

RKc

REX-F400 REX-F700 REX-F900

Digital Controllers



RKc

RKC INSTRUMENT INC.

You will be surely satisfied with our control and user-friendly operation

The NEW F series direct digital controllers have been designed with the concept of "Excellent control with user-friendly operation." A bar-graph display unit has been added for easy and prompt readout of the output status and the deviation from the setpoint.

The NEW F series use the unique "Brilliant PID" control with the "Enhanced Autotuning" and perform control at fast sampling time of 0.25 second.

The NEW F series provide three levels of operation; operation levels 1 and 2, and engineering level. This is to suppress the display of unnecessary functional parameters. Major operations are done via front keypad with easy key operations.

Applications include various plastic machines (extruders, injection machines, etc.), electric furnaces, semiconductor processing equipment, packaging machines, environmental chambers and many others.

■Features

Brilliant PID

The new PID algorithm assures stable control.

Enhanced Autotuning

The new PID autotuning method using AT bias and new calculation method.

Bar-graph Display

At-a-glance monitor of output and process status.

Programmable Input

Input type is field configurable within the same input group.

Selection for Front Panel Color

Selection of front panel color (blue or black) according to the installation location.

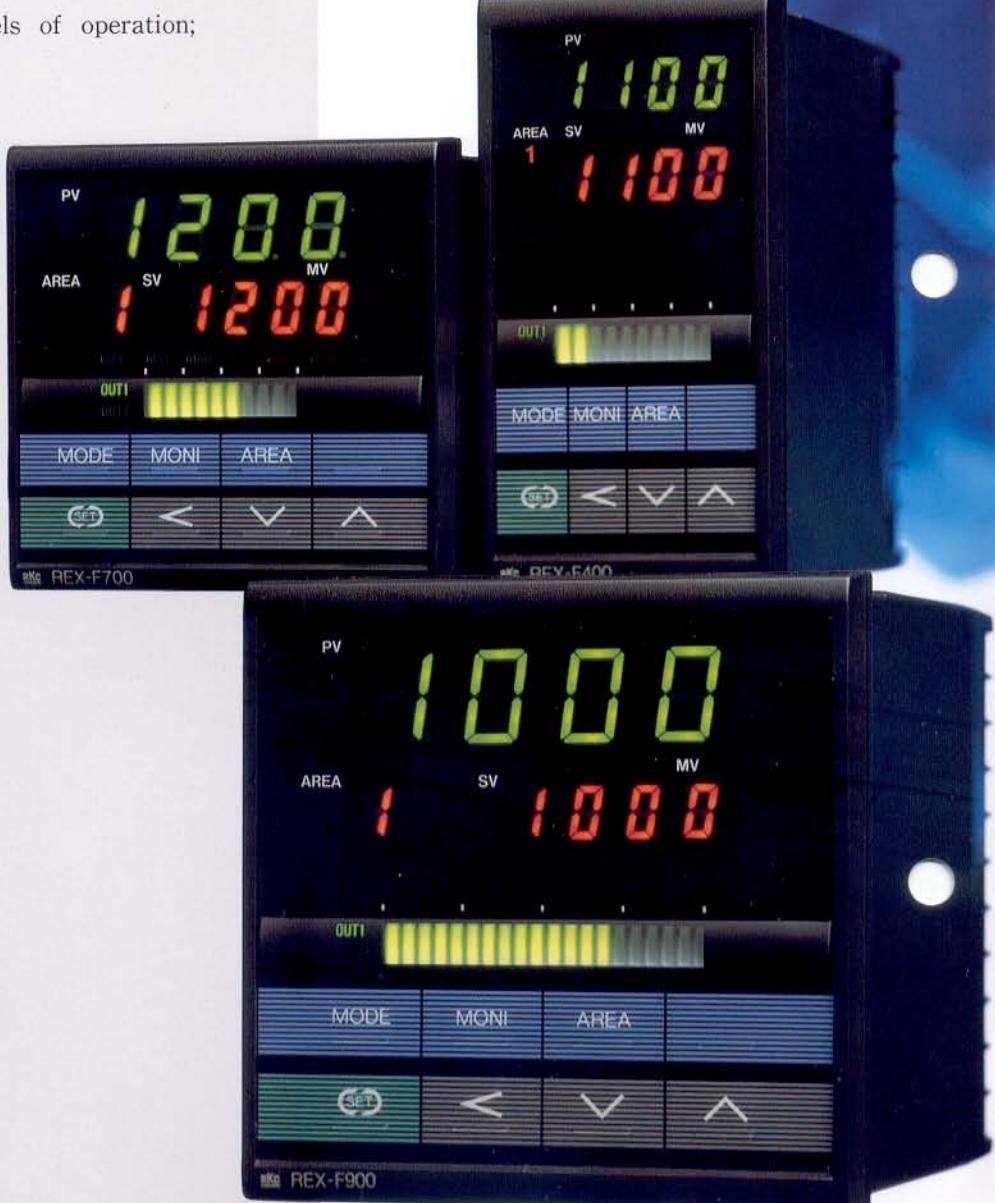
UL recognized (File NO.E82331)

