

Your Simple, Accurate and Economical  
Temperature Controller  
Compact temperature controller (DIN 48 x  
24) that can support pattern control

**KT Temperature  
Controller**



KT2 Series  
(48x24x98.5mm)



KT4 Series  
(48x48x95mm)



KT7 Series  
(22.5x75x100mm)



KT8 Series  
(48x96x98.5mm)



KT9 Series  
(96x96x98.5mm)

**RoHS Directive compatibility information**  
<http://www.nais-e.com/>

**FEATURES**

**1. Multi-input**

Versatile thermocouple, RTD, DC voltage and DC current input for temperature detecting sensors.

**2. Simple operation enables highly accurate temperature control**

All required operations can be enabled by the front keys and highly accurate PID control mode ensures an input span of  $\pm 0.2\%$ .

**3. DIN Rail mounting types are aligned taking global market demand into consideration**

The KT7 series is equipped with DIN rail mounting complying to DIN standards. Furthermore, because its control panel is compact, the KT7 saves space.

**4. Nine step pattern control possible.**

Despite DIN 48 x 24 size, selection is possible of control with fixed set point and nine step pattern control.

**5. Meets market demands for cost-effectiveness**

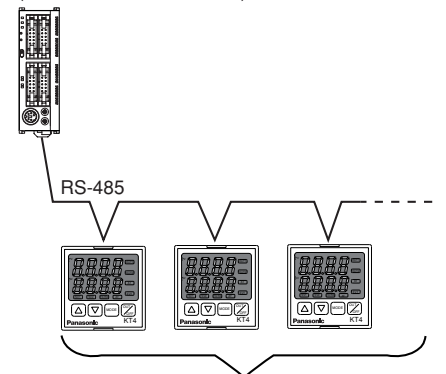
The KT series offers both economy and high performance.

**6. The KT series complies with UL, CSA standards and CE marking.**

**7. Communication specification uses RS485 (Modbus protocol)**

(Sample System Configuration)

FPΣ Programmable Controller  
(Matsushita Electric Works)



Up to 31 units can be connected

\* In the configuration above, the FPΣ requires a communication cassette (FPG-COM3).

\* Modbus is a communication protocol developed for PLCs by Modicon Inc.

# KT (AKT2,4,7,8,9)

## PRODUCT TYPES

### 1. KT2 Series

Base model	Power supply	Sensor input	Control output	Alarm output	Heating/cooling control	Heater burnout alarm	Communication function	Description
AKT2								48 × 24 × 98.5mm
	1							100 to 240V AC
	2							24V AC/DC
		1						Multi-input (Thermocouple, RTD, DC current and DC voltage)
			1					Relay contact output 1a 3A 250V AC
			2					Non-contact voltage output (for SSR drive)
			3					Current output
				2	0	0	Blank	When both heating/cooling and communication functions are not added: Relay contact output (alarm 1): Can be used Open collector output (alarm 2): Can be used
				1	1	0	Blank	When only heating/cooling function is added: Relay contact output (alarm 1): Cannot be used Open collector output (alarm 2): Can be used
				1	0	0	1	When only communication function is added: Relay contact output (alarm 1): Can be used Open collector output (alarm 2): Cannot be used
				0	1	0	1	When both heating/cooling and communication functions are added: Relay contact output (alarm 1): Cannot be used Open collector output (alarm 2): Cannot be used

\* When heating/cooling is selected, alarm output 1 cannot be used.  
When the communication function is selected, alarm output 2 cannot be used.

#### • Part No.

(Ex) Part No. when the optional functions (of Heating/Cooling control: relay contact output + Communications function) is added on to the basic model are as follows; Part No.: AKT21110101

#### • Options

Product name	Part No.
Shunt resistor (for Current input)	AKT4810
Terminal cover	AKT2801

Note: When Current input is specified, a shunt resistor (sold separately) is required.

### 2. KT4 Series

Base model	Power supply	Sensor input	Control output	Alarm output	Heating/cooling control	Heater burnout alarm	Communications function	Description
AKT4								48 × 48 × 95mm
	1							100 to 240V AC
	2							24V AC/DC
		1						Multi-input (Thermocouple, RTD, DC Voltage and DC Current)
			1					Relay contact output 1a 3A 250V AC
			2					Non-contact voltage output (for SSR drive)
			3					Current output
				1				Relay contact output 1a (Alarm output 1)
				2				Relay contact output 1a (Alarm output 2)
					0			Not available
					4			SSR output 0.3A 250V AC (Heating/Cooling control not supported when 2 alarm output points are selected)
						0		Not available
						1		5A (Heater burn-out alarm not supported when control output is current output type/not supported when heating and cooling control is selected)
						2		10A (Heater burn-out alarm not supported when control output is current output type/not supported when heating and cooling control is selected)
						3		20A (Heater burn-out alarm not supported when control output is current output type/not supported when heating and cooling control is selected)
						4		50A (Heater burn-out alarm not supported when control output is current output type/not supported when heating and cooling control is selected)
								Not available
							1	Available

Notes: 1. CT1 or CT2 for current detection is provided as an accessory when heater burn-out alarm function is added.  
2. Event output will be shared if you choose alarm output 2 and the heater burnout alarm.

#### • Part No.

(Ex) Part No. when the optional functions (of Heating/Cooling control: SSR output + Communications function) is added on to the basic model are as follows; Part No.: AKT41111401

#### • Options

Product name	Part No.
Shunt resistor (for Current input)	AKT4810
Terminal cover	AKT4801

Note: When Current input is specified, a shunt resistor (sold separately) is required.

**3. KT8 Series**

Base model	Power supply	Sensor input	Control output	Alarm output	Heating/cooling control	Heater burnout alarm	Communications function	Description
AKT8								48 × 96 × 98.5mm
	1							100 to 240V AC
	2							24V AC/DC
		1						Multi-input (Thermocouple, RTD, DC Voltage and DC Current)
			1					Relay contact output 1a1b 3A 250V AC
			2					Non-contact voltage output (for SSR drive)
			3					Current output
				1				Relay contact output 1a (Alarm output 1)
				2				Relay contact output 1a (Alarm output 2)
					0			Not available
					1			Relay contact output 1a
					2			Non-contact voltage output (for SSR drive)
					3			Current output
						0		Not available
						1		5A (Heater burn-out alarm not supported when control output is current output type/not supported when heating and cooling control is selected)
						2		10A (Heater burn-out alarm not supported when control output is current output type/not supported when heating and cooling control is selected)
						3		20A (Heater burn-out alarm not supported when control output is current output type/not supported when heating and cooling control is selected)
						4		50A (Heater burn-out alarm not supported when control output is current output type/not supported when heating and cooling control is selected)
								Not available
							1	Available

Notes: 1. CT1 or CT2 for current detection is provided as an accessory when heater burn-out alarm function is added.  
 2. If a communication function is added, second main setup is not possible

**• Part No.**

(Ex) Part No. when the optional functions (of Alarm output; Alarm output 2 + Heating/Cooling control: Current output) are added on to the basic model are as follows; Part No.: AKT8111230

**• Options**

Product name	Part No.
Shunt resistor (for Current input)	AKT4810
Terminal cover	AKT8801

Note: When Current input is specified, a shunt resistor (sold separately) is required.

**4. KT9 Series**

Base model	Power supply	Sensor input	Control output	Alarm output	Heating/cooling control	Heater burnout alarm	Communications function	Description
AKT9								96 × 96 × 98.5mm
	1							100 to 240V AC
	2							24V AC/DC
		1						Multi-input (Thermocouple, RTD, DC Voltage and DC Current)
			1					Relay contact output 1a1b 3A 250V AC
			2					Non-contact voltage output (for SSR drive)
			3					Current output
				1				Relay contact output 1a (Alarm output 1)
				2				Relay contact output 1a (Alarm output 2)
					0			Not available
					1			Relay contact output 1a
					2			Non-contact voltage output (for SSR drive)
					3			Current output
						0		Not available
						1		5A (Heater burn-out alarm not supported when control output is current output type/not supported when heating and cooling control is selected)
						2		10A (Heater burn-out alarm not supported when control output is current output type/not supported when heating and cooling control is selected)
						3		20A (Heater burn-out alarm not supported when control output is current output type/not supported when heating and cooling control is selected)
						4		50A (Heater burn-out alarm not supported when control output is current output type/not supported when heating and cooling control is selected)
								Not available
							1	Available

Notes: 1. CT1 or CT2 for current detection is provided as an accessory when heater burn-out alarm function is added.  
 2. If a communication function is added, second main setup is not possible

**• Part No.**

(Ex) Part No. when the optional functions (of Alarm output; Alarm output 2 + Heating/Cooling control: Non-contact voltage output) are added on to the basic model are as follows; Part No.: AKT9111220

**• Options**

Product name	Part No.
Shunt resistor (for Current input)	AKT4810
Terminal cover	AKT9801

Note: When Current input is specified, a shunt resistor (sold separately) is required.

# KT (AKT2,4,7,8,9)

## 4. KT7 Series

Base model	Power supply	Sensor input	Control output	Alarm output	Heating/cooling control	Heater burnout alarm	Communications function	Description
AKT7								22.5 × 75 × 100mm
	1							100 to 240V AC
	2							24V AC/DC
		1						Multi-input (Thermocouple, RTD, DC Voltage and DC Current)
			1					Relay contact output 1a 3A 250V AC
			2					Non-contact voltage output (for SSR drive)
			3					Current output
				1				Open collector output (Alarm output 1)
					0			Not available (without Heating/Cooling function)
						0		Not available
						1		5A (not available for the Current output type) Open collector output
						2		10A (not available for the Current output type) Open collector output
						3		20A (not available for the Current output type) Open collector output
						4		50A (not available for the Current output type) Open collector output
								Not available
							1	Available

Note: CT1 or CT2 for current detection is provided as an accessory when heater burn-out alarm function is added.

