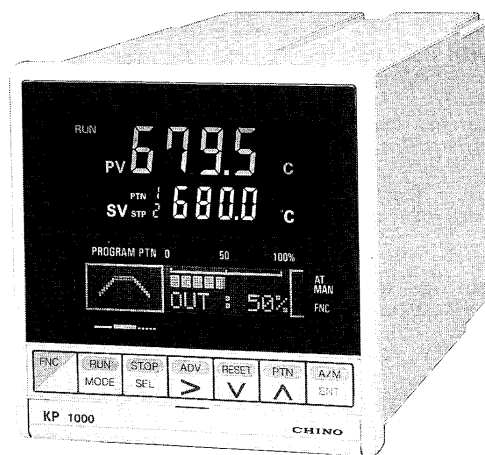


NEW KP SERIES DIGITAL PROGRAM CONTROLLER



New models KP1000 series are high-function digital program controllers. Being incorporated with high-performance microprocessors, they have materialized such high accuracies as $\pm 0.1\%$ of the indicating accuracy and 0.1 second of the controlling cycle. The controllers enable optimum program control to be performed over the wide temperature range. Since altogether sixteen kinds; viz, eight kinds that can optionally select the PID constants obtained by automatic tuning function step by step, and another eight kinds to be automatically selected by SV values, can be built-in.

They are standard-equipped with versatile functions such as multi setting, multi-range input, color LCD digital display and interactive system setting by full dot matrix color LCD.



■ FEATURES

• 19 program patterns

A maximum of 19 program patterns, each consisting of a maximum of 19 steps, can be stored in memory.

• Free program pattern linkage and repetition

Flexible pattern configurations are possible, including partial pattern repetition and linkage and the repetition of whole patterns. When the end of the program is reached, either fixed-value control can be selected or output can be suspended.

• Excellent operability, clear graphic display

A full dot-matrix color LCD with back-lit illumination displays the pattern of the step being executed as well as the steps before and after it. Parameters are set by interactive operation for easy access to the many advanced functions of KP-series controllers.

• Versatile display showing progress of process

The elapsed time of the pattern, the remaining time of the pattern, the elapsed time of the step or the remaining time of the step, can be displayed. The display is accompanied by a real-time bar-graph display so you can check progress at a glance.

• Reading accuracy of $\pm 0.1\%$, control switching period of 0.1 sec.

High speed and accuracy are achieved by the use of high-performance, high-speed A/D converters and an advanced microprocessor. The measurement resolution is also high at about 1/40000, so that minute changes in the input signal can be identified accurately. The resolution of display can be increased by 10 by shifting the display by one digit, making it possible to check the 0.1°C digit with an input of 1000°C or more.

• Auto tuning for the presetting of PID constants

A total of 16 PID constants, eight that can be selected arbitrarily per step and eight that are selected automatically according to the SV values, can be set so that optimum program control is possible over a wide temperature range.

• Two outputs (Heating/Cooling)

The two outputs, obtained by the combination of the current output, SSR drive pulse output and on-off pulse output, enable accurate temperature control. Forward operation and reverse operation can be selected freely and independently for each output.

• Multi-phenomena programming using master/slave system

Program operations can be synchronized between one master controller and several slave controller, so combined temperature and humidity control, temperature and pressure control, etc., are possible.

• Multiple input ranges

Models are available with either a total of 34 input ranges including 28 thermocouple inputs, 5 DC voltage inputs and 1 DC current input, or a total of 12 resistance thermometer inputs.

• Versatile alarm functions

Four alarm signal outputs are provided, with the output mode selectable between upper limit/lower limit and deviation/absolute value. For the deviation output, a wait function can be set which releases alarms generated while the process is advancing.

