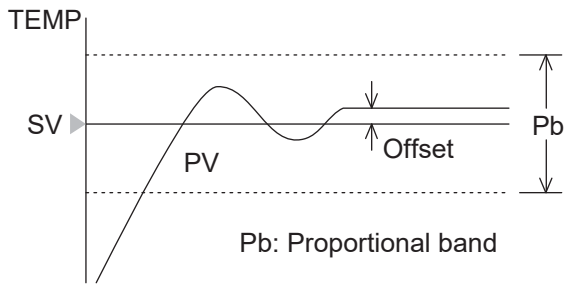


Fig 2.

Integral Action

Integral action is referred to as I or reset. The degree of integral action is expressed as integral time in seconds. The purpose of the integral action is to automatically compensate for any steady state offset inherent with a proportional controller.

The integral action moves or resets the proportional band up or down depending on the offset. The integral time on RKC instruments is adjustable and determines how fast the proportional band is moved.

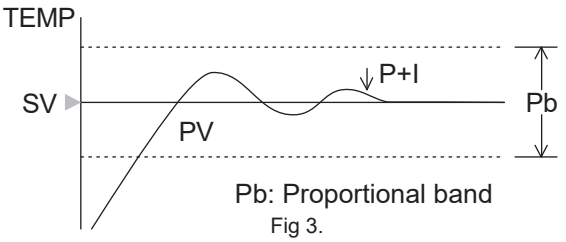


Fig 3.

Derivative Action

Derivative action is referred to as D or rate. The degree of derivative action is expressed by derivative time. This action on RKC controllers is adjustable in seconds.

The controller measures the rate of the temperature increase and moves the proportional band to minimize overshoot. The output change is directly proportional to the rate of change in the process value (PV).

Anti-Reset Windup

The anti-reset windup (ARW) inhibits the integral action until the PV is within the proportional band thus reducing overshoot on start-up. ARW inhibits the integral action by preventing the controller from moving the proportional band during start-up.

This action is measured in a percentage of proportional band and can be set from 0 - 100%.

(Century series, D series, CB series, SA100/200, REX-P48/96, REX-P24)

Direct/Reverse Action

Direct action is the control mode generally used for cooling or chilling applications. The output of the controller with direct action increases according to the increase of the measured value.

Reverse action is the control mode generally used for heating applications. The output of the controller with reverse action decreases according to the increase of the measured value.

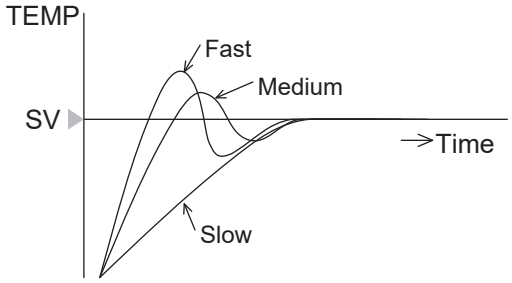
Cycle Time

With relay or SSR output, these are ON/OFF devices. In this case, RKC employs a time ratio (Pulse Width Modulation) method. A value set in seconds is entered into the cycle time parameters. The controller determines the correct ratio to maintain stady control.

Brillant PID

Brilliant PID utilizes an enhanced algorithm with two-degrees-of-freedom. This allows for optimum response to operation upsets by user defined selection of Fast, Medium or Slow response.

This algorithm handles process upsets with the PID parameters and has three selections for start-up or set point change (Fast, Medium or Slow). If a fast response is required.....Fast is chosen. If overshoot is critical.....Slow is chosen.



Response against setpoint change

Fig 4.

Traditional PID calculation is a PV-Derivative algorithm (one-degree-of-freedom). Brilliant PID provides two-degrees-of-freedom by using an I-PD algorithm. Depending upon what type of response is selected, Brilliant PID chooses the optimum algorithm to use. The relationship between these two methods is shown in the following table:

Response	I-PD	PV-Derivative PID
Slow	100%	0%
Medium	50%	50%
Fast	0%	100%

I-PD's characteristics suppress large output changes caused by set point change. Slow response uses I-PD action to produce a smooth set point change and this action takes longer than the PV-Derivative type of control. On the contrary, when the PV-Derivative PID is used and, the FAST response is selected, a faster response is obtained, although output change is greater than I-PD due to P action.

When Medium response is selected, both actions are used equally.

Brilliant PID is achieved by RKC's new Enhanced Autotuning algorithm. Enhanced Autotuning selects optimum PID parameters for the best response to external disturbances or process upsets.

At the same time, depending upon the requirements, a Fast, Medium or Slow setting can be selected manually to respond to a set point change.

Fuzzy Logic

Fuzzy logic is the latest development in machine intelligence that enables computers and controllers to determine a wider range of responses. Fuzzy logic manipulates precise facts that have been reduced to strings of zeros and ones, or statements that are either true or false. Fuzzy logic in controllers emulates human thinking by assisting the instrument to determine responses between two values. This technology allows the temperature controller to function like an expert operator.

Fuzzy logic technology is particularly effective:

- To suppress overshoot
- To shorten start-up time
- To suppress process upsets when frequent load changes occur
- To suppress upsets which occur with set point changes.

Fuzzy Logic Against Step Response

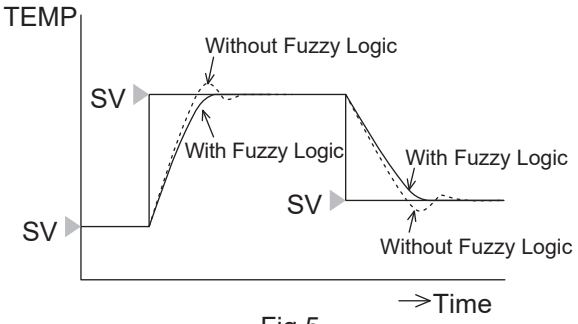


Fig 5.

