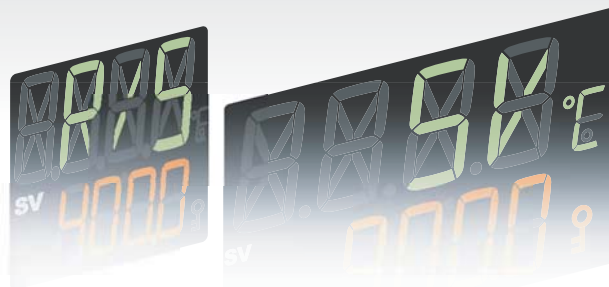


CONTROLLER

Temperature Controller

RF SERIES

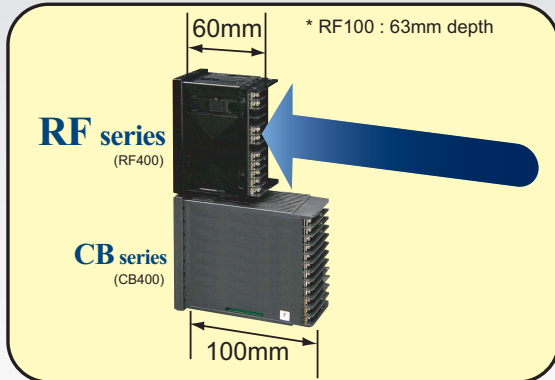


Improved visibility and enhanced PID control

Save panel space with short depth housing

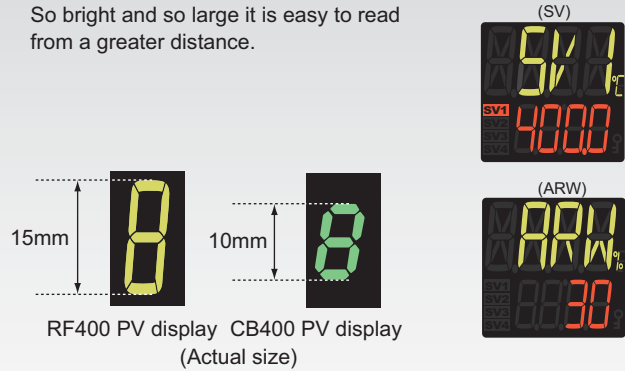
Panel space saving : 60mm depth

The RF Series has very short depth.
The series was designed with a mounting bracket that allows close horizontal mounting of as many as six units.



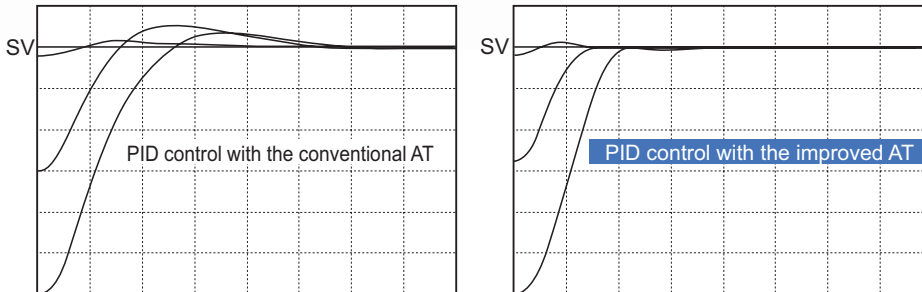
Easy-to-read with large 11-segment LCD display

So bright and so large it is easy to read from a greater distance.



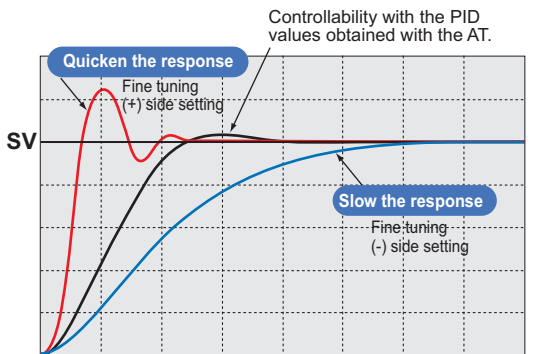
Calculates optimum PID values to stabilize control faster than ever

The improved autotuning algorithm calculates optimum PID values that shortens the time to reach stable control at the set value as well as eliminating overshoot/undershoot.
The new PID algorithm also suppress overshoot/undershoot against external disturbance.



