



## HA400 HA900 HA401 HA901



### General Description

The HA series are digital PID controllers with a high speed sampling time of 25 ms (0.025 sec) with high-resolution thermocouple, RTD or current voltage input, supplied with parameters settable in 1/100 sec.

A difference between HA400/900 and HA401/901 is in the autotuning. If the process is less than 30 seconds to setpoint, the HA400/900 is best suited with factory default values pre-set for fast process.

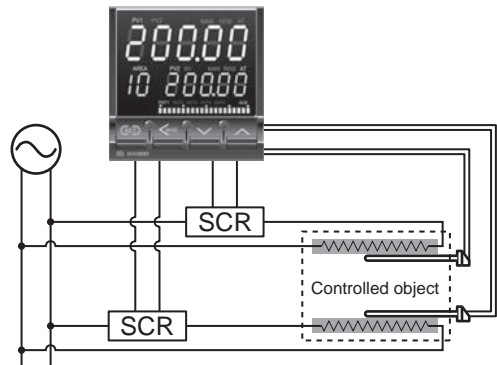
Applications in RTP (Rapid Thermal Process), RTA (Rapid Thermal Anneal) and temperature control of semiconductor manufacturing can be controlled by the HA series. The high speed sampling function also makes it suitable for other applications requiring fast control such as pressure or flow rate.

### Features

- ☆ Ultra High Speed Sampling 0.025 sec
- ☆ Two Channels in One Controller
- ☆ Ramp / Soak Program Control
- ☆ Cascade Control
- ☆ Power Feed Forward Function
- ☆ Communications

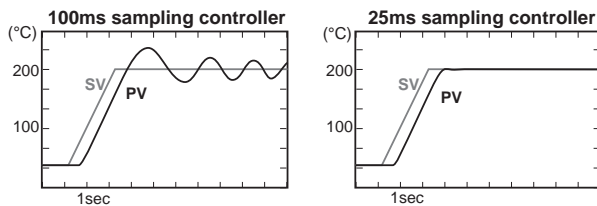
#### Two Channels in One Controller

Dual loop control can be performed with a single controller. All loops operate at 0.025ms sampling time.



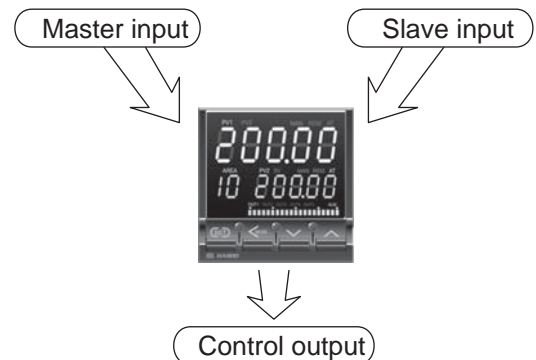
#### Ultra High Speed Sampling 0.025 sec

The HA series digital controller supplies feedback control 40 times in one second. It makes the HA series suitable for any application requiring fast control response and high accuracy. The PID parameters can be set in 1/100 unit which supports extremely fast and accurate control by the HA series.



#### Cascade Control in One Controller

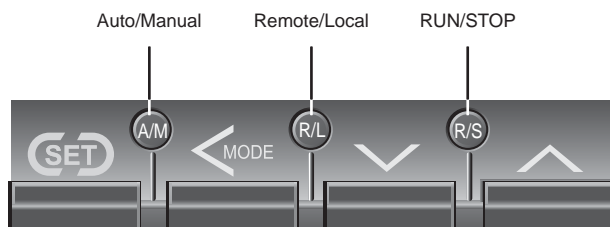
Cascade control can be performed with a single controller. Input type can be specified independently for each channel.



#### Direct Function keys

Direct function keys are marked for Auto/Manual, Remote /Local, and Run/Stop switching to eliminate error when entering changing patterns.

Used and Unused of each function key is also possible.

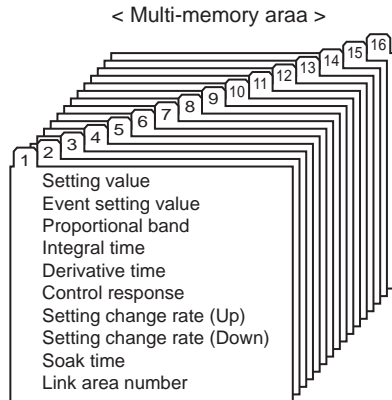


## Features

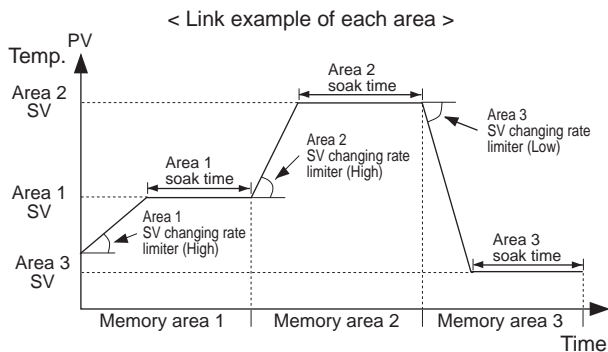
### Ramp / Soak Program Control

The HA Series high speed temperature controller has Multi-memory Area function which stores up to 16 sets of control parameters.