Heat/Cool Control

RKC's controllers are available for heat/cool control with only one controller.

For example, this is effective when cooling control is required for the barrel zones of an extruder. RKC controllers have the ability to overlap the heat and cool proportional bands or to set a deadband (gap) between the proportional bands.

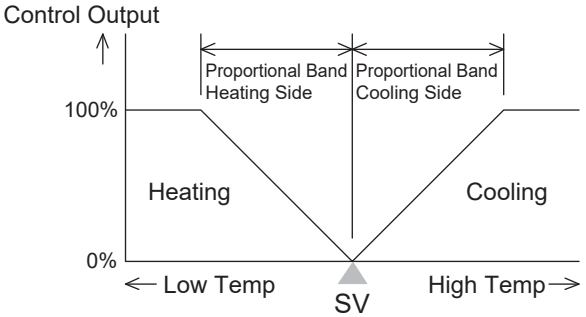
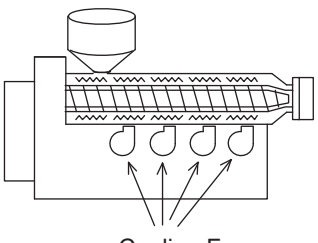


Fig 6.



Cooling Fan

Position Proportional Action

Position proportional action is used to control flow rate by using a control motor. The position of the control motor valve and the subsequent temperatures are transmitted to the controller.

In the control process, a delay in the control valve could cause the temperature to oscillate. The use of a control motor with a potentiometer improves system response because the valve position is transmitted by the resistance of a potentiometer. Typically, this value is a 135Ω resistance slide wire feedback.

The control motor has two directions of movement : OPEN and CLOSED. A signal is produced to drive the motor either OPEN or CLOSED. As a result, there is a zone called deadband to preventboth opening and closing outputs from being on at the same time.

Position proportional action is used to control flow rate by using a control motor. The motor actuator can be adjusted from fully open to fully closed and anywhere in between.

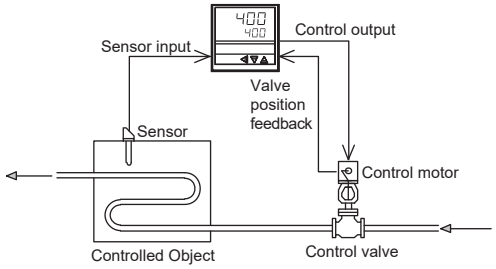


Fig 7.

Autotuning

Implementing proper PID values can often be difficult and time-consuming. With autotuning function, PID values are automatically measured, computed, and optimum PID constants are set using the Limit Sensitivity Method.

The purpose of deriving accurate PID values is to achieve stable control.

The autotuning feature of the instrument is activated during temperature rise and/or when controlis stabilized from any process state. The PID constants are derived via the software of themicroprocessor in the controller. The instrument actually goes into ON/OFF control for two orthree cycles.

The microprocessor calculates the amplitude of the slope of the rise and fall of the process over time, and automatically establishes the PID constants. This allows the operator as well as the process engineer to tune precise PID loops.

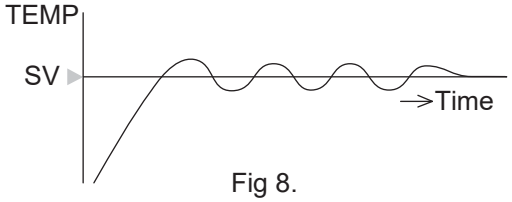


Fig 8.

Enhanced Autotuning

As a pioneer of PID autotuning, RKC offers this feature on all its microprocessor based instruments. Traditional autotuning algorithm uses a limit-cycle method which requires a few cycling around the set point to get optimum PID constants. This method is widely used throughout the industry, but a certain amount of overshoot does exist. As soon as the autotuning function is initiated, PID constants are calculated during the three cycles of ON/OFF control. Even though the control produces very good results, this method is not necessary acceptable in all applications.

RKC has developed a new PID autotuning method using a new PID algorithm called enhanced autotuning or Enhanced AT. The basic concept of this method is summarized in the Autotuning Bias diagram.

Enhanced Autotuning Cycles

Enhanced autotuning has a selection of two or three ON/OFF cycles. Three-cycle autotuning is recommended because more information can be obtained for PID calculation. However, for some applications, autotuning needs to be completed as soon as possible. For such applications, two-cycle autotuning can be used.

Autotuning Bias

Conventional autotuning methods required ON/OFF cycles at set point, which resulted in a large overshoot. With the new feature of AT bias, autotuning can be done below set point. Depending on the characteristics of the process, the bias range can be adjusted to suppress overshoot. Even if autotuning is started at the set point, it continues below the set point (at the preset value). When autotuning is completed, temperature returns to the original set point.

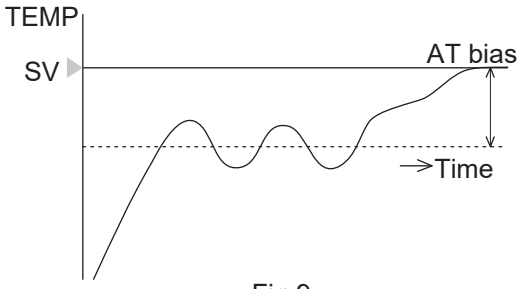


Fig 9.