Easy Fine tuning with 6-level of control response adjustment

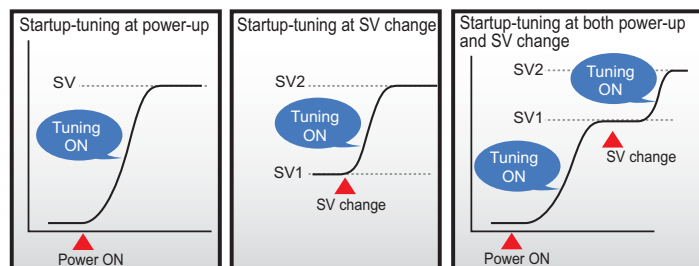
After the PID values have been autotuned, the Fine tuning (FT) function allows the operator to adjust the control response speed with a 6-level adjustment parameter (-3 to +3) without changing PID value.



- 3 to -1: Faster response
- 1 to 3: Slower response
- 0: Function OFF

Startup tuning

Startup tuning eliminates time required for conventional autotuning as it calculates optimum PID values by temperature characteristics at start up. It is useful in applications which require a long time for conventional autotuning. The timing of activation of start-up tuning can be selected from at power-up, at setpoint change, and at power-up/setpoint change. It is also settable to Only-once or always-ON.



- Startup tuning function can be set ON/OFF.
- Heater power needs to be turned on simultaneously with or before turning on power to the temperature controller.
- If startup tuning does not calculate suitable PID values due to characteristics of application, use Autotuning function.

Specifications

Input

Input	<ul style="list-style-type: none"> • Universal input a) Thermocouple : K, J, E, T, R, S, B, N (JIS/IEC) PLII (NBS), W5Re/W26Re (ASTM) b) RTD : Pt100 (JIS/IEC), JPt100 (JIS) • 3-wire system
Sampling time	0.5 sec.
Influence of external resistance	0.25 μ V/ Ω (Thermocouple input)
Influence of lead resistance	0.03% of span/ Ω (RTD input)
	• Maximum 10 Ω per wire
Input break action	Thermocouple input : Up-scale/Down-scale (Selectable) RTD input : Up-scale
Input short action	Down-scale (RTD input)
Input digital filter	1 to 100 sec. (OFF when 0 is set.)
PV bias	-1999 to 9999°C (°F) or -199.9 to 999.9°C (°F)

Performance

Measuring accuracy	See measuring accuracy code table
Influence of ambient temperature	$\pm 0.06^\circ\text{C}/^\circ\text{C}$ [at 5 to 40°C]
Close horizontal mounting error	$\pm 1.5^\circ\text{C}$ [Less than -100°C input : $\pm 3^\circ\text{C}$]
Insulation resistance	More than 20M Ω (500V DC) between measured terminals and ground More than 20M Ω (500V DC) between power terminals and ground
Dielectric voltage	1000V AC for 1 minute between measured terminals and ground 1500V AC for 1 minute between power terminals and ground

Control

Control method	PID control (With autotuning / Startup tuning / Fine tuning)
	• P, PI, PD, ON/OFF control selectable
	• Direct action/Reverse action is selectable
Setting range	a) Proportional band : 0 to input span(°C, °F) (ON/OFF control when P = 0) b) Integral time : 0 to 3600 sec (PD control when I = 0) c) Derivative time : 0 to 3600 sec (PI control when D = 0) d) Anti-reset-windup : 1 to 100% of proportional band (PD control when I = 0) e) Output limiter : -5.0 to +105.0% (High/Low individual setting) f) Proportional cycle : 1 to 100 sec
Control output	a) Relay contact output, Form a contact, 250V AC 3A (Resistive load) • Electric life : 100,000 cycles or more b) Voltage pulse output, 0/12V DC (Load resistance : more than 600 Ω)