Model REX-F900 and REX-F400 (Except triac trigger output)

CSA certified (File NO.LR46566)

Model REX-F900 and REX-F400

REX-F900
REX-F700
REX-F400



■The photo shows "blue front panel"

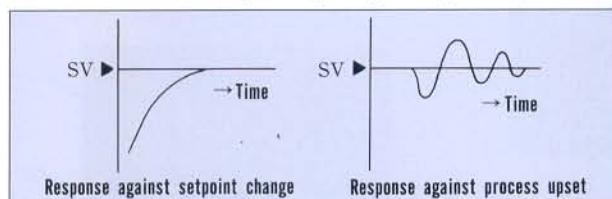
Major Functions

■Brilliant PID

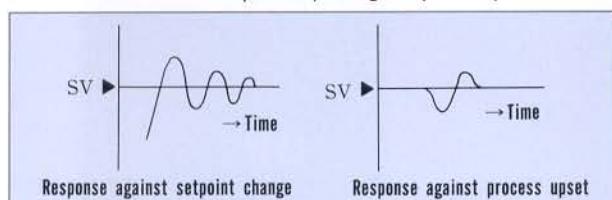
The PID control is one of the control methods. A stable result can be obtained by selecting proper values of P (proportional band), I (integral time) and D (derivative time). However, if you select PID values to improve "response against the setpoint change," you may have "response against the process upset" spoiled. On the contrary, if you select PID values to improve "response against the process upset," you may have "response against the setpoint change" spoiled. The Brilliant PID provides PID values suitable for "response against process upset" and simultaneously offers selection of "response against the setpoint change" from Fast, Medium and Slow.

【Conventional PID control】

When PID values are set to improve response against setpoint change

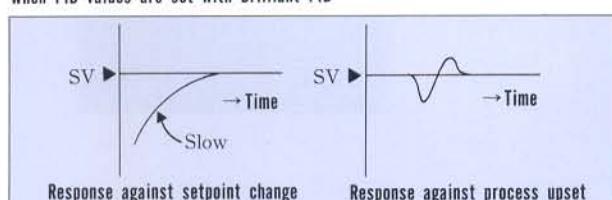


When PID values are set to improve response against process upset



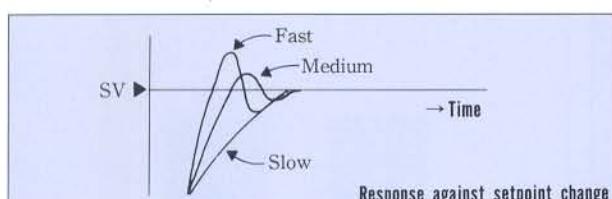
【Brilliant PID control】

When PID values are set with Brilliant PID



■Control response

This parameter has three types of response (Fast, Medium and Slow). If fast response is required, "Fast" is recommended. If overshoot is critical, "Slow" is recommended.



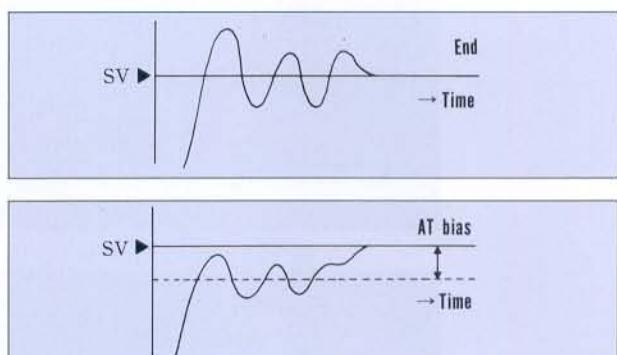
■Bar-graph display

The two 7-segment LED display units show various process data, but the output and the deviation status are displayed on the bar-graph display unit. The resolution is 20 segments for REX-F900 and 10 segments for REX-F400/REX-F700



■Enhanced autotuning

This autotuning method has been developed from our conventional autotuning method. In our former method, ON OFF cycling (hunting) was generated for calculation of PID values. Some process applications dislike overshoot caused by this hunting. In this latest autotuning, we can perform autotuning below (or above) the setpoint with the use of the AT bias function.



■PV Bias

This is an input corrective function. For example, if PV bias value is 2 degrees and the actual value is 98 degrees, the controller displays 100 degrees.

■Memory Area

This is a function to store groups of PID set values in memory. The parameters that can be stored are main setpoint, proportional band, integral time, derivative time, control response and alarm settings. When the setpoint is changed, other parameters can be easily changed by changing the memory area.

