DIN SIZE
144 × 96mm

REX-F1000
SINGLE-LOOP DIGITAL PROCESS CONTROLLER

Meets Temperature, Pressure, Flow Rate every Process
with High Accuracy and Various Functions.

RKc. RKC INSTRUMENT INC.

PERFORMS SUPERB AUTHORITY IN WIDE CONTROL FIELD

Accuracy ±0.1%, Resolution 0.1°C

In temperature control applications, high accuracy of ±0.1% and high resolution of 0.1°C in high temperature range have been realized. In addition to these, REX-F1000 comes with various functions that meet every process to perform optimum control in flow rate, pressure, etc.

High Resolution by 16-bit A/D Converter

REX-F1000 uses a 16-bit A/D converter which provides high resolution and increases the PV input accuracy.

Various Alarm Actions Selectable

Two alarm outputs are supplied and the action of each alarm is configurable via front panel for selection of PV, deviation, deviation band and remote setpoint alarms. Configurable items include 'energized' or 'de-energized' alarm, 'with' or 'without' high/low alarm hold action.

User-Configurable Functions at Initial Setting

All functions supplied on REX-F1000 are freely selectable at the initial setting. Suitable functions according to the application can be selected.
* Some functions may not be selected due to the hardware construction.

Complete Input and Output Isolation

All of REX-F1000's inputs (including remote setting and communication) and outputs are isolated.

Communication Function Supplied as Standard

Serial communication function (RS-422A) is incorporated as standard. Setting of each item from a host computer and PV transmission from REX-F1000 are easily achieved through the communication links. This function enables REX-F1000 to play an important role in FA (Factory Automation) applications.

Dual Control Algorithm

REX-F1000 comes with the following dual control algorithm to satisfy various process control like flow rate control etc. as well as temperature control.

① **I-PD Control**
This is the most suitable for such a critical process that dislikes rapid output variation. With this algorithm, sudden output variation by the deviation of P (proportional action) and D (derivative action) can be suppressed.

② **PV-derivative type PID**
This is a control algorithm that may replace a standard PID control. This suppresses the effect by the deviation of D (derivative action) and can be also used in a process control.

Various Input and Output Selections

Input . . Thermocouple : K, J, R, T, S, E, PL-Ⅱ, W5Re/W26Re, N
         RTD   : Pt100Ω (DIN/JIS)
         DC voltage   : 0 ~ 5V, 1 ~ 5V
         DC current   : 0 ~ 20mA, 4 ~ 20mA
Output . Continuous voltage, Current, Voltage pulse and SSR drive output.
* Type of thermocouple input (down scale) and voltage input are freely configurable via front keypad.

At-a-glance Monitor of Output and Deviation Values

The bar-graph display on the front panel provides easy-to-confirm output and the deviation values (switchable).

Superb Operation Mode

The following three operation modes are selectable.
● Remote mode . . . . Automatic output operation to set the SV by the external analog signal.
● Automatic mode . . Automatic output operation to set the SV by the communication interface or via front keypad.
● Manual mode . . . . Manual output operation to set the manipulated variable by the communication interface or via front keypad.
* Use or unuse of balanceless bumpless function is also selectable.

Use of Flat Keypad on the Front Panel

The use of the flat keypad upgrades performance against disturbances like electrostatic noise. It also prevents the dust going into the instrument through the panel.

EASY OPERATION AND EASY-TO-READ DISPLAY

PV mode indicating lamp.

PARA mode
indicating lamp.

SV Ⓛ mode
indicating lamp.

SV Ⓡ mode
indicating lamp.

Alarm 1 indicating lamp.
(AL ①)

Alarm 2 indicating lamp.
(AL ②)

MV mode
indicating lamp.

FAIL indicating lamp.

Unit indication.

PV or parameter signal
display.

SV display.

Output or deviation value
indicating bar-graph.

FAST key.
To accelarate data's UP/DOWN
speed by pushing the key
continuously.

UP key.
Used to increase the SV.

PID key.
Used to set and monitor the
PID constants.