Parameters stored in each memory area are the control set value, event set value, PID values, control response, ramp-to-setpoint UP and DOWN, soak time, and link area number.

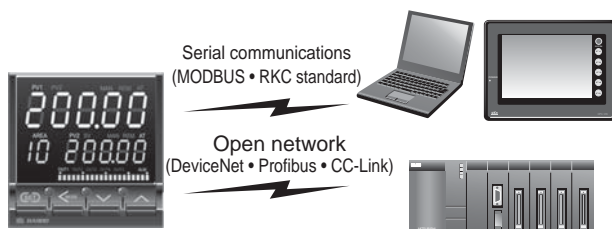


Up to 32-segment ramp/soak control is available by using the memory area function (ramp-to-set point UP and DOWN, soak time, link area number).



### Communications (Optional)

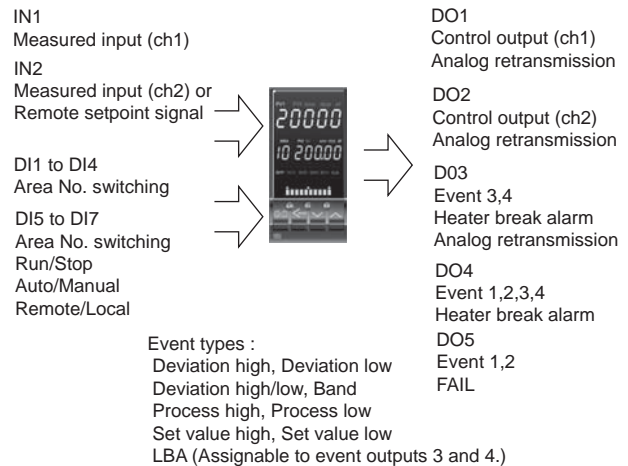
The HA Series incorporates a maximum of two communication ports. The communication method can be selected from serial communication (RS-485, RS-422A, RS-232C) and Open network (DeviceNet, Profibus, CC-Link).



### Numerous Inputs and Outputs

A maximum of two measuring inputs (one input can be used as a remote setpoint signal) and seven event inputs can be specified. A maximum of five outputs can be specified, and various output functions (control output, analog retransmission, event up to 4) can be allocated in output logic operation.

• Available inputs and outputs depend on the specifications.



- Sensor power supply output is also available.
  - 24V DC  $\pm$  5% (Max. 20mA)
  - Output from OUT3.
  - When sensor power supply output is specified, OUT4 and OUT5 can not be added.

### Suitable for Various Process Control

Using industry standard DC inputs (current and voltage), the HA Series can be used in process control applications including pressure, flow rate and levels.

### Autotuning

The Autotuning used on HA400/900 is suitable for a control system with a fast response. PID values can also be manually adjusted so that they may be further optimized for the processes.

Just for your information, this Autotuning is performs well for control systems in which temperature rises up to the set point in 30 seconds or faster. If the application is slower (e.g. 5 minutes to reach the set point), HA401/901 are recommended.



## Specifications

### Input

#### Number of inputs

- 2 points (IN1 to IN2)
  - Isolated between each channel
  - 2nd input (IN2) can be used as a remote input
  - Cascade connection available

#### Input

- Universal input
  - a) Low voltage input group
    - Thermocouple : K, J, R, S, B, E, T, N (JIS/IEC)
      - PLII (NBS), W5Re/W26Re (ASTM)
      - Influence of external resistance : Approx. 0.25 $\mu$ V/ $\Omega$
      - Input break action : Up-scale / Down-scale (Selectable)
    - RTD : Pt100 (JIS/IEC), JPt100 (JIS)
      - Influence of input lead resistance : Approx. 0.01[ $^{\circ}$ C/ $\Omega$ ] of reading
      - Maximum 10 $\Omega$  per wire
      - Input break action : Up-scale
    - Low voltage : 0 to 1V DC, 0 to 100mV DC, 0 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
      - Input break action : Uncertain (indicates a value around 0V)

#### Sampling Time

0.025 sec

#### Input Digital Filter

0.01 to 10.00 sec (OFF when 0 is set.)