Example :

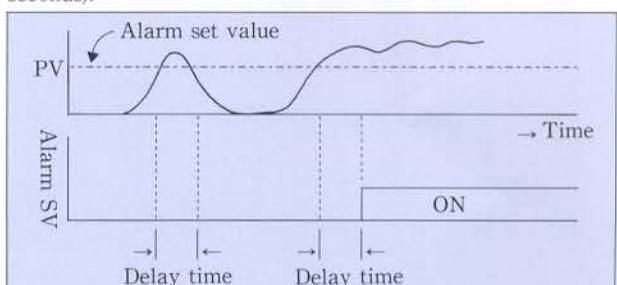
Memory area 1
SV=50%, P=10%, I=240, D=60, Slow,
AL1=5°C, AL2=5°C

Memory area change ↓

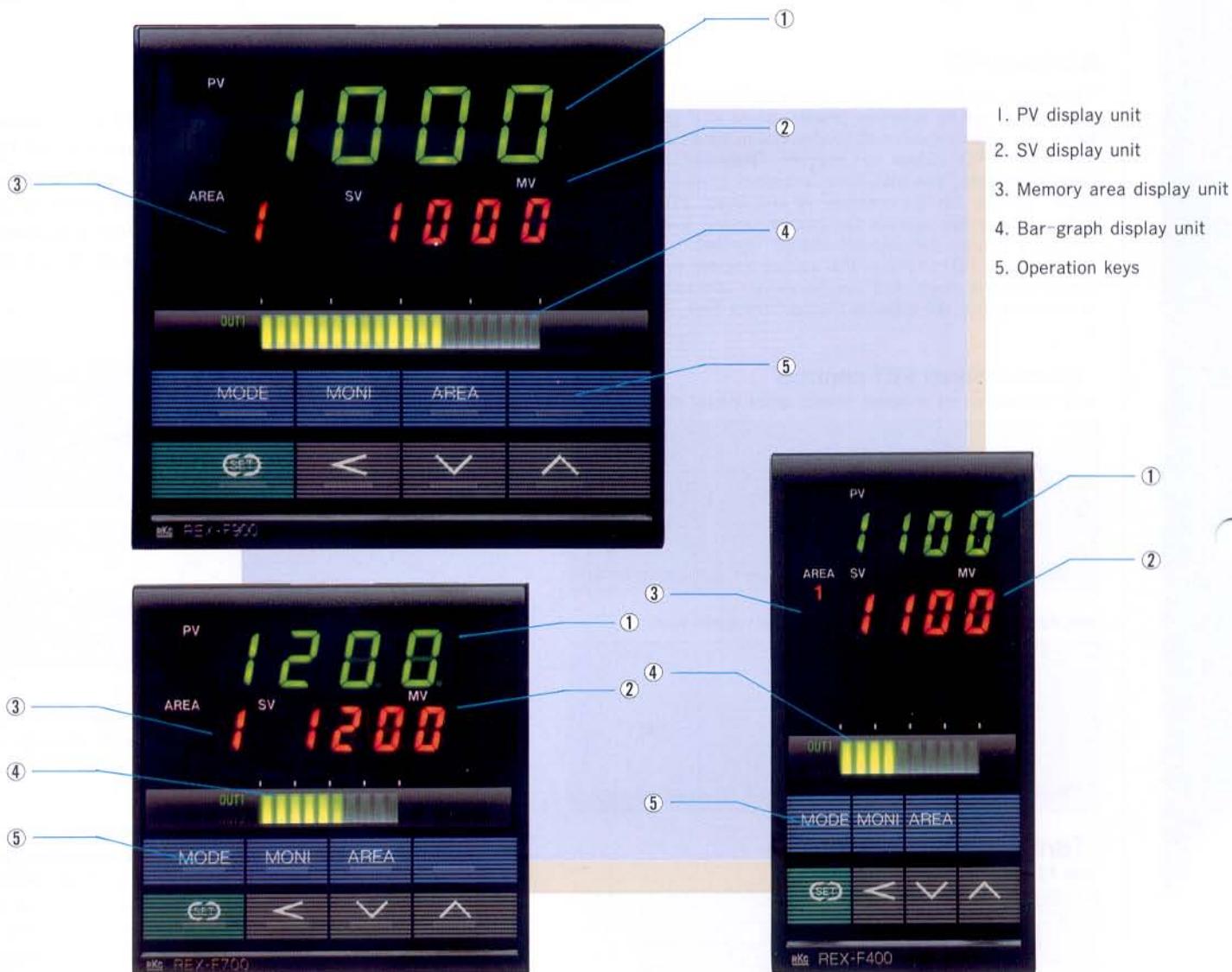
Memory area 2
SV=80%, P=20%, I=360, D=90, Slow,
AL1=10°C, AL2=20°C

■Alarm Delay

This is a function to delay alarm action. If alarm state is released during this delay period, alarm output will not be produced. For example, external disturbance such as noise may cause a momentary increase of the process value into the alarm area. This alarm delay function prevents alarm output to be generated in such a case. (Setting range : 0 to 600 seconds).