### • Part No.

(Ex) Part No. when the optional function (of Heater burnout alarm: 10A) is added on to the base model are as follows;

Part No.: AKT7111102

### • Options

Product name	Part No.
Shunt resistor (for Current input)	AKT4811

Note: When Current input is specified, a shunt resistor (sold separately) is required.

## RATING &amp; SPECIFICATIONS

Display		Specifications				
		KT2	KT4	KT8	KT9	KT7
Size		48 × 24mm	48 × 48mm	48 × 96mm	96 × 96mm	22.5 × 75mm
Supply voltage (Must be specified)		100 to 240V AC 24V AC/DC				
Frequency		50/60Hz				
Power consumption		Approx. 5VA	Approx. 8VA			Approx. 6VA
Input type		Input range				
Thermocouple	K	-200 to 1370°C (-320 to 2500°F)				
		-199.9 to 400.0°C (-199.9 to 750.0°F)				
	J	-200 to 1000°C (-320 to 1800°F)				
	R	0 to 1760°C (0 to 3200°F)				
	S	0 to 1760°C (0 to 3200°F)				
	B	0 to 1820°C (0 to 3300°F)				
	E	-200 to 800°C (-320 to 1500°F)				
	T	-199.9 to 400.0°C (-199.9 to 750.0°F)				
	N	-200 to 1300°C (-320 to 2300°F)				
	PL-II	0 to 1390°C (0 to 2500°F)				
C (W/Re5-26)		0 to 2315°C (0 to 4200°F)				
RTD	Pt100	-200 to 850°C (-300 to 1500°F)				
		-199.9 to 850.0°C (-199.9 to 999.9°F)				
	JPt100	-200 to 500°C (-300 to 900°F) -199.9 to 500.0°C (-199.9 to 900.0°F)				
DC	Current	4 to 20mA DC				
		0 to 20mA DC				
	Voltage	0 to 1V DC				
		0 to 10V DC				
		1 to 5V DC				
		0 to 5V DC				
		-1999 to 9999, -199.9 to 999.9 -19.99 to 99.99, -1.999 to 9.999				
		<ul style="list-style-type: none"> <li>Scaling and change to the decimal point position is possible for DC current and DC voltage input.</li> <li>DC current input is supported with an externally mounted 50Ω shunt resistor (sold separately).</li> </ul>				
Multi-input	Thermocouple	K, J, R, S, B, E, T, N, PL-II, C (W/Re5-26) External resistor: Max. 100Ω (max. 40Ω external resistor for B input)				
	RTD	Pt100, JPt100 3-conductor system (Allowable input conductor resistance for each conductor: max. 10Ω)				
	DC current	0 to 20 mA DC, 4 to 20 mA DC Input impedance: 50Ω (Connect 50Ω shunt resistor between input terminals.) Allowable input current: max. 50 mA (when 50Ω shunt resistor is used)				
	DC voltage	<ul style="list-style-type: none"> <li>0 to 1V DC Input impedance: min. 1 MΩ, Allowable input voltage: max 5 V, Allowable signal source resistance: max. 2 kΩ</li> <li>0 to 5 V DC, 1 to 5 V DC, 0 to 10 V DC Input impedance: min. 100 kΩ, Allowable input voltage: max 15 V, Allowable signal source resistance: max. 100Ω</li> </ul>				
Control output (Must be specified)	Relay contact (contact material: silver alloy)	1a	1a	1a1b	1a	
	Non-contact DC voltage	12 <sup>±</sup> V DC, Max. load current: 40mA (Short-circuit protected)				
	DC current	4 to 20mADC Load resistance: Max. 550Ω				
Alarm output 1	Relay contact 1a 3A 250V AC (Resistive load), 1a 1A 250V AC (Inductive load cosφ=0.4)	Relay contact 1a 3A 250VAC (Resistive load) Electric life: 100,000 times			Open collector, Control capacity: 24V DC 0.1A (Max.)	
Alarm output 2	Open collector 0.1A 24V DC	The same as the one of Alarm output 1			None	
Control mode	Actions mentioned below can be selected by key operation. [Default PID] PID (with auto-tuning function), PI, PD (with manual reset function), P (with manual reset function), ON/OFF action					
Target temperature setting	Primary setting/secondary setting (switched by external terminal)	—	Primary setting/secondary setting (switched by external terminal)		—	
Program control function	1 pattern, 9 step setting is possible (However, make function selection setting of either control with fixed set point or program control.)	—				
Accuracy	Thermocouple	Within ±0.2% ±1 digit of each input span or within ±2°C (4°F) whichever is greater However, R and S input: Within ±6°C (12°F) in the range of 0 to 200°C (0 to 400°F) B input 0 to 300°C (0 to 600°F): Accuracy is not guaranteed. K, J, E, and N input less than 0°C (32°F): Within ±0.4% ±1 digit of input span				
	RTD	Within ±0.1% ±1 digit of each input span or ±1°C (2°F) whichever is greater				
	DC current and DC voltage	Within ±0.2% ±1 digit of each input span				
Sampling period	250ms					

# KT (AKT2,4,7,8,9)

Display	Specifications				
	KT2	KT4	KT8	KT9	KT7
Hysteresis	Thermocouple & RTD: 0.1 to 100.0°C (°F) DC current and DC voltage: 1 to 1000 (The decimal point place follows the selection)				
Proportional band	For sensor input range and DC current, DC voltage 0.0 to 110.0%	Thermocouple: 0 to 1000°C (0 to 2000°F) RTD: 0.0 to 999.9°C (0.0 to 999.9°F) DC current and DC voltage: 0.0 to 100.0%			For sensor input range and DC current, DC voltage 0.0 to 110.0%
Integral time	0 to 1000 seconds				
Derivative time	0 to 300 seconds				
Proportional cycle	1 to 120 seconds				
Allowable voltage fluctuation	When 100 to 240V AC; 85 to 264V AC When 24V AC/DC; 20 to 28V AC/DC				
Insulated resistance	500V DC 10MΩ or greater				
Breakdown voltage	1.5kV AC for 1 min between input terminal and power terminal, & between output terminal and power terminal	1.5kV AC for 1min between input terminal and ground terminal, between input terminal and power terminal between power terminal and ground terminal and between output terminal and power terminal			1.5kV AC for 1 min between input terminal and power terminal, & between output terminal and power terminal
Malfunction vibration	10 to 55Hz (0.35mm) to each direction (120ms sweep) for 10min.				
Breakdown vibration	10 to 55Hz (0.75mm) to each direction (120ms sweep) for 10min.				
Malfunction shock	X, Y & Z each direction for 5 times 10G				
Breakdown shock	Same as above, but 30G				
Ambient temperature	0 to 50°C				
Ambient humidity	35 to 85%RH (No condensation)				
Mass	Approx. 120g	Approx. 130g	Approx. 240g	Approx. 370g	Approx. 150g
Waterproof	IP66 (applicable only to the front panel subject to rubber gasket employed)				None
Display character height	PV: 8.7mm, SV: 8.7mm (PV/SV switching display)	PV: 10.2mm SV: 8.8mm	PV: 11.2mm SV: 11.2mm	PV: 18mm SV: 13.2mm	PV: 7.4mm SV: 7.4mm
Options	Heating/Cooling control (Relay contact material: silver alloy)	Relay contact: 1a 3A 250V DC (Resistive load)	Non contact relay 0.3A 250V AC (Resistive load)	<ul style="list-style-type: none"> <li>Relay contact: 1a 250V AC 3A (Resistive load), 250V AC 3A (Inductive load <math>\cos\phi=0.4</math>), Electric life: 100,000 times</li> <li>Non-contact voltage: 12<math>\frac{1}{2}</math>V DC Max. 40mA (Short-circuit protected)</li> <li>DC current: 4 to 20mA DC Load resistance: Max. 550Ω</li> </ul>	None
	Heater burn-out alarm output (Relay contact material: silver alloy)	—	Heater rated current must be selected from 5A, 10A, 20A and 50A. Setting accuracy: Within 5% of heater rated current Relay contact 1a 250V AC 3A (Resistive load), Electric life: 100,000 times	Open collector, Control capacity: 24V DC 0.1A (Max.)	
	Communication function	RS-485/Modbus Protocol (Modbus is a communication protocol developed for PLCs by Modicon Inc.) Communication speed: 2400/4800/9600/19200bps			
Accessories	Mounting frame	Included with unit			Not available
	Terminal cover	Sold separately			Not available

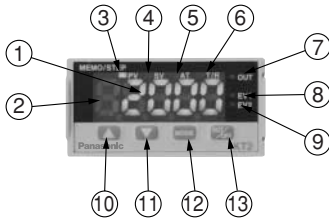
## COMMUNICATION FUNCTION OVERVIEW

Item	Specification
Communication type	Half-duplex
Communication speed	Select 2400, 4800, 9600, or 19200 bps using key operation.
Synchronization type	Asynchronous
Protocol	Modbus
Coding	ASCII
Error correcting	Command re-send
Error detection	Parity check, check sum
Data structure	Start bit: 1 Data bit: 7 Parity: Even parity Stop bit: 1
Interface	RS485 compliant
No. of nodes	31
Maximum cable length	1,000 m (cable resistance must be within 50Ω)

Note) That main setting No. 2 will not be possible on the KT8 and KT9 when the communications functions is added.