#### PV Bias

-span to +span

#### PV Ratio

0.500 to 1.500

#### Square Root Extraction

Equation :  $PV = \sqrt{O}$  (Input value x PV ratio + PV bias)  
 Low level cut OFF : 0.00 to 25.00% of span

### Performance

#### Measuring Accuracy

- a) Thermocouple
  - Type : K, J, T, E, PLII
    - Less than -100 $^{\circ}$ C (-148 $^{\circ}$ F) :  $\pm 1.0^{\circ}$ C ( $\pm 1.8^{\circ}$ F)
    - 100 to 500 $^{\circ}$ C (-148 to 932 $^{\circ}$ F) :  $\pm 0.5^{\circ}$ C ( $\pm 0.9^{\circ}$ F)
    - More than 500 $^{\circ}$ C (932 $^{\circ}$ F) :  $\pm (0.1\%$  of Reading + 1 digit)
  - Type : N, S, R, W5Re/W26Re
    - Less than -100 $^{\circ}$ C (-148 $^{\circ}$ F) :  $\pm 2.0^{\circ}$ C ( $\pm 3.6^{\circ}$ F)
    - 100 to 1000 $^{\circ}$ C (-148 to 1832 $^{\circ}$ F) :  $\pm 1.0^{\circ}$ C ( $\pm 1.8^{\circ}$ F)
    - More than 1000 $^{\circ}$ C (1832 $^{\circ}$ F) :  $\pm (0.1\%$  of Reading + 1 digit)
  - Type : B
    - Less than 400 $^{\circ}$ C (752 $^{\circ}$ F) :  $\pm 70.0^{\circ}$ C ( $\pm 126^{\circ}$ F)
    - 400 to 1000 $^{\circ}$ C (752 to 1832 $^{\circ}$ F) :  $1.0^{\circ}$ C (1.8 $^{\circ}$ F)
    - More than 1000 $^{\circ}$ C (1832 $^{\circ}$ F) :  $\pm (0.1\%$  of Reading + 1 digit)
- Cold junction temperature compensation error
  - $\pm 1.0^{\circ}$ C (1.8 $^{\circ}$ F) [at 23 $^{\circ}$ C $\pm 2^{\circ}$ C (73.4 $^{\circ}$ F $\pm 3.6^{\circ}$ F)]
  - Within  $\pm 1.5^{\circ}$ C ( $\pm 2.7^{\circ}$ F) [Between 0 and 50 $^{\circ}$ C (14 to 122 $^{\circ}$ F)]
- b) RTD
  - Less than 200 $^{\circ}$ C (392 $^{\circ}$ F) :  $\pm 0.2^{\circ}$ C ( $\pm 0.4^{\circ}$ F)
  - More than 200 $^{\circ}$ C (392 $^{\circ}$ F) :  $\pm (0.1\%$  of Reading + 1 digit)
- c) DC voltage and DC current
  - $\pm (0.1\%$  of span)

#### Insulation Resistance

More than 20M $\Omega$  (500V DC) between measured terminals and ground  
 More than 20M $\Omega$  (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) Brilliant PID control with enhanced autotuning.
    - Available for reverse and direct action.
  - b) Position proportioning control.
- a) or b) is selectable.

#### Major Setting Range

- Set value : Same as input range.
- Proportional band : 0 to input span (Temperature input)  
0.0 to 1000.0% of span (Voltage, Current input)
- Integral time : 0.00 to 360.00sec. or 0.0 to 3600.0sec. (selectable)
- Derivative time : 0.00 to 360.00sec. or 0.0 to 3600.0sec. (selectable)
- Control response : Slow, Medium, Fast
- Output limiter : -5.0 to +105.0% (High/Low individual setting)
- Output change rate limiter : 0.0 to 100.0%/sec. (Up/Down individual setting)
- Proportional cycle time : 0.1 to 100.0 sec.
- Memory area : 16 sets

#### Motor Valve Control (position proportioning control type only)

- Input resistance (feedback resistance) : 135 $\Omega$  as standard
- POS sampling cycle : 0.075 sec.
- Neutral zone : 0.1 to 10.0% (output), resolution 0.1%
- Output : Relay output
- Motor rotating speed : Suitable for ??? to ??? sec. (full open to full close)

- When motor valve control is used, neither heater break alarm nor power feed forward function is available.

### Output

#### Main Output

- Number of output : Up to 3 points (OUT1 to OUT3)
- Output function :
  - OUT1, 2 : Control output
  - OUT3 : Event output or analog retransmission output (Optional)
- Output type :
  - Relay output :
    - Form A contact, 250V AC 3A (resistive load)
  - Voltage pulse output : 0/12V DC
    - (Load resistance : More than 600 $\Omega$ )
    - Current output : 4 to 20mA DC, 0 to 20mA DC
      - (Load resistance : Less than 600 $\Omega$ )
  - Continuous voltage output :
    - 0 to 5V DC, 1 to 5V DC, 0 to 10V DC
      - (Load resistance : More than 1k $\Omega$ )
  - SSR (Triac) output (Rated current : 0.4A)

#### Sub Output (Optional)

- Number of output : Up to 2 points (OUT4, OUT5)
- Output function : Event output (Optional)
- Output type :
  - Relay output :
    - Form A contact, 250V AC 1A (resistive load)

#### Sensor Power Supply Output (Optional)

- 24V DC  $\pm 5\%$  (Max. 20mA)
- Output from OUT3.
- When sensor power supply output is specified, OUT4 and OUT5 can not be added.