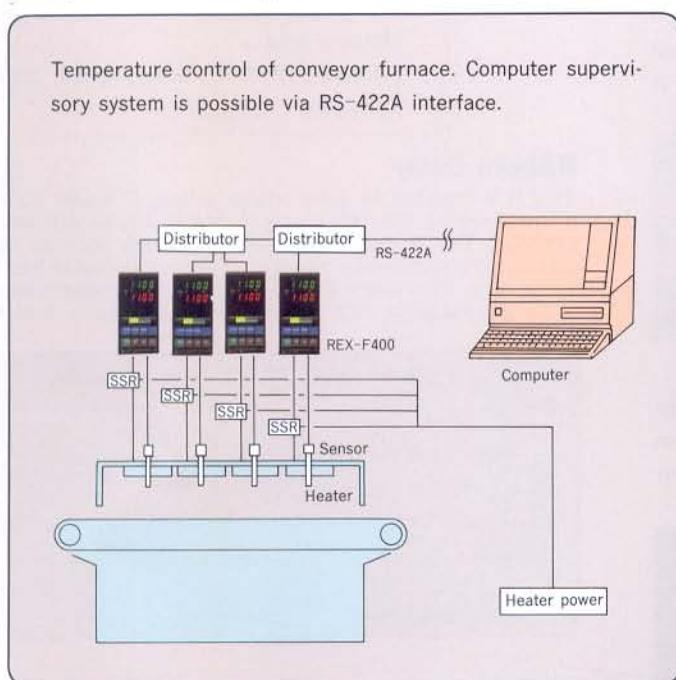


■Name of Parts

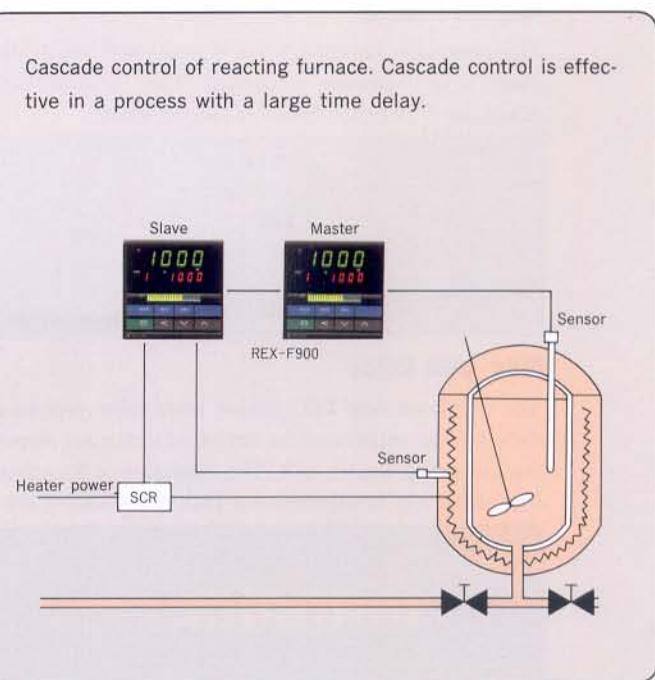


■Application Examples

Temperature control of conveyor furnace. Computer supervisory system is possible via RS-422A interface.



Cascade control of reacting furnace. Cascade control is effective in a process with a large time delay.



■ Specifications

1. Input

a) Temperature input group

T/C input

Input type : K,J,R,S,B,E,T (JIS/IEC), N(IEC), PLII(NBS), W5Re/W26Re(ASTM) U,L (DIN)

Effect by signal source : Approx. $20\mu V/\Omega$.

Action on input disconnection : UP scale.

RTD input

Input type : Pt100 (JIS/IEC), JPt100 (JIS)

Leadwire resistance : Approx. less than 20Ω .

Action on input disconnection : UP scale.

b) DC voltage input group

Input level : 0~10mV, 0~100mV, 0~1V, 0~5V, 0~10V, 1~5V

Action on input disconnection : DOWN scale (value around zero).

c) DC current input group

Input level : 0~20mA, 4~20mA

Action on input disconnection : DOWN scale (value around zero).

2. Accuracy

(a) Measurement accuracy : $\pm(0.1\% \text{ of span} + 1 \text{ digit})$

(b) Cold junction compensation error : within $\pm 1.0^\circ C$ (between 0 and $50^\circ C$)

* Accuracy is not guaranteed between 0 and $399^\circ C$ (0 and $800^\circ F$) of type B Thermocouple input.

3. PV sampling time : 0.25 second.

4. PV bias : -5.00 to 5.00% of span.

5. Bar-graph display

REX-F900 : 20-dot green LED.

REX-F400 REX-F700 : 10-dot green LED.

MV, deviation or POS (valve position) display (configurable)

6. Control method

a) ON/OFF control.

b) Brilliant PID control with enhanced autotuning.

c) Brilliant PID (heat/cool type).