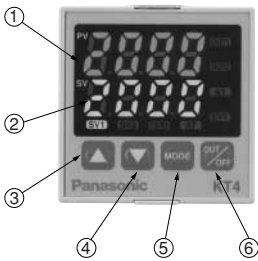
# PARTS AND FUNCTIONS

## 1. KT2 series

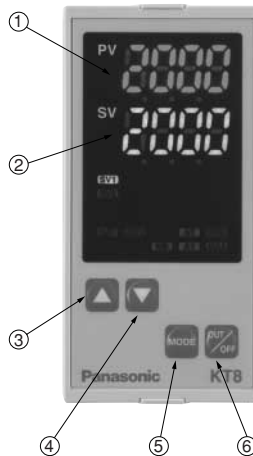


- ① PV/SV display (red): Indicates the input value and setting value. During setting mode, characters and setting value of the setting item are indicated in turn.
- ② MEMO/STEP display (green): Indicates memory number during fixed value control. Indicates step number during program control.
- ③ PV indicator (red): Lights up when the input value (PV) is indicated.
- ④ SV indicator (green): Lights up when main setting value (SV) is indicated.
- ⑤ AT indicator (yellow): Flashes during AT (auto-tuning).
- ⑥ T/R indicator (yellow): Flashes during serial communication (Lit while sending data, Unlit while receiving data)
- ⑦ OUT indicator (green): Lights up when control output or OUT1 (Heating side, option Heating/Cooling control) is ON. (For DC current output type, it flashes corresponding to the manipulated variable in a 0.25 second cycle)
- ⑧ EV1 indicator (red): Lights up when Event output 1 or OUT2 (Cooling side, option Heating/Cooling control) is ON.
- ⑨ EV2 indicator (red): Lights up when Event output 2 is ON.
- ⑩ Increase key (▲): Increases the numeric value.
- ⑪ Decrease key (▼): Decreases the numeric value.
- ⑫ Mode key (MODE): Selects the setting mode or registers the setting value. (By pressing the Mode key, the setting value or selected value can be registered)
- ⑬ OUT/OFF key (OUT/OFF): The control output OUT/OFF or program control RUN/STOP can be switched.

## 2. KT4 series



## 3. KT8 series

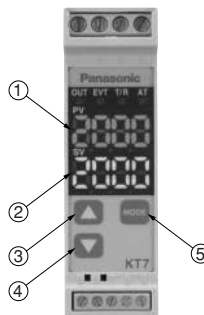


- ① PV display  
Indicates PV (process variable).
- ② SV display  
Indicates SV (setting value).
- ③ Increase key  
Increases numerical value.
- ④ Decrease key  
Decreases numerical value.
- ⑤ Mode key  
Switches the setting mode.
- ⑥ OUT/OFF key  
Control output is turned on or off when control output is ON.

## 4. KT9 series



## 5. KT7 series



Note: Color selection is the same for each size.



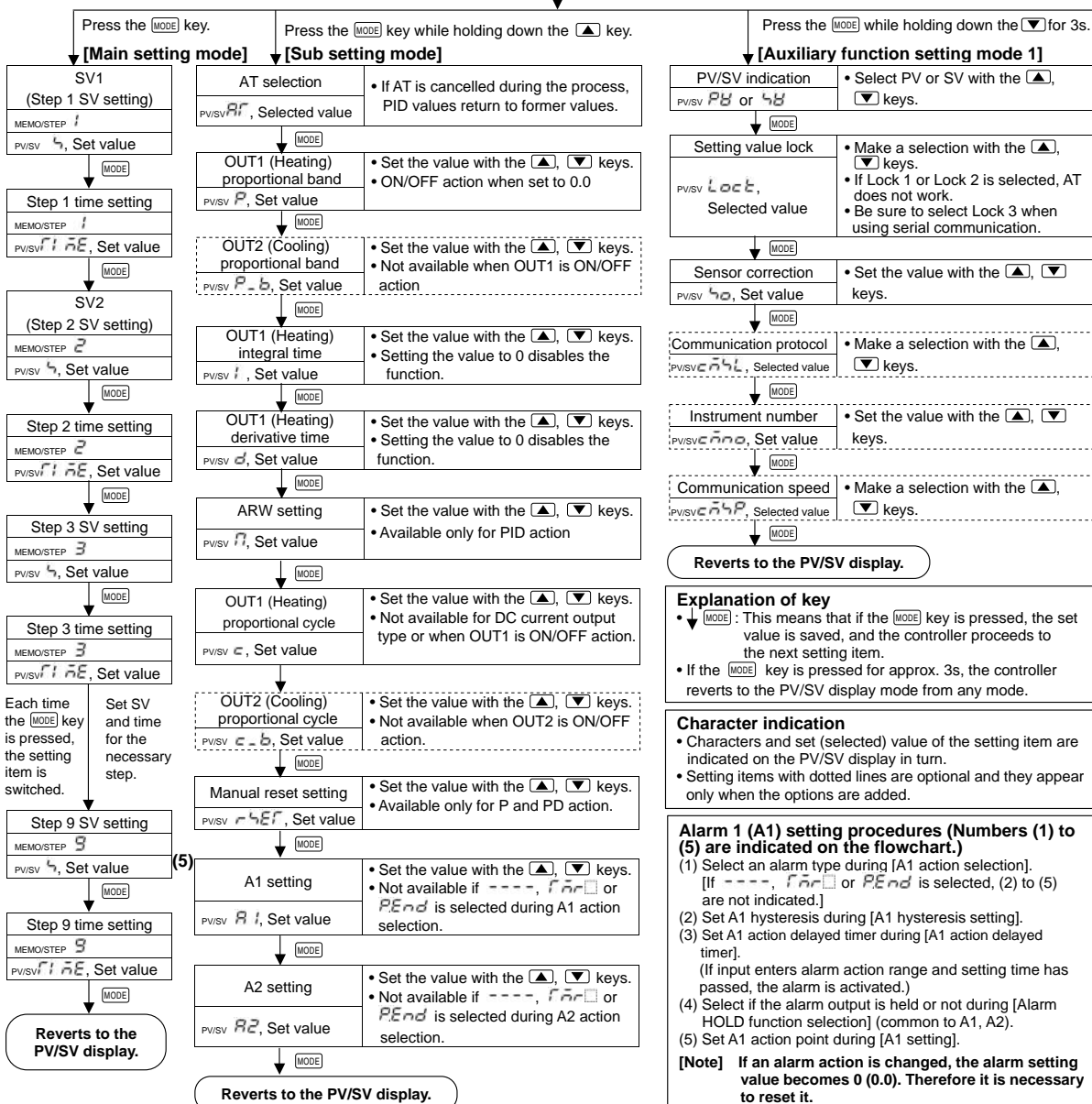
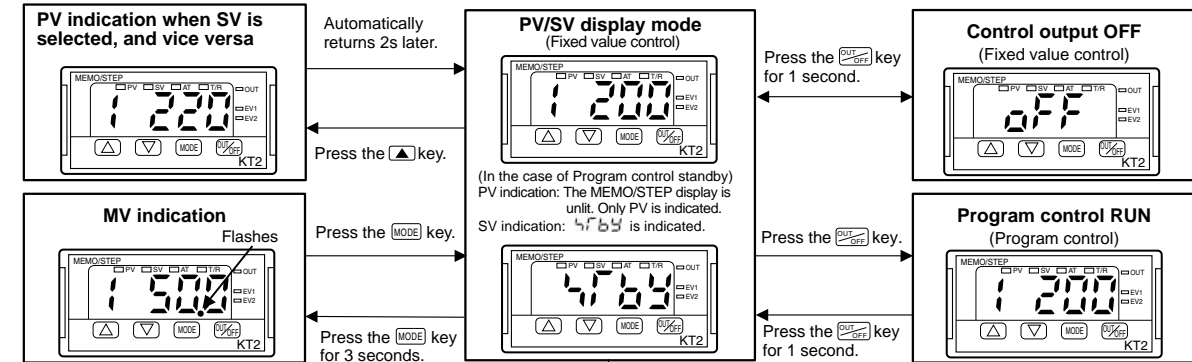
# KT (AKT2,4,7,8,9)

## Setup procedures

### • KT2 series

The setup procedures of this controller is shown below. Refer to each item for details.

- (1) Initial setting : Set the Input type, Alarm action, etc. during Auxiliary function setting mode 2.  
(If the users' specification is the same as the default value of the KT2, initial setting is not necessary for the controller.)
  - (2) Main setting mode : Set Step SV and Step time for Program control during Main setting mode.
  - (3) Sub setting mode : Set PID values, A1 setting, etc. during Sub setting mode.  
(If the users' PID values are the same as the default value of the KT2, it is not necessary to set them.)
  - (4) Auxiliary function setting mode 1 : Set the Lock function, Communication conditions, etc. during Auxiliary function setting mode 1.  
(If the users' specification is the same as the default value of the KT2, it is not necessary to set them.)
- Running



Note: Please refer to the user manual for detailed operating procedures.