PARA key.
Used to set and monitor
each parameter

MODE key.
Used to change the mode.

DOWN key.
Used to decrease the SV.

DISP key.
Used to monitor the SV
of each mode.

COMP key.
Used for switching into the
computer mode.

REM key.
Used for switching into the
remote mode.

AUTO key.
Used for switching into the
automatic mode.

MAN key.
Used for switching into the
manual mode.
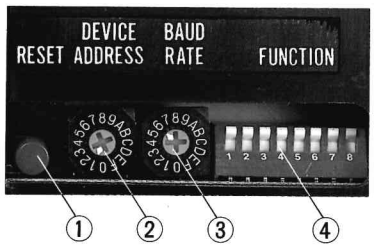
① Reset Switch.
Used to return the system to
initial state.

② Address Setting Switch.
Used to set the address of instrument
in case of communication.

③ Communication Speed Switch.
Used to set the communication speed.

④ Function Switch.
Used to set each mode of the system.

SPECIFICATIONS

INPUT

Input	: Thermocouple ANSI/JIS K, J, T, R, S, B, E. NBS PL-II, N (Nicrosil/Nisil). Hoskins type W5Re/W26Re. (input impedance more than 1MΩ.) RTD JIS Pt 100Ω 3-wire type. Voltage DC/0 ~ 5V, 1 ~ 5V (input impedance more than 1MΩ) Current DC/0 ~ 20mA, 4 ~ 20mA. (input impedance 250Ω.).
Effect of external resistance	: Less than 0.3μV/Ω. (for thermocouple input only.)
Effect of input lead wire resistance	: Less than 0.01°C/Ω/wire. (for RTD input only.)
Sampling cycle	: 250 m sec.
Digital filter	: 0 ~ 255 sec. variable.
PV bias	: ± span (See Page 9.)
Ratio	: 0.001 ~ 10.000 variable (on a voltage/current input type) (See Page 9.)
Square-root extraction	: Square-root extraction is possible on a voltage/current input type. (See Page 9.) Low input dropout; 0.0 ~ 10.0% (See Page 9.)
Action at input break-out	: Thermocouple input; Up scale, Down scale. RTD input; Up scale. Voltage input, current input; Down scale.

* Whichever is specified among thermocouple input (up scale), RTD input, thermocouple input (down scale), voltage input and current input.

DISPLAY

Measuring input display	: 5 digits, 7-segment LED (green). Display resolution ..according to scale range. (See P. 8 Standard Ranges.) Display range .....(See P. 8 Standard Ranges.) Display accuracy ...Within ±(0.1% of span +1 digit).
Setting display	: 5 digits, 7-segment LED (yellow) displays of remote setting, local setting, PV output and parameter setting etc. : Display resolution; Remote setting display .... same as MV input display. Local setting display .... ditto MV output display .... 0.1% Parameter setting display .... according to range of parameter setting. : Display range; Remote setting display .... same as setting limit range. Local setting display .... ditto MV output display .... same as output limit range. Parameter setting display .... according to range of parameter setting.

Bar-graph display	: 20 segment green LED; MV output display Deviation display } * Whichever is selected. : Display resolution; MV output display ...5%. Deviation display .... variable. : Display range; MV output display ...0 ~ 100%. Deviation display .... display range is variable.

SETTING

● Mode Changing

1. Computer mode/local mode changing
 : a) Computer mode
   Setting and monitoring of all set items by a host computer.
 : b) Local mode
   Setting and monitoring of all set items via front keypad.

2. Operation mode changing
 : a) Remote mode
   An automatic output operation to set the SV with the external analog signal.
 : b) Automatic mode
   An automatic output operation to set the SV through the communication interface or via front keypad.
 : c) Manual mode
   A manual output operation to set the manipulated variable through the communication interface or via front keypad.

3. Balanceless · Bumpless on operation mode changing
 : a) At remote mode ↔ automatic mode changing
   With or without the balanceless · bumpless changing of the main setting value is selectable.
 : b) At remote mode / auto./mode ↔ manual mode changing
   With or without the balanceless · bumpless changing of the operation output is selectable.