(Possible to select dedicated autotuning function for extruder)

d) Position proportioning control.

7. Memory area

REX-F900 REX-F700 : 8 areas

REX-F400 : 2 areas (8 areas if Z-163 is specified)

8. Control start/stop function : supplied as standard.

9. Balanceless bumpless

Balanceless bumpless transfer between Auto and Manual (both directions). This function is not supplied on T/C and RTD input types except position proportioning type (code Y).

10. Major setting range

Setting range : Same as input range.

Heating prop. band : 0.1 to 999.9% of span (Zero is not settable).

Cooling prop. band : 0.1 to 999.9% of span (Zero is not settable).

Integral time : 1 to 3600 sec. (Zero is not settable).

Derivative time : 0.1 to 3600 sec. (PI action when D=0).

Deadband : -10.0 to +10.0% of span.

Control response : Slow, medium and fast.

Proportional cycle : 1 to 100 sec.

Output limiter high : -5.0 to 105.0%

Output limiter low : -5.0 to 105.0%

Output changing rate limiter : 0.1 to 100.0%/sec (OFF by setting zero).

11. Control output

Current output : 4~20mA or 0~20mA DC (Load resistance less than 600Ω)

Continuous voltage output : 0~5V, 0~10V, 1~5V DC (Load resistance more than $1K\Omega$).

Voltage pulse output : 0/12 DC (Load resistance more than 600Ω).

Relay output : (OUT1) 1c contact, 250V AC 3A (resistive load)

(OUT2) 1a contact, 250V AC 3A (resistive load)

Triac trigger output : Zero-cross method. Effective ON current 50mA (at $50^\circ C$), 70mA (at $25^\circ C$).

* Triac trigger output is not available on OUT2 of heat/cool and position proportioning types.

12. Motor valve control (Position proportioning type only)

Input resistance (Feedback resistance) : 135 ohms as standard

(Other feedback : 100, 200, 500, 1K, 5K, 10K ohms).

POS sampling time : 1 sec.

Neutral band : 0.1 to 10.0% (Output), resolution 0.1%

Output : Relay output, 250V AC 3A (resistive load)

1c contact for OPEN and 1a contact for CLOSE.

Motor rotating speed : Suitable for 20 to 240 seconds (Full open to full close).

13. Alarm function (option)

a) No. of alarm : 2 points (Independently programmable).

b) Alarm action : Programmable (Process, Deviation, FAIL)

c) Alarm delay : 0 to 600 sec.

d) Alarm output : Relay output, 1a contact 250V AC 1A (resistive load).

14. Remote setpoint function (option)

a) Remote setpoint signal (RS input)

1] DC voltage (low) : 0~10mV, 0~100mV, 0~1V DC

2] DC voltage (high) : 0~5V, 1~5V, 0~10V DC

3] DC current : 0~20mA, 4~20mA DC

b) Sampling time : 0.5 sec.

* PV input and RS input are not isolated from each other.

15. Heater break alarm (option)

a) Input : Current detector CTL-6-P-N (30A) or CTL-I2-S56-IOL-N (100A).

b) Display range : 0.0 to 100.0A

c) Output : Relay output, 250V 1A (resistive load), 1a contact.

* When heater break alarm (HBA) function is used, remote setpoint function is not available.

* When control output type is current output or continuous voltage, heater break alarm is not available.

16. Retransmission output (option)

a) No. of output : 1 point.

* Output data can be configured. PV for process value, DEV for deviation, SV (L) for local setpoint, SV (R) for remote setpoint, MV for heating or cooling output and POS for valve position.

b) Output type

1] DC voltage : 0~10mV, 0~100mV, 0~1V, 0~5V, 0~10V, 1~5V

2] DC current : 0~20mA, 4~20mA

17. External contact input (option)

REX-F900, REX-F700 : 4 points.

a) Memory area; 3 points (BCD)

b) Mode change ; 1 point

REX-F400 : 1 point (memory area or mode change).

18. Digital communication (option)

a) Communication method : RS-422A (4-wire), RS-485 (2-wire), RS-232C (3-wire)

b) Communication speed : 1200, 2400, 4800, 9600, (19200) * BPS

c) Bit format

1] Start bit : 1

2] Data bit : 7 or 8

3] Parity bit : "with" or "without", even or odd in case of "with" parity

4] Stop bit : 1 or 2

d) Communication code : ASCII (JIS) 7-bit code

* RS-485 only.

19. General specifications

Self-diagnosis function : ROM/RAM check, input value check, CPU power supply monitor, and watchdog timer.

Insulation resistance

a) Between input and ground terminals : More than 20M ohms (500V DC).

b) Between power and ground terminals : More than 20M ohms (500V DC).

Dielectric strength

a) Between input and ground terminals : 1000V AC for one minute.

b) Between power and ground terminals : 1500V AC for one minute.

