C-1815-E1

SINGLE LOOP MCU BASED DIRECT DIGITAL CONTROLLERS

DIN SIZED 72×72mm

REX-F7

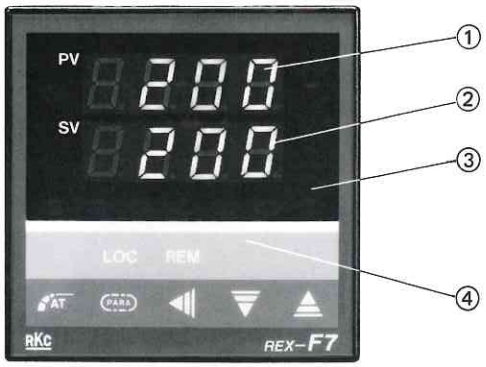
LEADING CONTROLLERS WITH HIGH TECHNOLOGY

- PID Auto-tuning Function
- PV Bias
- °C/ °F, Direct Action/Reverse Action Selector Function
- Heater Break Alarm Function
- Self-diagnosis Function
- Reconfigurable Thermocouple Types and Alarm Actions.

RKC INSTRUMENT INC.

NAMES OF PARTS

① PV display (green)
Indicates a measured value.
② SV display (orange)
Indicates a setpoint value.
③ Indicator lamps
(some lamps are not supplied specification)
OUT(1) . . . Lights when output is ON (Heating)
OUT(2) . . . Lights when output is ON (Cooling)
AT . . . Lights during PID auto-tuning
STEP . . . Step function, lights during "CLOSE"
ALM1 ALM2 . . . Lights when alarm output is ON
HBA . . . Lights when HBA output is ON
ERR . . . Lights when self-diagnosis function detects faults
REM . . . Lights during remote mode
④ Setting key (Flat key)
LOC . . . Pressed to enter local mode
REM . . . Pressed to enter remote mode
AT . . . Pressed to initiate PID auto-tuning
PARA . . . Pressed to scroll parameters for setting and monitoring



◀| . . . Cursor shift key
▼ . . . Increment key
▲ . . . Decrement key
For explanation purpose all functions are shown in this figure

FEATURES

■ PID Constants Auto-tuning

The optimum PID constants according to control object are easily settable just at a touch of the AT Key, therefore the PID controller can be used by any people.

■ Heating/Cooling PID Action

The control represented on the extrusion molding, temperature tends to go higher by the heat generation caused by friction etc. In this case, the instrument not only provides good control result but also contributes to energy saving.

■ Heater Break Alarm

The instrument compares the input with the setpoint (SV1 or SV (R)), makes PID calculation, and produces output signal to the load in the form appropriate to each operating units. Thus, the instrument and other units make a closed loop. Failure of signal from any one of them causes improper control. The instrument can incorporate input break alarm and heater break alarm as option to detect faults. The output from the instrument is relay contact output that can be easily used for alarm. (Max. 100A available as option.)

■ Analog output

In addition to the control output, either of manipulated variable (MV), measured value (PV) and local setpoint (SV1), remote setpoint (SV (R)) can be output in DC analog signal form.

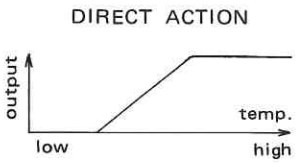
■ External Setting

With this function, the setpoint of the instrument can be set or changed by the external DC current or voltage signal. The instrument controls the object to maintain this set value. The external setting signal must be fed constantly. During the external setting mode, auto-tuning function is not available.
The remote setpoint input section is not electrically isolated from the thermocouple input section.
When the setpoint signal is set from one instrument to two or more controllers, an isolator must be used.
The instrument has the following operation modes and when the mode is changed from one type to the other, the incorporated balanceless bumpless function works to prevent abrupt change in the process because of setpoint and output change. The balanceless bumpless function can be prohibited in the initial setting mode, if unnecessary.

■ °C/ °F, Direct Action/Reverse Action Selecting

The instrument is also recommendable for the research fields because of °C/ °F selection is easy and Direct action/Reverse action is also switchable.

A direct action shown in the right drawing is an action of the output increasing together with the temperature rising. The cooling control is an example of this action.



■ PV Bias

The displayed values on the controller and the recorder may often be different from each other. With this function, the displayed value can be adjusted easily without recalibration of the controller.

■ Automatic Calibration

The controller uses no potentiometers for calibration. It only uses digital data which is not affected by secular changes. In addition, the built-in automatic calibration function constantly calibrates the zero point of the preamplifier and the drift of the gain. Thus, compared with the conventional instruments, the new controller provides superb stability without recalibration over a long period.