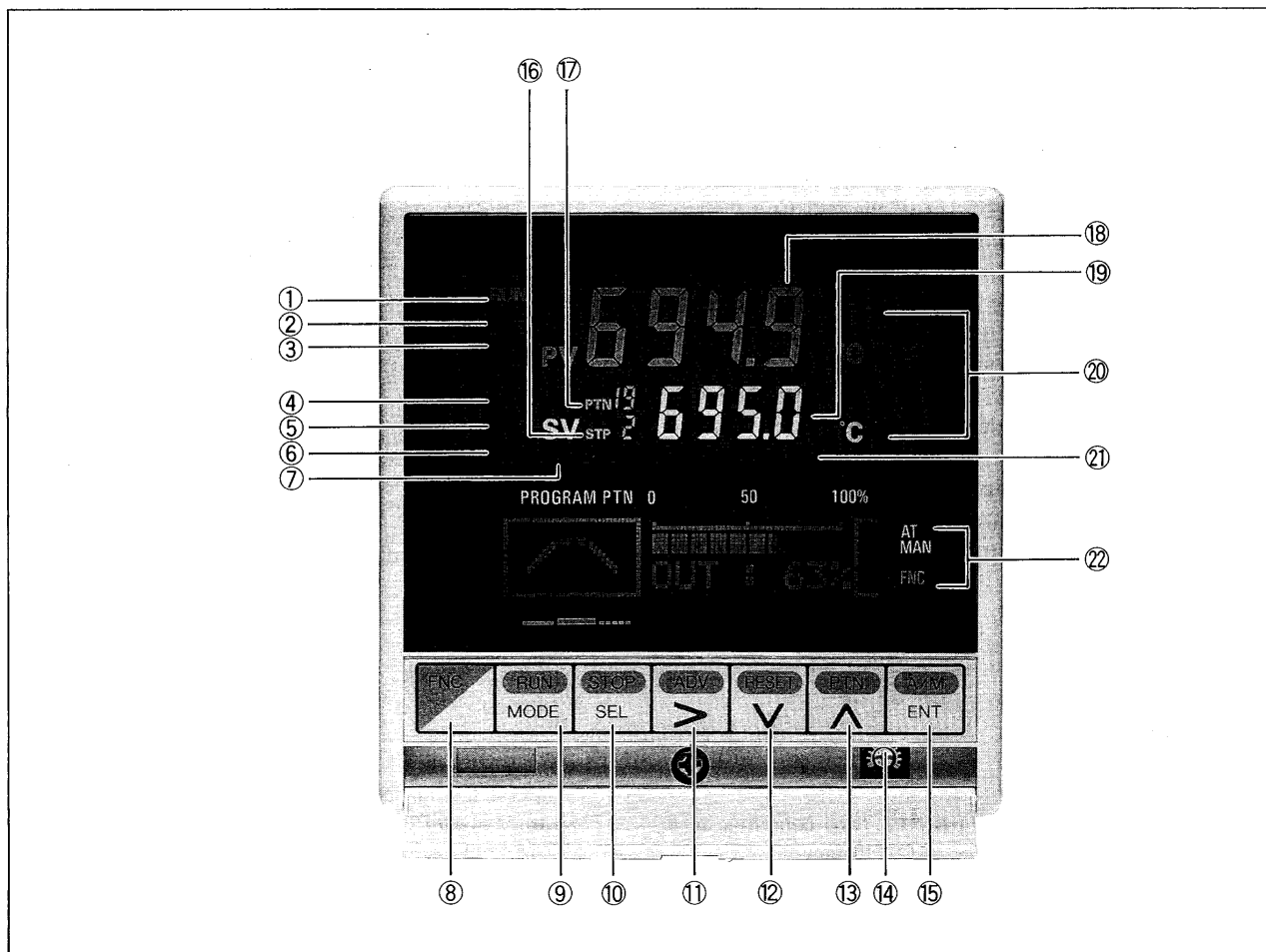
• Free power supply

The power supply range is from 85 to 264 V AC so the unit can be used with any local supply voltage.

CHINO
CORPORATION

PSE-152-ID

■ FUNCTIONS OF COMPONENT PARTS



• DISPLAY 1

- ① • **Program running (RUN) indicator**
Lights while a program is being executed.
- ② • **Constant value running (CONST) indicator**
Lights during constant-value control operations.
- ③ • **Setting mode (SET) indicator**
Lights in the setting mode (initiated by pressing the MODE key).
- ④ • **Alarm wait (WAIT) indicator**
Lights during alarm waiting. "Alarm waiting" is set to inhibit the generation of alarms until the process value (PV) passes the higher or lower-limit deviation alarm point once during program running (RUN) or advancing (ADV). Also lights during the alarm reset operation.
- ⑤ • **Program remote (REM) indicator**
Lights when pattern selection or program drive is driven externally.
- ⑥ • **Error (ERR) indicator**
Lights when there is an abnormality in setting data.
- ⑦ • **Program stop (STOP) indicator**
lights when program execution is stopped.
- ⑪ • **Execution step number (STP) display**
Displays the number of the step of the pattern being executed.
- ⑫ • **Execution pattern number (PTN) display**
Displays the number of pattern selected or being executed.
- ⑬ • **Process value (PV) display**
Displays the process value measured.
- ⑭ • **Set value (SV) display**
Displays the set value.
- ⑮ • **Unit display**
Displays the set unit (°C, °F, K, %, blank).
- ⑯ • **Alarm operation (AL1 to 4) indicators**
Lights when an alarm is generated.

MEASUREMENT INPUTS

		Input	Input Range	
Type 1	Thermocouple	B	0 to 1820°C	32 to 3300°F
		R	0 to 1760°C	32 to 3200°F
		S	0 to 1200°C	32 to 2100°F
		K	0 to 1760°C	32 to 3200°F
			-200 to 1370°C	-300 to 2450°F
			0 to 600.0°C	32 to 1100°F
		E	-200.0 to 300.0°C	-300 to 550°F
			-270 to 1000°C	-450 to 1800°F
			0 to 700.0°C	32 to 1250°F
			-270 to 300°C	-450 to 550°F
			-270 to 150°C	-450 to 300°F
		J	-200 to 1200°C	-300 to 2100°F
			-200.0 to 900.0°C	-300 to 1650°F
			-200.0 to 400.0°C	-300 to 700°F
		T	-100.0 to 200.0°C	-100.0 to 300.0°F
			-270 to 400°C	-450 to 700°F
			-200.0 to 200.0°C	-300 to 300°F
		WWre5-26	0 to 2320°C	32 to 4200°F
		WWre0-26	0 to 2320°C	32 to 4200°F
		NiMo	0 to 1310°C	32 to 2350°F
Type 2	Resistance Thermocouple	AuFe	0 to 300.0K	-400 to 80°F
		NiCr	0 to 1300°C	32 to 2350°F
		PR5-20	0 to 1800°C	32 to 3250°F
		PR20-40	0 to 1880°C	32 to 3400°F
		Platinel	-100 to 1390°C	-100 to 2500°F
			-100.0 to 600.0°C	-100 to 1100°F
		U	-200.0 to 400.0°C	-300 to 750°F
		L	-200.0 to 900.0°C	-300 to 1650°F
		DC Voltage	-10 to 10mV, -20 to 20mV, -50 to 50mV, -100 to 100mV, -5 to 5V	
		DC Current	-20 to 20mA	
		Pt100	-200.0 to 649.0°C	-300 to 1200°F
			-200.0 to 400.0°C	-300 to 700°F
			-200.0 to 300.0°C	-300 to 550°F
			-200.0 to 200.0°C	-300 to 300°F
			-100.0 to 100.0°C	-100.0 to 200.0°F
		JPt100	-200.0 to 649.0°C	-300 to 1200°F
			-200.0 to 400.0°C	-300 to 700°F
			-200.0 to 300.0°C	-300 to 550°F
			-200.0 to 200.0°C	-300 to 300°F
			-100.0 to 100.0°C	-100.0 to 200.0°F
		JPt50	-200.0 to 649.0°C	-300 to 1200°F
		Pt-Co	4.0 to 374.0K	-450 to 200°F