### Event (Alarm) Output (Optional)

#### Number of Event Outputs

Up to 4 points (Event 1 to 4)

#### Alarms

- Type :
  - Deviation High, Low, High/Low, Band, Process High, Low
  - Set value High, Low
- Differential gap : 0 to input span

#### Heater Break Alarm (For single phase)

- CT type : CTL-6-P-N(30A), CTL-12-S56-10L-N(100A)
- Display range : 0.0 to 100.0A
- Accuracy :  $\pm 5\%$  of input value or  $\pm 2A$  (whichever is larger)

#### Control Loop Break Alarm (LBA)

- LBA time setting : 0.1 to 7200 sec. (OFF by setting zero)
- LBA deadband : 0 to input span

#### Output

Assignable to main output (OUT3) or sub output (OUT4 to 5).

#### Other Functions

- HOLD action (Valid for deviation/band/PV alarms only)
- Selection of event action for input abnormality.

## Specifications

### Non-isolated Remote Setpoint Input (Optional)

- Only available in a 1 channel control type.

#### Input

- a) 0 to 1V DC, 0 to 100mV DC, 0 to 10mV DC
- b) 0 to 5V DC, 1 to 5V DC, 0 to 10V DC
- c) 4 to 20mA DC, 0 to 20mA DC

#### Accuracy

0.1% of span

### Event Input (Optional)

#### Number of Inputs

Up to 7 points

#### Input Rating

Non-voltage contact input

#### Functions

- a) Memory area selection
- b) Run/Stop switching
- c) Remote/Local switching
- d) Auto/Manual switching

- Event input logic selection functional allocation table

	DI1	DI2	DI3	DI4	DI5	DI6	DI7
1	Memory area selection (1 to 16)				Area set	Run/Stop	Auto/Manual
2	Memory area selection (1 to 16)				Area set	Run/Stop	Remote/Local
3	Memory area selection (1 to 16)				Area set	Remote/Local	Auto/Manual
4	Memory area selection (1 to 8)		Area set		Run/Stop	Remote/Local	Auto/Manual
5	Memory area selection (1 to 8)		Area set	Remote/Local			
6	Memory area selection (1 to 8)		Area set	Auto/Manual			

### Analog Retransmission Output (Optional)

#### Number of Outputs

- Up to 3 points
- Functions are assignable to OUT1 to OUT3.

#### Output types

- a) Measured value (PV)
- b) Deviation (DV)
- c) Set value (SV)
- d) Manipulated output value (MV)

### Communications (Optional)

**Number of communications :** 2 points

**Communication method :** COM1: RS-485, RS-232C  
COM2: RS-232C, RS-485, RS-422A  
DeviceNet, PROFIBUS, CC-Link

**Communication speed :** 2400, 9600, 19200, 38400 BPS

**Protocol :** ANSI X3.28(1976) 2.5 A4  
MODBUS

#### 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

**Communication code :** ASCII(JIS) 7-bit code

**Maximum connection :** RS-485, RS-422A : 31  
(Address can be set from 0 to 99.)  
RS-232C : 1

### Waterproof/Dustproof (Optional)

Waterproof/dustproof protection : 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:24VDC]

#### Power Consumption

- HA400 : Less than 22.5VA for AC type (at 240V AC)  
Less than 15.0VA for 24V AC type  
Less than 430mA for 24V DC type
- HA900 : Less than 24.0VA for AC type (at 240V AC)  
Less than 16.0VA for 24V AC type  
Less than 470mA for 24V DC type

#### Power Failure Effect

Not affected by power failure shorter than 20msec, otherwise reset to the initial state. (HOT or COLD start is selectable.)

#### Self-Diagnostic Function

CPU power check, Adjustment data check, EEPROM check, RAM check, etc..

#### Operating Environments :

-10 to 50°C [14 to 122°F]  
5 to 95% RH.  
Absolute humidity : MAX. W.C 29g/m<sup>3</sup> dry air at 101.3kPa.

