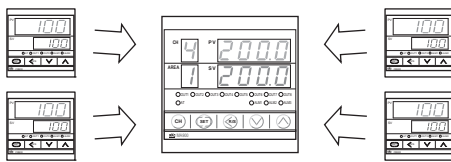# MA900

General Description

The MA900 controls up to 4 channels in a compact 1/4 DIN size. The MA900 increases zone density and makes smaller numbers of loops affordable, yet still holds many of the advantages that a single loop controller might offer. This unit will aid designers of control equipment by saving labor costs, installation costs, electric panel sizes, and operation costs.

Features

☆ 4 channels control
☆ Multi-memory area
☆ Digital communications
☆ Heat/Cool action
☆ Digital contact input
☆ Multiple alarm functions
☆ Close horizontal mounting
☆ IP65 Waterproof/dustproof protection

4 channels Control

4 channels of temperature controls are packed into 96 x 96 x 100mm case. The MA900 can reduce your panel cutouts and make your panel board smaller.
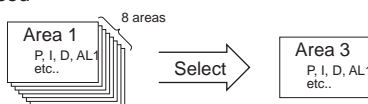

Multi-Memory Area

Up to 8 kinds of combinations of temperature set value, PID constant, alarm set value, etc. for each channel can be registered as "Memory area" (recipe).

The change of settings caused by the change of a process and product can be simply realized only by switching the "Area". The switching of the area by optional external contact input is also available.
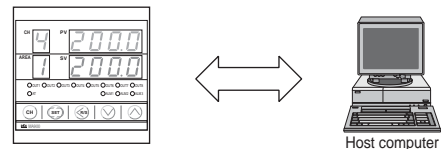
The available parameters for multi memory area :
SV, Alarm set values, PID constants, Anti-reset windup, Overlap/dead band, Setting change rate limiter, Channel used/unused

Area 1
P, I, D, AL1 etc..

8 areas

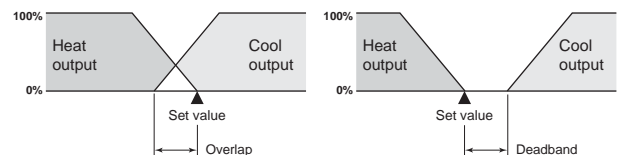Select

Area 3
P, I, D, AL1 etc..

Digital Communications   (Optional)

An optional communications interface, RS-232C, RS-422A or RS-485 is available for networking to computers, PLCs and SCADA software. MODBUS or ANSI (RKC standard) protocol can be selected. Up to 31 units can be interfaced on one RS-422A or RS-485 communication line.

Host computer

Heat/Cool Control   (Optional)

The Heat/Cool PID control features heat and cool outputs for use where process-generated heat exists. This allows the input of overlap or deadband settings which contribute to energy savings.

100%		
Heat output		Cool output
0%		
	Set value	
	Overlap	

100%		
Heat output		Cool output
0%		
	Set value	
	Deadband	

Digital Contact Input   (Optional)

An optional digital contact input is available for RUN/STOP and memory area switching. (RUN/STOP switching can also be completed at the front key panel.)

PLC

Multi-Loop Digital Temperature Controller MA900

Features

Multiple of Alarm Functions

The MA900 provides a wide selection of alarm types to configure up to three alarms.
Alarm 1 (Standard) :
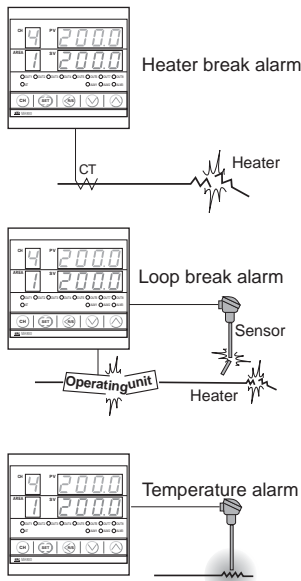Temperature alarms, Loop break alarm, FAIL
Alarm 2 (Optional) :
Temperature alarms, Heater break alarm, FAIL
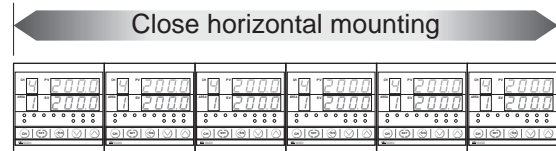Alarm 3 (Optional) :
Temperature alarms, FAIL
Alarm output is common to all channels. But alarm 3 is available for optional independent output for each channel.

