# HA400 HA900
# HA401 HA901

## General Description

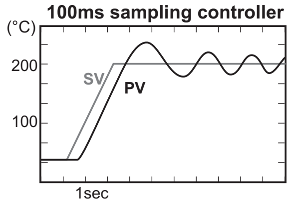
The HA series are digital PID controllers with a high speed sampling time of 25 ms (0.025 sec) with high-resolution thermocouple, RTD or current voltage input, supplied with parameters settable in 1/100 sec.
A difference between HA400/900 and HA401/901 is in the autotuning. If the process is less than 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.

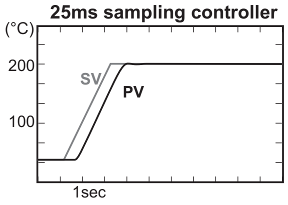
## Features

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

### Ultra High Speed Sampling 0.025 sec

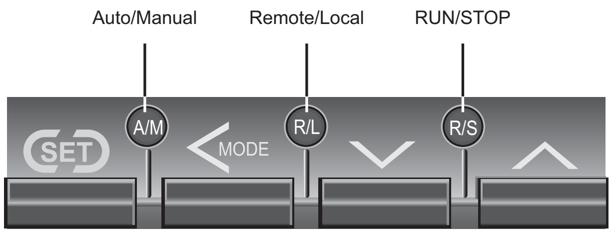
The HA series digital controller supplies feedback control 40 times in one second. It makes the HA series suitable for any application requiring fast control response and high accuracy. The PID parameters can be set in 1/100 unit which supports extremely fast and accurate control by the HA series.



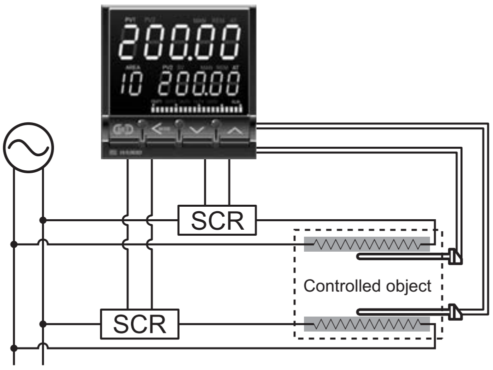

### Direct Function keys

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.



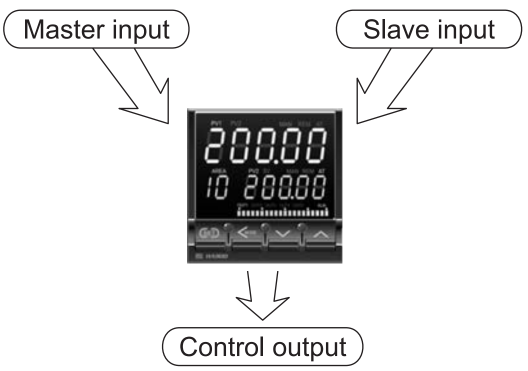

### Two Channels in One Controller

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




### Cascade Control in One Controller

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



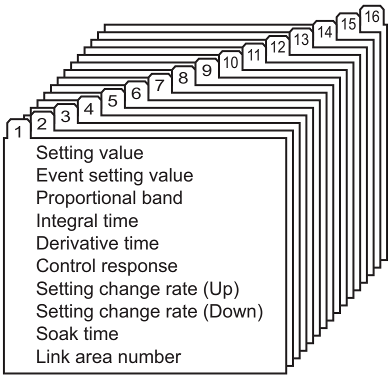
# Features

## 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.

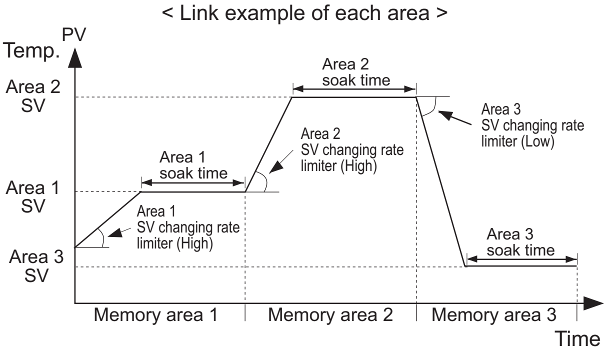
Parameters stored in each memory area are the control set value, event set value, PID values, control response, ramp-to-setpoint UP and DOWN, soak time, and link area number.