**Memory Backup :** Backed up by non-volatile memory.  
Number of writing : Approx. 100,000 times

#### Net Weight

- HA400 : Approx. 360g
- HA900 : Approx. 460g

#### External Dimensions (W x H x D)

- HA400 : 48 x 96 x 100mm
- HA900 : 96 x 96 x 100mm

### Compliance with Standards

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



- Event output logic selection functional allocation table

	OUT1	OUT2	OUT3	OUT4	OUT5
1	CH1 control output	HBA1 (Energized) HBA2 (Energized)	Event3 (Energized) Event4 (Energized)	Event2 (Energized)	Event1 (Energized)
2	CH1 control output	HBA1 (De-energized) HBA2 (De-energized)	Event3 (De-energized) Event4 (De-energized)	Event2 (De-energized)	Event1 (De-energized)
3	CH1 control output	Event3 (Energized) Event4 (Energized) HBA1 (Energized) HBA2 (Energized)	Event2 (Energized)	Event1 (Energized)	FAIL (De-energized)
4	CH1 control output	Event3 (De-energized) Event4 (De-energized) HBA1 (De-energized) HBA2 (De-energized)	Event2 (De-energized)	Event1 (De-energized)	FAIL (De-energized)
5	CH1 control output	CH2 control output	Event4 (Energized) HBA2 (Energized)	Event3 (Energized) HBA1 (Energized)	Event1 (Energized) Event2 (Energized)
6	CH1 control output	CH2 control output	Event4 (De-energized) HBA2 (De-energized)	Event3 (De-energized) HBA1 (De-energized)	Event1 (De-energized) Event2 (De-energized)
7	CH1 control output	CH2 control output	Event3 (Energized) Event4 (Energized) HBA1 (Energized) HBA2 (Energized)	Event2 (Energized)	Event1 (Energized)
8	CH1 control output	CH2 control output	Event3 (De-energized) Event4 (De-energized) HBA1 (De-energized) HBA2 (De-energized)	Event2 (De-energized)	Event1 (De-energized)
10	CH1 control output (OPEN)	CH1 control output (CLOSE)	Event3 (Energized) Event4 (Energized) HBA1 (Energized) HBA2 (Energized)	Event2 (Energized)	Event1 (Energized)
11	CH1 control output (OPEN)	CH1 control output (CLOSE)	Event3 (De-energized) Event4 (De-energized) HBA1 (De-energized) HBA2 (De-energized)	Event2 (De-energized)	Event1 (De-energized)
12	CH1 control output	Event4 (Energized) HBA2 (Energized)	Event3 (Energized) HBA1 (Energized)	Event2 (Energized)	Event1 (Energized)

\* An output logic becomes OR output when two or more output functions are assigned to one output.

\* When three analog outputs are selected, the analog outputs are automatically assigned to OUT1 through OUT3 and it has priority over the output logic selection.



## Model and Suffix Code

### 1 channel control type

Specifications	Model and Suffix Code																	
Model	HA400 (48 x 96mm 1/8 DIN size)      - □ □ - □ □ □ - □ * □ □ - □ □ □ □ - □ / □ / □ HA900 (96 x 96mm 1/4 DIN size) HA401 (48 x 96mm 1/8 DIN size) HA901 (96 x 96mm 1/4 DIN size)																	
Input (IN1 : No 1 input)	See Input and Range code table      □																	
Non isolated type remote set value	Not supplied      0 See Remote input code table      □																	
Output 1 (Main output)	1 3	Relay contact output Voltage pulse output : 0/12V DC DC voltage : 0 to 5V DC voltage : 0 to 10V DC voltage : 1 to 5V DC current : 0 to 20mA DC current : 4 to 20mA SSR (Triac) output							M V 4 5 6 7 8 T									
Output 2 (Main output) * Not isolated from OUT1.	1 3	No output from OUT2 Relay contact output Voltage pulse output : 0/12V DC DC voltage : 0 to 5V DC voltage : 0 to 10V DC voltage : 1 to 5V DC current : 0 to 20mA DC current : 4 to 20mA SSR (Triac) output							N M V 4 5 6 7 8 T									
Power supply	24V AC/DC 100 to 240V AC							3 4										
Output 3 (Main output)	2 3	No output from OUT3 Relay contact output Voltage pulse output : 0/12V DC DC voltage : 0 to 5V DC voltage : 0 to 10V DC voltage : 1 to 5V DC current : 0 to 20mA DC current : 4 to 20mA SSR (Triac) output Sensor power supply output (Output 4 and 5 can not added)							N M V 4 5 6 7 8 T P									
Output 4, 5 (OUT4, 5 : Sub output)	2	No outputs from OUT4 and OUT5 OUT4 : Relay contact output, No output from OUT5 OUT4 and OUT5 : Relay contact output							N 1 2									
Event input 1 to 5	Not supplied Event input : 5 points (DI 1 to DI5)							N 1										
CT input, Power feed forward (PFF) input, Feedback resistance	Not supplied CT input 1 point (CTL-6-P-N) CT input 1 point (CTL-12-S56-10L-N) CT input 2 points (CTL-6-P-N) CT input 2 points (CTL-12-S56-10L-N) PFF input (Within transformer 100 to 120V AC type) PFF input (Within transformer 200 to 240V AC type) CT input 1 point (CTL-6-P-N) + PFF input (Within transformer 100 to 120V AC type) CT input 1 point (CTL-6-P-N) + PFF input (Within transformer 200 to 240V AC type) CT input 1 point (CTL-12-S56-10L-N) + PFF input (Within transformer 100 to 120V AC type) CT input 1 point (CTL-12-S56-10L-N) + PFF input (Within transformer 200 to 240V AC type) Feedback resistance input							N P S T U 1 2 3 4 5 6 F										
Communication 1 or Event input 6 to 7	Not supplied RS-232C (ANSI/RKC standard) RS-485 (ANSI/RKC standard) RS-485 (MODBUS) RS-232C (MODBUS) Event input : DI6 and DI7							N 1 5 6 8 D										
Communication 2	Not supplied RS-232C (ANSI/RKC standard) RS-422A (ANSI/RKC standard) RS-485 (ANSI/RKC standard) RS-485 (MODBUS) RS-422A (MODBUS) RS-232C (MODBUS) DeviceNet PROFIBUS CC-Link							N 1 4 5 6 7 8 A B C										
Waterproof/Dustproof	Not supplied Waterproof/Dustproof protection							N 1										
Body color	White Black							N A										
Instrument version	Version symbol																	Y