Alarm

Number of event outputs	1 point
Alarm type	Deviation high, Deviation low, Deviation high/low*1, Band*1, Process high, Process low, Set value high, Set value low, LBA (Control loop break alarm) FAIL, RUN status output *1: Two types of alarm settings are field-selectable. 1. Independent high and low settings. 2. Common high/low setting (Factory setting, unless specified in alarm code when ordering)
	<ul style="list-style-type: none"> • LBA : LBA time 0 to 7200 sec LBA deadband 0 to input span
Alarm output	Relay contact output, Form a contact, 250V AC 1A (Resistive load)
Other functions	a) Hold/Re-hold action • Hold action is activated at power-on and stop-to-run. Re-hold action is activated at power-on, stop-to-run, and the control set value change. b) Alarm output ON/OFF at stop mode is selectable. c) Energized/de-energized action is configurable. d) Delay timer : 0.0 to 600.0 sec e) Interlock (latch) function is configurable.

Waterproof/Dustproof

(Optional)

NEMA4X, IP66
 • Waterproof/Dustproof protection is only effective from the front in panel mounted installation.

General Specifications

Supply voltage	90 to 264V AC (Including supply voltage variation) Rating: 100 to 240V AC (50/60Hz common)
Power consumption	RF100: Less than 8.1VA (240V), Less than 5.1VA(100V) RF400: Less than 7.5VA (240V), Less than 4.9VA (100V) RF900: Less than 7.7VA (240V), Less than 5.2VA (100V)
Rush current	Less than 13.3A (240V), Less than 5.6A (100V)
Power failure	A power failure of 20msec or less will not affect the control action.
Memory backup	Backed up by Nonvolatile memory <ul style="list-style-type: none"> • Data retaining period : Approx. 10 years • Number of writing : Approx. 1,000,000 times. (Depending on storage and operating conditions.)
Ambient temperature	0 to 50°C (32 to 122°F)
Ambient humidity	10 to 90%RH (Non condensing) <ul style="list-style-type: none"> • Absolute humidity : MAX.W.C29.3g/m³ dry air at 101.3kPa
External dimensions (W x H x D)	RF100: 48 x 48 x 63mm, RF400: 48 x 96 x 60mm RF900: 48 x 48 x 60mm
Weight	RF100 : Approx. 100g, RF400: Approx. 145g, RF900: Approx. 210g
Compliance with standards	UL,cUL,CE,C-Tick

Rear Terminals

RF100

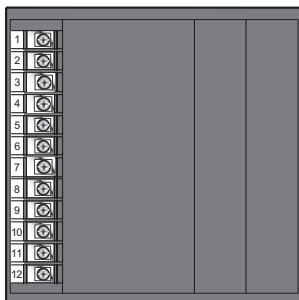


• Use a solderless terminal for screw size M3, width 5.5mm or less.

No	Contents
1	100 to 240V Power supply
2	
3	Control output 1 (OUT1) (1) Relay contact output (2) Voltage pulse
4	
5	Control output 1 (OUT1) (1) Relay contact output (2) Voltage pulse
6	

No	Contents
7	Digital output 1 (ALM1) Relay contact output
8	Measuring input (1) Thermocouple (2) RTD
9	
10	Measuring input (1) Thermocouple (2) RTD
11	
12	Measuring input (1) Thermocouple (2) RTD

RF900



• Use a solderless terminal for screw size M3, width 5.5mm or less.