GENERAL SPECIFICATIONS

Input signals:

Thermocouple — B, R, S, K, E, J, T, WWre5-26, WWre0-26, NiMo, AuFe, NiCr, PR5-20, PR20-40, Platinel, U, L
 DC voltage — ± 10 mV, ± 20 mV, ± 50 mV, ± 100 mV, ± 5 V
 DC current — ± 20 mA
 Resistance thermometer — Pt 100 Ω , JPt 100 Ω , JPt 50 Ω , Pt-Co

Measurement ranges:

Refer to "Measurement Inputs" table. 34 ranges; 28 thermocouples, 5 DC voltages, 1 DC current, or 12 resistance thermometers.

Measurement input shifting (sensor compensation):

± 1000 times the display resolution (selectable from 8 options for each step)

Rated measurement accuracy:

Larger value of $\pm 0.1\%$ ± 1 digit of input span or ± 10 μ V (Reference point compensation accuracy is not included for thermocouple inputs.)

Reference junction compensation accuracy: $\pm 0.5^\circ\text{C}$

Sampling period: 0.1 sec.

Burn-out: Higher-limit burn-out is provided as standard for temperature inputs and mV inputs.

In case of burn-out, any required value in the range from -5% to 105% of the regulated output can be output.

In case of burn-out, the higher-limit alarm output is turned on.

Digital filter constant: 0 to 99.9 sec.

Scaling: DC voltage or current inputs — within any 4-digit range

Display types:

Display 1: 7-segment LCD with back-lit illumination

Display 2: Full dot-matrix LCD with back-lit illumination (96 $\times$ 20 dots), viewing angle adjustment ($\pm 20^\circ$), brightness control (2-step)

Display contents:

Display 1: Process value (PV) and set value (SV) simultaneous display, arbitrary decimal point setting from digit 0 to 3

Higher row — Process value (PV), 4-digit digital and unit display.

Lower row — Set value (SV), 4-digit digital and unit display. Execution pattern, step No. display (2-digit digital).

Other indicators — Alarm operation, set mode, alarm standby, running status, error

Display 2: Running mode and set mode display.

In operation mode — Graphic display of pattern, digital/bar-graph display of output or time.

In setting mode — Parameter setting display.

Auto return:

If no key is operated for more than about 2 minutes in the setting mode, the mode returns automatically to the operation mode.

Power supply:

Free supply from 85 to 264 V AC, 50/60 Hz

Operating temperature range: -10 to 50°C

Operating humidity range:

Less than 90% Rh (non-condensing)

Power failure measure:

Set contents are backed up for more than 5 years by a lithium battery.

Permissible signal source resistances:

Thermocouple inputs: 100 Ω or less

Voltage inputs: 100 Ω or less (mV), 300 Ω or less (± 5 V)

Resistance thermometer inputs: 5 Ω or less per line

Input resistances:

Thermocouple and mV inputs: 8 MΩ

V inputs: 1 MΩ

Current input: 250Ω

Measuring current:

Resistance thermometer inputs: 2 mA

Max. common mode voltage: 250 V AC

Common mode rejection ratio: 130 dB or more

Series mode rejection ratio: 50 dB or more

Insulation resistances:

Across measured terminal and GND terminal:

500 V DC, 20 MΩ or more

Across power supply terminal and GND terminal:

500 V DC, 20 MΩ or more

Across measured terminal and power supply terminal:

500 V DC, 20 MΩ or more

Withstand voltages:

Across measured terminal and GND terminal:

500 V AC, 1 min.

Across power supply terminal and GND terminal:

1500 V AC, 1 min.

Across measured terminal and power supply terminal:

1500 V AC, 1 min.

Power consumptions: Approx. 12 VA

Case: ABS resin

Color: Gray

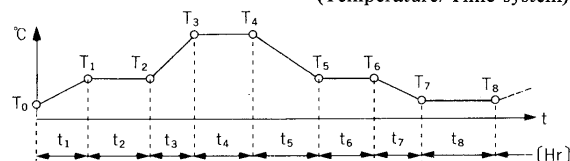
Mounting: Panel flush mounting

Weight: Approx. 750 g

PROGRAM SPECIFICATIONS

Program pattern setting system: Key switch setting

(Temperature/Time system)



Number of program pattern steps:

Max. 19 steps/pattern

Number of program patterns:

Max. 19 patterns

Number of program step repetitions:

Max. 99 times

Setting ranges:

Temperature: Same as input range

DC voltage, current: Same as scale range

Time: 0 to 999 hours 59 min. (setting resolution: 1 minute)

Start temperature:

Input value or 0°C (or arbitrarily set value)

Output at End:

Constant-value control using final SV value or 0% output, arbitrarily selectable

Parameters to be selected for each step:

PID constants (8 types, SV section automatic switching)

Alarm (8 types × points)

Output limiter (higher and lower limits, 8 types)

Output variation limit (8 types)

Actual temperature compensation (8 types)

Waiting time alarm (8 types)

Sensor compensation (8 types)

Time signals (total 10 types; 8 types, all OFF and all ON)

DETAILED ACCURACY RATING

	Input	Accuracy Rating (of input span)	Exception
Thermocouple	B	±0.1% ± 1 digit However, ●(-)270 to (-)200°C : ±1.0% ± 1 digit ●(-)200 to 0°C : ±0.15% ± 1 digit	0 to 400°C : ± 4 ± 4%
	R		400 to 800°C : ± 0.15% ± 1 digit
	S		0 to 200°C : ± 0.15% ± 1 digit
	K		0 to 200°C : ± 0.15% ± 11 digit
	E		Scale : ± 2% ± 1 digit -270 to -200°C with -270 to 300 scale or -270 to 150°C
	J		
	T		
	WWre5-26		
	WWre0-26		0 to 100°C : ± 0.3% ± 1 digit
	NiMo		
	NiCr		
	Platinel		
	U		
	L		
Resistance thermometer	AuFe	0.2% ± 1 digit	20K under : ± 0.5% ± 1 digit 20 to 50K : ± 0.3% ± 1 digit
	PR5-20		0 to 100°C : ± 4%
			100 to 200°C : ± 0.5% ± 1 digit
	PR20-40		0 to 300°C : ± 1.5% ± 1 digit 300 to 800°C : ± 0.8% ± 1 digit
	DC voltage	±0.1% ± 1 digit	
	DC current		
Resistance thermometer	Pt100 Ω	±0.1% ± 1 digit	-100 to 100°C scale : ± 0.15% ± 1 digit
	JPt100 Ω		-100 to 100°C scale : ± 0.15% ± 1 digit
	JPt50 Ω		
	Pt-Co	±0.15% ± 1 digit	20K under : ± 0.5% ± 1 digit 20 to 50K : ± 0.3% ± 1 digit

Note : 1 digit refers to the set resolution.

ALARM SPECIFICATIONS

Number of alarm points: 4

Alarm system:

Higher-/lower-limit alarms and deviation/absolute value alarms. Can be set arbitrarily and individually for each point. Alarm standby function available with deviation alarm.

Alarm setting range: -9999 to 9999

Alarm blind sector: 1000 times SV setting resolution.

Alarm outputs:

Transistor open-collector output (load max. 24 V DC, 50 mA).

Common COMMON shared by Alarm 1 and alarm 2.

Common COMMON shared by Alarm 3 and alarm 4.

Waiting time alarm:

Alarm for waiting time of actual temperature compensation. 0 to 999 hrs./59 min. WAIT indicator blinks when an alarm is generated.

• DISPLAY 2

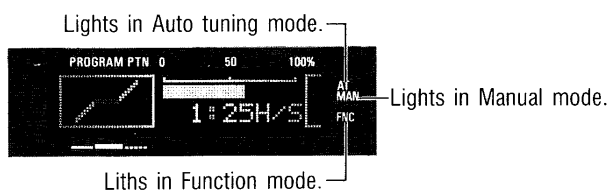
② • Operation screen A

Displays the patterns and outputs of three steps (digital displays and bar-graph).



• Operation screen B

Displays the patterns and times of three steps (digital displays and bar-graph).



• Setting screen

Displays the set contents of parameters during constant setting and function selection.



• OPERATION SECTION

⑧ • Function (FNC) key

Press when the upper functions of the other six keys are required.

• RUN key

⑨ Press to start running a program.

• MODE key

Press to switch between the operation screen and setting screen.

• STOP key

⑩ Press to stop a program during execution.

• Select (SEL) key

Press to switch between operation screen A and B.
Press to switch the setting screen between setting mode 0 to 8.

• Advance (ADV) key

⑪ Press to advance program execution to the beginning of the next step.

• Shift (>) key

- Press to shift digits or select functions when setting constants.
- When pressed with the operation screen displayed, the PV value is shifted by one digit and resolution is increased.

• RESET key

⑫ Press to reset the program being executed, after suspending it.

• Down (▽) key

Press to count down the set value by one.

• Pattern select (PTN) key

⑬ When resetting, press to select the number of the program pattern to be started.

• Up (^) key

Press to count up the set value by one.

• Auto/Manual (A/M) key

⑮ Press to switch the control output between automatic and manual.

• Entry (ENT) key

Press to enter the constant set or the function selected.

⑭ • View angle adjustment trimmer

Adjusts the angle of view of the LCD dot display screen.