< Multi-memory araa >



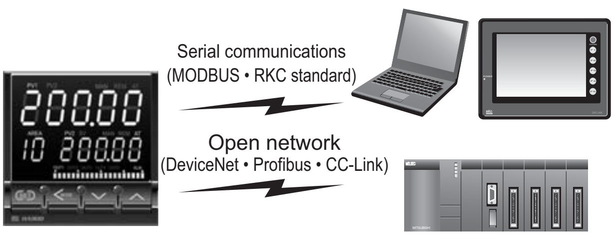

Up to 32-segment ramp/soak control is available by using the memory area function (ramp-to-set point UP and DOWN, soak time, link area number).

< Link example of each area >




## 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).

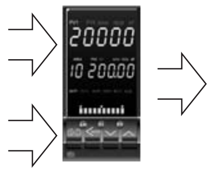



## Numerous Inputs and Outputs

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.

IN1
Measured input (ch1)
IN2
Measured input (ch2) or
Remote setpoint signal
DI1 to DI4
Area No. switching
DI5 to DI7
Area No. switching
Run/Stop
Auto/Manual
Remote/Local



DO1
Control output (ch1)
Analog retransmission
DO2
Control output (ch2)
Analog retransmission
D03
Event 3,4
Heater break alarm
Analog retransmission
DO4
Event 1,2,3,4
Heater break alarm
DO5
Event 1,2
FAIL

Event types :
Deviation high, Deviation low
Deviation high/low, Band
Process high, Process low
Set value high, Set value low
LBA (Assignable to event outputs 3 and 4.)

• Sensor power supply output is also available.
24V DC ± 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. 0.25µV/Ω
- Input break action : Up-scale / Down-scale (Selectable)

RTD : Pt100 (JIS/IEC), JPt100 (JIS)
- Influence of input lead resistance : Approx. 0.01[°C/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
- 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 = √ (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°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 -100°C (-148°F) : ±2.0°C (±3.6°F)
-100 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) : 1.0°C (1.8°F)
More than 1000°C (1832°F) : ±(0.1% of Reading + 1 digit)
Cold junction temperature compensation error
±1.0°C (1.8°F) [at 23°C±2°C (73.4°F± 3.6°F)]
Within ±1.5°C (± 2.7°F) [Between 0 and 50°C (14 to 122°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