1 Only OUT1 can be used for control outputs. (Only OUT1 and OUT2 can be used for position proportioning control.)

2 Event (alarm) outputs, heater break alarm outputs are assignable to OUT3 - OUT5.

3 Analog output (PV, SV, etc) are assignable to OUT1 - OUT3.

#### Caution

- If two isolated analog outputs are required, use OUT1 (or OUT2) and OUT3. OUT1 and OUT2 are not isolated.
- To use as a position proportioning controller, two or more outputs must be supplied.
- If heater break alarm is assigned to event function, current transformer (sold separately) is required.

#### Autotuning

The Autotuning used on HA400/900 is suitable for a control system with a fast response. PID values can also be manually adjusted so that they may be further optimized for the processes.

Just for your information, this Autotuning is performs well for control systems in which temperature rises up to the set point in 30 seconds or faster. If the application is slower (e.g. 5 minutes to reach the set point), HA401/901 are recommended.

## Model and Suffix Code

### 2 channel control type

Specifications	Model and Suffix Code											
Model	HA400 (48 x 96mm 1/8 DIN size) HA900 (96 x 96mm 1/4 DIN size) HA401 (48 x 96mm 1/8 DIN size) HA901 (96 x 96mm 1/4 DIN size)											- □ □ - □ □ - □ * □ □ □ - □ □ □ - □ / □ / □
Input 1 (IN1 : No 1 input)	See Input and Range code table											□ :
Input 2 (IN2 : No 2 input)	See Input and Range code table											□
Output 1 (Main output)	1 3	Relay contact output Voltage pulse output : 0/12V DC DC voltage : 0 to 5V DC voltage : 0 to 10V DC voltage : 1 to 5V DC current : 0 to 20mA DC current : 4 to 20mA SSR (Triac) output										M V 4 5 6 7 8 T
Output 2 (Main output) * Not isolated from OUT1.	1 3	No output from OUT2 Relay contact output Voltage pulse output : 0/12V DC DC voltage : 0 to 5V DC voltage : 0 to 10V DC voltage : 1 to 5V DC current : 0 to 20mA DC current : 4 to 20mA SSR (Triac) output										N M V 4 5 6 7 8 T
Power supply	24V AC/DC 100 to 240V AC											3 4
Output 3 (Main output)	2 3	No output from OUT3 Relay contact output Voltage pulse output : 0/12V DC DC voltage : 0 to 5V DC voltage : 0 to 10V DC voltage : 1 to 5V DC current : 0 to 20mA DC current : 4 to 20mA SSR (Triac) output Sensor power supply output (Output 4 and 5 can not added)										N M V 4 5 6 7 8 T P
Output 4, 5 (OUT4, 5 : Sub output)	2	No outputs from OUT4 and OUT5 OUT4 : Relay contact output, No output from OUT5 OUT4 and OUT5 : Relay contact output										N 1 2
Event input 1 to 5	Not supplied Event input : 5 points (DI 1 to DI5)											N 1
CT input, Power feed forward (PFF) input, Feedback resistance	Not supplied CT input 1 point (CTL-6-P-N) CT input 1 point (CTL-12-S56-10L-N) CT input 2 points (CTL-6-P-N) CT input 2 points (CTL-12-S56-10L-N) PFF input (Within transformer 100 to 120V AC type) PFF input (Within transformer 200 to 240V AC type) CT input 1 point (CTL-6-P-N) + PFF input (Within transformer 100 to 120V AC type) CT input 1 point (CTL-6-P-N) + PFF input (Within transformer 200 to 240V AC type) CT input 1 point (CTL-12-S56-10L-N) + PFF input (Within transformer 100 to 120V AC type) CT input 1 point (CTL-12-S56-10L-N) + PFF input (Within transformer 200 to 240V AC type) Feedback resistance input											N P S T U 1 2 3 4 5 6 F
Communication 1 or Event input 6 to 7	Not supplied RS-232C (ANSI/RKC standard) RS-485 (ANSI/RKC standard) RS-485 (MODBUS) RS-232C (MODBUS) Event input : DI6 and DI7											N 1 5 6 8 D
Communication 2	Not supplied RS-232C (ANSI/RKC standard) RS-422A (ANSI/RKC standard) RS-485 (ANSI/RKC standard) RS-485 (MODBUS) RS-422A (MODBUS) RS-232C (MODBUS) DeviceNet PROFIBUS CC-Link											N 1 4 5 6 7 8 A B C
Waterproof/Dustproof	Not supplied Waterproof/Dustproof protection											N 1
Body color	White Black											N A
Instrument version	Version symbol											Y

<sup>1</sup> Only OUT1 and OUT2 can be used for control outputs.

<sup>2</sup> Event (alarm) outputs, heater break alarm outputs are assignable to OUT3 - OUT5.