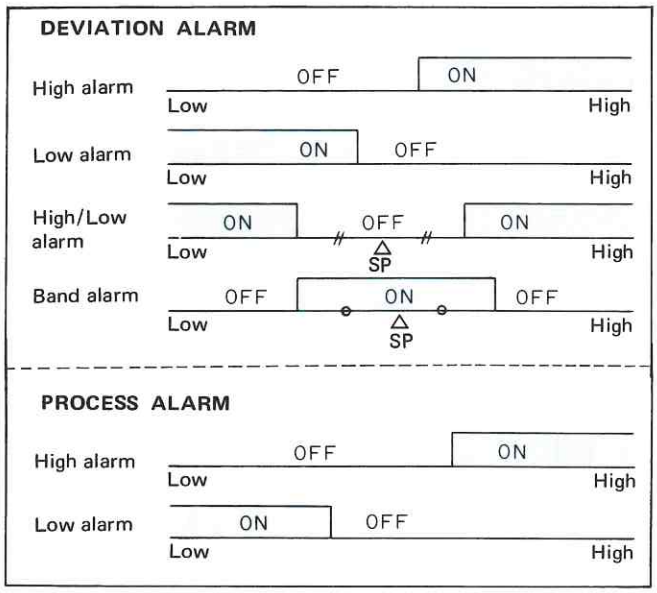
■ Process Alarm · Deviation Alarm

(please refer to TYPE OF ALARM ACTION)
Either process alarm or deviation alarm can be specified at the time of ordering. (Field reconfigurable)

Process alarm : Independent of the setpoint value (SV), the alarm output turns ON (or OFF) when the input value reaches the alarm set value.

Deviation alarm : The alarm output turns ON (or OFF) when the input value reaches the alarm set value which is set in plus or minus degrees from the set value (SV).

TYPE OF ALARM ACTION



SP: Setpoint *Alarm mode is field configurable.

SPECIFICATIONS

INPUT

- **Input** : Thermocouple (T/C), Resistance Temperature Detector (RTD), DC Voltage • Current (Regarding input types and standard ranges please refer to the last page.)
- **Effect of External Resistance** : Approx. 0.35 μV/Ω (thermocouple input)
- **Effect of Input Lead Resistance** : Approx. 0.0075%/Ω of reading (RTD input)
- **Input Break Action** : Up-scale (as standard, down-scale is also available in case of T/C input as option) [Down-scale for 1 to 5V, 4 to 20mA DC in case of Voltage • Current input.]
- **Sampling Cycle** : 0.5 sec.
- **PV Bias** : −1999 to 9999°C [°F or %]

SETTING

Analog signal setting (external setting) or setting via key pad.

- **Setting Accuracy** :

  Set Value (SV)

  T/C . . .Within ±(0.3% of SV + 1 digit) or ±2°C [4°F] (whichever is larger)

  R,S input 0 to 199°C [0 to 399°F] . . .within ±4°C [8°F]

  B input 0 to 399°C [0 to 799°F] . . .out of accuracy guarantee range.

  RTD . . .Within ±(0.3% of SV + 1 digit) or ±0.8°C [1.6°F] (whichever is larger)

  Voltage • Current DC . . .Within ±(0.2% of setting range + 1 digit)

  The other SV . . .Within ±0.5% of setting range

- **External Setting Signal** (against setting range)

  DC Voltage : Please refer to the table of signal code (Input impedance : more than 250 KΩ)

  DC Current : Please refer to the table of signal code (Input impedance : approx. 250 Ω)

  Input Break Action : Down-scale (1 ~ 5V, 4 ~ 20mA DC only)

DISPLAY

- **Input Display Range** : −1999 to 9999°C [°F or %]
- **Input Display Accuracy** : Same as setting accuracy

CONTROL ACTION

- **PID Action** (auto-tuning function also available as option)

  ON/OFF • P • PI • PD action also available, Direct/Reverse action field selectable.

  Proportional band (PH) for heating. : 1 (0.1) to setting range or 0.0 to 100.0% of setting limiter span. ON/OFF action when P = 0 (0.0) Hysteresis band : 0 to 100 (0.0 to 100.0)°C [°F] (TC/RTD input) or 0.0 to 100.0% of setting range (Voltage/current input)

  Proportional band (PC) for cooling : 1 ~ 1000% of PH.

  Integral (I) : 1 to 3600 sec.

  Derivative (D) : 1 to 3600 sec.

  Anti-Reset Windup (ARW) : 1 to 100% of proportional band (PH).

