CB100   CB700
CB400   CB900
CB500

CE ®U ® ®

● General Description

Launching temperature control into the new Millennium

CB series is the state-of-the-art temperature controller developed to pursue "easy and user-friendly" temperature control.
It provides easy operation, versatile functions including self-tuning and stable control with 0.3% measurement accuracy.

● Features

☆ Clear and easy-to-read large LED
☆ RKC self-tuning
☆ Digital communications
☆ Heat/cool action
☆ LBA (Loop Break Alarm) and HBA (Heater Break Alarm) as option
☆ Waterproof and dustproof protection

Clear and easy-to-read large LED

It has a very clear and easy-to-read large LED display.

PV
400 10mm
SV
400 8mm
CB100/400

PV
901 20mm
SV
900 14mm
CB900

PV
700 14mm
SV
700 10mm
CB700
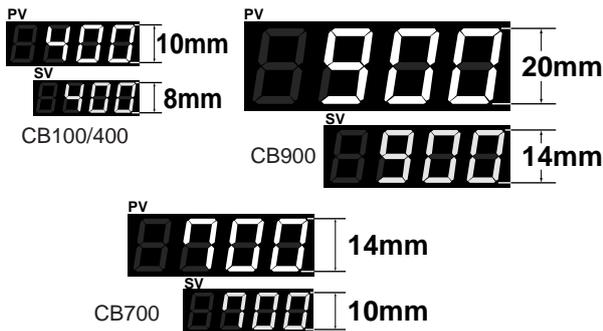
Digital communications   (Optional)

The CB series 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.
MODBUS protocol is also available.

RS-485   Communication RS-232C
          level converter

Max 31 units   Host computer
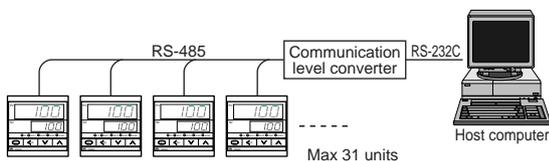
RKC self-tuning
Advanced algorithm for optimum control

RKC self-tuning offers the most advanced algorithm for precise temperature control. Self-tuning is initiated at start-up and when process parameters or conditions change. At these times, new PID parameters are calculated for the best control performance. With the unique RKC self-tuning, the controller evaluates whether PID parameters should be maintained or replaced, selecting the best setting for the controlled process. If it is determined that the existing PID parameters can achieve the best control for the process, the present PID parameters will be retained and the new PID parameters will be canceled. Self-tuning can be turned on/off in parameter setting mode. Self-tuning is not available with heat/cool control.

In addition to self-tuning, the controller also has autotuning (AT) so that either function can be selected for optimum process control.

At start-up or set value change

When overshoot occurs, self-tuning is initiated

When control disturbance occurs, self-tuning is initiated

Oscillation

When control is stable, self-tuning is not initiated

When undershoot occurs, self-tuning is initiated

At set value change

When control is stable, self-tuning is not initiated

When control is stable, self-tuning is not initiated

Temp

Time

Heat/cool control   (Optional)

The heat/cool PID controller has heat and cool outputs for use where process-generated heat exists. The controller allows the input of overlap or deadband settings which can contribute to energy savings.

100%   100%
Heat   Cool   Heat   Cool
output   output   output   output
0%   0%
Set value   Set value
Overlap   Deadband
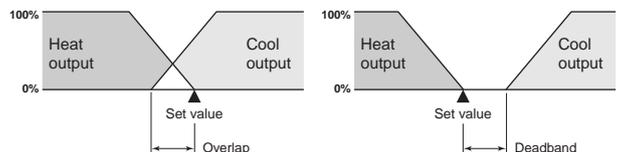
Features

Heater break alarm (HBA)   (Optional)

The HBA detects a fault in heating or cooling circuit.
If the measured value becomes lower than the preset value, the alarm is generated.
The HBA function requires a current detector for measuring load current.