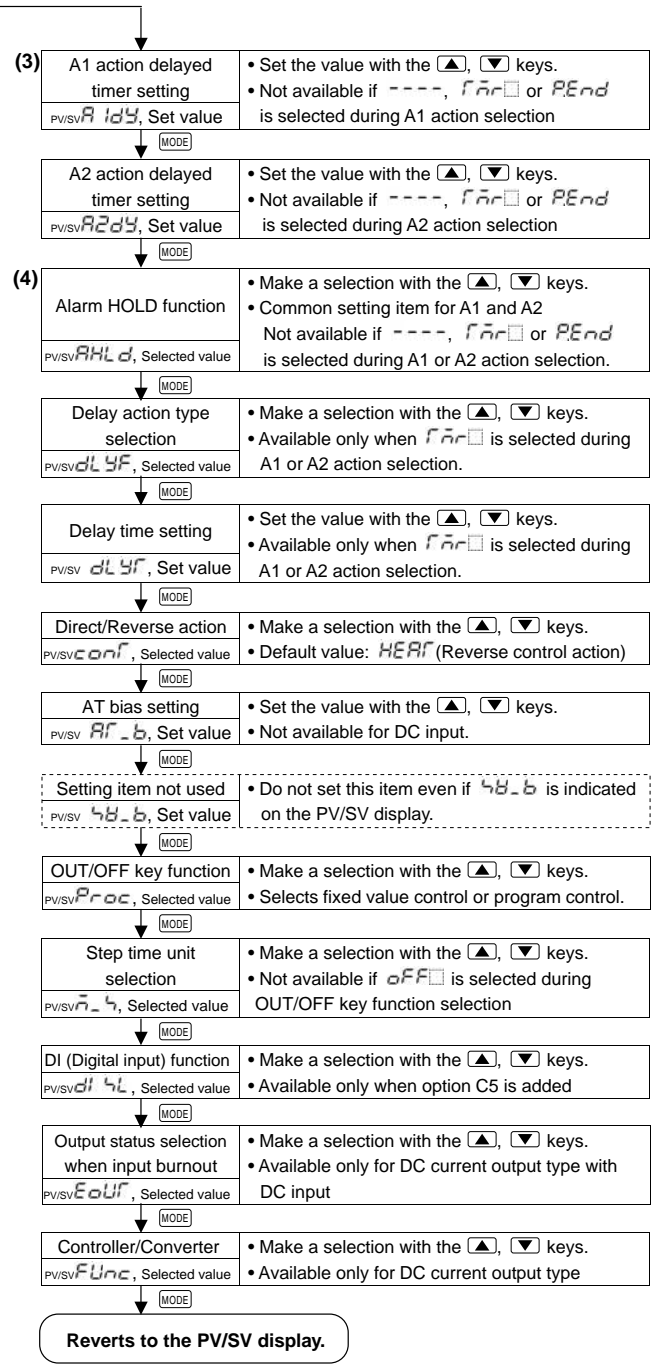
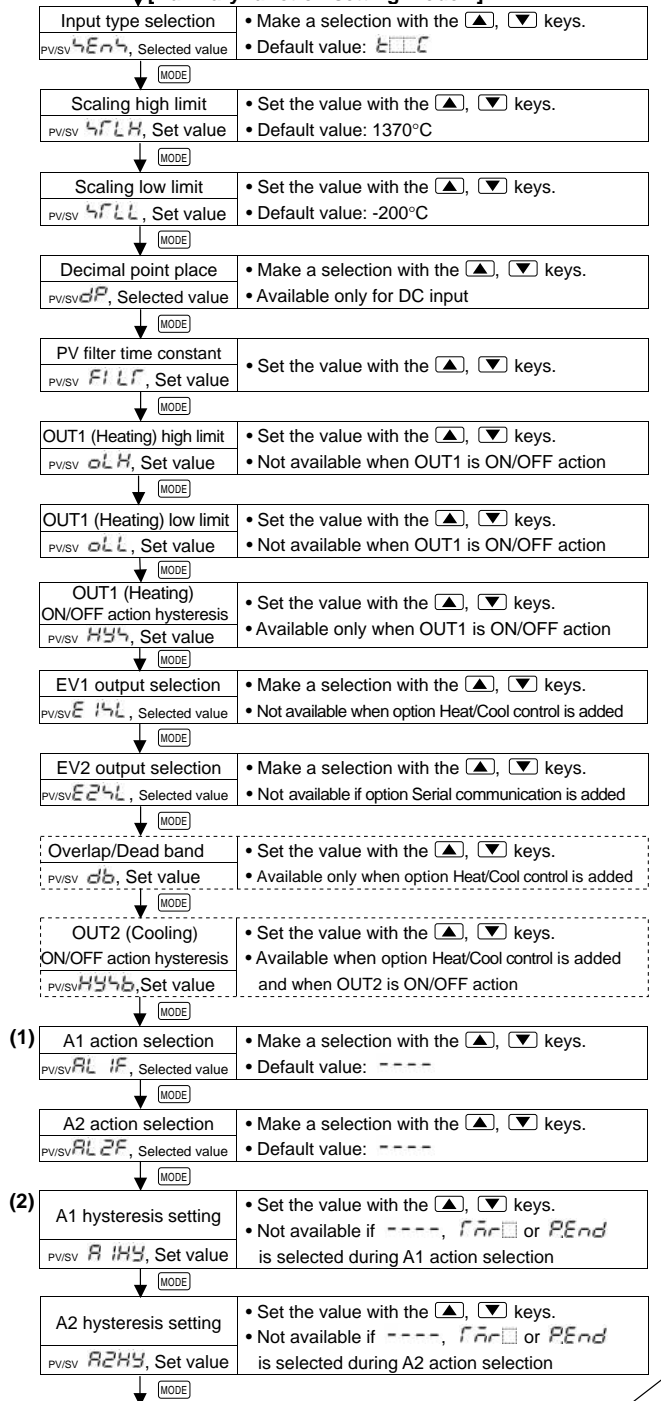


Input type (Character indication) and range			
$E_{\square\square\square}C$ : K	-200 to 1370°C	$E_{\square\square\square}F$ : K	-320 to 2500°F
$E_{\square\square\square}C$ : C	-199.9 to 400.0°C	$E_{\square\square\square}F$ : F	-199.9 to 750.0°F
$J_{\square\square\square}C$ : J	-200 to 1000°C	$J_{\square\square\square}F$ : J	-320 to 1800°F
$r_{\square\square\square}C$ : R	0 to 1760°C	$r_{\square\square\square}F$ : R	0 to 3200°F
$4_{\square\square\square}C$ : S	0 to 1760°C	$4_{\square\square\square}F$ : S	0 to 3200°F
$b_{\square\square\square}C$ : B	0 to 1820°C	$b_{\square\square\square}F$ : B	0 to 3300°F
$E_{\square\square\square}C$ : E	-200 to 800°C	$E_{\square\square\square}F$ : E	-320 to 1500°F
$f_{\square\square\square}C$ : T	-199.9 to 400.0°C	$f_{\square\square\square}F$ : T	-199.9 to 750.0°F
$n_{\square\square\square}C$ : N	-200 to 1300°C	$n_{\square\square\square}F$ : N	-320 to 2300°F
$PL_{2C}$ : PL-II	0 to 1390°C	$PL_{2F}$ : PL-II	0 to 2500°F
$c_{\square\square\square}C$ : C(W/Re5-26)	0 to 2315°C	$c_{\square\square\square}F$ : C(W/Re5-26)	0 to 4200°F
$PF_{\square\square}C$ : Pt100	-199.9 to 850.0°C	$PF_{\square\square}F$ : Pt100	-199.9 to 999.9°F
$JPF_{\square\square}C$ : JPt100	-199.9 to 500.0°C	$JPF_{\square\square}F$ : JPt100	-199.9 to 900.0°F
$PF_{\square\square}C$ : Pt100	-200 to 850°C	$PF_{\square\square}F$ : Pt100	-300 to 1500°F
$JPF_{\square\square}C$ : JPt100	-200 to 500°C	$JPF_{\square\square}F$ : JPt100	-300 to 900°F
$420A$ : 4 to 20mA DC	-1999 to 9999	$0_{\square\square}1B$ : 0 to 1V DC	-1999 to 9999
$020A$ : 0 to 20mA DC	-1999 to 9999	$0_{\square\square}5B$ : 0 to 5V DC	-1999 to 9999
		$1_{\square\square}5B$ : 1 to 5V DC	-1999 to 9999
		$0_{\square\square}10B$ : 0 to 10V DC	-1999 to 9999

Alarm action types	
$H_{\square\square\square}$ (High limit alarm):	The alarm action is a $\pm$ deviation setting from the SV. The alarm is activated if the input value reaches the high limit setting value.
$L_{\square\square\square}$ (Low limit alarm):	The alarm action is a $\pm$ deviation setting from the SV. The alarm is activated if the input value goes under the low limit setting value.
$HL_{\square\square}$ (High/Low limits alarm):	Combines High limit and Low limit alarm actions. When input value reaches high limit setting value or goes under the low limit setting value, the alarm is activated.
$HL_{\square\square}d$ (High/Low limit range alarm):	When input value is between the high limit setting value and low limit setting value, the alarm is activated.
$R_{\square\square}$ (Process high alarm), $r_{\square\square}R_{\square\square}$ (Process low alarm):	Within the scale range of the controller, alarm action points can be set at random and if the input reaches the randomly set action point, the alarm is activated.
$H_{\square\square}d$ (High limit alarm with standby), $L_{\square\square}d$ (Low limit alarm with standby), $HL_{\square\square}d$ (High/Low limits alarm with standby):	When the power to the controller is turned on, even if the input enters the alarm action range, the alarm is not activated. (If the controller is allowed to keep running, once the input exceeds the alarm action point, the standby function will be released.)
$f_{\square\square}r_{\square\square}$ (Timer function):	If external signal enters, timer counting starts, and the action selected during Delay action type selection is outputted after the set delay time has passed.
$PE_{\square\square}nd$ (Pattern end output):	When the program ends normally, pattern end output is turned on. The output is maintained until it is released with the $\square_{\square}^{OUT/ON/OFF}$ key.

Press  $\square$  key for 3s while holding down the  $\square$  key.

**[Auxiliary function setting mode 2]**



# KT (AKT2,4,7,8,9)

## • KT4 series

### Operating Procedure

- Step 1 - Initialization In auxiliary function setup mode 2, select entry type, alarm behavior, control behavior, etc.
- Step 2 - Calibration In ancillary setup mode, set the PID and alarm values.
- Step 3 - Lock Setup In auxiliary function setup mode 1, set the setting lock, SV max, and SV min. (If Step 3 is not necessary, proceed to Step 4.)
- Step 4 - Operation Setup In main setup mode, set the SV (target value).