Supply voltage : 90 to 264V AC (including supply voltage variation).

[Rating : 100 to 240V AC] (50/60Hz common use)

24VDC, 24VAC

Power consumption : REX-F900 : Less than 15VA (at 264V AC)

REX-F700 : Less than 13VA (at 264V AC)

REX-F400 : Less than 12VA (at 264V AC)

24V AC : Less than 8VA.

24V DC : Less than 350mA.

Effect by power failure : HOT or COLD start selectable.

Memory back up

a) RAM is backed up by lithium battery.

b) Data retaining period : Approx. 10 years (Depends on storage and operating conditions)

Net weight : REX-F900 : 0.45kg.

REX-F700 : 0.35kg.

REX-F400 : 0.31kg.

External dimensions : (REX-F900) 96×96×100mm.

(REX-F700) 72×72×100mm.

(REX-F400) 96×48×100mm.

■ Model and Suffix Code

Specification	Model and Suffix Code							
	REX-F400	REX-F700	REX-F900		*			
Control action	ON/OFF control PID control with AT Heat/Cool PID Heat/Cool PID with AT for extruder (Air cooling type) Heat/Cool PID with AT for extruder (Water cooling type) Position proportional PID	A F V B W Y						
Input type	See input and range codes	---	<input checked="" type="checkbox"/>					
Scale range	See input and range codes	---		<input checked="" type="checkbox"/>				
Control output (OUT1)	Relay output Voltage pulse Triac trigger DC mA, V (Nos. 4~8)	---		M V G <input checked="" type="checkbox"/>				
Control output (OUT2)	Control actions A,F,Y Relay output Voltage pulse Triac trigger DC mA, V (Nos. 4~8)	---		No code M V G <input checked="" type="checkbox"/>				
Alarm 1	No alarm See alarm code	---		N <input checked="" type="checkbox"/>				
Alarm 2	No alarm See alarm code	---		N <input checked="" type="checkbox"/>				
Remote setpoint	Not supplied See signal code	---		N <input checked="" type="checkbox"/>				
Contact input	Not supplied Memory area A/M selection R/L selection C/L selection (Only F700/F900) Memory area+A/M (Only F700/F900) Memory area+R/L (Only F700/F900) Memory area+C/L (Only F900)	---		N 1 2 3 4 5 6 7				
Analog output	Not supplied See signal code	---		N <input checked="" type="checkbox"/>				
Computer interface	Not supplied RS-232C RS-422A (4-wire) RS-485 (2-wire)	---		N 1 4 5				
Front panel color	Blue (standard) Black	---		N A				

■ Table 1. Combination of control action and output

Action \ Output	M Relay output	V Voltage pulse	G Triac trigger	4~8 DC mA, V
ON/OFF control	<input checked="" type="radio"/>	<input checked="" type="radio"/>	<input checked="" type="radio"/>	<input checked="" type="checkbox"/>
PID control with AT	<input checked="" type="radio"/>	<input checked="" type="radio"/>	<input checked="" type="radio"/>	<input checked="" type="radio"/>
OUT(1) of heat/cool PID	<input checked="" type="radio"/>	<input checked="" type="radio"/>	<input checked="" type="radio"/>	<input checked="" type="radio"/>
OUT(2) of heat/cool PID	<input checked="" type="radio"/>	<input checked="" type="radio"/>	<input checked="" type="checkbox"/>	<input checked="" type="radio"/>
Position proportional PID	<input checked="" type="radio"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>

: Available, : Not available

■ Table 2. Combination of option and type

Option \ Type	F900	F700	F400
Contact input (Memory area)	<input checked="" type="radio"/>	<input checked="" type="checkbox"/>	<input checked="" type="radio"/>
Analog output	<input checked="" type="radio"/>	<input checked="" type="radio"/>	<input checked="" type="checkbox"/>
Computer interface	<input checked="" type="radio"/>	<input checked="" type="checkbox"/>	<input checked="" type="radio"/>
Position proportional PID	<input checked="" type="radio"/>	<input checked="" type="radio"/>	<input checked="" type="radio"/>

: Available, : Not available

: Other options are not selectable if this item is specified.

Note :

1. A/M function is not available on thermocouple and RTD input types except control action Y.
2. No need to specify (*) if no option is required. If any option is supplied, please specify all suffix code.
3. Please use alarm 2 for heater break alarm (HBA).
4. Heater break alarm and remote setpoint are not available at the same time.
5. CT (Current transformer) for heater break alarm is sold separately.
 - CTL-6-P-N (0~30A) Through hole φ5.8
 - CTL-12-S56-10L-N (0~100A) Through hole φ12

How to specify safety standard

When you specify the models with CE mark· UL / CSA certification,

Please add the suffix of "/ CE " to the model code.

F700 is not available with UL, CSA and CE marking.