■ MODELS

KP1 ☐ ☐ ☐ B ☐ ☐ ☐

Input signals

- 1: Thermocouples, DC voltages, DC current
- 2: Resistance thermometers

Output mode 1 (Output 1)

- 1: On-of pulse type PID system
- 2: On-off servo type PID system
- 3: Current output type PID system
- 5: SSR drive pulse type PID system
- 6: Voltage output type PID system (option)

Output mode 2 (Output 2)

- 0: None
- 1: On-off pulse type PID system *1
- 3: Current output type PID system *2
- 5: SSR drive pulse type PID system *1
- 6: Voltage output type PID system (option) *2

Communication interface (Zone 1)*

- 0: None
- R: RS 232C
- A: RS 422A
- T: 5 Time signal output
- S: 4 Status output + End signal
- D: 4 External drive input
- P: Pattern select input
- M: 4 Time signal output + End signal

Transmission signal output (Zone 2)*

- 0: 4 to 20 mA
- 1: 0 to 1 V
- 3: 0 to 10 V
- 4: Other
- T: 5 Time signal output
- S: 4 Status output + End signal
- D: 4 External drive input
- P: Pattern select input
- M: 4 Time signal output + End signal

External drive input (Zone 3)*

- 0: None
- 5: 4 Time signal output + End signal + 3 External drive input
- 6: 5 Time signal output + 3 External drive input
- 7: 4 Status output + 4 External drive input
- 8: 3 External drive input + Pattern select input
- T: 5 Time signal output
- S: 4 Status output + End signal
- D: 4 External drive input
- P: Pattern select input
- M: 4 Time signal output + End signal

Items marked * are option.

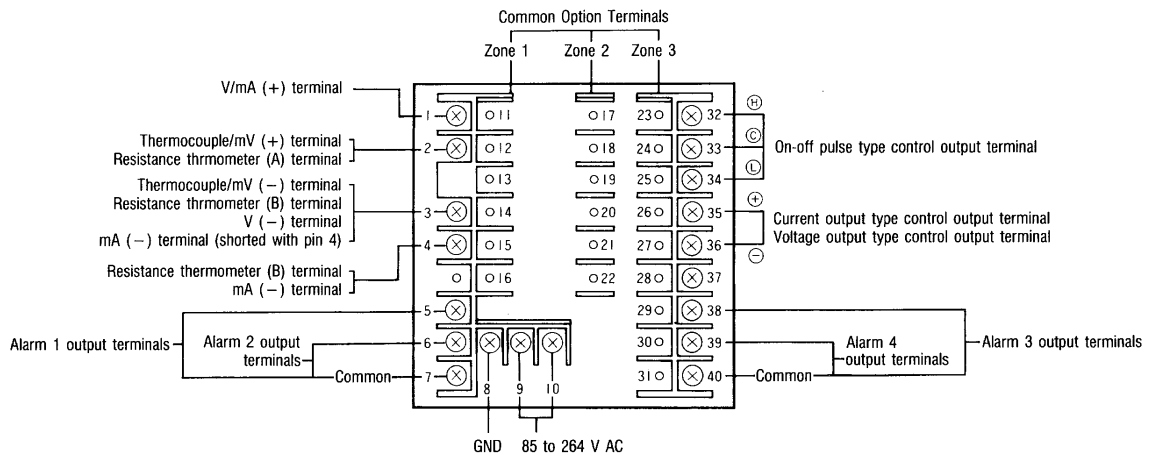
*1. Applicable when Output 1 is the current output type PID system or voltage output type PID system.

*2. Applicable when Output 1 is not the on-off servo type PID system.

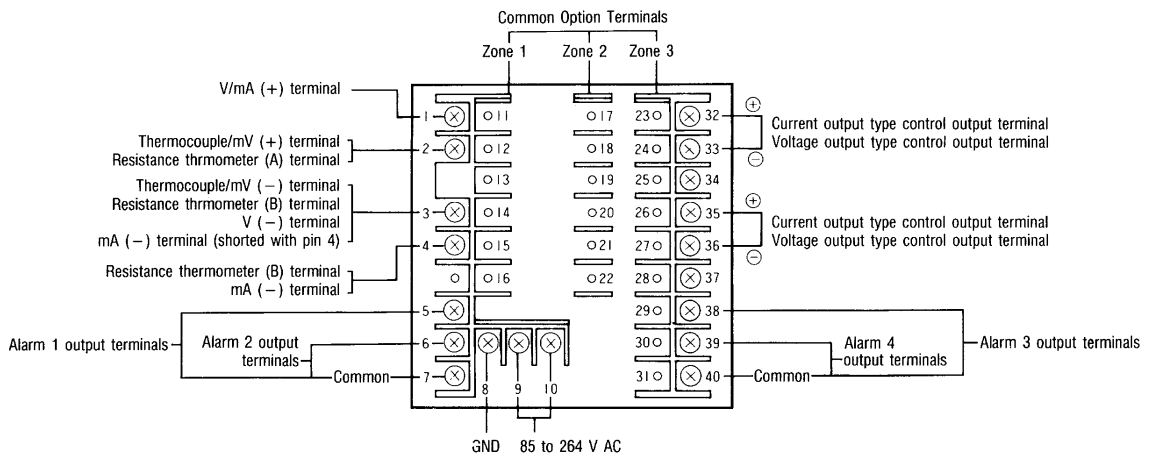
Note 1. Options common to different zones shall be specified in the order T, S, D, P and M, with Zone 3 having priority.