<sup>3</sup> Analog output (PV, SV, etc) are assignable to OUT1 - OUT3.

#### Caution

- If two isolated analog outputs are required, use OUT1 (or OUT2) and OUT3. OUT1 and OUT2 are not isolated.
- To use as a position proportioning controller, two or more outputs must be supplied.
- If heater break alarm is assigned to event function, current transformer (sold separately) is required.

#### Autotuning

The Autotuning used on HA400/900 is suitable for a control system with a fast response. PID values can also be manually adjusted so that they may be further optimized for the processes.

Just for your information, this Autotuning is performs well for control systems in which temperature rises up to the set point in 30 seconds or faster. If the application is slower (e.g. 5 minutes to reach the set point), HA401/901 are recommended.

# High-Speed Digital Controller - 1 or 2 loops HA Series

## Range and Input Table

Thermocouple, RTD, Low voltage and Current group

Input	Code	Range		Resolution
K	K	-200 - 1372°C	-328 - 2501°F	1°C, 0.1°C, 1°F, 0.1°F (Selectable)
J	J	-200 - 1200°C	-328 - 2192°F	
T	T	-200 - 400°C	-328 - 752°F	
E	E	-200 - 1000°C	-328 - 1832°F	
PLII	A	0 - 1390°C	32 - 2534°F	
N	N	0 - 1300°C	32 - 2372°F	
S	S	-50 - 1768°C	-58 - 3214°F	
R	R	-50 - 1768°C	-58 - 3214°F	
W5Re/W26Re	W	0 - 2300°C	32 - 4172°F	
B	B	0 - 1800°C	32 - 3272°F	
Pt100 (3 wire)	D	-200 - 850°C	-328 - 1562°F	1°C, 0.1°C, 0.01°C 1°F, 0.1°F, 0.01°F (Selectable)
JPt100 (3 wire)		-200 - 600°C	-328 - 1112°F	
Pt100 (4 wire)	C	-200 - 850°C	-328 - 1562°F	
JPt100 (4 wire)		-200 - 600°C	-328 - 1112°F	
0 - 10mV DC	3	-19999 - 99999 (Programmable)		1, 0.1, 0.01, 0.001, 0.0001 (Programmable)
0 - 100mV DC				
0 - 1V DC				
0 - 20mA DC				
4 - 20mA DC	8			

High voltage group

0 - 5V DC	6	-19999 - 99999 (Programmable)		1, 0.1, 0.01, 0.001, 0.0001 (Programmable)
0 - 10V DC				
1 - 5V DC				

## Remote Signal Code Table

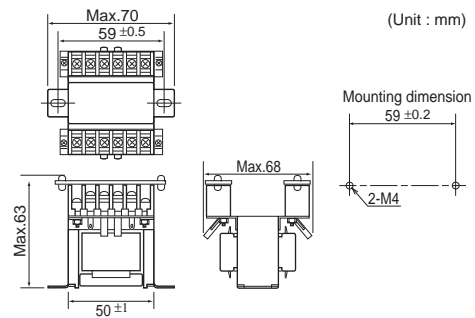
Not isolated from the No.1 input [IN1]

Input type	Code	
	Low voltage group	0 - 10mV DC 0 - 100mV DC 0 - 1V DC
High voltage group	0 - 5V DC 0 - 10V DC 1 - 5V DC	V
Current group	0 - 20mA DC 4 - 20mA DC	Y

## Power Feedback Transformer (for Power Feed Forward Input)

- Supplied when power feed forward function is specified.
- When ordering transformer for replacement, please specify one of the following model codes :

Specification	Model Code
100 to 120V AC type	PFT - 01
200 to 240V AC type	PFT - 02

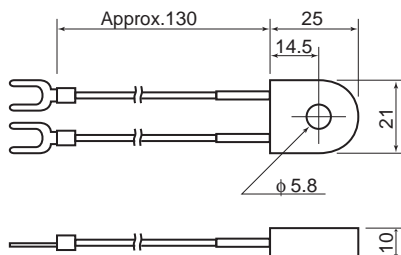


## Current Transformer (CT)

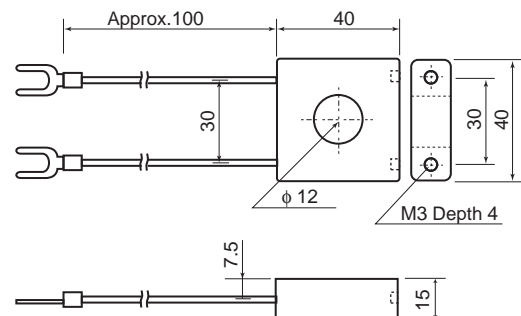
- Sold separately.