Self-Tuning

Featured in the CB, SA series of controls. When this function is on, PID values are calculated and evaluated for use under these condition

- Power on
- SV change
- Process upset

Unlike other manufacturers', RKC Self-tuning evaluates the results of a process upset and the controller ability to recover. Based upon the recovery the new PID values may be used if they are predicted to be better. Self-tuning may not fit every application.

PV Bias

The value obtained by adding bias to the measured value (PV). This function is used in such a case that the display of a controller and a recorder in the same loop is different and it is necessary to set the displayed value of either one to the other.

[Example]

To correct the characteristic dispersion of a thermocouple and RTD input, or to correct the difference between measured value (PV) of relevant and other instruments.

Actual PV		PV bias		Indication
197°C	+	+3°C	=	200°C

ALARM FUNCTIONS

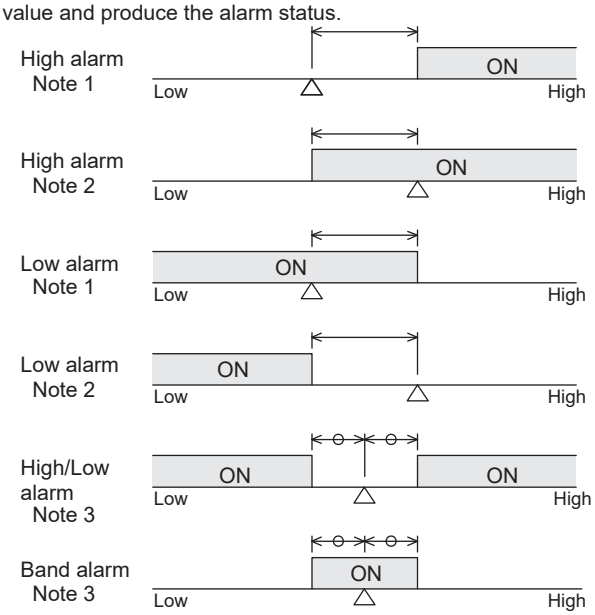
RKC controllers and indicators have a variety of alarm types and functions. Typically the controllers have individual alarm lamps on the front panel and relay outputs from the back screw terminal. Alarms can be used for warning personnel of safety problems or tied in to equipment interlocks or used for general purpose signals.

Deviation/Process Alarm

Deviation alarm

The alarm lamp lights if the deviation [Measured value (PV) - Set value (SV)] reaches the alarm set value. Therefore, the deviation alarm set value moves with the set value (SV) change.

- **High alarm**
  The alarm lamp lights if the deviation [Measured value (PV) - Set value (SV)] exceeds the alarm set value and produce the alarm status.
- **Low alarm**
  The alarm lamp lights if the deviation [Measured value (PV) - Set value (SV)] falls below the alarm set value and produce the alarm status.
- **High/Low alarm**
  The alarm lamp lights if the deviation absolute value [Measured value (PV) - Set value (SV)] is less than or greater than the alarm set value and produce the alarm status.
- **Band alarm**
  The alarm lamp lights if the deviation absolute value [Measured value (PV) - Set value (SV)] is within the alarm set value and produce the alarm status.



Note 1: Alarm set value is a positive(+) setting.
Note 2: Alarm set value is a negative(-) setting.
Note 3: Alarm set value is the absolute deviation value.

Fig 10.

Process alarm

This alarm is generated if a measured value (PV) reaches the alarm set value.

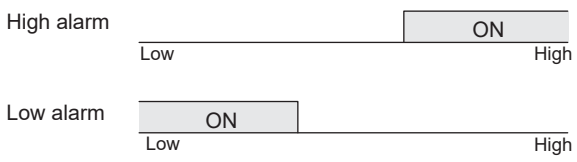


Fig 11.

Hold Action

The alarm will become effective after it has first entered non-alarm range, such as the switching of power-on, the switching of operation mode from STOP to execution (RUN) or changing the set value (SV).

Example : Low alarm with hold action
For some models, this function is partially limited.
(Please refer to the individual catalog for each model.)

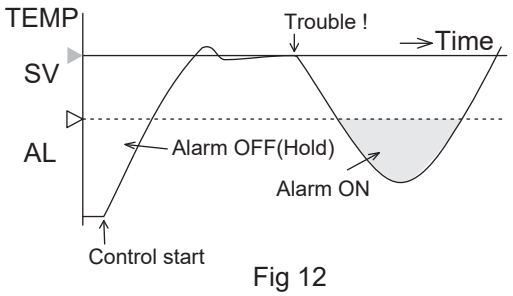


Fig 12

Set Value Alarm

This alarm works like the process alarm except its alarm is based upon the set value (SV).

Alarm Delay Timer

This is the function to delay the alarm action by setting delay time, if the alarm state exceeds the set time, the alarm is activated.

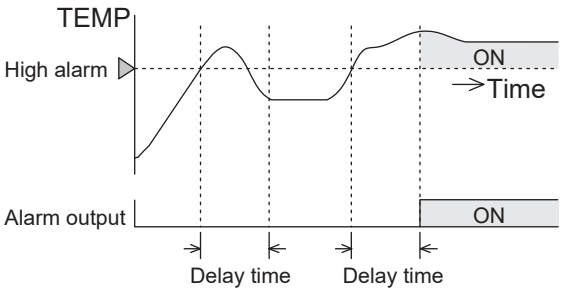


Fig 13

Alarm Energized/De-energized

Energized: A relay contact closes at the alarm status.
De-energized: A relay contact opens at the alarm status.
RKC controllers are typically set to Energized at time of shipment.