Heater break alarm

CT — Heater

Loop break alarm

Operating unit — Sensor — Heater

Temperature alarm

Close Horizontal Mounting   (Optional)

The MA900 has been designed with a unique mounting bracket that allows close horizontal mounting of multiple instruments to save valuable panel space.

Close horizontal mounting

Waterproof / Dustproof   (Optional)

For operation in severe environments or when washdown is required, the IP65 rating is available for waterproof/dustproof protection.

Specifications

Input

Number of Inputs
4 points

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
   • Input is not isolated.
c) DC voltage : 0 to 5V, 1 to 5V, 0 to 10V
   • Input break action : Down-scale
   • Input is not isolated.

Sampling Time
0.5 sec

Input Filter
First order lag digital filter
Time constant 1 to 100 sec. (OFF when 0 is set)

PV Bias
- span to +span (Within -1999 to 9999)

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 799°F) for type R, S and B.
   • Accuracy is not guaranteed less than -100.0°C (-158.0°F) for type K, J, T and U.
b) RTD
   ±(0.3% of reading + 1 digit) or ±0.8°C (1.6°F) whichever is larger
c) DC voltage
   ±(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 function)
  •Available for reverse and direct action. (Specify when ordering.)
b) Heat/Cool PID control (with autotuning function)
  •Air and water cooling types are available. (Specify when ordering.)

Major Setting Range
Set value :   Same as input range.
Heat side proportional band : 1 to span (ON/OFF action when P=0)
  •Differential gap at ON/OFF action is 2°C (°F) or 0.2%.
Cool side proportional band : 1 to 1000% of heat side proportional band
Integral time :   1 to 3600sec.(P + D action when I=0)
Derivative time :   1 to 3600sec.(P + I action when D=0)
Anti-Reset Windup(ARW) : 1 to 100% of heat side proportional band
  (Integral action is OFF when ARW=0)
Deadband/Overlap :   -span to +span (Within -1999 to 9999)
  •Minus setting : Over lap
Proportional cycle time : 1 to 100 sec.

Operation Mode
Available for switching each channel to be normal (control), alarm monitoring (control output OFF, alarm action enabled) and unused.

Control Output
Relay output :   Form A contact, 250V AC 3A (resistive load)
Voltage pulse output :   0/12V DC
  (Load resistance : More than 600Ω)
Current output :   4 to 20mA DC or 0 to 20mA DC
  (Load resistance : Less than 600Ω)
Triac output :   Rating : 0.5A
  (An ambient temperature is less than 40°C)
•Between output terminals are not isolated.

Alarm (Up to 3 points) (Optional)

•Alarm 1 output (Standard), Alarm 2, 3 (Optional)
•Independent output for each channel of Alarm 3 is optionally available (OUT 5 to 8) , but not available for Heat/Cool control type.

Temperature Alarm
a) Type :   Deviation High, Low, High/Low, Band,
  Process High, Low
  Set value High, Low, Fail
b) Differential gap :   2°C (°F) or 2.0°C (°F) (Temperature input)
  0.2% (Voltage, current input)

Control Loop Break Alarm (LBA)
a) LBA time setting :   0.1 to 200.0 min.
b) LBA deadband :   0 to 9999 °C [°F] or 100% of span
  (OFF by setting zero)
  •Output from Alarm 1 terminal.

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.

Alarm Output
a) Alarm Output 1 to 3
  Relay output, Form A contact 250V AC 1A (resistive load)
b) OUT 5 to 8
  Relay output, Form A contact 250V AC 3A (resistive load)

Contact Input (Optional)

Number of Inputs :   5 points

Contact Input Type
a) RUN/STOP switching (OPEN : STOP, CLOSE : RUN)
b) Memory area selection :
  Area selection : 3 points (BCD input 0 to 7)
  Data set : 1 point

Input Rating
Non-voltage contact input (OPEN : 500kΩ or more, CLOSE : 10Ω or less)

Communications (Optional)

a) Communication method : RS-232C (3-wire), RS-422A (4-wire)
  RS-485 (2-wire)
b) Communication speed : 2400, 4800, 9600, 19200 BPS
c) 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) Communication code : ASCII(JIS) 7-bit code
e) Maximum connection : RS-232C : 1 unit
  RS-422A, RS-485 : 31 units
  (Address can be set from 0 to 99.)

Waterproof/Dustproof (Optional)

IP65
•Waterproof/dustproof protection only effective from the front in panel mounted installations.