Sensor
Heater
Controlled object
CT
Actuator
Mechanical relay, SSR
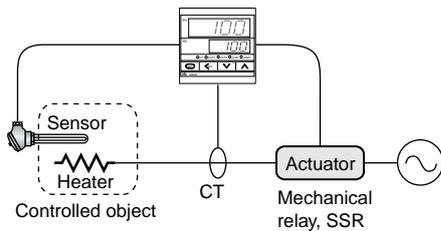
CTL-6-P-N(0 to 30A)	CTL-12-S56-10L-N(0 to 100A)
Length of lead wire : Approx. 130mm (standard)	Length of lead wire : Approx. 100mm (standard)
ϕ 5.8	ϕ 12

Temperature alarms   (Optional)

The CB serise provides a wide selection of alarm types to configure up to two alarm contacts. Alarm Hold action is configured in the controller.
Upon start-up alarm action is suppressed by the Hold function until the process value has entered the non-alarm range.

Contact output
Various alarm devices
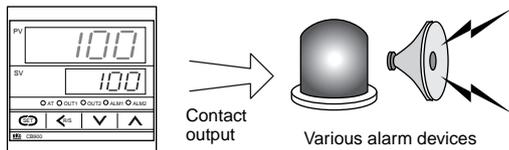
Close horizontal spacing

The mounting bracket has been designed to allow close horizontal mounting to save valuable panel space.

Close horizontal mounting
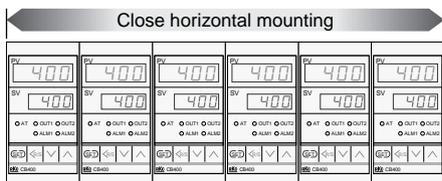
## Loop break alarm (LBA)   (Optional)

The control loop break alarm (LBA) monitors and protects an entire temperature control system. The LBA detects heater breaks, thermocouple or RTD failures, short circuits, or the failure of an operating device such as a mechanical or solid state relay.

When the PID computed value reaches 100% and the temperature does not respond in a set time, the loop break alarm is activated. Conversely, when the PID value reaches 0% and the temperature does not respond accordingly, the loop break alarm is turned on.

*The above examples are for reverse action.
For direct action. the LBA action becomes reversed.
*LBA deadband is available to suppress the influence by external disturbances.

Sensor
Heater
Controlled object
Actuator
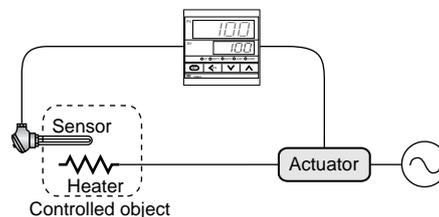
RUN/STOP mode   (Optional)

To toggle between modes, press the RUN/STOP key for one second.
The instrument monitors the process value even when in STOP mode.

(STOP is displayed on the upper LEDs as standard. A model which displays STOP on the lower LEDs is also available.
For details, please contact RKC or RKC's agent.)
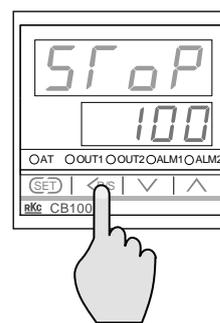
Watertproof and dustrpoof protection (Optional)

For operation in severe environments or when washdown is required, IP66(65) is available.

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
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
c) DC voltage : 0 to 5V, 1 to 5V (0.0 to 100.0% fixed)
•Input break action : Down scale
d) DC current : 0 to 20mA, 4 to 20mA (0.0 to 100.0% fixed)
•For DC current input, connect a 250 Ω resister to the input terminals.
•Input break action : Down-scale

Sampling time
0.5 sec

PV bias
Temperature input : -1999(-199.9) to 9999(999.9)℃[℉]
DC voltage, DC current : - span to +span

Performance

Measuring accuracy
a) Thermocouple
±(0.3% of reading + 1 digit) or ±2℃ (4℉) whichever is larger
•Accuracy is not guaranteed between 0 and 399℃ (0 and 749℉) for
type R, S and B.
•Accuracy is not guaranteed between -199.9 and -100.0℃ (-199.9
and -158.0℉) for type T and U.
b) RTD
±(0.3% of reading + 1 digit) or ±0.8℃ (1.6℉) 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

Control

Control method
a) PID control (with autotuning and self-tuning function)
•Available for reverse and direct action. (Specify when ordering.)
b) Heat/cool PID control (with autotuning function)
•Air cooling and water cooling type are available. (Specify when ordering.)