• 2-output specifications

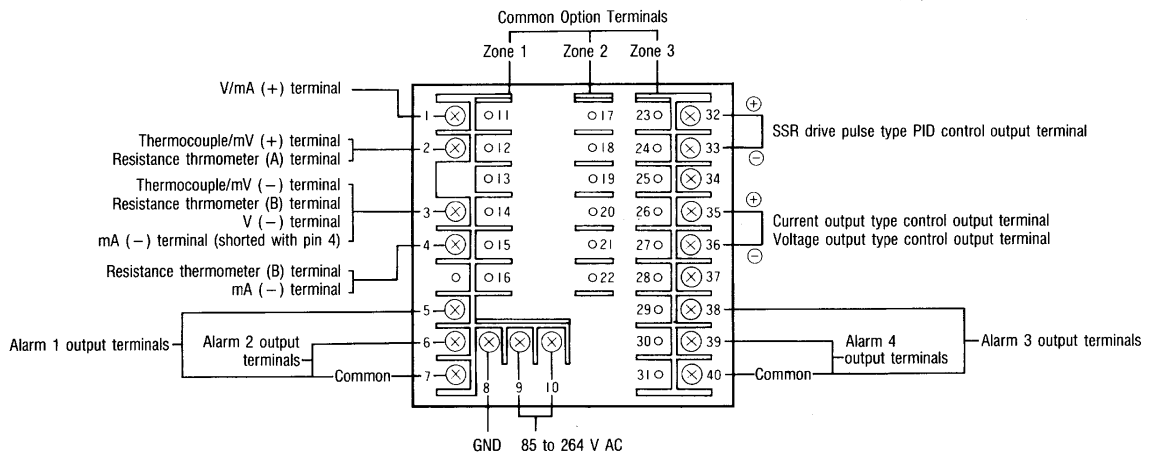
On-off pulse type PID system + Current output type PID system or Voltage output type PID system (option)



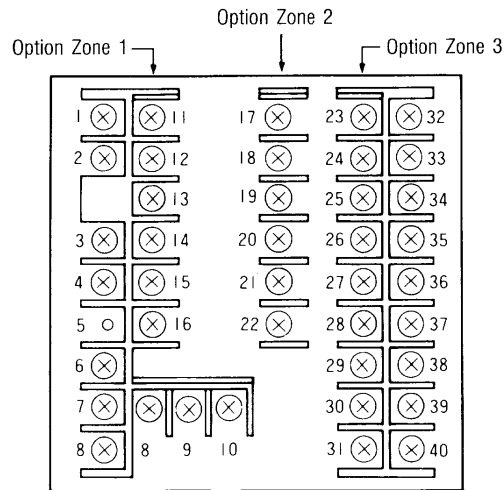
Current output type PID system or Voltage output type PID system (option) + Current output type PID system or Voltage output type PID system (option)



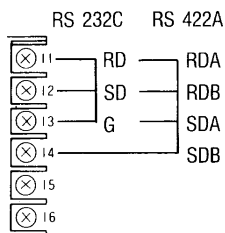
SSR drive pulse type PID system + Current output type PID system or Voltage output type PID system



• Option Terminals



Communication interface (Zone 1)

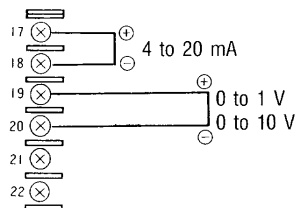


External input/output signals (Common for all zones)

Terminal			T	M	S	P	D
Zone 1	Zone 2	Zone 3					
11	17	23	T ₁	T ₁	RUN/STOP	10	
12	18	24	T ₂	T ₂	ADVANCE	8	WAIT
13	19	25	T ₃	T ₃	RESET	4	RESET
14	20	26	T ₄	T ₄	WAIT	2	ADVANCE
15	21	27	T ₅	END	END	1	RUN/STOP
16	22	28	COM	COM	COM	COM	COM
		29					
		30					
		31					

T: 5 Time signal output
 S: 4 Status output + End signal
 D: 4 External drive input
 P: Pattern select input
 M: 4 Time signal output + End signal

Transmission signal output (Zone 2)



External drive input (Zone 3)

Terminal	5	6	7	8
23	T ₁	T ₁	RUN/STOP	10
24	T ₂	T ₂	ADVANCE	8
25	T ₃	T ₃	RESET	4
26	T ₄	T ₄	WAIT	2
27	END	T ₅	WAIT	1
28	RESET	RESET	RESET	RESET
29	ADVANCE	ADVANCE	ADVANCE	ADVANCE
30	RUN/STOP	RUN/STOP	RUN/STOP	RUN/STOP
31	COM	COM	COM	COM

5: 4 Time signal output + End signal
 + 3 External drive input
 6: 5 Time signal output + 3 External
 drive input
 7: 4 Status output + 4 External drive
 input
 8: 3 External drive input + Pattern
 select input

■ CONTROL SPECIFICATIONS

Control switching cycle: Approx. 0.1 sec.
Control systems:

- Current output type PID system
- On-off pulse type PID system
- SSR drive pulse type PID system
- On-off servo type PID system
- Voltage output type PID system (option)

PID values:

- Automatic setting by auto tuning, or manual setting
- P: 0 to 999.9% (2-position operation in case of 0)
- I: ∞, 1 to 9999 sec.
- D: 0 to 9999 sec.

Voltage output type PID system controller:

- Output signal: 4 to 20 mA (or 1 to 5 mA), load resistance no more than 750Ω (no more than 3 KΩ for 1 to 5 mA).
- However, with Output 2 in case of 2-output specification which is only possible by combining current outputs, load resistance is no more than 400Ω (no more than 1.6 KΩ for 1 to 5 mA).