Name	Range	Model Code
Current transformer for heater break alarm	0 - 30A	CTL-6-P-N
	0 - 100A	CTL-12-S56-10L-N

### CTL-6-P-N



### CTL-12-S56-10L-N

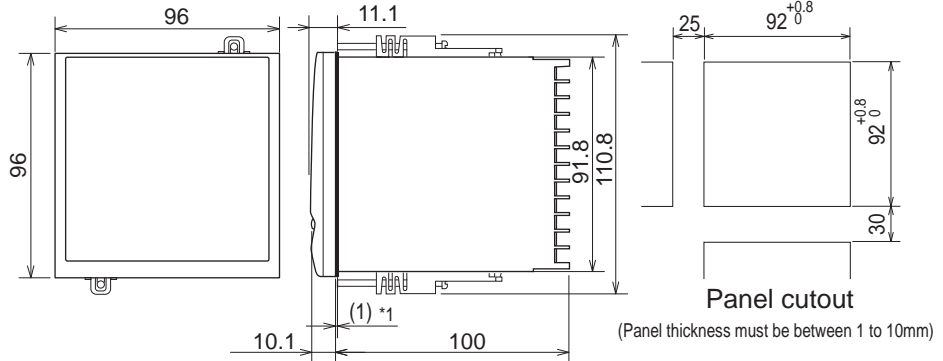
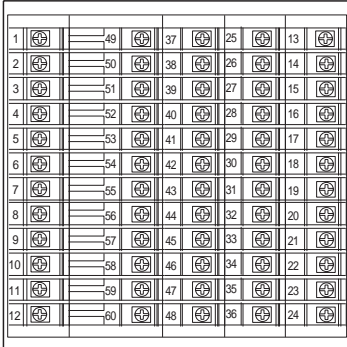


# High-Speed Digital Controller - 1 or 2 loops HA Series

## External Dimensions and Rear Terminals

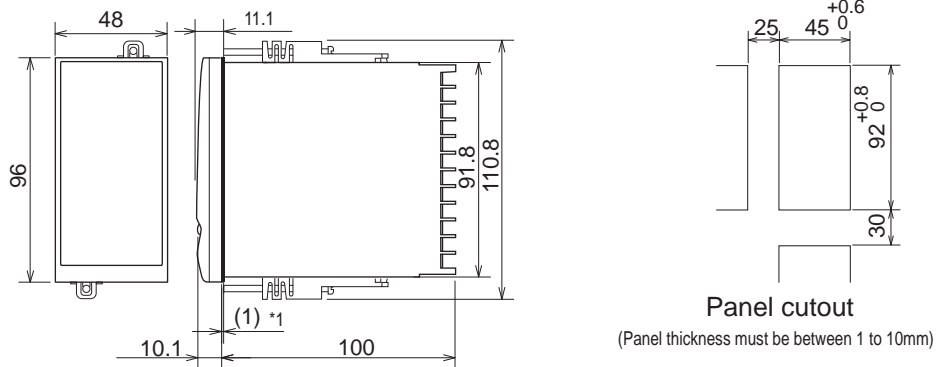
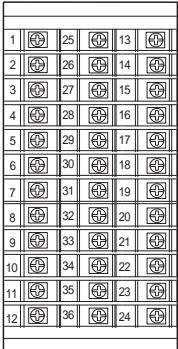
Unit : mm

### HA900, HA901



\*1 IP65 waterproof/dustproof protection is molded into case and can not be added in the field.

### HA400, HA401



\*1 IP65 waterproof/dustproof protection is molded into case and can not be added in the field.

No	Description
1	100 - 240V AC 24V DC Power supply
2	Relay contact output Output 5 (OUT5) *
3	Relay contact output Output 4 (OUT4) *
4	Relay contact output Output 3 (OUT3) *
5	(1) Relay contact output (2) Voltage pulse/Current/Voltage output (3) SSR (Triac) output (4) Sensor power supply output
6	Output 2 (OUT2) *
7	(1) Relay contact output (2) Voltage pulse/Current/Voltage output (3) SSR (Triac) output
8	Output 1 (OUT1)
9	(1) Relay contact output (2) Voltage pulse/Current/Voltage output (3) SSR (Triac) output
10	
11	
12	

No	Description
49 37	Not used
50 38	
51 39	
52 40	
53 41	
54 42	
55 43	
56 44	
57 45	
58 46	
59 47	
60 48	

No	Description
25	Communication *
26	(1) RS-422A (2) RS-485 (3) RS-232C
27	
28	
29	
30	Event input 1 to 4 *
31	Non-voltage contact input
32	
33	
34	
35	Event input 5 *
36	Non-voltage contact input

No	Description
13	(A) Communication 1 *
14	(1) RS-485 (2) RS-232C
15	(B) Event input 6 to 7 Non-voltage contact input
16	(A) CT1, CT2 input *
17	(B) Feedback resistance input
18	(C) CT1 input + Power feed forward input
19	(A) 1 channel type *
20	No.1 Input (IN1) + Non-isolated type remote input
21	(B) 2 channel type
22	No.1 Input (IN1) + No.2 Input (IN2)
23	(1) Thermocouple (2)-1 RTD (3 or 4 wire) (2)-2 RTD (3 wire) (3) Voltage/Current
24	

\* Functions (A) to (C) and types (1) to (3) must be specified when instrument is ordered as change can not be made in the field.

\* : Option