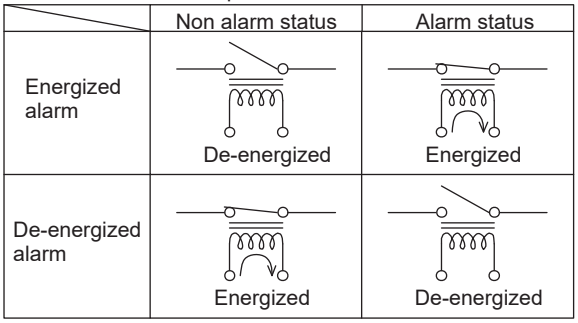


Fig 14

Heater Break Alarm (HBA)

This function detects the current draw of the load by the current transformer (CT).

The controller compares the detected value with the heater break alarm set value. In alarm status,a red lamp lights and an alarm relay contact is closed.

• Heater break alarm is activated in the following cases:

1. When no heater current flows ----- Heater break. faulty operating unit, etc.
   When the control output is ON and the current transformer input value is equal to or less than the heater break alarm set value, an alarm status is produced. (If the control output ON time is not at least 0.5sec, the heater break alarm is not activated.)
2. When the heater current can not be turned off ----- Weld relay contact, etc.
   When the control output is OFF and the current transformer input value is equal to greater than the heater break alarm set value, an alarm status is produced. (If the control output OFF time is not at least 0.5sec, the heater break alarm is not activated.)

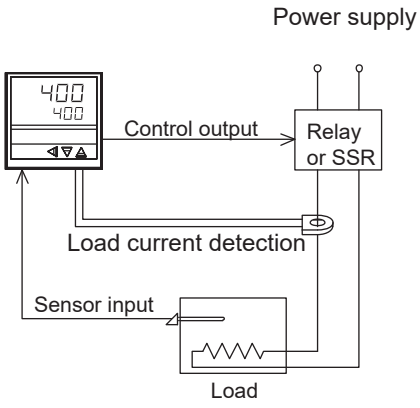


Fig 15.

Loop Break Alarm (LBA)

Loop Break Alarm is designed for temperature control applications. The LBA monitors and protects an entire temperature control system. LBA can detect heater breaks, thermocouple or RTD failure, short circuits, or the failure of an operating device such as a mechanical relay, SCR, and SSR.

It can be used alone or in combination with a temperature alarm.

How LBA Works

Loop Break Alarm is set as a function of time, and can be set from 0 to 7200 seconds. It can be manually entered or set during the autotuning cycle. If LBA is set during autotuning, it will be set automatically to twice the integral time. The control loop break alarm timer starts when the controller output becomes 0% or 100%..

In a reverse-action control system, if the controller output is 100% (full-on), and the measured value does not rise by 2°C (°F) during a control loop break alarm time cycle, the LBA will turn on. Similarly, the LBA will be turned on if the controller output is 0% (no heating) and the measured value does not fall by at least 2°C (°F) or more during a control loop break alarm time cycle.

When the LBA turns on, it causes an internal relay to close.

This switch action can be used to activate an external device to shut down the process if necessary. In this way, a control loop problem can be detected early in the process, minimizing serious damage to materials or machinery.

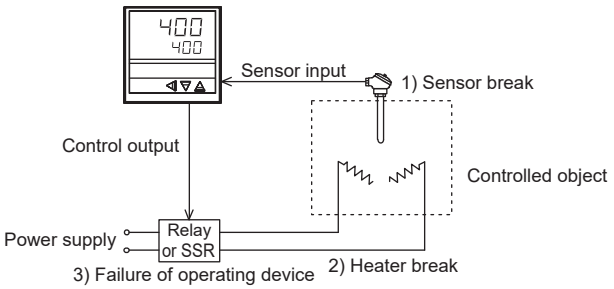


Fig 16.

SETTING

Memory Area

This is the function of storing parameters such as set value (SV), etc. in up to 8 memories. The parameters which can be stored as one of memories are set value (SV), first alarm, second alarm, proportional band, integral time, derivative time, etc.

The parameters stored in one memory are called as necessary from among those stored in the 8 memories and used for control. The memory area used for this control is called "Controls area".

They can be accessed via front panel setting, digital input, or digital communications

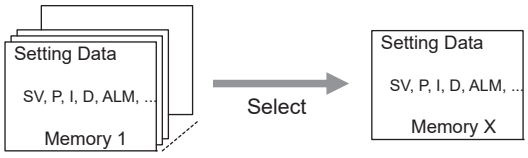


Fig 17.

Remote Setting (RS)

This is the function of setting and changing set value (SV) by an external instrument.

The processing steps of each function for remote setting (RS) input are shown as follows:

Fig 18.

Remote set-value (RS) used for display and control
= [RS digital filter] x [RS ratio] + [RS bias]

(1) RS digital filter

This is a first order lag filter to reduce, by software, the noise contained in remote set value (RS).

(2) RS ratio

This is the function of inputting the remote set value (RS) obtained by multiplying the remote set value (RS) by a multiplying factor.

[Remote set value (RS)] x [RS ratio]
= Remote set value (RS) for the display and control

[Example]

For an input range of 0 to 400°C and a remote set value (RS) input of 0 to 5V

1. When RS ratio is 1.000
   400°C x 1.000 = 400°C
   0°C x 1.000 = 0°C
2. When RS ratio is 0.500
   400°C x 0.500 = 200°C
   0°C x 0.500 = 0°C

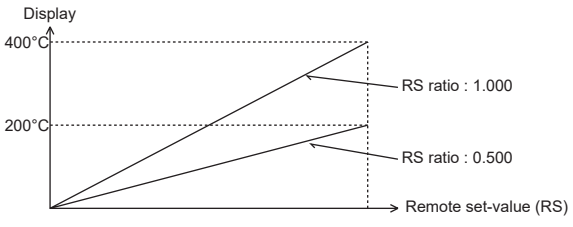


Fig 19.