General Specifications

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 14VA for standard AC type at 100V
Less than 20VA for standard AC type at 240V
Less than 11VA for 24V AC type
Less than 330mA for 24V DC type

Power Failure Effect
Not affected by power failure shorter than 30msec, 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.
Number of writing : Approx. 100,000 times
Data retaining period : Approx. 10 years

Net Weight
Approx. 560g

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

Compliance with Standards

• CE Mark
• UL/cUL Recognized
• C-Tick Mark

Multi-Loop Digital Temperature Controller MA900

Model and Suffix Code

Specifications		Model and Suffix Code
Model	MA900-4	□ □ □−□ □−□＊□ □ □−□ □／□／Y
Control method	PID control with AT (reverse action) PID control with AT (direct action) Heat/Cool PID with AT (water cooling) Heat/Cool PID with AT (air cooling)	F D W A
Input type	See Range and Input Code Table	□
Range	See Range and Input Code Table	□
Control output 1 (OUT 1 to 4)	Relay output Voltage pulse DC current : 0 to 20mA DC current : 4 to 20mA Triac output	M V 7 8 T
Control output 2 [3] (OUT 5 to 8) (Control method F, D : Alarm 3 independent output)	No output (Only control method F and D) Relay output Voltage pulse DC current : 0 to 20mA ⎫ DC current : 4 to 20mA ⎬ (Only control method type W and D) Triac output ⎭	N M V 7 8 T
Power supply voltage	24V AC/DC 100 to 240V AC	3 4
Alarm 1 [1]	See Alarm 1 Code Table (Standard)	□
Alarm 2 [1, 2]	No alarm Heater break alarm (CTL-6-P-N) Heater break alarm (CTL-12-S56-10L-N) See Alarm 2 and 3 Code Table	N P S □
Alarm 3 [1]	No alarm See Alarm 2 and 3 Code Table	N □
Contact input	Not supplied Contact input (RUN/STOP, Area select • Data set)	N D
Digital communications	Not supplied RS-232C (3-wire system : RKC standard) RS-422A (4-wire system : RKC standard) RS-485 (2-wire system : RKC standard) RS-485 (2-wire system : MODBUS) RS-422A (4-wire system : MODBUS) RS-232C (3-wire system : MODBUS)	N 1 4 5 6 7 8
Waterproof / Dustproof	Not supplied Waterproof / Dustproof protection	N 1
Instrument version	Version symbol	Y

[1] Alarm output is common to all channels.
[2] Heater break output is not available if either control is current output.
[3] As for control output of 5 to 8, when code A or W is selected they are used as cool-side control output, and when F or D is selected, they are used as channel output for alarm 3.

Range and Input Code Table

Thermocouple (Field-programmable)

Input	Code	Range		Input	Code	Range		Input	Code	Range
K [1]	K 01	0 − 200°C		J [1]	J 22	0.0 − 200.0°C		T [1]	T 01	-199.9 − 400.0°C
	K 02	0 − 400°C			J 23	0.0 − 600.0°C			T 02	-199.9 − 100.0°C
	K 03	0 − 600°C			J 30	-199.9 − 600.0°C			T 03	-100.0 − 200.0°C
	K 04	0 − 800°C			J A1	0 − 800°F			T 04	0.0 − 350.0°C
	K 05	0 − 1000°C			J A2	0 − 1600°F			T A1	-199.9 − 752.0°F
	K 06	0 − 1200°C			J A3	0 − 2192°F			T A2	-100.0 − 200.0°F
	K 07	0 − 1372°C			J A6	0 − 400°F			T A3	-100.0 − 400.0°F
	K 08	-199.9 − 300.0°C			J A9	-199.9 − 999.9°F			T A4	0.0 − 450.0°F
	K 09	0.0 − 400.0°C			J B6	0.0 − 800.0°F			T A5	0.0 − 752.0°F
	K 10	0.0 − 800.0°C		R [2]	R 01	0 − 1600°C		W5Re /W26Re	W 01	0 − 2000°C
	K 13	0 − 100°C			R 02	0 − 1769°C			W 02	0 − 2320°C
	K 14	0 − 1350°C			R 04	0 − 1350°C			W A1	0 − 4000°F
	K 17	0 − 450°C			R A1	0 − 3200°F		PL II	A 01	0 − 1300°C
	K 20	0 − 500°C			R A2	0 − 3216°F			A 02	0 − 1390°C
	K 29	0.0 − 1200.0°C		S [2]	S 01	0 − 1600°C			A 03	0 − 1000°C
	K 37	0.0 − 600.0°C			S 02	0 − 1769°C			A A1	0 − 2400°F
	K 38	-199.9 − 800.0°C			S A1	0 − 3200°F			A A2	0 − 2534°F
	K A1	0 − 800°F			S A2	0 − 3216°F		U [1]	U 01	-199.9 − 600.0°C
	K A2	0 − 1600°F		B [2]	B 01	400 − 1800°C			U 02	-199.9 − 100.0°C
	K A3	0 − 2502°F			B 02	0 − 1820°C			U 03	0.0 − 400.0°C
	K A4	0.0 − 800.0°F			B A1	800 − 3200°F			U A1	-199.9 − 999.9°F
	K A9	20 − 70°F			B A2	0 − 3308°F			U A2	-100.0 − 200.0°F
	K B2	-199.9 − 999.9°F		E	E 01	0 − 800°C			U A3	0.0 − 999.9°F
J [1]	J 01	0 − 200°C			E 02	0 − 1000°C		L	L 01	0 − 400°C
	J 02	0 − 400°C			E A1	0 − 1600°F			L 02	0 − 800°C
	J 03	0 − 600°C			E A2	0 − 1832°F			L A1	0 − 800°F
	J 04	0 − 800°C		N	N 01	0 − 1200°C			L A2	0 − 1600°F
	J 05	0 − 1000°C			N 02	0 − 1300°C				
	J 06	0 − 1200°C			N 06	0.0 − 800.0°C				
	J 07	-199.9 − 300.0°C			N A1	0 − 2300°F				
	J 08	0.0 − 400.0°C			N A2	0 − 2372°F				
	J 09	0.0 − 800.0°C			N A5	0.0 − 999.9°F				
	J 10	0 − 450°C								