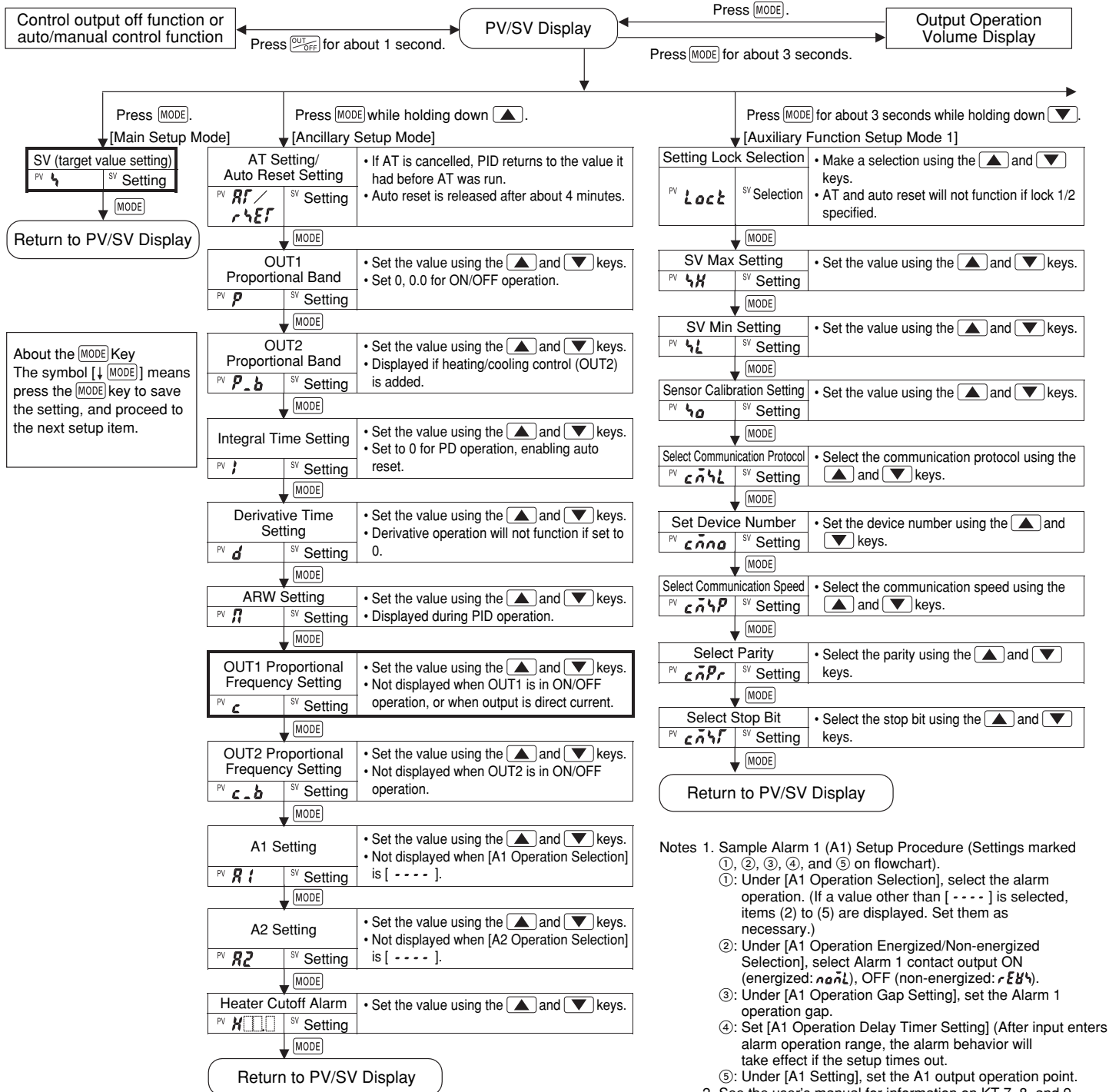
### Sample configuration:

Input sensor: K thermocouple (–200 to 1,370°C)  
 Control method: PID  
 Alarm behavior: Max alarm (deviation setting)  
 Control behavior: Inverse (heat)  
 A1 setting: 50°C 122°F  
 SV (target value): 150°C 302°F  
 AT setting: Run AT

To set up the system as shown above:

- 1) In Step 1 - Initialization, set the necessary values in auxiliary function setup mode 2.
- 2) In Step 2 - Calibration, set the necessary values in ancillary setup mode.
- 3) In Step 4 - Operation Setup, set the SV (target) value in main setup mode, and begin control.
- 4) In ancillary setup mode, under AT Setup/Auto Reset Setup, set AT, and press the MODE key to begin AT.

See the flowchart below for the operation sequence.

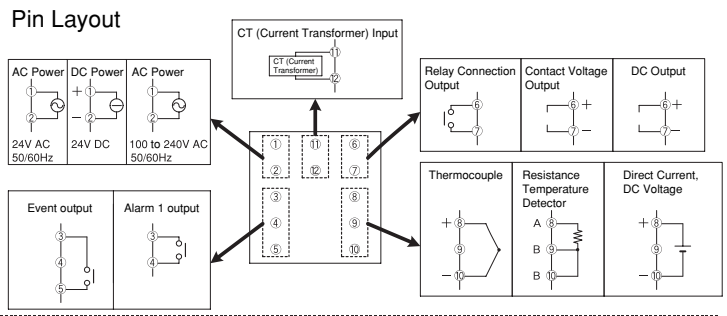


- Notes
1. Sample Alarm 1 (A1) Setup Procedure (Settings marked ①, ②, ③, ④, and ⑤ on flowchart).
    - ①: Under [A1 Operation Selection], select the alarm operation. (If a value other than [ - - - ] is selected, items (2) to (5) are displayed. Set them as necessary.)
    - ②: Under [A1 Operation Energized/Non-energized Selection], select Alarm 1 contact output ON (energized:  $\text{no}\bar{\text{n}}\bar{\text{l}}$ ), OFF (non-energized:  $\text{r}\bar{\text{E}}\bar{\text{H}}\bar{\text{y}}$ ).
    - ③: Under [A1 Operation Gap Setting], set the Alarm 1 operation gap.
    - ④: Set [A1 Operation Delay Timer Setting] (After input enters alarm operation range, the alarm behavior will take effect if the setup times out).
    - ⑤: Under [A1 Setting], set the A1 output operation point.
  2. See the user's manual for information on KT 7, 8, and 9.
  3. See the user's manual for details on factory settings.

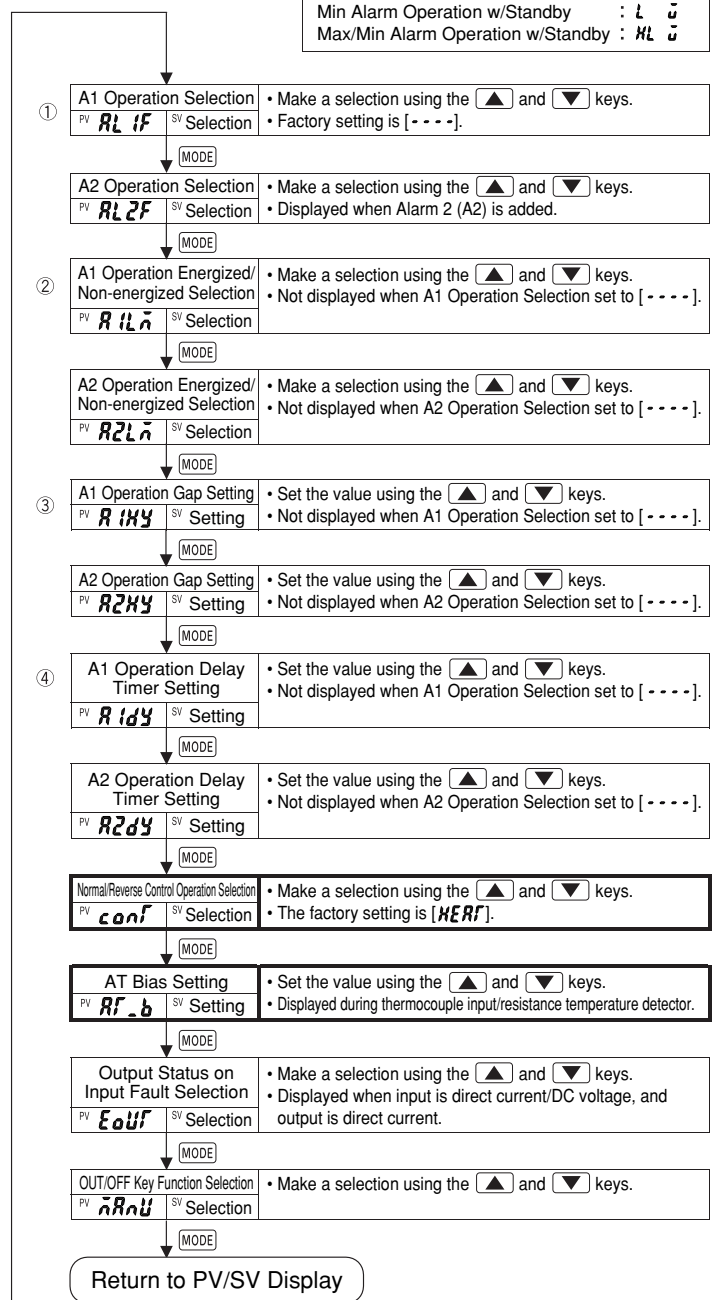
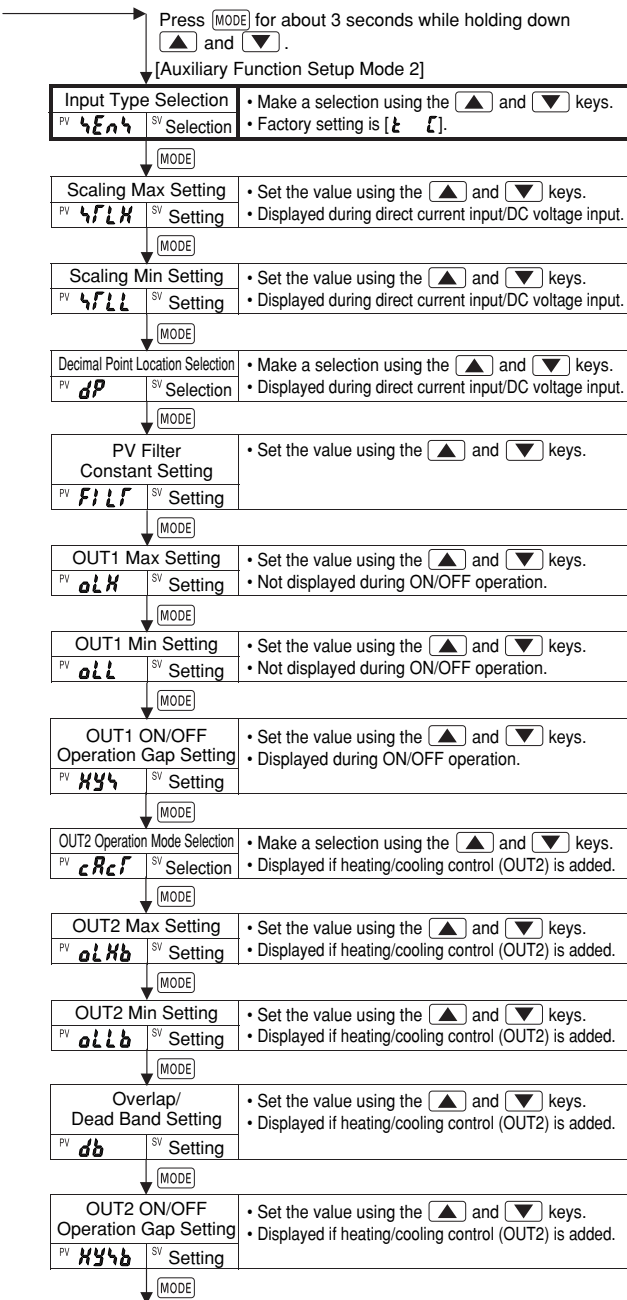
Input Type Selection			
K	-200 to 1370°C: <b>k</b>	K	-320 to 2500°F: <b>k</b>
J	-200 to 1000°C: <b>j</b>	J	-199.9 to 750.0°F: <b>j</b>
R	0 to 1760°C: <b>r</b>	R	0 to 3200°F: <b>r</b>
S	0 to 1760°C: <b>s</b>	S	0 to 3200°F: <b>s</b>
B	0 to 1820°C: <b>b</b>	B	0 to 3300°F: <b>b</b>
E	-200 to 800°C: <b>e</b>	E	-320 to 1500°F: <b>e</b>
T	-199.9 to 400.0°C: <b>t</b>	T	-199.9 to 750.0°F: <b>t</b>
N	-200 to 1300°C: <b>n</b>	N	-320 to 2300°F: <b>n</b>
PL-II	0 to 1390°C: <b>PL2C</b>	PL-II	0 to 2500°F: <b>PL2C</b>
C (W/Re5-26)	0 to 2315°C: <b>c</b>	C (W/Re5-26)	0 to 4200°F: <b>c</b>
Pt100	-199.9 to 850.0°C: <b>PF</b>	Pt100	-199.9 to 999.9°F: <b>PF</b>
JPt100	-199.9 to 500.0°C: <b>JPF</b>	JPt100	-199.9 to 900.0°F: <b>JPF</b>
Pt100	-200 to 850°C: <b>PF</b>	Pt100	-300 to 1500°F: <b>PF</b>
JPt100	-200 to 500°C: <b>JPF</b>	JPt100	-300 to 900°F: <b>JPF</b>