■ Output code

4	0 to 5V DC	5	0 to 10V DC	6	I to 5V DC	7	0 to 20mA DC	8	4 to 20mA DC
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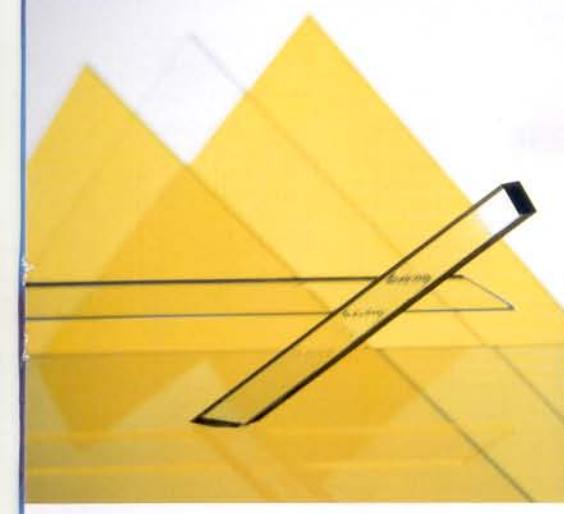
■ Alarm code

A	Deviation High	B	Deviation Low	C	Deviation High-Low	D	Deviation Band
E	Deviation High (with alarm hold)	F	Deviation Low (with alarm hold)	G	Deviation High-Low (with alarm hold)	H	Process High
J	Process Low	K	Process High (with alarm hold)	L	Process Low (with alarm hold)	M	FAIL
P	HBA (CTL-6-P-N)	S	HBA (CTL-12-S56-10L-N)				

■ Signal code

1	0 to 10mV DC	2	0 to 100mV DC	3	0 to 1V DC	4	0 to 5V DC	5	0 to 10V DC
6	I to 5V DC	7	0 to 20mA DC	8	4 to 20mA DC				

Supply voltage	AC100~240V	AC24V	DC24V
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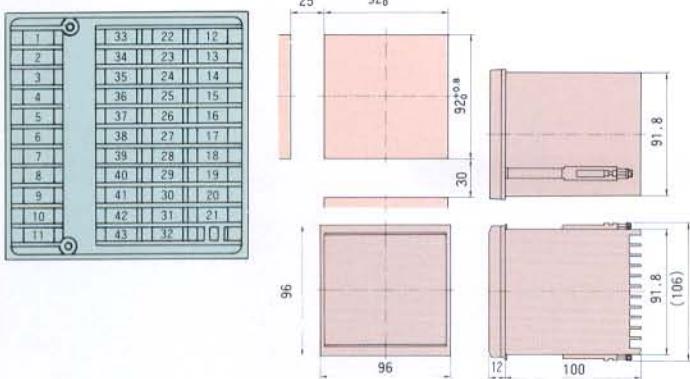
(Black type)

■ Scale Range and Input Code

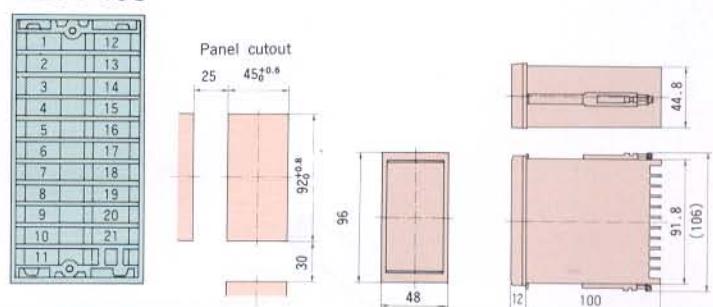
	Code Input	Code Scale	Scale Range	Code Input	Code Scale	Scale Range	Code Input	Code Scale	Scale Range
T/C input	Type K (JIS/IEC)	K 0 8	-199.9~300.0 °C	K 0 9	0.0~400.0 °C		K 1 0	0.0~800.0 °C	
		K 1 1	0~1300 °C						
		K A 4	0.0~800.0 °F	K A 5	0~2400 °F				
	Type J (JIS/IEC)	J 0 7	-199.9~300.0 °C	J 0 8	0.0~400.0 °C		J 0 9	0.0~800.0 °C	
		J 0 6	0~1200 °C						
		J A 4	0.0~700.0 °F	J A 5	0~2100 °F				
	Type R (JIS/IEC)	R 0 3	0~1700 °C						
		R A 1	0~3200 °F						
	Type S (JIS/IEC)	S 0 3	0~1700 °C						
		S A 1	0~3200 °F						
	Type B (JIS/IEC)	B 0 3	0~1800 °C						
		B A 3	0~3300 °F						
RTD input	Type E (JIS/IEC)	E 0 3	0.0~700.0 °C	E 0 2	0~1000 °C				
		E A 3	0~1800 °F						
	Type T (JIS/IEC)	T 0 5	-199.9~300.0 °C	T 0 6	0.0~400.0 °C				
		T A 6	-199.9~400.0 °F	T A 7	0.0~700.0 °F				
DC input	Type N (IEC)	N 0 2	0~1300 °C						
		N A 1	0~2300 °F						
	Type PLII (NBS)	A 0 1	0~1300 °C						
		A A 3	0~2300 °F						
	Type (ASTM) W5Re/W26Re	W 0 3	0~2300 °C						
		W A 2	0~4200 °F						
	Type U (DIN)	U 0 4	0.0~600.0 °C						
		U A 4	0~1100 °F						
	Type L (DIN)	L 0 3	0.0~400.0 °C	L 0 4	0.0~900.0 °C				
		L A 2	0~1600 °F						
JPt100 (JIS)	P 0 4	-100.0~100.0 °C		P 1 1	-199.9~500.0 °C				
	P B 1	-150.0~200.0 °F		P B 2	-199.9~900.0 °F				
Pt100 (JIS/IEC)	D 0 4	-100.0~100.0 °C		D 1 2	-199.9~600.0 °C				
	D B 1	-150.0~200.0 °F		D B 3	-199.9~999.9 °F				
0~10mV	1 0 1	0.0~100.0%							
0~100mV	2 0 1	0.0~100.0%							
0~1V	3 0 1	0.0~100.0%							
0~5V	4 0 1	0.0~100.0%							
0~10V	5 0 1	0.0~100.0%							
1~5V	6 0 1	0.0~100.0%							
0~20mA	7 0 1	0.0~100.0%							
4~20mA	8 0 1	0.0~100.0%							