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 − 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 DC [3] (Field-programmable)

Input	Code	Range
0 − 5V	4 01	0.0 − 100.0 (Default)
0 − 10V	5 01	0.0 − 100.0 (Default)
1 − 5V	6 01	0.0 − 100.0 (Default)

[1] Type K, J, T and U input : Accuracy is not guaranteed less than -100.0°C (-158.0°F)
[2] Type R, S and B input : Accuracy is not guaranteed between 0 to 399°C (0 to 799°F)
[3] DC voltage input can be used for the input of 0 to 20mA (in case of 0 to 5V) and 4 to 20mA (1 to 5V) by attaching 250Ω shunt resistor (sold separately) to input terminal. (The model of shunt resistor : KD100-55)

Alarm 1 Code Table

Code	Type
A	Deviation High
B	Deviation Low
C	Deviation High/Low
D	Band Alarm
E	Deviation High with Alarm Hold

Code	Type
F	Deviation Low with Alarm Hold
G	Deviation High/Low with Alarm Hold
H	Process High
J	Process Low
K	Process High with Alarm Hold

Code	Type
L	Process Low with Alarm Hold
M	FAIL
R [1]	Loop break alarm (LBA)
V	Set value High
W	Set value Low

[1] Loop break alarm is not available for Heat/Cool PID control type.

Alarm 2 and 3 Code Table

Code	Type
A	Deviation High
B	Deviation Low
C	Deviation High/Low
D	Band Alarm
E	Deviation High with Alarm Hold

Code	Type
F	Deviation Low with Alarm Hold
G	Deviation High/Low with Alarm Hold
H	Process High
J	Process Low
K	Process High with Alarm Hold

Code	Type
L	Process Low with Alarm Hold
M	FAIL
V	Set value High
W	Set value Low

Accessories

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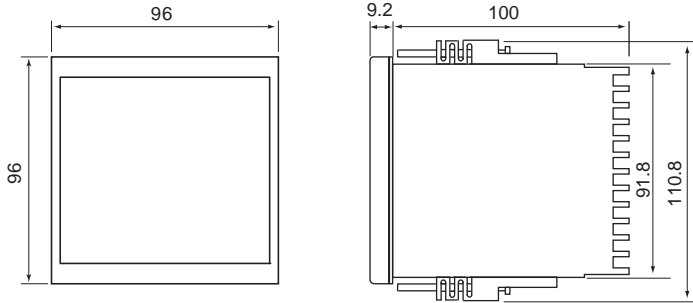CTL-6-P-N (0 – 30A)
CTL-12-S56-10L-N (0 – 100A)