4 to 20mA DC	-1999 to 9999	: <b>420R</b>
0 to 20mA DC	-1999 to 9999	: <b>020R</b>
0 to 1V DC	-1999 to 9999	: <b>0 1V</b>
0 to 5V DC	-1999 to 9999	: <b>0 5V</b>
1 to 5V DC	-1999 to 9999	: <b>1 5V</b>
0 to 10V DC	-1999 to 9999	: <b>0 10V</b>



Alarm (A1/A2) Behavior	
Alarm Off	: - - - -
Max Alarm Operation	: <b>H</b>
Min Alarm Operation	: <b>L</b>
Max/Min Alarm Operation	: <b>HL</b>
Max/Min Range Alarm Operation	: <b>HL d</b>
Absolute Max Alarm Operation	: <b>RH</b>
Absolute Min Alarm Operation	: <b>RL</b>
Max Alarm Operation w/Standby	: <b>H u</b>
Min Alarm Operation w/Standby	: <b>L u</b>
Max/Min Alarm Operation w/Standby	: <b>HL u</b>



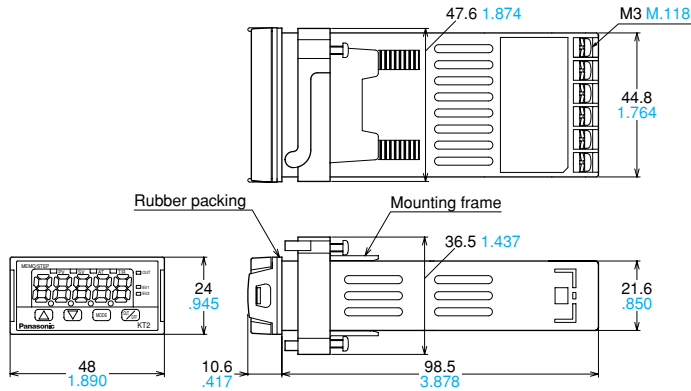
• KT7, 8, 9 series  
Please refer to the user manual.

# KT (AKT2,4,7,8,9)

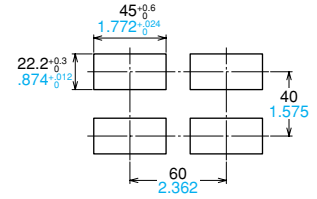
## DIMENSIONS (unit: mm inch) Tolerance: $\pm 1 \pm 0.039$

### 1. KT2 series

#### External dimension



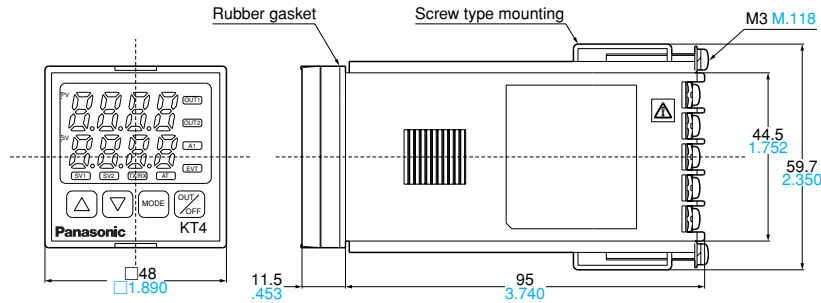
#### Panel cutout



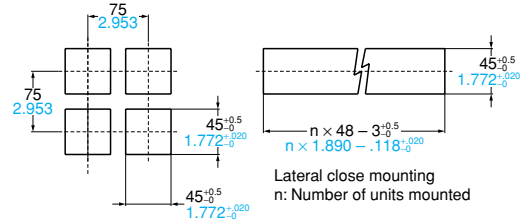
Note) The communications terminal is the screw terminal on the back of the unit.

### 2. KT4 series

#### External dimension



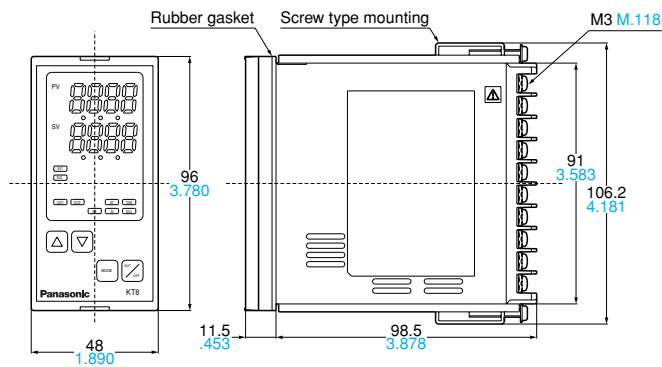
#### Panel cutout



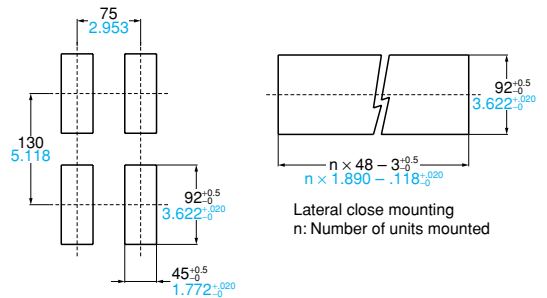
Note) The communications terminal is the screw terminal on the back of the unit.

### 3. KT8 series

#### External dimension



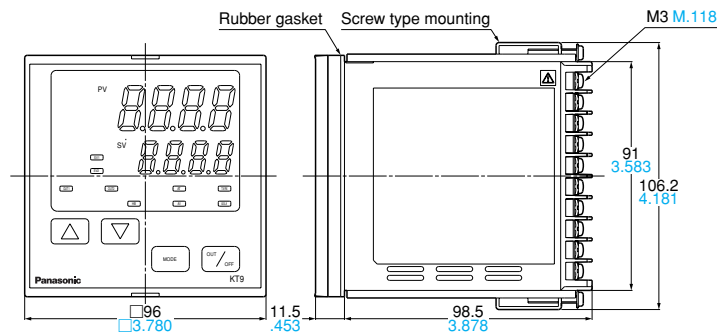
#### Panel cutout



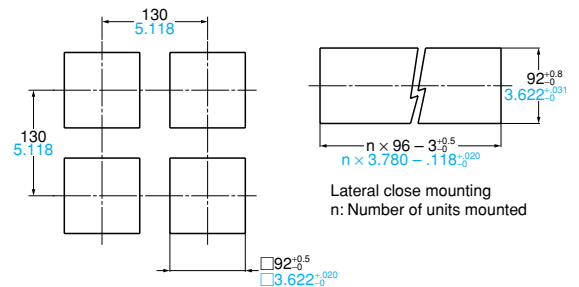
Note) The communications terminal is the screw terminal on the back of the unit.