● Main setting

Setting method	: ① Setting by the front up/down keys. ② Setting through the communication interface. ③ Setting by the external signal.
Setting range	: Same as scale range. (but supplied with the limiters of upper limit and lower limit.) ① Upper limiter scale range } ② Lower limiter scale range } lower limiter ≦ upper limiter
Remote setting	: Input types; ① DC voltage input 1 ~ 5V, 0 ~ 5V (input impedance more than 1MΩ.) ② DC current input 4 ~ 20mA, 0 ~ 20mA (input impedance 250Ω.) * Whichever is specified.
Action at input Break out	: Down scale Sampling cycle, digital filter, ratio, bias and square-root extraction are same as the above input. (See Page 9.)

CONTROL ACTION

Method of PID calculation (See Page 9.)
: a) PID 1 . . . I-PD
  PID 2 . . . Measured value derivative type PID } * Whichever is selected.
  b) Two PID constants are settable against the selected PID calculation method.
  c) Direct action · Reverse action changeable.

Setting range
: Proportional band 0.1 ~ 1000.0% of span.
  Integral time 1 ~ 3600 sec.
  Derivative time 0 ~ 3600 sec.
  Reset feedback type output limiter
  −10 ~ 110% of output for upper limit and lower limit together.
  Manual reset ±50% range of output. (in case of P and PD action on PID-2.)
  Hysteresis range of 2-position action
  0 ~ 1000 unit of engineering. (decimal place is according to the scale.)

Control cycle
: 250m sec.

OPERATION OUTPUT

Output
: Continuous voltage output, current output, SSR drive output. (See Page 8, Model code.)

COMMUNICATION FUNCTION

Communication method
: 4-wire type, half duplex multi drop connection, start-stop synchronization. Based on EIA RS-422A.

Communication speed
: 110, 300, 600, 1200, 2400, 4800, 9600 BPS. (select one of the above by the dip switch.)

Max. connection
: 16 points (address 0 ~ 15)

Bit formation
: Start bit 1
  Data bit 7 JIS (ASC II)
  Parity bit 1 (selectable in odd or even number)
  Stop bit 1 or 2 selectable
  * Data bit becomes 8, if parity is not used.

COMMON SPECIFICATIONS

Power source
: 90 ~ 264V AC (50/60 Hz common), including voltage variation.

Ambient condition:
Allowable temperature 0 ~ 50°C (32 ~ 122°F)
Allowable humidity 5 ~ 90% RH (should not be dew condensed.)

Power consumption
: About 32VA (care about heat generation when installing.)

Weight
: About 2.8kg.

Countermeasure for power failure
: a) Power shut down within about 3 sec. Hot start A
  b) Power shut down longer than about 3 sec. Hot start A · B, cold start (whichever is selected.)
  * Hot start A → Restarting with the operation mode and the output value of before power shut down.
  Hot start B → Restarting with the operation mode of before shut down, but the output value is from the lower limit value of the output limiter.

Cold start → Restarting with the manual mode and the output value of the output limiter's lower limit value.

Data protection during power shut down
: RAM backed-up with Lithium cell.

Self-diagnosis function
: Fault indication of CPU, ROM, RAM errors.
  Output . . . . 1 relay contact (less than AC250V, 0.1A load.)
  Fault . . . . FAIL lamp lights and relay contact opens.

External dimensions
: Refer to drawing of the external dimensions (page 12.)

OTHERS

Analog output (See Page 9.)
: Continuous voltage output 1 point.
  ① 0 ~ 5V, 1 ~ 5V DC
  ② 0 ~ 10V DC
  * Whichever is speified.
  Output type
  ① Measured value (PV)
  ② Deviation value (DEV)
  ③ Local set value (SV (L))
  ④ Remote set value [SV (R)].
  * Whichever is speified.
  Output type
  Upper · lower limits are settable.