(3) RS bias

The value obtained by adding RS bias to remote set value (RS) set by an external instrument becomes the remote set value (RS) of this instrument.

Remote set value (RS) display
= [Remote set value (RS)] + [RS bias]

Setting Change Rate Limiter (RAMP)

This function is used to allow the set point to be automatically changed at specific rates when new set point is used.

[Example] Setting change rate limiter : 20°C/min

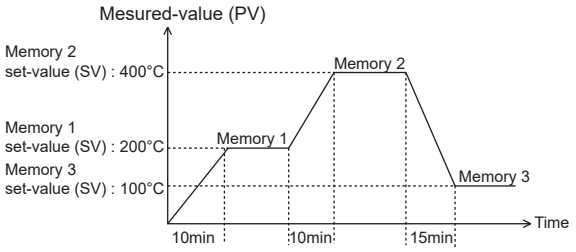


Fig 20.

Serial Communication/Protocols

Serial communication refers to data bits that are transmitted sequentially through a single line. For longer cable lengths, serial communication is less expensive than parallel communication.

<RS-232C>

RS-232C is used for interfaces between data terminal equipment and data communication equipment. Data rates range from 50 to 19200 baud and the maximum permissible line length under the RS-232C specification is approximately 15 meters.

<RS-422A>

The RS-422A standard specifies a low impedance differential signal enabling the line length to reach approximately 1200 meters.

<RS-485>

The RS-485 standard specifies the electrical characteristics of the driver and the receiver to be used by the line interface. It does not specify or recommend any protocol; the protocol is left to the user. This communications standard is used where a balanced transmission line is required in party-line configuration. The EIA RS-485 standard is widely accepted because it enables users to configure inexpensive local area networks and multi-drop communication links using twisted pair wire and the protocol of their choice. The user has flexibility in matching cable quality, signaling rate and distance to the specific application to optimize cost versus performance.

<Protocol>

RKC uses ANSI protocol or Modbus protocol using RS-232C, RS-422A and RS-485 methods. This protocol is similar from product to product. Many software packages have standard drivers for RKC protocol.

How to Obtain PID Value

To have good control result with PID control, optimum PID values must be obtained to meet the control objective.
The optimum PID values can be obtained by either of the following two methods.

1. **Step response method**
2. **Limit sensitivity method**

1. Step response method
Generally, the response in thermal process is slow and it is a S-shaped response as shown in fig. a.
This is called second order lag. Even if capacity is increased, there is no change in S-shaped response, only the delay increases. This is called "Higher order lag".

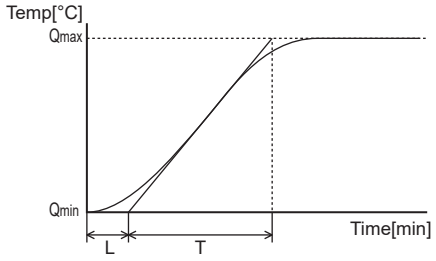
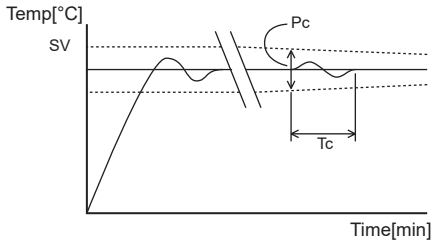


Fig a.

[How to determine values]
First, we check the characteristic of the controlled object using a temperature controller and a recorder, and get L (dead time) and T (time constant, 0.63 x Q max.) referring to fig. 1. Then, we can obtain PID values as follows.

Control method	Proportional gain	Integral time	Derivative time
P	KpK = $\frac{T}{L}$	———	———
PI	KpK = 0.9 $\frac{T}{L}$	I = 3.3L	———
PID	KpK = 1.2 $\frac{T}{L}$	I = 2L	D = 0.5L

2. Limit sensitivity method
In this method, first, PID controller is operated only by proportional action, and I and D action is turned off. Narrowing proportional band gradually causes oscillation of controlled temperature. Assuming that proportional at this moment is Pc and cycle time of oscillation is Tc, each of PID values can be obtained from the following equation.



P = 1.7 Pc
I = 0.5 Tc
D = 0.125 Tc
Equation No.1

[How to determine values]
1. Attempt wiring of temperature controller.
2. Set each PID value as follows.
P=20°C (sometimes more than 20°C)
I =¥
D=0
3. Make sure the temperature recording is a straight line after the temperature is stabilized to a set point.
4. Narrowing the proportional band causes oscillation of temperature.
5. Read the proportional band Pc and a cycle time Tc at that moment from the recorder.

Temperature input

RKC supplies thermocouples and resistance bulbs.
A thermocouple utilizes the thermoelectric force generated by the temperature difference between both ends of the connection in the closed circuit configured by the different kind of metals. Several kinds of thermocouples are standardized according to the applications.

A resistance bulb utilizes the characteristics that the resistance value of a metal changes according to the change of temperature. RKC supplies 3-wire type platinum resistance bulbs.

Thermocouples

Type K
K type thermocouple uses chromel (chrome alloy) and alumel (copper and nickel alloy) for its wires. The chromel wire is positive and alumel is used as the negative lead.
This type has excellent acid resistance under the temperature below 1000°C and widely used as an industrial thermocouple. But it is not suitable for the use in the reducing atmosphere (H2, CO gas, etc.).