On-off pulse type PID system controller:

- Output signal: On-off pulse conducting signal
- Contact capacity: Load resistance 100 V AC/2 A, 200 V AC/1 A.
- Load inductance 100 V AC/1 A, 200 V AC/0.5 A.
- On-off pulse duration: Approx. 1 to 180 sec. variable (1 sec./step)

SSR drive pulse type PID system controller:

- Output pulse: On-off pulse voltage signal.
- On level 12 V DC $\pm 10\%$ (max. 20 mA)
- Off level 0.5 V DC or less
- On-off pulse duration: Approx. 1 to 180 sec. variable (1 sec./step)

On-off servo type PID system controller:

- Output signal: On off pulse conductive signal
- Contact capacity: Load inductance 100 V AC/1 A, 200 V AC/0.5 A.
- Feedback resistance: 100Ω to 2 KΩ
- Feedback zero adjustment: 0.0 to 100.0%
- Feedback span adjustment: 0.0 to 100.0%
- Feedback blind sector: Approx. 0.2 to 2.0%

Output limiter: (-)5 to 105%

Output variation limiter: 0.1 to 100.0%

Output preset:

- Output when PV = SV in P operation (I, D = Set to 0). (-)100 to 100%.

Output blind sector:

- In case of 2-position control (P = Set to 0). Setting range 0.1 to 9.9%.

Regulation operation: Forward/reverse switchable

Real temperature compensation:

- 0 to 9999 (same resolution as SV). Step number blinks during real temperature compensation.

PV abnormal output:

- Output in case of over-range or abnormality in instrument internal data.
- 5.0 to 105.0%.

Anti-reset wind up:

- Setting of deviation for starting intergration operation.
- Higher limit: 0 to 50.0%
- Lower limit: -50 to 0.0%

Constant-value control setting value:

- Same as input range or scale range.

Manual operation:

- During MAN → AUTO: Balance-less, bump-less.
- During AUTO → MAN:
- Output in AUTO is retained.

CPU error output: 0% or less

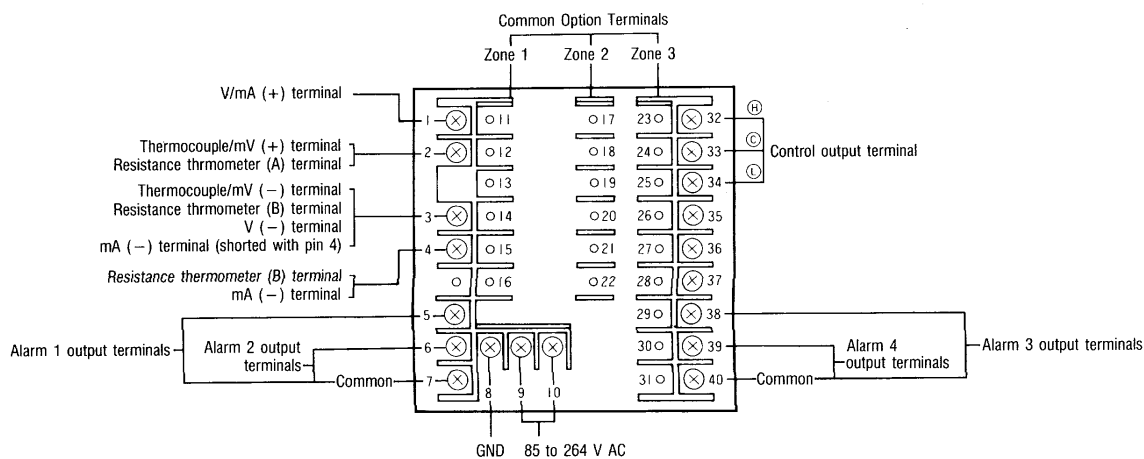
■ OPTIONAL FEATURES

Option	Details
Communication interface	An RS 232C or RS 422A interface can be used to transmit set values, process values and output values from the controller to a personal computer; parameters can also be set from the computer.
Transmission signal output (with scaling function)	Analog signals proportional to the set value and the measured or output value can be output.
Slope setting of program patterns	Patterns can be set by the slope/time system rather than the target temperature/time system.
Square root operation	Extracts the square root of the input signal to control the indication.
Minute/second time setting	For a higher time resolution, patterns can be set using minute/second units rather than hour/minute units. (Setting range: 0 to 999 min. 59 sec.)
Output scaling	The control output signal can be scaled. This function can be used to adjust the gain of a thyristor ignition unit.
Voltage output type PID system	This is used when an inverter is connected to the operation outputs. Output signal: 0 to 10 V DC, current capacity 2 mA.
Time signals	Number of outputs: 5 points (4 points when combined with an END signal.) Output format: Open-collector transistor output (load max. 24 V DC, 50 mA).
External drive inputs	4 modes: RUN/STOP, Advance, Reset, Wait (with 4-point external drive inputs). Drive signal: Make-contact signal (12 V DC, 2 mA or more).
Status outputs	4 output types: RUN/STOP, Advance, Reset, Wait (controller only). Output format: Open-collector transistor output (max. load 24 V DC, 50 mA).
Pattern select input	5 Input types. Input format: Selected by BCD code based on combination of 1, 2, 4, 8 and 10. Drive signal: Make-contact signal (12 V DC, 2 mA or more).
End signal	Output format: Open-collector transistor output (max. load 24 V DC, 50 mA).