  Proportional Cycle (TH) : 1 to 100 sec.

  Proportional Cycle (TC) : 1 to 100 sec.

  Dead Band (DB) : 0 ~ 10 (0.0 ~ 10.0)°C [°F]. (TC/RTD input) or 0.0 ~ 10.0% of setting range. (Voltage/current input)

OUTPUT

- **Control Output** :

  Relay Contact . . Capacity 250V AC 3A (resistive load), 1 form "c" contact (For heating), 1 form "a" contact (for heat/cool)

  SSR Driving. . . 0/12V DC (constant voltage pulse) [load resistance more than 800 Ω]

  Current . . . . . 0 to 20mA or 4 to 20mA DC [load resistance less than 600Ω], whichever is specified.

  Continuous Voltage . . . 0 to 5V, 0 to 10V, 1 to 5V DC [load resistance more than 1 KΩ], whichever is specified.

  Trigger for triac driving . . . . . Zero-cross method for medium capacity triac driving. (Heating type only)

  Triac . . . . . Capacity 0.5A (at ambient temperature 40°C [104°F]) zero-cross method.

ALARM

- **Alarm Action** : Deviation alarm, process alarm (selectable). [Hold action is also selectable.] (Refer to type of alarm action (P.3).

  Relay contact output capacity 250V AC 1A (resistive load) 1 form "a" contact [2 point energizing alarm] [Malfunction may occur if alarm is used in inductive load]

  Alarm setting range . . . −1999 to 9999°C (°F or %)

  Hysteresis width 2°C [°F] or 0.2% of setting range.

GENERAL SPECIFICATIONS

- **Self-diagnosis** : ERR display. RAM check, A/D converter check, monitoring of CPU power supply.
- **Supply Voltage** : 100/110V, 200/220V AC or 110/120V, 220/240V AC (50/60Hz) [whichever is specified]
- **Voltage Variation** : Within ±10% of rated supply voltage.

- **Power Consumption** : Less than 5VA.
- **Ambient Temperature** : 0 to 50°C (32 to 122°F)
- **Ambient Humidity** : 45 to 85% RH.
- **Net Weight** : Approx. 500g
- **External Dimensions** : Refer to dimensions.
- **Option** : Analog output (PV,SV,MV)
  Voltage output
  . . . 0 ~ 10mV, 0 ~ 100mV
  (Load resistance more than 20KΩ)
  0 ~ 1V, 0 ~ 5V, 0 ~ 10V, 1 ~ 5V
  (Load resistance more than 1KΩ)
  Current output
  . . . 4 ~ 20mA, 0 ~ 20mA
  (Load resistance less than 600Ω)
  : External setting function
  : Heater break alarm
  : Contact input (Step function, Remote/Local)