Type J
In type J, iron is used as the material for plus and constantan (copper and nickel alloy) for minus. Suitable for the use in the reducing atmosphere, but not suitable for the oxidizing atmosphere as the iron is deteriorated.

Type T
In type T, copper is used as the material for plus and constantan (copper and nickel alloy) for minus. This type is used in the low temperature range (-200 to 300°C).

Type E
In type E, chromel (chrome alloy) is used as the material for plus and constantan (copper and nickel alloy) for minus. The thermoelectric force is the strongest among all thermocouples, but the use in reducing atmosphere (H2 , CO gas, etc.) is not suitable.

Type R
In type R, Pt alloy including 13% of Rh is used as the material for plus, and Pt for minus.
This type is widely used in the high temperature range as the noble-metal thermocouple, but it is not suitable for the direct use in vacuum and reducing atmosphere.

Type S
In type S, Pt alloy including 10% of Rh is used as the material for plus, and Pt for minus.
This type shall be handled with deep care as this is a noble-metal thermocouple like R type.

Type B
In type B, Pt alloy including 30% of Rh is used as the material for plus, and Pt alloy including 6% of Rh. This type can be used in higher temperature range than R and S types. But it cannot be used in a low temperature range as the characteristics of thermoelectric is not favorable.

Type N
In type N, Nicrosil (nickel, chrome and silicon alloy) is used as the material for plus, and Nisil (nickel and silicon alloy) for minus. The acid resistance of this type is better than K type.

Type PLII
In type PLII, the alloy mainly consists of Pb, Pt and Au is used as the material for plus, and the alloy mainly consists of Au and Pb for minus.
This type, as the noble-metal thermocouple, has realized almost same thermoelectric force with K type.

Type W5Re/W26Re
In type W5Re/W26Re, the alloy comprising 5% of W is used as the material for plus, and the alloy comprising 26% of W for minus. This type is excellent for the measurement in vacuum with high temperature and in reducing atmosphere. But this type is to be handled with care as it cannot be used in the oxidizing atmosphere.

Type U
U type thermocouple is specified by the German standard of DIN. The characteristics of it is similar to type T.

Type L
L type thermocouple is specified by the German standard of DIN. The characteristics of it is similar to type J.

Resistance Bulb

Type Pt100
Pt100 type resistance bulb has the resistance value of 100Ω at 0°C. (R100/R0 = 1.3850)
From low temperature range to medium temperature range, high accuracy and stable measurement is possible with this sensor. But in using cryogenic range, it must be careful for the error by self-heating of the RTD element.

Type JPt100
JPt100 type resistance bulb is the temperature sensor specified in JIS (Japan Industrial Standard) (R100/R0 = 1.3916). It has the same application as the Pt100.

Control Output

Relay output
The relay used in a normal temperature controller is small in capacity and impossible to drive a large load. The use of an external auxiliary relay is recommended to reduce the load on the controller relay. To increase the mechanical relay life, reduce load and/or increase the cycle time setting in the controller.

Voltage pulse output
This is a pulse signal output of voltage level of 0 to 12V DC for driving external SSR (Solid State Relay).
The larger the load capacity, the larger the load to a mechanical relay and the more frequent ON/OFF switching per specified period, the shorter the relay life. SSR can be used in such an application instead of a mechanical relay. The ON/OFF time ratio is changed by PWM (Pulse Width Modulation) method under a constant cycle time, and then the ON/OFF switching ratio of SSR is changed to control the load.

Current output
Most common current output range is continuous 4 to 20mA DC, which is used to drive external power control unit like SCR power controller, valve or speed controller.
<Note>
Typically, RKC calls for loads of 600Ω or less. Larger loads can be driven, but maximum output is 12 to 13VDC at 20mA.

Trigger output
This output is used to directly produce trigger output to thyristor element on triac unit. Usually trigger output is designed to be used for zero-cross control.

Product List Conforming to International Standards

Controls

MAR.2020

Model	UL/cUL recognized (File No.)	CE Mark		Notes
		EMC Directive	Low Voltage Directive	
FZ110/400/900	E172270	EN61326 (Class A)	EN61010-1	
RZ100/400				
RB100/400/900 RB500/700				
CB100, CB400 CB500, CB700 CB900 CB103, CB403 CB903				
SA100 SA200, SA201				
FB100/400/900				
GZ400/900				
HA400/401/430 HA900/901/930				
SB1				
REX-P24				
PZ400/900				
PF900/901				
SR Mini HG				
SRZ				
SRX				
SRV				
MA900/901				

Indicators, Recorders

Model	UL/cUL recognized (File No.)	CE Mark		Notes
		EMC Directive	Low Voltage Directive	
AG500	E172270	EN61326 (Class A)	EN61010-1	
AE500				
DP-700	————	EN61326 (Class A)	————	
VGR-B100	————	EN61326 (Class A)	EN61010-1	
SBR EW100/180	99988 * CSA certified			

Others

Model	UL/cUL recognized (File No.)	CE Mark		Notes
		EMC Directive	Low Voltage Directive	
CB100L	E172270	EN61326 (Class A)	EN61010-1	FM3545 Approved
SA100L				
COM-J/M				
THV	E177758	EN60947 (Class A)	EN60947-4-3	
THV-A1(20 to 100A)	E172270		EN61010-1	
THV-A1(150/200A)	E177758	————	————	
THV-10	E177758	EN60947-4-3 (Class A)	EN60947-4-3	
THV-40	E177758	EN60947-4-3 (Class A)	EN60947-4-3	
SSNP	E177758	————	————	
SSL/SSN		EN60947 (Class A)	EN60947	
SSJ		EN55011 (Class A), EN61000	EN60950	
PG500	E172270	EN61326 (Class A)	EN61010-1	
PCT-300				
LE100/110				
LT1				
LTM-100	————	EN61326(Ckass B), EN61326 Annex C	————	
RHT-E1	————	EN55011 (Class A), EN50082-2	————	
RMC-500	E172270	EN61326 (Class A)	EN61010-1	