Rear Terminal Wiring and Dimensional Details

REX-F900



REX-F400



* Terminals 22 thru 32 are used only F900.

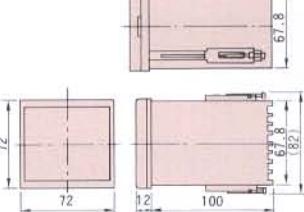
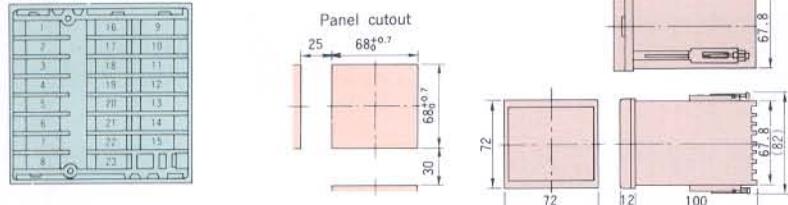
No.	Functions		
1			Ground
2	AC		DC
3	100~240V		24V
4	NO		
5	ALM 1		Alarm output
6	NO		ALM 2
7	Relay	DC V, mV, mA	Control output (OUT2)
8	C	+	
9	Relay	DC V, mV, mA	Trigger
10	C	T ₂	Control output (OUT1)
11	NO	+	T ₁
	NC	-	G

No.	Functions		
22	COM (-)		
23	1 (+)		AREA (Area change)
24	2 (+)		Contact input
25	4 (+)		
26	RS-232C	RS-485	RS-422A
27	SG	T ₈ (A)	
28	SD	T ₈ (B)	
29	RD	T(A)	Communication
30		T(B)	
31		R(A)	
32		R(B)	
	AO		
	Analog output		

* Communication of terminals 12 thru 16 are used only F400.

No.	Functions		
12	+	Contact	RS-232C
13	-	input	SG SG SG
14	O		SD T ₈ (A) T(A)
15	w-W	FBR (Y action)	RD T ₈ (B) T(B)
16	C		R(A) R(B)
17		Remote setpoint	CTL input
18		RS	CT
19	TC-RTD	DC V, mV	DC mA
20	+ TC	A	B
21	-	+ +	- -
22			
23			

REX-F700



No.	Functions		
1			Ground
2	AC		DC
3	100~240V		24V
4	Relay		Control output (OUT2)
5	C		
6	NO		
7	Relay	DC V, mV, mA	Trigger
8	C	T ₂	Control output (OUT1)
9	NO	+	T ₁
10	NC	-	G

No.	Functions		
16	O	FBR (Y action)	RS-232C
17	w-W		SG SG SG
18	C		SD T ₈ (A) T(A)
19	+ AO	Analog output	RD T ₈ (B) T(B)
20	-		R(A) R(B)
21			
22		NO	AREA (Area change)
23		NO	Contact input
		ALM1	
		ALM2	Alarm output

No.	Functions		
9	+	DI (Mode change)	Contact input
10	-		
11	Remote	CTL	Analog input
12	+	RS	CT
13	-		
14	TC-RTD	DC V, mV	DC mA
15	+ TC	A	B
16	-	+ +	- -



For proper operation of this precision instrument, please read the instruction manual carefully. This instrument is not designed for use with medical equipment affecting human life. To ensure safe operation of this instrument, please prepare an appropriate independent protection device.



한국이화기술주식회사
텔텍소프트웨어주식회사
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