Major setting range
Set value : Same as input range.
Heat side proportional band : 1 to span or 0.1 to span (Temperature input)
When 0.1℃ (℉) resolution, within 999.9℃ (℉)
or 0.1 to 100.0% of span (voltage, current input)
(ON/OFF action when P=0)
*Differential gap at ON/OFF action is 2℃ (℉).
Cool side proportional band : 0 to 1000% of heat side proportional band
(Heat/Cool ON/OFF action when Pc=0)
Integral time : 0 to 3600sec.(P + D action when I=0)
Derivative time : 0 to 3600sec.(P + I action when D=0)
Anti-Reset Windup(ARW) : 1 to 100% of heat side proportional band
Deadband/Overlap : -10 to 10℃ (℉) or -10.0 to 10.0℃ (℉)
-10.0 to +10.0% of span (Voltage, current input)
Proportional cycle time : 1 to 100 sec.

Control output
Relay output : Form C contact, 250V AC 3A (resistive load)
(Form A contact : Heat/Cool PID type)
Voltage pulse output : 0/12V DC
(Load resistance : More than 600Ω)
Current output : 4 to 20mA DC
(Load resistance : Less than 600Ω)
Triac trigger output : Zero-corss method for medium capacity
triac drive (less than 100A)
•Not available for Heat/Cool PID type.
Triac output : Rating : 0.5A
(An ambient temperature is less than 40℃)

Alarm (Up to 2 points)   (Optional)

Temperature alarm
a) Type : Deviation High, Low, High/Low, Band,
Process High, Low
Set value High, Low
b) Differential gap : 2℃ (℉) or 2.0℃ (℉) (Temperature input)
0.2% (Voltage, current input)

Heater break alarm (For single phase)
a) CT type : CTL-6-P-N(30A), CTL-12-S56-10L-N(100A)
b) Display range : 0.0 to 100.0A
c) Accuracy : ± 5% of input value or ± 2A (whichever is larger)
•Output from alarm 2 terminal.

Control loop break alarm (LBA)
a) LBA time setting : 0.1 to 200.0 min.
b) LBA deadband : 0 to 9999 ℃[℉] or 100% of span
(OFF by setting zero)
•Not available for heat/cool type.

Alarm output
Relay output, Form A contact 250V AC 1A (resistive load)

Communications   (Optional)

a) Communication method : RS-485 (2-wire)
b) Communication speed : 1200, 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.)

Waterproof and dustproof   (Optional)

CB100 : IP66
CB400/500/700/900 : IP65
•Dustproof and waterproof are effective only to the front direction
when installed on a panel.
•Dustproof and waterproof are not effective when controllers are closely
mounted.

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

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

Operating environments : 0 to 50℃ [32 to 122℉] , 45 to 85% RH

Memory backup : Backed up by non-volatile memory.

Net weight
CB100 : Approx. 170g   CB700 : Approx. 290g
CB400 : Approx. 250g   CB900 : Approx. 340g
CB500 : Approx. 250g

External Dimensions (W x H x D)
CB100 : 48 x 48 x 100mm   CB700 : 72 x 72 x 100mm
CB400 : 48 x 96 x 100mm   CB900 : 96 x 96 x 100mm
CB500 : 96 x 48 x 100mm

Compliance with standards

• CE marked
• UL recognized
• CSA certified

•Triac trigger output type and triac output are not CE marked, UL
recognized or CSA certified.