Alarm output
: Relay contact output 2 point (independent each.)
  Output type
  ① Measured value (PV).
  ② Deviation value (DEV).
  ③ Deviation absolute value (DEV).
  ④ Remote set value (SV (R)).
  * Whichever is selected.
  * Also can be used to descriminate the state of auto./manual mode. (See Page 9.)
  Setting ranges;
  ① PV . . . . 0 ~ 100% of span.
  ② DEV . . . −100 ~ +100% of span.
  ③ |DEV| . . 0 ~ 100% of span.
  ④ SV (R) . . 0 ~ 100% of span.
  Hysteresis range;
  0 ~ 1000 unit of engineering. (decimal place is according to the scale.)
  Output type;
  Relay contact output (less than AC 250V, 0.1A load, resistance load, single pole single touch (SPST).)
  Excitation or non-excitation.
  * Whichever is selected.

Contact input (D11): Function
To specify with or without changing function of PID constants. (See Page 9.)

Contact input (D12): Function
Changing the operation mode of
automatic
remote } ↔ manual or remote ↔ auto.
* Whichever is selected. (See Page 9.)

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FUNCTIONS, MODEL CODE AND STANDARD RANGES

● FUNCTIONS

	MAIN FUNCTIONS	DESCRIPTION
INPUT	Input	Selectable from ten (10) types of thermocouples.
	Upper/Lower Limit Setting Limiter	Settable voluntarily.
	Remote Setting	Standard analog signal from external peripheral equipment as main setting.
CONTROL ACTION	Control Action	Two (2) modes of I-PD control and PV-derivative type PID control.
	PID Constants Changing	Two (2) PID constants against selected PID calculation formula settable. Remote setting also changeable.
	Balanceless · Bumpless	Preventing sudden output variation at operation mode change.
	Direct/Reverse Action	Selectable according to the controlled object.
OUTPUT	Alarm Output	Selectable among PV, deviation, absolute deviation, remote set value. 2 contacts.
	Analog Output	Selectable among PV, local set value, deviation, remote set value.
	Upper/Lower Limit Output Limiter	Output limit (load rate) of operating output is settable.
	Self-Diagnosis	External signalling of CPU, ROM, RAM faults by FAIL output.
ATTACHED FUNCTIONS	Communication Function (RS-422A)	Can be used in the data management and central control system by sending operating status of the PV to or receiving the SV from host computer.
	Computer/Local Mode	Changeable between data setting by communication function and front keypad operation.
	Operation Mode Changing	Three operating status of remote mode, auto. mode, manual mode available.
	External Changing of Operation Mode	Remote mode ⎫ Auto. mode ⎭ ↔ manual mode, remote mode ↔ auto. mode changeable by external contacts.
	Bar-graph Display	Changeable between MV output display and deviation indicating.

● MODEL CODE

MODEL	SUFFIX CODE				DESCRIPTION
REX F1000	—□	—□	—□	—□	
Measured Input (PV)	U D R I				Thermocouple input. (up scale at sensor break) Thermocouple input, voltage input. (down scale at sensor break) RTD (JIS) input: Pt 100Ω 3-wire type. (up scale at sensor break) Current input: 0 ~ 20mA, 4 ~ 20mA DC.
Remote Set Input (SV)		E I			Voltage input: 0 ~ 5V, 1 ~ 5V DC. Current input: 0 ~ 20mA, 4 ~ 20mA DC.
Operation Output (MV)			E E1 R V T		Voltage continuous output: 0 ~ 5V, 1 ~ 5V DC, load impedance more than 1KΩ, resolution 0.03%. Voltage continuous output: 0 ~ 10V DC, load impedance more than 1KΩ, resolution 0.03%. Current output: 4 ~ 20mA, 0 ~ 20mA DC, load impedance less than 750Ω, resolution 0.03%. Voltage pulse output: 0~12V DC, load impedance more than 800Ω, cycle 2 ~ 100 sec. variable. SSR drive output: 250V AC, 1A, resistance load, cycle 2 ~ 100 sec. variable.
Analog Output				E E1	Voltage output: 0 ~ 5V, 1 ~ 5V DC Voltage output: 0 ~ 10V DC