● MODEL CODE

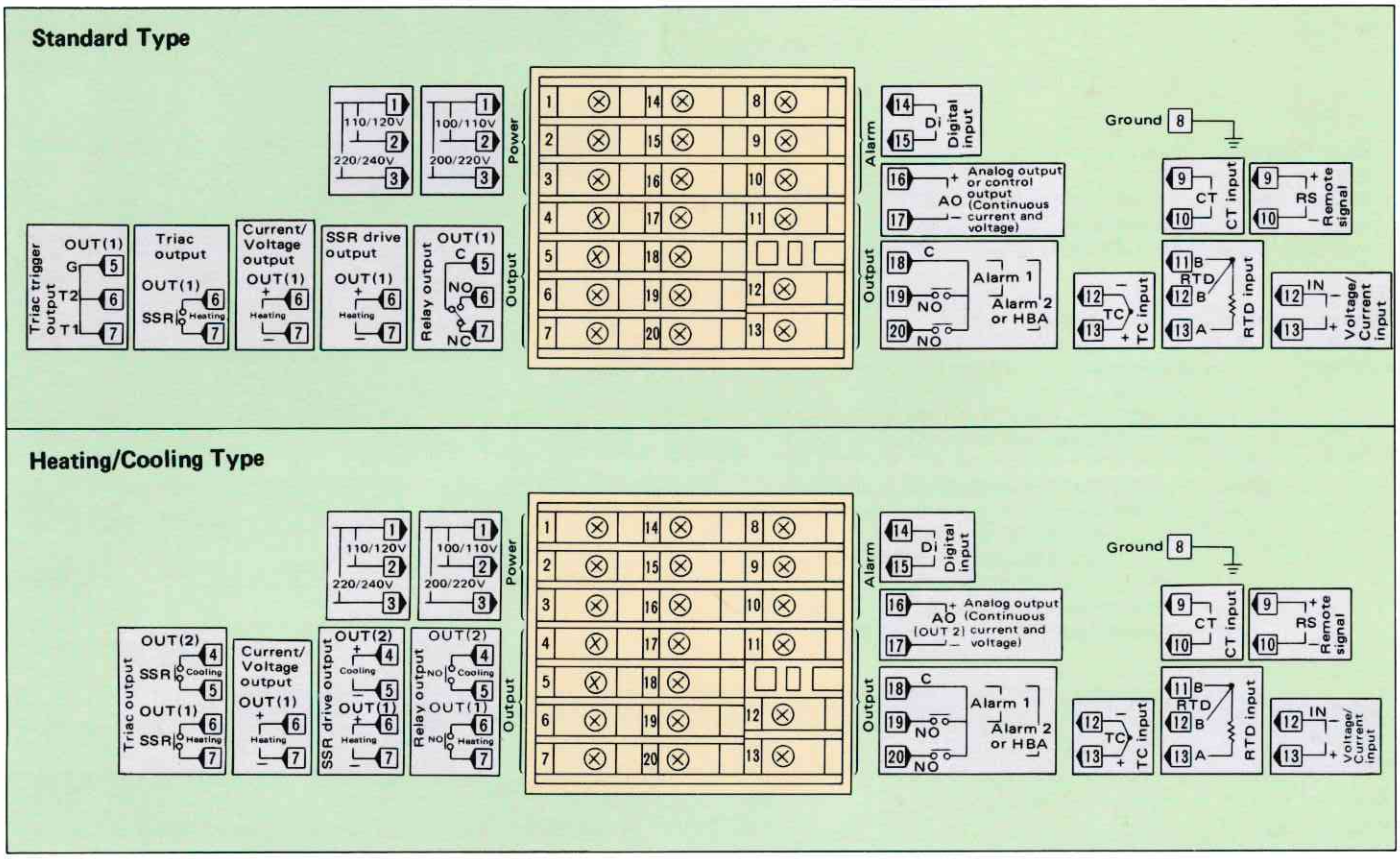
REX-F7	□	□	□	□	□	□	□	□	72 x 72mm sized MCU based controller
Control action	H								PID action
	F								PID action with AT
	V								Heat/Cool PID action
	W								Heat/Cool PID action with AT
Alarm		N							No alarm
		S							Single alarm
		D	*1						Dual alarm
Input			C						T/C input
			R						RTD input
			□	*2					DC voltage/current input
Output (heating)				M					Relay output
				V					SSR drive output
				R					4 ~ 20mA (0 ~ 20mA) DC
				E					1 ~ 5V (0 ~ 5V) DC
				T					Triac output
Output (cooling) *3					M				Relay output
					V				SSR drive output
					R				4 ~ 20mA (0 ~ 20mA) DC
					E				1 ~ 5V (0 ~ 5V)DC
Analog input						N			None
						H	*1		Heater break alarm (HBA)
						□	*2		Remote setpoint
Contact input							N		None
							1		STEP, REM/LOC switching
Analog output								N	None
								□ *2	SV/PV/MV output

*1 When HBA function is supplied, dual alarm is not available.
*2 Specify signal code. (See below)
*3 Specify when control action is either V or W, otherwise skip this section.

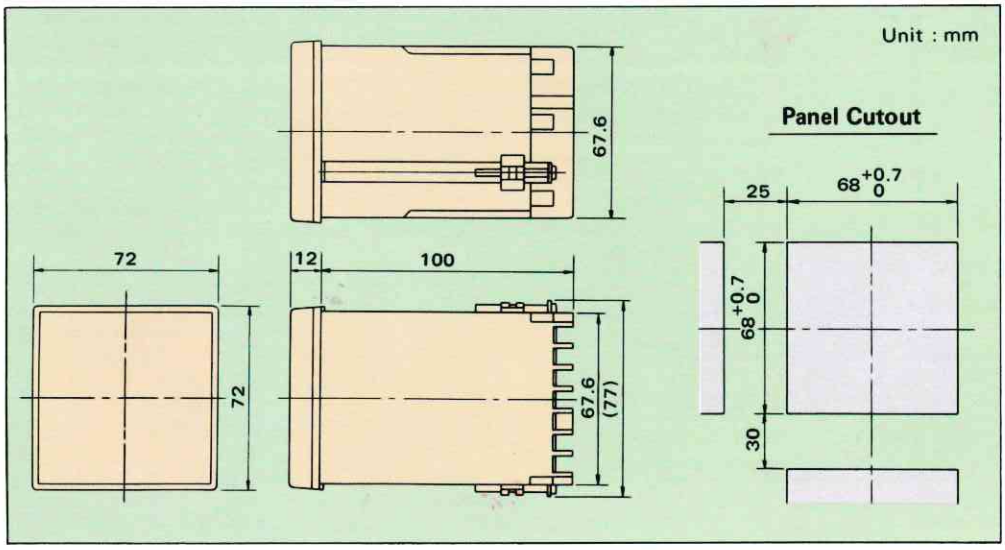
Signal Code			
1) 0 to 10mV	2) 0 to 100mV	3) 0 to 1V	4) 0 to 5V
5) 0 to 10V	6) 1 to 5V	7) 0 to 20mA	8) 4 to 20mA
9) Others			