RCM Confirming Product List

Model	Supplier's Code No.
FZ110/400/900, RZ100/400, RB100/400/500/700/900, FB100/400/900, SA200, SA100, GZ400/900, HA400/401, HA900/901, MA900/901, PZ400/900, PF900/901, HA430/930, SRZ, SRV, SRX, DP-700, AG500, PG500, COM-J, COM-M,	N11717

*RCM : Australian EMC Directive.

List of Discontinued Models

MAR.2020

RKC provides repair services for 5 years after a product has been discontinued from production.
This period may be shorter due to unavailability of the necessary components.

Controls

Model	Final production date	Replacing Models
B800	Nov.2010	Contact RKC or RKC distributors
B850	Nov.2010	Contact RKC or RKC distributors
CB900L	Nov.2015	Contact RKC or RKC distributors
REX-F4/F7/F9	Nov.2007	FB400/900, RB400/700/900
REX-F9 with communication function	Sep.1999	FB900, RB900
REX-F4 with trigger output	Sep.1999	Contact RKC or RKC distributors
REX-G9	Oct.2004	HA901
REX-C4/C9	Dec.1997	RB400/900
REX-C40/C41/C70/C90	Dec.1997	RB400/500/700/900
REX-C1000	Dec.1998	RB900
REX-C10	Jun.2008	RB100
REX-D100/D400/D900	Nov.2015	FB100/400/900, RB100/400/900
REX-F400/F700/F900	Nov.2015	FB400/900
HA430	Nov.2015	Contact RKC or RKC distributors
REX-P100	Mar.2003	PZ900,PF900/901
REX-P200	Nov.2010	PF900/901
REX-P210	May.2001	PF900/901
REX-P250	Nov.2010	PF900/901
REX-P300	May.2011	PF900/901
REX-P48/P96	May.2019	PZ400/900
REX-P90	May.1997	PZ900
CVM-3C (Output Converter for REX-P300/210)	Nov.2007	Not available
CVM-4 (Output Converter for REX-P300/200)	Nov.2007	Not available
REX-C2000	Dec.1998	MA900,MA901
REX-Z2500	May.2001	SR Mini HG, SRZ, SRV
FAREX-MIGHTY 5E	Nov.1996	SR Mini HG
SR SYSTEM	Nov.2007	SR Mini HG
OPL	Mar.2001	Not available
OPM, OPM-H	Nov.2010	Not available
OPC-H	Feb.2012	Contact RKC or RKC distributors
OPC-SC1/SC2/SE1	Nov.2006	Not available
OPC-V06	Mar.2011	Contact RKC or RKC distributors
DB-480	May.2001	RB400
DBH-480	Nov.2007	RB400
DN-96	May.2001	RB900
MC-1/MF-1	Jun.1995	RB100
MD-21/MD-51	Dec.1998	Contact RKC or RKC distributors
MF-48	May.2001	RB400
MF-65	Jun.1995	RB900
MR-12	May.2001	Contact RKC or RKC distributors
MS-2,MS-3,MSN-1	Dec.1992	Contact RKC or RKC distributors
PB-6	May.2001	RB900
PB-6H/H6	Mar.1998	RB900
PB-96	May.2001	RB900
PF-4	Jan.2014	RB700
PF-62	May.2001	RB900
PF-8	Oct.1995	Contact RKC or RKC distributors
PN-4	Apr.2014	RB700
PN-6	May.2001	RB900

Indicators, Recorders

Model	Final production date	Replacing Models
AF-48	May.1991	AG500, AE500
DP-1*A	May.1997	Contact RKC or RKC distributors
DP-100	Feb. 2001	DP-350
DP-300	May.1997	DP-350
DP-500	Dec.2004	DP-700
DP-4	May.1997	AG500, AE500
DP-48	May.2001	AG500, AE500
HPO-30	May.1997	Not available
HPS-51	Jun.1994	Contact RKC or RKC distributors
HPS-62	Dec.1997	Contact RKC or RKC distributors
REX-AC110	Nov.2010	Contact RKC or RKC distributors
REX-AC410	Nov.2010	AG500, AE500
REX-AF4	May.1997	AG500, AE500
REX-DP110	Nov.2010	Contact RKC or RKC distributors
REX-DP410	Nov.2010	AG500, AE500
REX-PG410	Oct.2009	PG500, AE500
RMC-410	Nov.2010	RMC-500
SP-48 (Input Selector Unit)	May.2001	Not available
SP-400 (Input Selector Unit)	Nov.2007	Not available
CS-4 (Power supply unit for SP-4)	Jun.1995	Not available
SBR-EM100/180	Mar.2011	SBR-EW100/180
SBR-ET100/180	Mar.1996	SBR-EW100/180
SBR-EX100/180	Mar.1996	SBR-EW100/180
SBR-EY100	Sep.1995	SBR-EW100
SBR-EY180	May.1996	SBR-EW180