## 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) : 135Ω 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 600Ω)
Current output : 4 to 20mA DC, 0 to 20mA DC
(Load resistance : Less than 600Ω)
Continuous voltage output :
0 to 5V DC, 1 to 5V DC, 0 to 10V DC
(Load resistance : More than 1kΩ)
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 ± 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 : ± 5% of input value or ± 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$^3$ 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 Recognized
• CSA Certified
• 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-nergized) Event4 (De-nergized) 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-nergized) Event4 (De-nergized) 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-nergized) Event4 (De-nergized) 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, tha 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 | Code |
|---|---|---|
| Model | HA400 (48 x 96mm 1/8 DIN size)<br>HA900 (96 x 96mm 1/4 DIN size)<br>HA401 (48 x 96mm 1/8 DIN size)<br>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 [1][3]<br>(Main output) | Relay contact output | M |
| | Voltage pulse output : 0/12V DC | V |
| | DC voltage : 0 to 5V | 4 |
| | DC voltage : 0 to 10V | 5 |
| | DC voltage : 1 to 5V | 6 |
| | DC current : 0 to 20mA | 7 |
| | DC current : 4 to 20mA | 8 |
| | SSR (Triac) output | T |
| Output 2 [1][3]<br>(Main output)<br>* Not isolated from OUT1. | No output from OUT2 | N |
| | Relay contact output | M |
| | Voltage pulse output : 0/12V DC | V |
| | DC voltage : 0 to 5V | 4 |
| | DC voltage : 0 to 10V | 5 |
| | DC voltage : 1 to 5V | 6 |
| | DC current : 0 to 20mA | 7 |
| | DC current : 4 to 20mA | 8 |
| | SSR (Triac) output | T |
| Power supply | 24V AC/DC | 3 |
| | 100 to 240V AC | 4 |
| Output 3 [2][3]<br>(Main output) | No output from OUT3 | N |
| | Relay contact output | M |
| | Voltage pulse output : 0/12V DC | V |
| | DC voltage : 0 to 5V | 4 |
| | DC voltage : 0 to 10V | 5 |
| | DC voltage : 1 to 5V | 6 |
| | DC current : 0 to 20mA | 7 |
| | DC current : 4 to 20mA | 8 |
| | SSR (Triac) output | T |
| | Sensor power supply output (Output 4 and 5 can not added) | P |
| Output 4, 5 [2]<br>(OUT4, 5 : Sub output) | No outputs from OUT4 and OUT5 | N |
| | OUT4 : Relay contact output, No output from OUT5 | 1 |
| | OUT4 and OUT5 : Relay contact output | 2 |
| Event input 1 to 5 | Not supplied | N |
| | Event input : 5 points (DI 1 to DI5) | 1 |
| CT input,<br>Power feed forward (PFF) input,<br>Feedback resistance | Not supplied | N |
| | CT input 1 point (CTL-6-P-N) | P |
| | CT input 1 point (CTL-12-S56-10L-N) | S |
| | CT input 2 points (CTL-6-P-N) | T |
| | CT input 2 points (CTL-12-S56-10L-N) | U |
| | PFF input (Within transformer 100 to 120V AC type) | 1 |
| | PFF input (Within transformer 200 to 240V AC type) | 2 |
| | CT input 1 point (CTL-6-P-N) + PFF input (Within transformer 100 to 120V AC type) | 3 |
| | CT input 1 point (CTL-6-P-N) + PFF input (Within transformer 200 to 240V AC type) | 4 |
| | CT input 1 point (CTL-12-S56-10L-N) + PFF input (Within transformer 100 to 120V AC type) | 5 |
| | CT input 1 point (CTL-12-S56-10L-N) + PFF input (Within transformer 200 to 240V AC type) | 6 |
| | Feedback resistance input | F |
| Communication 1<br>or<br>Event input 6 to 7 | Not supplied | N |
| | RS-232C (ANSI/RKC standard) | 1 |
| | RS-485 (ANSI/RKC standard) | 5 |
| | RS-485 (MODBUS) | 6 |
| | RS-232C (MODBUS) | 8 |
| | Event input : DI6 and DI7 | D |
| Communication 2 | Not supplied | N |
| | RS-232C (ANSI/RKC standard) | 1 |
| | RS-422A (ANSI/RKC standard) | 4 |
| | RS-485 (ANSI/RKC standard) | 5 |
| | RS-485 (MODBUS) | 6 |
| | RS-422A (MODBUS) | 7 |
| | RS-232C (MODBUS) | 8 |
| | DeviceNet | A |
| | PROFIBUS | B |
| | CC-Link | C |
| Waterproof/Dustproof | Not supplied | N |
| | Waterproof/Dustproof protection | 1 |
| Body color | White | N |
| | Black | 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 | Code |
|---|---|---|
| Model | HA400 (48 x 96mm 1/8 DIN size)<br>HA900 (96 x 96mm 1/4 DIN size)<br>HA401 (48 x 96mm 1/8 DIN size)<br>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 | M |
| | Voltage pulse output : 0/12V DC | V |
| | DC voltage : 0 to 5V | 4 |
| | DC voltage : 0 to 10V | 5 |
| | DC voltage : 1 to 5V | 6 |
| | DC current : 0 to 20mA | 7 |
| | DC current : 4 to 20mA | 8 |
| | SSR (Triac) output | T |
| Output 2 (Main output) * Not isolated from OUT1. [1] [3] | No output from OUT2 | N |
| | Relay contact output | M |
| | Voltage pulse output : 0/12V DC | V |
| | DC voltage : 0 to 5V | 4 |
| | DC voltage : 0 to 10V | 5 |
| | DC voltage : 1 to 5V | 6 |
| | DC current : 0 to 20mA | 7 |
| | DC current : 4 to 20mA | 8 |
| | SSR (Triac) output | T |
| Power supply | 24V AC/DC | 3 |
| | 100 to 240V AC | 4 |
| Output 3 (Main output) [2] [3] | No output from OUT3 | N |
| | Relay contact output | M |
| | Voltage pulse output : 0/12V DC | V |
| | DC voltage : 0 to 5V | 4 |
| | DC voltage : 0 to 10V | 5 |
| | DC voltage : 1 to 5V | 6 |
| | DC current : 0 to 20mA | 7 |
| | DC current : 4 to 20mA | 8 |
| | SSR (Triac) output | T |
| | Sensor power supply output (Output 4 and 5 can not added) | P |
| Output 4, 5 (OUT4, 5 : Sub output) [2] | No outputs from OUT4 and OUT5 | N |
| | OUT4 : Relay contact output, No output from OUT5 | 1 |
| | OUT4 and OUT5 : Relay contact output | 2 |
| Event input 1 to 5 | Not supplied | N |
| | Event input : 5 points (DI 1 to DI5) | 1 |
| CT input, Power feed forward (PFF) input, Feedback resistance | Not supplied | N |
| | CT input 1 point (CTL-6-P-N) | P |
| | CT input 1 point (CTL-12-S56-10L-N) | S |
| | CT input 2 points (CTL-6-P-N) | T |
| | CT input 2 points (CTL-12-S56-10L-N) | U |
| | PFF input (Within transformer 100 to 120V AC type) | 1 |
| | PFF input (Within transformer 200 to 240V AC type) | 2 |
| | CT input 1 point (CTL-6-P-N) + PFF input (Within transformer 100 to 120V AC type) | 3 |
| | CT input 1 point (CTL-6-P-N) + PFF input (Within transformer 200 to 240V AC type) | 4 |
| | CT input 1 point (CTL-12-S56-10L-N) + PFF input (Within transformer 100 to 120V AC type) | 5 |
| | CT input 1 point (CTL-12-S56-10L-N) + PFF input (Within transformer 200 to 240V AC type) | 6 |
| | Feedback resistance input | F |
| Communication 1 or Event input 6 to 7 | Not supplied | N |
| | RS-232C (ANSI/RKC standard) | 1 |
| | RS-485 (ANSI/RKC standard) | 5 |
| | RS-485 (MODBUS) | 6 |
| | RS-232C (MODBUS) | 8 |
| | Event input : DI6 and DI7 | D |
| Communication 2 | Not supplied | N |
| | RS-232C (ANSI/RKC standard) | 1 |
| | RS-422A (ANSI/RKC standard) | 4 |
| | RS-485 (ANSI/RKC standard) | 5 |
| | RS-485 (MODBUS) | 6 |
| | RS-422A (MODBUS) | 7 |
| | RS-232C (MODBUS) | 8 |
| | DeviceNet | A |
| | PROFIBUS | B |
| | CC-Link | C |
| Waterproof/Dustproof | Not supplied | N |
| | Waterproof/Dustproof protection | 1 |
| Body color | White | N |
| | Black | A |
| Instrument version | Version symbol | Y |