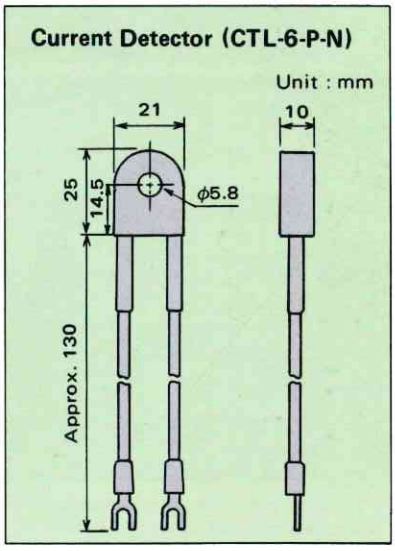
#The functions paired with the same alphabet are selectable only from either of them.

REAR TERMINAL



DIMENSIONS & PANEL CUTOUT





STANDARD RANGES

The figure in the parenthesis is a minimum resolution.

Input #4		Standard ranges
Thermocouple #1	Type K (IEC/JIS)	0~200°C, 0~400°C, 0~600°C, 0~800°C, 0~1000°C, 0~1200°C, 0~1372°C (1°C) 0~800°F, 0~1600°F, 0~2502°F (1°F)
	Type J (IEC/JIS)	0~200°C, 0~400°C, 0~600°C, 0~800°C, 0~1000°C, 0~1200°C (1°C) 0~800°F, 0~1600°F, 0~2192°F (1°F)
	Type R, S (IEC/JIS)	0~1600°C, 0~1769°C (1°C) 0~3200°F, 0~3216°F (1°F)
	Type B #2 (IEC/JIS)	400~1800°C, 0~1820°C (1°C) 800~3200°F, 0~3308°F (1°F)
	Type E (IEC/JIS)	0~800°C, 0~1000°C (1°C) 0~1600°F, 0~1832°F (1°F)
	Type T (IEC/JIS)	0~400°C (1°C) 0~752°F (1°F) −199.9~400.0°C, −199.9~100.0°C, −100.0~200.0°C, 0.0~350.0°C (0.1°C) −199.9~752.0°F, −100.0~200.0°F, −100.0~400.0°F, 0.0~450°F, 0.0~752.0°F (0.1°F)
	Type N (NBS)	0~1200°C, 0~1300°C (1°C) 0~2300°F, 0~2372°F (1°F)
RTD #3	Pt 100 (IEC/JIS) JPt100 (JIS)	−199.9~649.0°C, −199.9~200.0°C, −100.0~50.0°C, −100.0~100.0°C, −100.0~200.0°C, 0.0~50.0°C, 0.0~100.0°C, 0.0~200.0°C, 0.0~300.0°C, 0.0~500.0°C (0.1°C)
	Pt 100 (Equivalent to IEC/JIS)	−199.9~999.9°F, −199.9~400.0°F, −199.9~200.0°F, −100.0~100.0°F, −100.0~300.0°F, 0.0~100.0°F, 0.0~200.0°F, 0.0~400.0°F, 0.0~500.0°F (0.1°F)
DC Voltage • Current	0~ 10mV, 0~100mV, 0~ 1V, 0~5V, 0~10V, 1~5V	0.0~100.0% (0.1%) But range and resolution can be specified within −1999 to 9999 and resolution from (1, 0.1, 0.01, 0.001)
	0~20mA, 4~20mA	[Input inpedance : DC0~20mA, 4~20mA . . 250Ω, other . . over 250kΩ]

#1 Input inpedance . . . Approx 1MΩ

#2 0~399°C (0~799°F) is out of accuracy guarantee range.

#3 Input lead wire resistance . . . Less than 10Ω per each wire.

#4 Input . . . ANSI, DIN, JIS same as IEC (International Electrotechnical Commission)

Subject to change without notice due to design changes.

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