Digital Temperature Controller
CB series

Model and Suffix Code

Specifications	Model and Suffix Code
Size	CB100 (1/16 DIN size) CB400 (1/8 DIN Vertical size) CB500 (1/8 DIN Horizontal size) CB700 (3/16 DIN size) CB900 (1/4 DIN size) □ □ □－□ □＊□ □－□ □／□／Y
Control method	PID control with AT (reverse action) F PID control with AT (direct action) D Heat/cool PID with AT (water cooling) W Heat/cool PID with AT (air cooling) A
Input type	See range and input code table □
Range	See range and input code table □
Control output (OUT1)	Relay output M Voltage pulse V DC current : 4 to 20mA 8 Triac trigger G Triac output T
Control output (OUT2)	Control method : F, D No symbol Relay output M Voltage pulse V DC current : 4 to 20mA 8 Triac output T
Alarm 1	No alarm N See alarm code □
Alarm 2	No alarm N See alarm code □
Digital communications	Not supplied N RS-485 (2-wire system) *1 5
Waterproof and dustproof	Not supplied N Waterproof and dustproof protection 1
Body color	Black A White N
Instrument version	Version symbol Y

*1: MODBUS protocol is also available. Please specify "Z-1021" along with full model code. For details, please contact RKC, or RKC's agent.

Range and input code table

Thermocouple

Input	Code	Range
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	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	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	01	0 － 1600°C
S	02	0 － 1769°C
S	A1	0 － 3200°F
S	A2	0 － 3216°F
B	01	400 － 1800°C
B	02	0 － 1820°C
B	A1	800 － 3200°F
B	A2	0 － 3308°F

Input	Code	Range
E	01	0 － 800°C
E	02	0 － 1000°C
E	A1	0 － 1600°F
E	A2	0 － 1832°F
N	01	0 － 1200°C
N	02	0 － 1300°C
N	A1	0 － 2300°F
N	A2	0 － 2372°F
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	01	0 － 2000°C
W5Re/W26Re	02	0 － 2320°C
W5Re/W26Re	A1	0 － 4000°F
PL II	01	0 － 1300°C
PL II	02	0 － 1390°C
PL II	03	0 － 1200°C
PL II	A1	0 － 2400°F
PL II	A2	0 － 2534°F
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	01	0 － 400°C
L	02	0 － 800°C
L	A1	0 － 800°F
L	A2	0 － 1600°F

RTD

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 － 100.0°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

Input	Code	Range
0 – 5V DC	4 01	0.0 － 100.0
1 – 5V DC	6 02	0.0 － 100.0
0 – 20mA DC	7 03	0.0 － 100.0
4 – 20mA DC	8 04	0.0 － 100.0

* Type R, S and B input : Accuracy is not guaranteed between 0 to 399°C (0 to 799°F)
* Type T and U input : Accuracy is not guaranteed between -199.9 to -100.0°C (-199.9 to -158.0°F)
* DC current input : A 250 Ω resistor is externally connected at the input terminals.

Supply voltage

100 - 240V AC	24V AC	24V DC

Alarm code

Code	Type
A	Deviation High
B	Deviation Low
C	Deviation High/Low
D	Band Alarm
E	Deviation High with Alarm Hold
F	Deviation Low with Alarm Hold
G	Deviation High/Low with Alarm Hold
H	Process High

Code	Type
J	Process Low
K	Process High with Alarm Hold
L	Process Low with Alarm Hold
R	Loop break alarm (LBA)
P	Heater break alarm (CTL-6-P-N [30A])
S	Heater break alarm (CTL-12-S56-10L-N [100A])
V	Set value High
W	Set value Low

*1 Loop break alarm is not available for heat/cool PID control type.
*2 Heater break alarm is allocated to Alarm 2. Heater break alarm is not available for current output.

Accessory

Current transformer for heater break alarm
CTL-6P-N (0 – 30A)
CTL-12-S56-10L-N (0 – 100A)

Shunt resistor for DC current input
KD100-55

Terminal cover
KCA100-517 (CB100)   KCA400-513 (CB400/500)
KCA700-53 (CB700)   KCA900-58 (CB900)