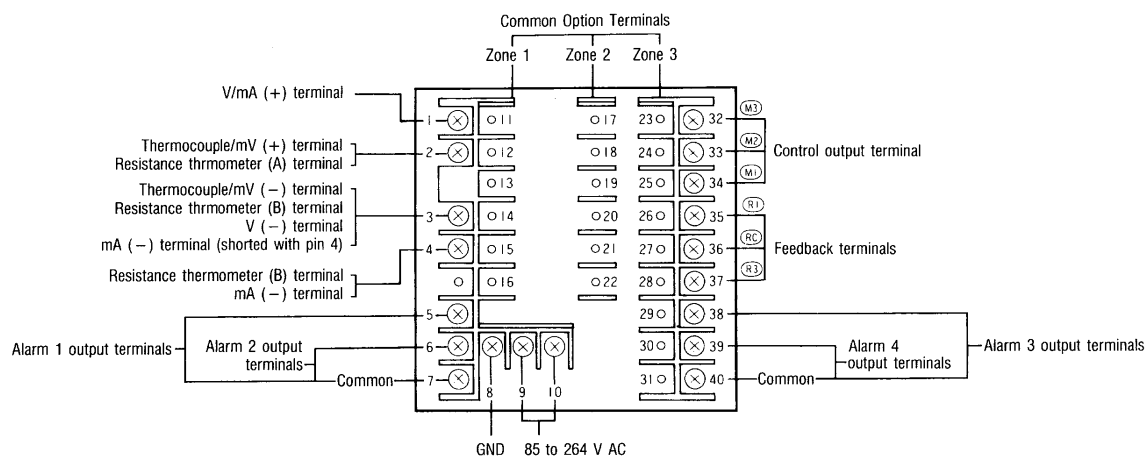
■ TERMINAL BOARD

• 1-output specification

On-off pulse type PID system



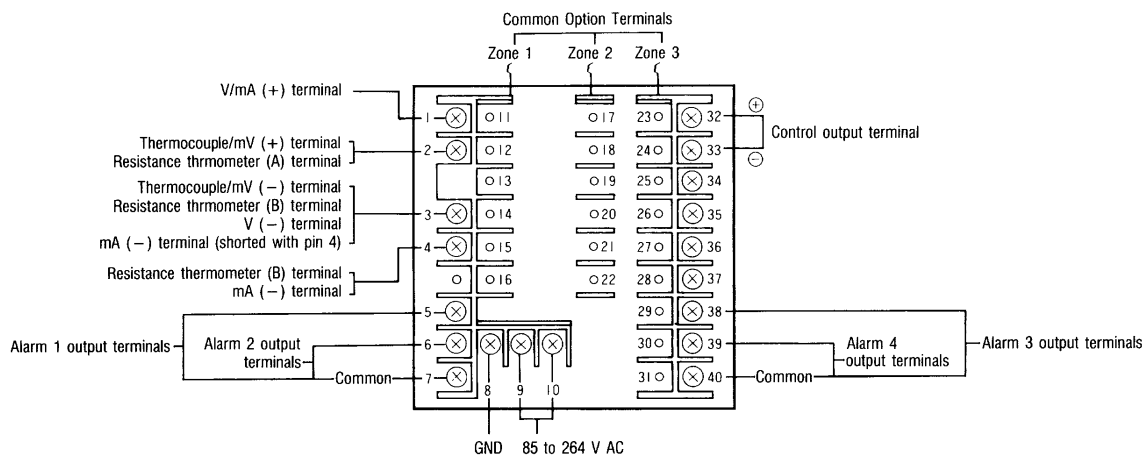
On-off servo type PID system



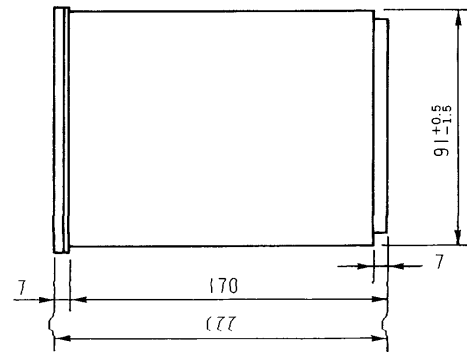
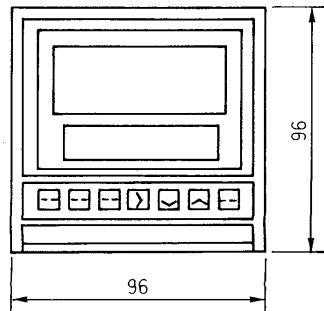
Current output type PID system

SSR drive pulse type PID system

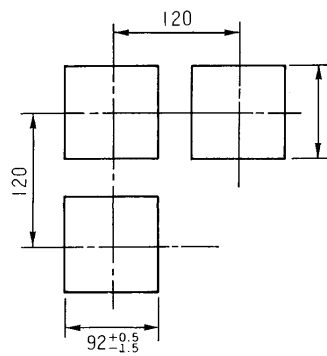
Voltage output type PID system



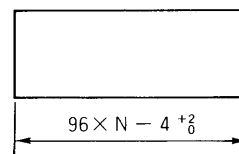
■ EXTERNAL DIMENSIONS



• Panel Cut-out Diagram



• Contact Instrumentation



N: Number of mounted units

Unit: mm

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