[1] Only OUT1 and OUT2 can be used for control outputs.
[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.

## 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 | 8 | | | |
| 4 − 20mA DC | | | | |

High voltage group

| Input | Code | Range | Resolution |
|---|---|---|---|
| 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]

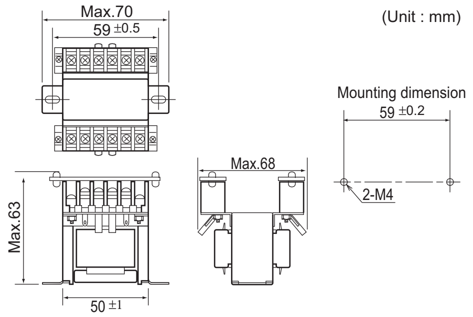
| Input type | | Code |
|---|---|---|
| Low voltage group | 0 − 10mV DC | G |
| | 0 − 100mV DC | |
| | 0 − 1V DC | |
| High voltage group | 0 − 5V DC | V |
| | 0 − 10V DC | |
| | 1 − 5V DC | |
| Current group | 0 − 20mA DC | Y |
| | 4 − 20mA DC | |

## 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 |

(Unit : mm)



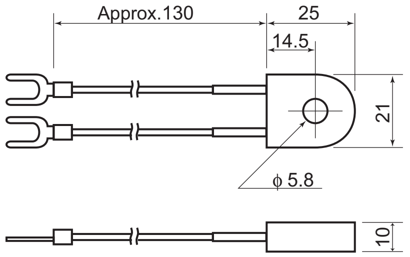

## Current Transformer (CT)

• Sold separately.

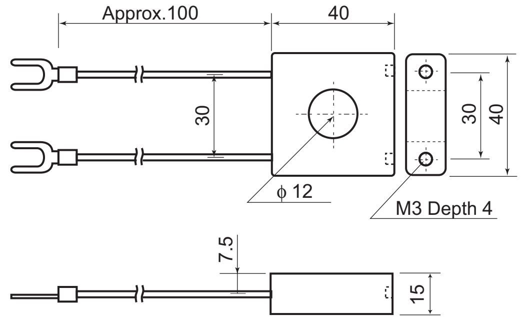
| Name | Range | Model Code |
|---|---|---|
| Current transformer for heater break alarm | 0 − 30A | CTL−6−P−N |
| | 0 − 100A | CTL−12−S56−10L−N |

(Unit : mm)