CB_03E

External Dimensions

Units : mm

•External demensions

•Panel cutouts

CB900

$$L=(96xn-4)^{+0.8}_{0}$$
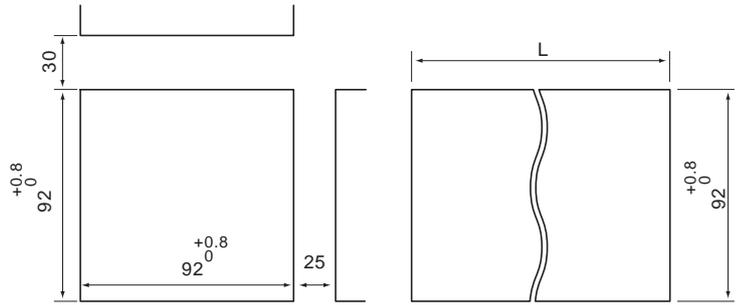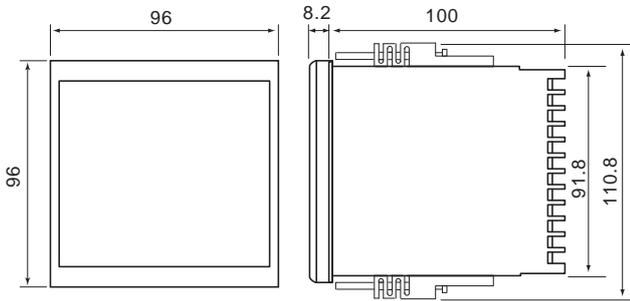
n : Number of controllers (2=<n=<6)

CB700

$$L=(72xn-4)^{+0.7}_{0}$$
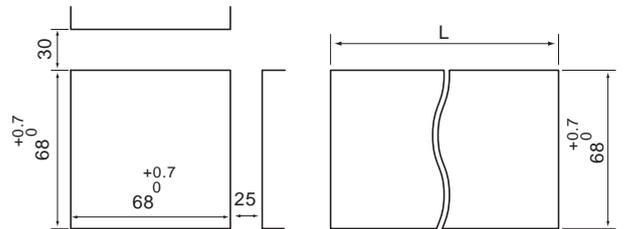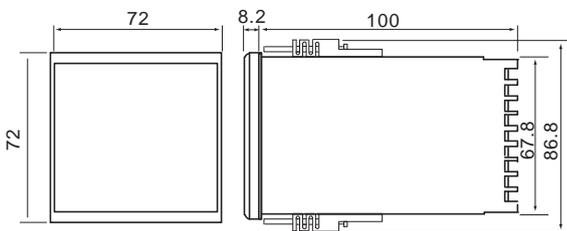
n : Number of controllers (2=<n=<6)

CB500

$$L=(48xn-3)^{+0.6}_{0}$$
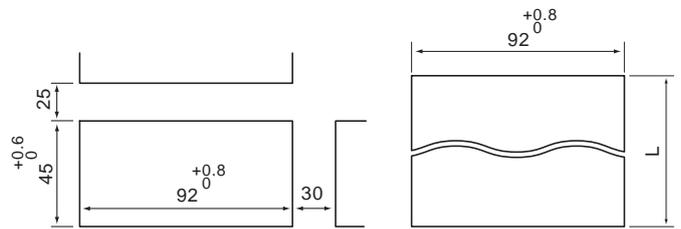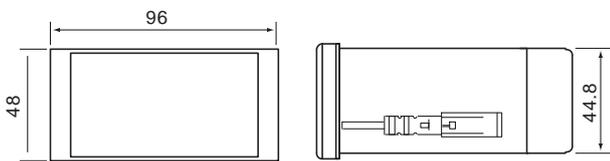
n : Number of controllers (2=<n=<6)

CB400

$$L=(48xn-3)^{+0.6}_{0}$$
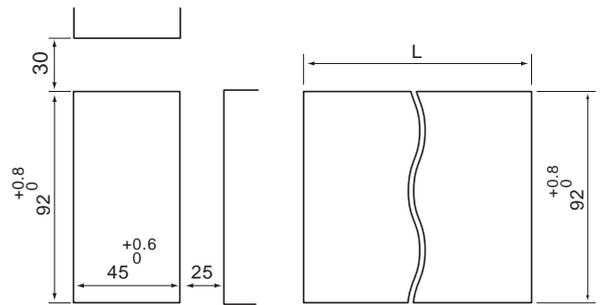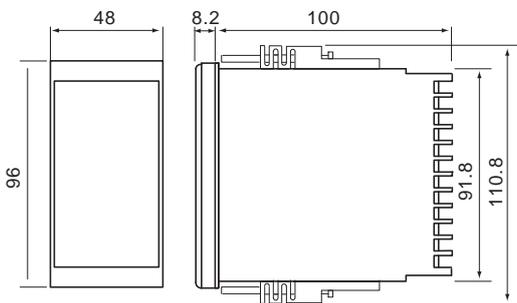
n : Number of controllers (2=<n=<6)