### 4. KT9 series

#### External dimension



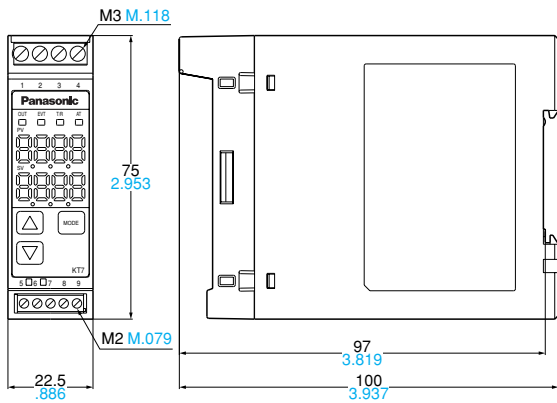
#### Panel cutout



Note) The communications terminal is the screw terminal on the back of the unit.

## 5. KT7 series

### • External dimension



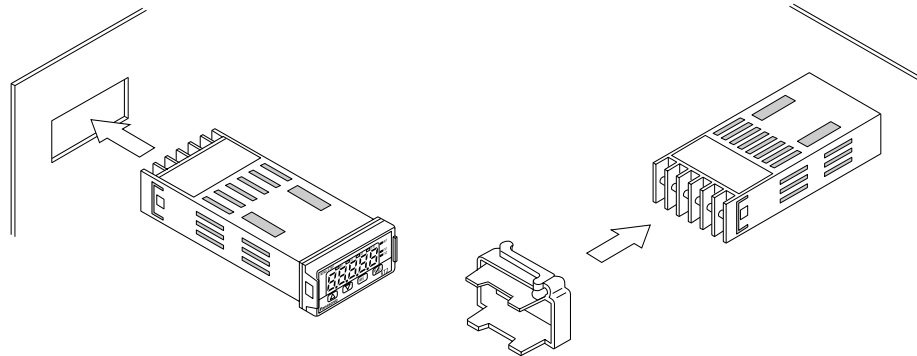
Note) The communications terminal is the modular jack on the bottom of the unit.

## INSTALLATION

### 1. KT2 series

Please install vertically in order to satisfy the IP66 specification for dust and splash proofing. The possible control panel plate thickness for installation is between 1 to 10 mm.

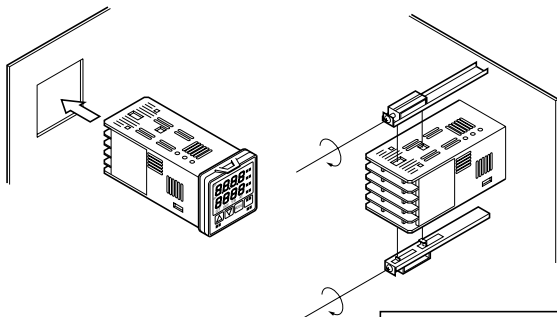
- (1) Insert the unit from the front of the control panel.
- (2) Insert the mounting frame until that the edges (2) make contact with the panel.
- (3) Tighten the clamp screw and then turn it 3/4 of a turn after the edge of the screw reaches the panel.



### 2. KT4, 7, 8, 9 series

#### • Panel Mounting

Mountable panel thickness: Within 1 to 15mm **.039 to .591inch**  
 Insert a controller from the front side of the panel.  
 Attach the mounting brackets by the holes at the top and bottom of the case and secure the controller in place with the screws.

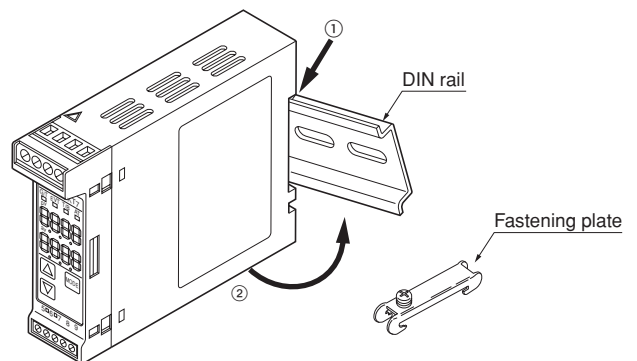


**⚠ Notice**  
 As the case is made of resin, do not use excessive force while screwing in the mounting bracket. The torque is approximately 0.12N·m

#### • DIN rail mounting (KT7)

- 1) Hook ① of the KT7 on the upper side of the DIN rail.
- 2) Making the ① part of the KT7 as a support, fit the lower part of the KT7 to the DIN rail.

KT7 will be completely fixed to the DIN rail with a "Click" sound.  
 Recommended DIN rail: Part No. ATA48011  
 Recommended fastening plate: Part No. ATA4806



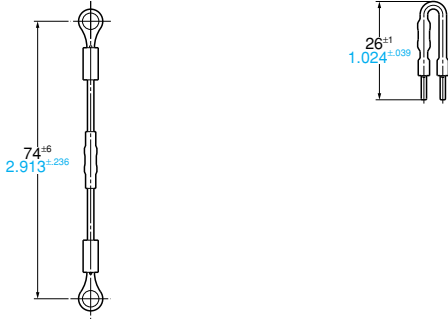
# KT (AKT2,4,7,8,9)

## OPTION

### 1. Shunt resistor

AKT4810 (for KT2, 4, 8 and 9)

AKT4811 (for KT7)



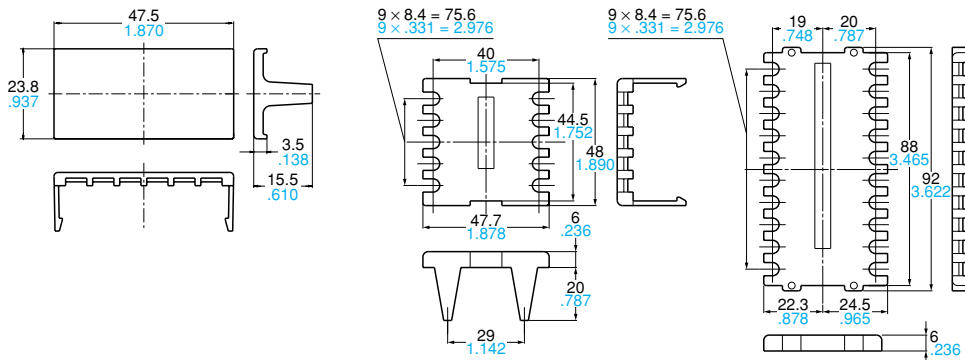
### 2. Terminal cover

AKT2801 (for KT2)

AKT4801 (for KT4)

AKT8801 (for KT8)

AKT9801 (for KT9)



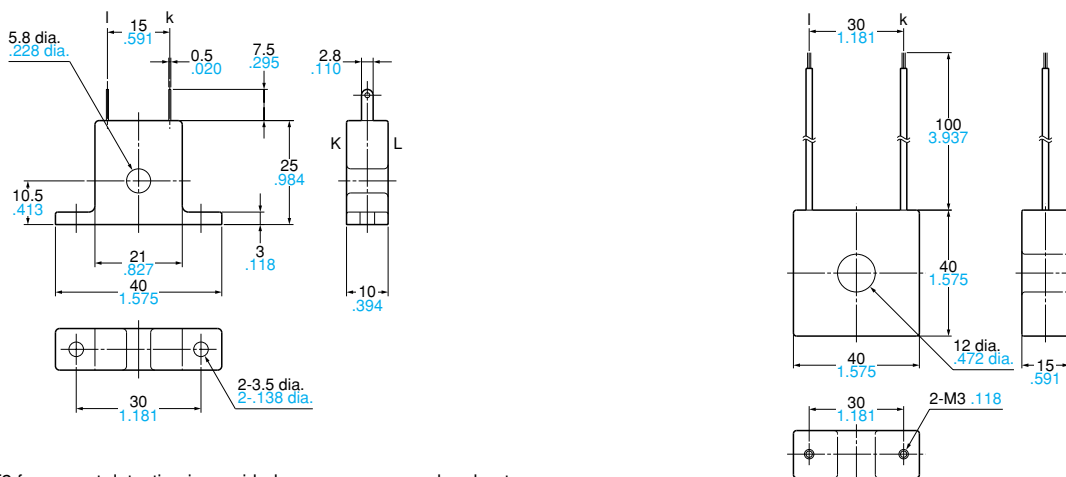
Note: 2pcs of terminal cover of AKT8801 can be used as an AKT9801 cover.

### 3. Current transformer (CT)

• External dimension

1) CT1 (for 5,10 and 20A)

2) CT2 (for 50A)

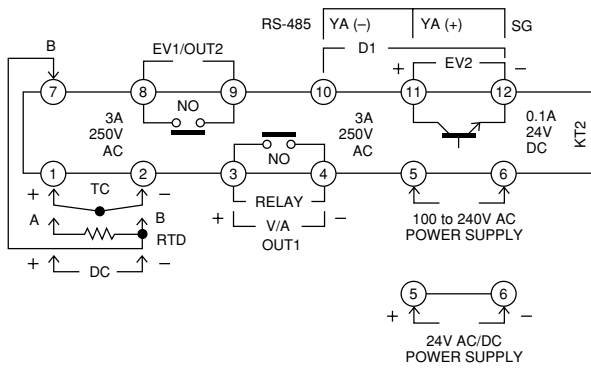


Note: CT1 or CT2 for current detection is provided as an accessory when heater burn-out alarm function is added.