● STANDARD RANGES

INPUTS		SCALE RANGES	DISPLAY RESOLUTION
Thermocouple	JIS/ANSI Type K	−200.0 ~ 1200.0 °C	0.1 °C
	JIS/ANSI Type J	−100.0 ~ 900.0 °C	0.1 °C
	JIS/ANSI Type T	−200.0 ~ 400.0 °C	0.1 °C
	JIS/ANSI Type R	0.0 ~ 1700.0 °C	0.1 °C
	JIS/ANSI Type S	0.0 ~ 1700.0 °C	0.1 °C
	JIS/ANSI Type B	0.0 ~ 1800.0 °C*	0.1 °C
	JIS/ANSI Type E	−100.0 ~ 900.0 °C	0.1 °C
	NBS PL-II	0.0 ~ 1300.0 °C	0.1 °C
	NBS N	0.0 ~ 1300.0 °C	0.1 °C
	Hoskins W5Re/W26Re	0.0 ~ 2000.0 °C	0.1 °C
RTD	JIS Pt100	−200.0 ~ 630.0 °C	0.1 °C
DC voltage	0 ~ 5V, 1 ~ 5V	Programmable count within 20000 max.	
DC current	0 ~ 20mA, 4 ~ 20mA	Programmable count within 20000 max.	

* The range of accuracy guaranteed is 500.0 ~ 1800.0°C.

INITIAL SETTING

REX-F1000 is a multi functional instrument capable of controlling various process, therefore, some detailed specifications which cannot be described in a model code are user-configurable. Please confirm the initial set values before the operation of the instrument. The following are default values at the time of delivery.

| ITEM OF SETTING	SETTING AND CODE	ON DELIVERY
Selecting PV Input type /Not all of inputs are selectable due to different hardware formation. Please refere to P. 8 MODEL CODE./	Thermocouple: K ... 0, J ... 1, T ... 2, R ... 3, S ... 4, B ... 5, E ... 6, PL-II ... 7, W5Re/W26Re ... 8, N ... 9. RTD: Pt100Ω ... 10 Voltage: 1 ~ 5V DC or Current: 4 ~ 20mA DC . . . 11 Voltage: 0 ~ 5V DC or Current: 0 ~ 20mA DC . . . 12	0
Setting for Decimal Place of Programmable Range	Setting code 4 3 2 1 0 * To set in case of PV input is voltage or current input.	1
Setting for Scale Upper Limit of Programmable Range	To set uper limit of scale range to be used. Max. range width is 20000. * To set in case of PV input is voltage or current input.	100.0
Setting for Scale Lower Limit of Programmable Range	To set lower limit of scale range to be used. Max. range width is 20000. * To set in case of PV input is voltage or current input.	0.0
Selecting Alarm 1 or Alarm 2	To select among PV, DEV, |DEV|, SV (R), also to select either excitation or non-excitation and upper limit or lower limit hold action. It is also selectable for distingush between auto status and manual status.	*A
Selecting Balanceless · Bumpless	Nil . . . . 0 Setting balanceless-bumpless . . . . 2 Output balanceless.bumpless . . . . 1 Output·setting balanceless·bumpless . . 3	3
Selecting Start Mode of longer than about 3 sec. Power Shut Down	From lower limit of output limiter at manual mode . . . . 0 From lower limit of output limiter at mode of before shut down . . . . 1 From output value of before shut down at mode of before shut down 2	1
Ratio of Remote Setting	To set the ratio within range of 0.001 ~ 10.000 against remote setting input. (In case of nil, to set as 1.000.)	1.000
Bias of Remote Setting	To set the bias of ± span against remote setting input. (In case of nil, to set as 0.0.)	0.0
Square-root Extraction of Remote Setting	Without . . . . 0 With 1	0
Setting for Drop-out of Remote Setting	To set in range of 0.0 ~ 10.0% in case of performing square-root extraction of remote setting.	0.0
Selecting input type of Remote Setting	1 ~ 5V DC or 4 ~ 20mA DC . . . . 0 0 ~ 5V DC or 0 ~ 20mA DC 1	0
Ratio of PV	To set the ratio within range of 0.001 ~ 10.000 against remote setting input.	1.000
Square-root Extraction of PV	Without . . . . 0 With 1	0
Setting Drop-out of PV	To set in range of 0.0 ~ 10.0% in case of performing square-root extraction of PV.	0.0
Selecting Method of PID Calculation	I-PD calculation . . . . 0 PV-derivative type PID calculation . . . 1	0
Selecting Method of PID Constant Changing	Without changing . . . . 0 /Main setting is enable\ Changing by external contact input DI (1) . . . . . . 1 |to have 2 of before Changing by deviation . . . . 2 \and after changings. /	0
Selecting Function of External Contact Input DI (2)	Without changing . . . . 0 Contact close → auto. mode/Contact open → manual mode . . . . 1 Contact close → remote mode/Contact open → auto. mode 2	0
Selecting Direct·Reverse Actions	Reverse action . . . . 0 Direct action 1	0
Selecting Operating Output (MV) type	1 ~ 5V DC or 4 ~ 20mA DC . . . . 0 0 ~ 5V DC or 0 ~ 20mA DC . . . . 1 Voltage pulse output or SSR drive output 2	0
Selecting Analog Output type	1 ~ 5V DC . . . . 0 0 ~ 5V DC or 0 ~ 10V DC 1	0