Output Device

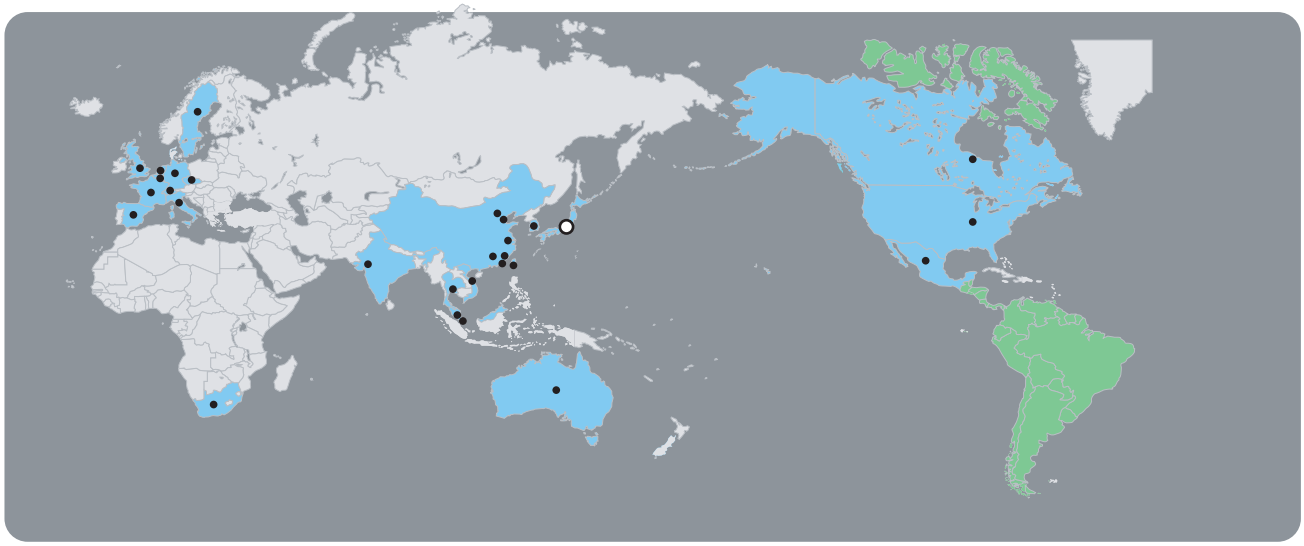
Model	Final production date	Replacing Models
1( )PH,1( )ZE	Nov.2005/Nov.2006	THV
13PHB	Nov. 2006	13PHM
1( )PHS	Nov.2005/Nov.2006	THV
1( )PHF	Nov.2005/Nov.2006	THV, 1( )PHM
1( )PHN	Nov.2005/Nov.2006	THV, 1( )PHM
11PHM	Nov.2006	THV
11ZEF,13ZEF,14ZEF	Nov.2005	THV
33PHF,34PHF	Nov.2006	THW
3( )PHN	Nov.2005	THW
1( )SRF	Nov.2005	THV
11SRN, 14SRN	Nov.2005	THV
SSE	Nov.2006	SSJ

Accessories

Model	Final production date	Replacing Models
BRA-100A/100B	May.2001	Not available
COM-B	Nov.2010	Contact RKC or RKC distributors
COM-E	Nov.2015	Not available
COM-G	Nov.2014	Not available
COM-100A/101A	May.2001	Not available
COM-102A	Dec.1998	Not available
COM-103C	Nov.2007	Contact RKC or RKC distributors
COM-104	Nov.2013	Contact RKC or RKC distributors
CT-300	Nov.2011	Contact RKC or RKC distributors
CVM-48N6	Nov.2007	Not available
EP-48, EP-61	May.1997	Not available
REX-AP4	Nov.2014	Not available
REX-EP4	Nov.2014	Not available

CAUTION

Replacing models are not completely interchangeable with discontinued models. Please carefully check the specifications, or contact RKC/RKC distributors for any assistance.



INTERNATIONAL NETWORK

at The JAN. 2025 present

<North America, South America>

USA, Canada, Mexico, Central&South America

Please see our website.
https://www.rkcinst.co.jp/english/company/overseas-base/

<North Europe>

Sweden

Teddington AB
Tel: +46+(0)8-505 207 60
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http://www.teddington.se

<South Europe>

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Rotfil Srl
Tel: +39-011-9683111
Fax: +39-011-9683225
http://www.rotfil.com

Spain

Rasesa Automatismos S.L.
Tel: +34-3-712-1561
Fax: 34-3-712-1833
http://www.rasesa.com

<West Europe>

England, UK

TC Limited
Tel: +44-1895-252222
Fax: +44-1895-273540
http://www.tc.co.uk

France

TC S.A.
Tel: +33-478-432725
Fax: +33-478-432762
http://www.tcsa.fr

Austria

PELAN KEG
Tel: +43 1 / 292 64 00
http://www.pelan.at

Switzerland

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Tel: +41-(0)61-753-0950
Fax: +41-(0)61-753-0953
http://www.hantec.ch

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Cascade Automation Systems B.V.
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Fax: +31-180-463-871
http://www.cascade.net

Germany

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Fax: +49-2166-999 456
http://www.tcgmbh.de

<Asia>

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DELTA I/O CO., LTD.
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Fax: +82-31-245-6182,+82-31-256-7875
http://www.deltaio.co.kr

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Tai Yu & Co., Ltd
Taipei head office
Tel: +886-2-2595-3355
Fax: +886-2-2596-4871
http://www.ty-c.com.tw
Taichung office
Tel: +886-4-2234-7491
Kaohsiung office
Tel: +886-7-556-8555

Thailand

SUMMIT INDUSTECH CO.,LTD.
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http://www.summitindustech.com

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Fax: +65-6265-9579
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