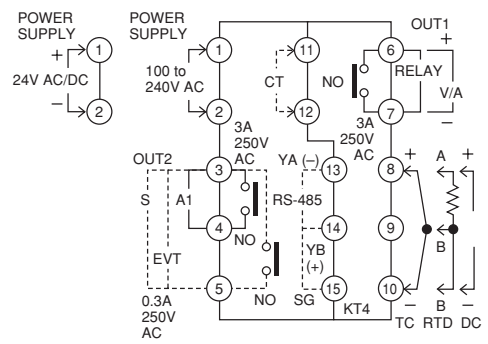
# EXTERNAL CONNECTION DIAGRAM

## 1. KT2 series



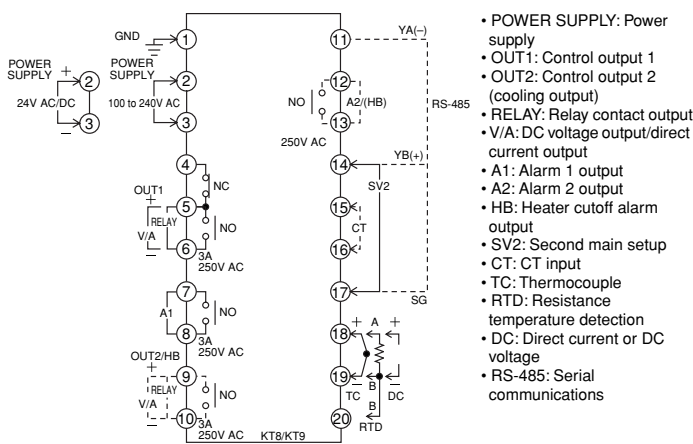
- TC: Input terminal for thermo couple.
- RTD: Input terminal for the resistance temperature sensor.
- DC: Input terminal for DC current or DC voltage.  
For DC current input, connect a separately sold receipt resistor (50Ω) between the input terminals.
- OUT1: Output terminal for the control output or heating output [option: heating/cooling control].
- POWER SUPPLY: Power supply terminal.
- EV1/OUT2: Output terminal for event output 1 or cooling output [option: heating/cooling control].
- EV2: Output terminal for event output 2.
- DI: Input terminal for DI input. (There are three types of DI input, the SV1/SV2 external switching function, the OUT/OFF (RUN/STOP) output switching function, and timer function.)
- RS-485: Communication terminal for serial communication. (EV1, 2 is alarm output)

## 2. KT4 series



- POWER SUPPLY: Power supply
- OUT1: Control output 1 (heat output)
- OUT2: Control output 2 (cooling output)
- RELAY: Relay contact output
- V/A: DC voltage output/direct current output
- V: Contactless relay output
- A1: Alarm 1 output
- A2: Alarm 2 output and heater cutoff alarm output
- EVT: Event output (A2 output and heater cutoff alarm output)
- CT: CT input
- TC: Thermocouple
- RTD: Resistance temperature detection
- DC: Direct current or DC voltage
- RS-485: Serial communications

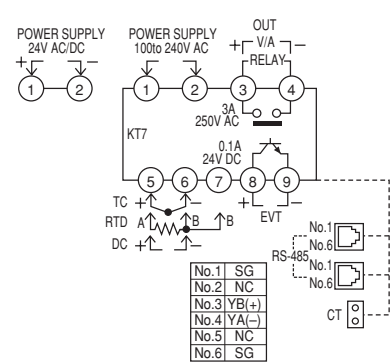
## 3. KT8 and KT9 series



- POWER SUPPLY: Power supply
- OUT1: Control output 1 (heating output)
- OUT2: Control output 2 (cooling output)
- RELAY: Relay contact output
- V/A: DC voltage output/direct current output
- V: DC voltage output/direct current output
- A1: Alarm 1 output
- A2: Alarm 2 output
- HB: Heater cutoff alarm output
- SV2: Second main setup
- CT: CT input
- TC: Thermocouple
- RTD: Resistance temperature detection
- DC: Direct current or DC voltage
- RS-485: Serial communications

Note) That main setting No. 2 will not be possible on the KT8 and KT9 when the communications functions is added.

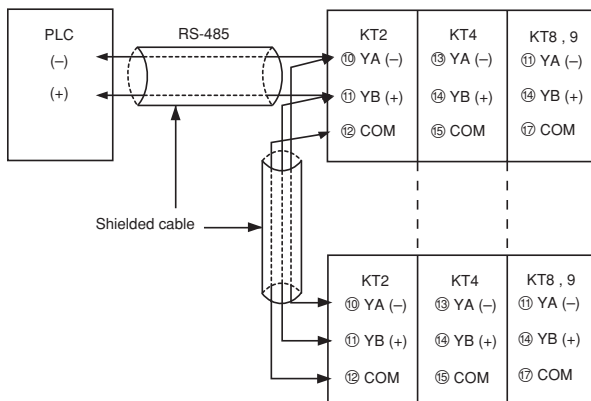
## 4. KT7 series



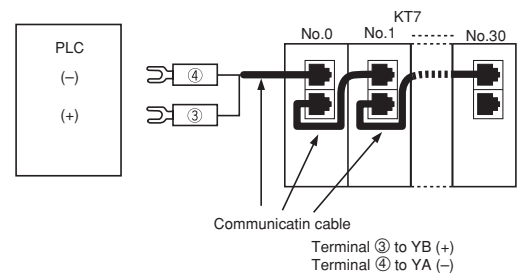
- POWER SUPPLY: Power supply
- OUT: Control output
- RELAY: Relay contact output
- V/A: DC voltage output/direct current output
- EVT: Event output
- [Alarm, loop fault alarm or heater cutoff alarm (optional)]
- TC: Thermocouple
- RTD: Resistance temperature detection
- DC: Direct current or DC voltage
- RS-485: Serial communications
- CT: CT input

# Communication Function Connection Diagram (PLC Connection Diagram)

## 1. KT2, 4, 8 and 9 series



## 2. KT7 series



- Terminating Resistors (Terminators)  
The KT series has a built-in pull-up resistor or pull-down resistor, which serves as the terminating resistor. For this reason, do not connect the terminating resistor on the communication line.
- Please use a RJ-116 polarized type modular connector.  
Please use a cable that is suitable for a modular connector.



# KT (AKT2,4,7,8,9)

## NOTICE ON OPERATION

### 1. NOTICE ON SITE SELECTION

This instrument is intended to be used in the following environment (IEC61010-1) Overvoltage category II, Pollution degree 2

Mount the controller in a place with:

- 1) A minimum of dust, and an absence of corrosive gases
- 2) No flammable, explosive gases
- 3) Few mechanical vibrations or shocks
- 4) No exposure to direct sunlight, an ambient temperature of 0 to 50°C (32 to 122°F) that does not change rapidly
- 5) An ambient non-condensing humidity of 35 to 85%RH
- 6) No large capacity electromagnetic switches or cables through which large current is flowing
- 7) No water, oil or chemicals or where the vapors of these substances can come into direct contact with the controller

### 2. NOTICE ON THE WIRING

1) The terminal block of KT4, 8 and 9 series are designed to be wired from the left side (KT2 series are designed to be wired from the upper and lower direction). The lead wire must be inserted from the left side of the terminal, and fastened by the terminal screw. Use a solderless terminal with insulation sleeve that fits to the M3 screw.



2) Terminal fastening torque is approximately 0.6N·m to 1.0N·m (KT4, 8 & 9). For KT7 series by M3.0 screw is less than 0.5N·m and by M2.0 screw 0.25N·m respectively.

3) Use a thermocouple and compensating lead wire according to the input specification of the controller.

4) Use a 3-wire system of RTD according to the input specification of the controller.

5) This controller has no built-in power switch, circuit breaker or fuse. Therefore, it is necessary to install them in the circuit near the external controller.

(Recommended fuse: Time-lag fuse, rated voltage 250V AC, rated current 2A)

6) In the case of 24V AC/DC power supply, do not confuse the polarity when it is DC.

7) With the relay contact output type, use an auxiliary electromagnetic switch externally according to the capacity of the load to protect the built-in relay contact.

8) When wiring, keep input wire (thermocouple, RTD, etc.) away from AC source and load wire to avoid external interference.

9) Turn the power supply to the instrument off before wiring or checking. Working or touching the terminal with the power switched on may result in Electric Shock which could cause severe injury or death.

10) Do not drop wire chips into the holes of vent when wiring, because they could cause fire, malfunction or trouble with the device.

11) To prevent the unit from harmful effects of unexpected high level noise, it is recommended that a surge absorber be installed between the electromagnetic switch coils.

### 3. NOTICE ON THE MOUNTING

1) Do not use excessive force while screwing in the mounting bracket of KT4, 8 & 9 series. Recommended torque is approximately 0.12N·m.

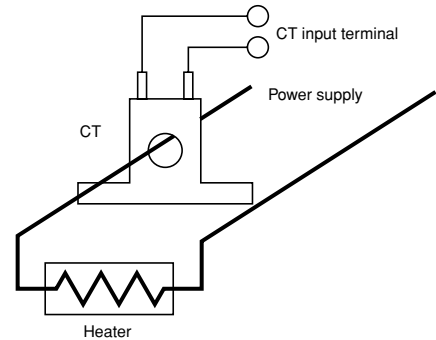
2) When mounting the KT7 series to the DIN rail, mount it in a lateral direction. Make sure a click is audible when fixed into place.

### 4. OPTIONAL HEATER BURN-OUT ALARM OUTPUT (KT4, 7, 8, 9 series)

1) This alarm is not available for detecting current under phase control.

2) Use the current transformer (CT) provided, and pass one lead wire of the heater circuit into the hole of CT.

3) When wiring, keep CT wire away from AC source and load wire to avoid external interference.



### 5. Please use rod terminals for the terminal portion of the KT7 series.

We recommend terminals made by Phoenix Contact.

(1) to (4) are AI0.25-8YE, AI0.34-8TQ, AI0.5-8WH, AI0.75-8GY, AI1.0-8RD, and AI1.5-8BK.

(5) to (9) are AI0.25-8YE, AI0.34-8TQ, and AI0.5-8WH.

The screw tightening torque for (1) to (4) should be no more than 0.5 N·m and for (5) to (9) it should be no more than 0.25 N·m. Make sure no screw is loose.