* A: Alarm 1.   Without measured input upper limit excitation alarm hold 1
  Alarm 2.   Without measured input lower limit excitation alarm hold 5

REAR TERMINALS·EXTERNAL DIMENSIONS

● REAR TERMINALS

NO: normal open.
C: common.

● EXTERNAL DIMENSIONS

Unit: mm

Panel Cutting
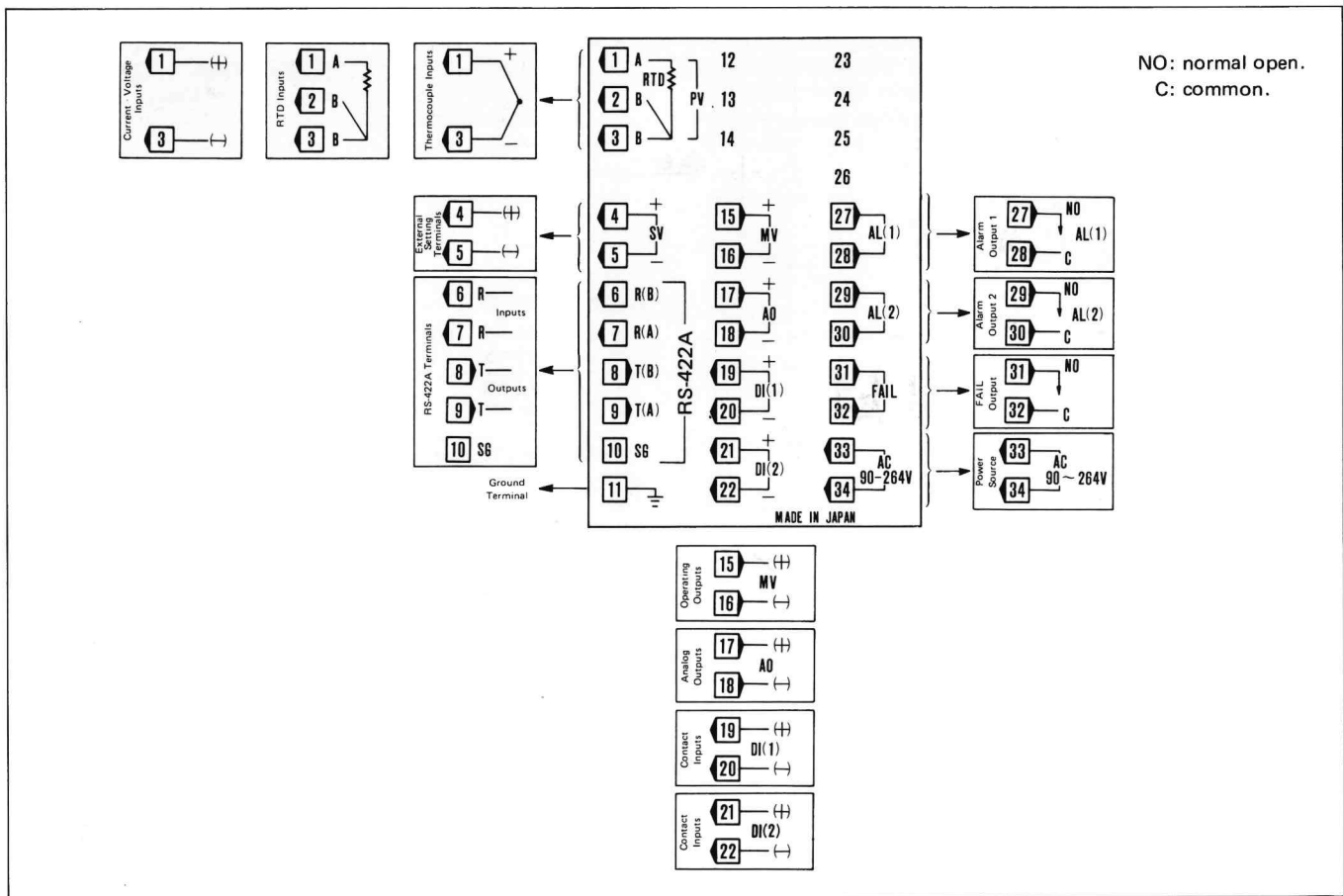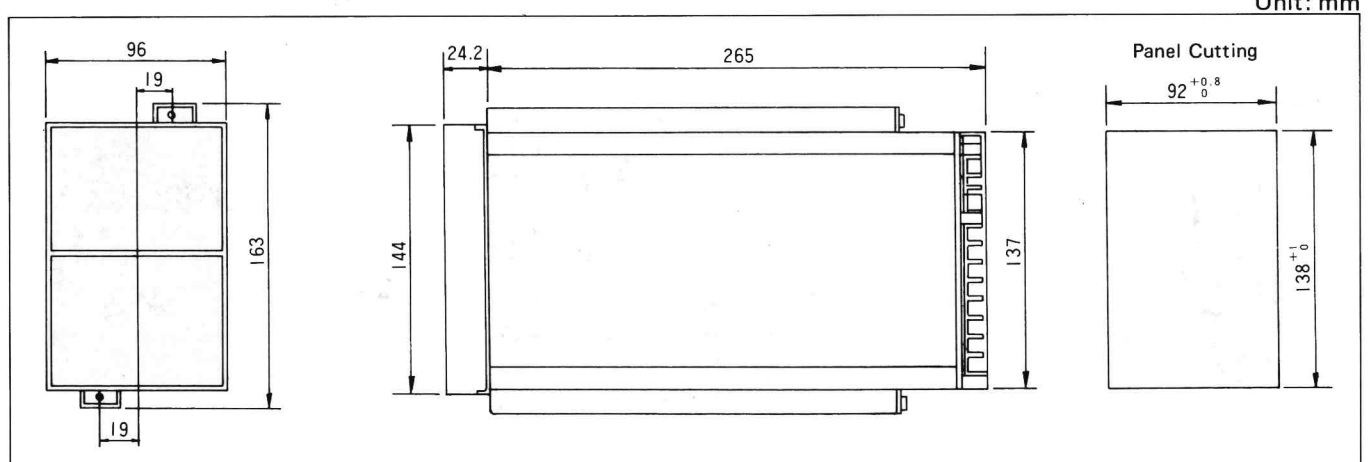
* Attention for the instrument assembling: May generating the heat under operation, please to reserves the space for thermal diffusion.