CTL−6−P−N



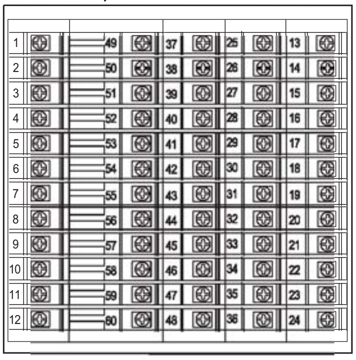

CTL−12−S56−10L−N

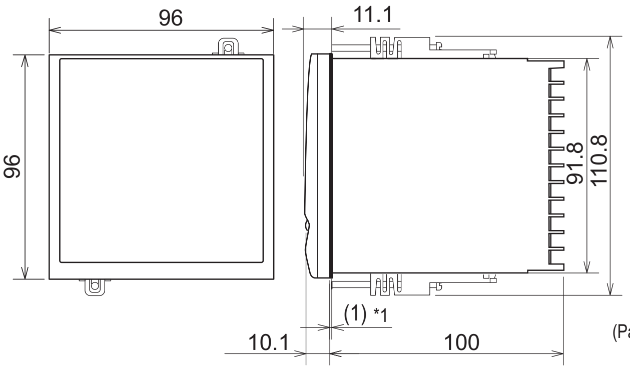


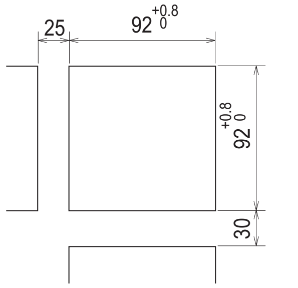
# External Dimensions and Rear Terminals

Unit : mm

## HA900, HA901



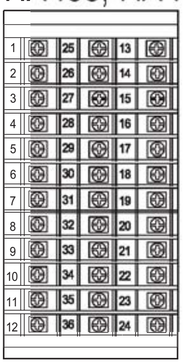



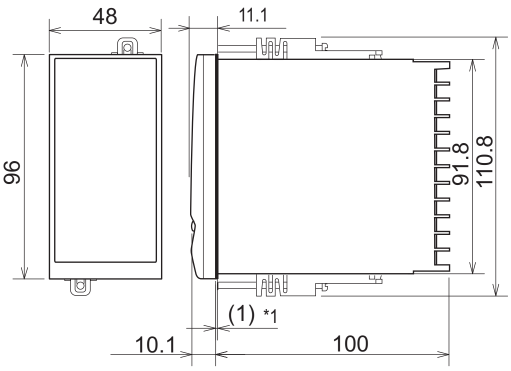



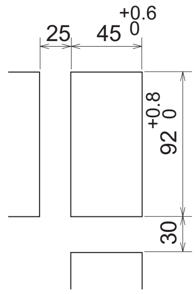

Panel cutout
(Panel thickness must be between 1 to 10mm)

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

## HA400, HA401




Panel cutout
(Panel thickness must be between 1 to 10mm)

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

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

| No | | |
|---|---|---|
| 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 | SG / SG / SG | Communication * (1) RS-422A (2) RS-485 (3) RS-232C |
| 26 | T (A) / T/R (A) / SD | |
| 27 | T (B) / T/R (B) (2) / RD (3) | |
| 28 | R (A) | |
| 29 | R (B) (1) | |
| 30 | COM (−) | Event input 1 to 4 * |
| 31 | DI1 | |
| 32 | DI2 Non-voltage contact input | |
| 33 | DI3 | |
| 34 | DI4 | |
| 35 | COM (−) DI5 Non-voltage contact input | Event input 5 * |
| 36 | | |

| No | Description | |
|---|---|---|
| 13 | (A) SG / SG; (B) COM | (A) Communication 1 * (1)RS-485 (2)RS-232C (B) Event input 6 to 7 Non-voltage contact input |
| 14 | T/R (A) / SD; DI6 | |
| 15 | T/R (B) (1) / RD (2); DI7 | |
| 16 | (A) COM; (B) OPEN (O); (C) COM | (A) CT1,CT2 input * (B) Feedback resistance input (C) CT1 input + Power feed forward input |
| 17 | CT1 CT2; (W); CT1 PFF | |
| 18 | CLOSE (C) | |
| 19 | (A) Non isolated type remote input +; (B) No.2 Input (IN 1) A | (A) 1 channel type * No.1 Input (IN1) + Non-isolated type remote input (B) 2 channel type No.1 Input (IN1) + No.2 Input(IN 2) (1) Thermocouple (2)-1 RTD (3 or 4 wire) (2)-2 RTD (3 wire) (3) Voltage/Current |
| 20 | (3) −; + B + | |
| 21 | No.1 Input (IN 1) A'; B − (1) (2)-1 (3) | |
| 22 | A; No.1 Input (IN 1) A | |
| 23 | + B +; + B + | |
| 24 | B − (1) (2)-1 (3); B − (1) (2)-1 (3) | |

* 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