Shunt resistor for DC current input
KD100-55

Multi-Loop Digital Temperature Controller MA900

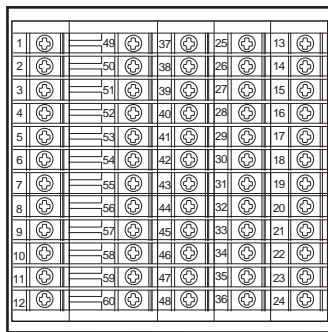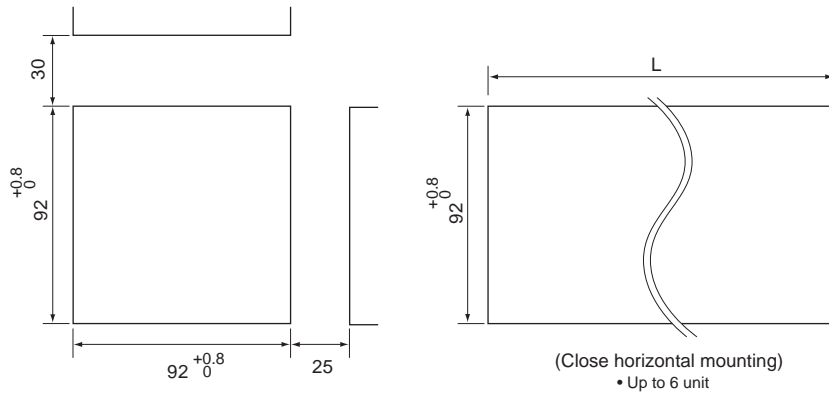## External Dimensions and Rear Terminals

Unit : mm

96

96

9.2 100

91.8
110.8

For mounting of the controllers, panel thickness must be between 1 to 10mm. When mounting multiple controllers close together, the panel strength should be checked to ensure proper support..

• Dustproof and waterproof are not effective when controllers are closely mounted.

Panel Cutouts

30

$92^{+0.8}_{0}$

$92^{+0.8}_{0}$ 25

L

$92^{+0.8}_{0}$

$$L = 96Xn-4^{+0.8}_{0}$$

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

(Close horizontal mounting)
• Up to 6 unit

• Use the solder less terminal appropriate to the screw size.
Screw size : M3 X 6

No.	Description		No.	Description		No.	Description		No.	Description		No.	Description	
1	AC 100 to 240V / DC 24V	Power supply	49	NO	Alarm 2 output	37	DI	Contact input (RUN/STOP)	25	COM CT1	CT input for heater break alarm	13	A B	CH1 Measured input (1) Thermocouple (2) RTD (3) Voltage
2			50			38			26	CT2		14		
3	NO	Alarm 1 output	51	NO	Alarm 3 output	39	COM		27			15		
4			52			40	DI 1	Contact input (Memory area)	28	COM CT3		16	A B	CH2 Measured input (1) Thermocouple (2) RTD (3) Voltage
5	NO (1) (2) (3)	Output 1 (1) Relay contact (2) Voltage pulse/Current (3) Triac	53	NO (1) (2) (3)	Output 5 (1) Relay contact (2) Voltage pulse/Current (3) Triac	41	DI 2		29	CT4		17		
6			54			42	DI 4		30			18		
7	NO (1) (2) (3)	Output 2 (1) Relay contact (2) Voltage pulse/Current (3) Triac	55	NO (1) (2) (3)	Output 6 (1) Relay contact (2) Voltage pulse/Current (3) Triac	43	DI SET		31			19	A B	CH3 Measured input (1) Thermocouple (2) RTD (3) Voltage
8			56			44	SG SG SG		32			20		
9	NO (1) (2) (3)	Output 3 (1) Relay contact (2) Voltage pulse/Current (3) Triac	57	NO (1) (2) (3)	Output 7 (1) Relay contact (2) Voltage pulse/Current (3) Triac	45	T(A) T/R(A) SD	Communications (1) RS-422A (2) RS-485 (3) RS-232C	33			21		
10			58			46	T(B) T/R(B) RD		34			22	A B	CH4 Measured input (1) Thermocouple (2) RTD (3) Voltage
11	NO (1) (2) (3)	Output 4 (1) Relay contact (2) Voltage pulse/Current (3) Triac	59	NO (1) (2) (3)	Output 8 (1) Relay contact (2) Voltage pulse/Current (3) Triac	47	R(A)		35			23		
12			60			48	R(B)		36			24		

About output 5 to 8
• It becomes Cool side output for CH1 to CH4 in Heat/Cool control specification.
• It can be used as independent channel output for Alarm 3 in PID control specification. (Specify when ordering)