CB100

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

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

Digital Temperature Controller
CB series
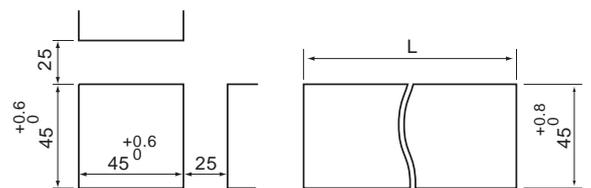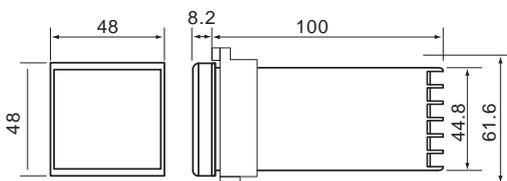
Rear Terminals

CB400

CB500

CB900

CB700

CB100

CB500 / CB900 Description tables

No.	Description	
1 / 2	AC 100 to 240V / AC 24V / DC 24V + −	Power supply
3 / 4 / 5 / 6	PID Control (OUT1) — Heat/cool PID Control (OUT2)(OUT1) — Cool / Heat / SSR / C NO NC G T2 T1	Control Output (1) Relay contact output (2) Voltage DC/Current DC (3) Triac output (4) Triac trigger output
7 / 8 / 9	NO Alarm 2 / NO Alarm 1	Alarm output / Relay contact output
10 / 11 / 12	A B B (1) (2) (3)	Measured input (1) Thermocouple (2) RTD (3) Voltage/Current

No.	Description	
13 / 14 / 15	SG / T/R(A) — RS-485 / T/R(B)	Communications
16 / 17 / 18 / 19 / 20 / 21 / 22		
23 / 24	CT — CT input for heater break alarm	Current transformer input

CB700 Description tables

No.	Description	
1 / 2	AC 100 to 240V / AC 24V / DC 24V + −	Power supply
3 / 4 / 5 / 6	PID Control (OUT1) — Heat/cool PID Control (OUT2)(OUT1) — Cool / Heat / SSR / C NO NC G T2 T1	Control Output (1) Relay contact output (2) Voltage DC/Current DC (3) Triac output (4) Triac trigger output
7 / 8 / 9	SG / T/R(A) — RS-485 / T/R(B)	Communications

No.	Description	
10 / 11 / 12	NO Alarm 2 / NO Alarm 1	Alarm output / Relay contact output
13		
14 / 15	CT — CT input for heater break alarm	Current transformer input
16 / 17 / 18	A B B (1) (2) (3)	Measured input (1) Thermocouple (2) RTD (3) Voltage/Current

CB100 Description tables

No.	Description	
1 / 2	AC 100 to 240V / AC 24V / DC 24V + −	Power supply
3 / 4 / 5 / 6	PID Control (OUT1) — Heat/cool PID Control (OUT2)(OUT1) — Cool / Heat / SSR / C NO NC G T2 T1	Control Output (1) Relay contact output (2) Voltage DC/Current DC (3) Triac output (4) Triac trigger output
7 / 8 / 9	NO Alarm 2 / NO Alarm 1	Alarm output / Relay contact output
10 / 11 / 12	A B B (1) (2) (3)	Measured input (1) Thermocouple (2) RTD (3) Voltage/Current

No.	Description	
13 / 14 / 15	SG / T/R(A) — RS-485 / T/R(B)	Communications
16		
17 / 18	CT — CT input for heater break alarm	Current transformer input