RF400



No	Contents
1	100 to 240V AC Power supply
2	
3	Control output (1) Relay contact (2) Voltage pulse
4	
5	Control output (1) Relay contact (2) Voltage pulse
6	
7	Alarm output Relay contact
8	
9	Alarm output Relay contact
10	
11	Measuring input (1) Thermocouple (2) RTD
12	

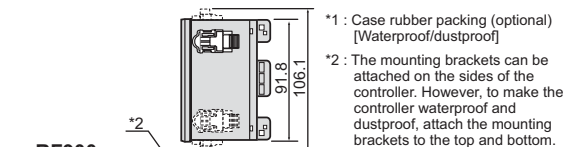
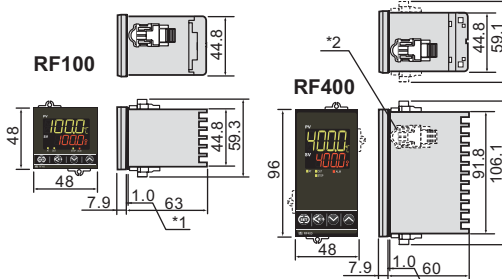
Measuring accuracy table

Input Type	Range	Accuracy
K, J, T, E	Lower than -100°C (-148°F) -100 to 500°C (-148 to 932°F) 500°C (932°F) or higher	$\pm (3.0^\circ\text{C} [5.4^\circ\text{F}] + 1 \text{ digit})$ $\pm (1.5^\circ\text{C} [2.7^\circ\text{F}] + 1 \text{ digit})$ $\pm (0.3\% \text{ of Reading} + 1 \text{ digit})$
N, R, S, PLII W5Re/W26Re	Lower than 0°C (32°F) 0 to 1000°C (32 to 1832°F) 1000°C (1832°F) or higher	$\pm (6.0^\circ\text{C} [10.8^\circ\text{F}] + 1 \text{ digit})$ $\pm (3.0^\circ\text{C} [5.4^\circ\text{F}] + 1 \text{ digit})$ $\pm (0.3\% \text{ of Reading} + 1 \text{ digit})$
B	Lower than 400°C (752°F) 400 to 1000°C (752 to 1832°F) 1000°C (1832°F) or higher	$\pm (7.0^\circ\text{C} [12.6^\circ\text{F}] + 1 \text{ digit})$ $\pm (3^\circ\text{C} [5.4^\circ\text{F}] + 1 \text{ digit})$ $\pm (0.3\% \text{ of Reading} + 1 \text{ digit})$
Pt100, JPt100	Lower than 200°C (392°F) 200°C (392°F) or higher	$\pm (0.6^\circ\text{C} [1.1^\circ\text{F}] + 1 \text{ digit})$ $\pm (0.3\% \text{ of Reading} + 1 \text{ digit})$

*1 : Accuracy is not guaranteed for less than -100°C.

*2 : Accuracy is not guaranteed for less than 400°C (752°F) for Input Type R, S, B, and W5Re/W26Re.

External Dimensions



*1 : Case rubber packing (optional) [Waterproof/dustproof]

*2 : The mounting brackets can be attached on the sides of the controller. However, to make the controller waterproof and dustproof, attach the mounting brackets to the top and bottom.

• If you specified the waterproof and dustproof structure, four mounting brackets are included with the RF900 as accessories.

Model and Suffix Codes

Specifications	48 x 48mm (1/16 DIN) 48 x 96mm (1/8 DIN) 96 x 96mm (1/4 DIN)	RF100 RF400 RF900	① ② ③ ④ ⑤ ⑥ ⑦ ⑧
① Control Method	PID control (Reverse action) PID control (Direct action)	F D	
② Input Range	See Input Range Code Table		
③ Control Output	Relay contact output Voltage pulse output (0/12V DC)	M V	
④ Alarm	See Alarm Code Table		
⑤ Waterproof/Dustproof	Not supplied Waterproof/Dustproof protection	N 1	
⑥ Case color	Black case		A
⑦ Instrument version	Version symbol		Y
⑧ Specification No.	Specification No.		Z-1132

Alarm Code Table (Programmable)

Code	Alarm Type
A	Deviation High
B	Deviation Low
C	Deviation High/Low (Common high/low setting)
D	Band (Common high/low setting)
E	Deviation High with Hold
F	Deviation Low with Hold
G	Deviation High/Low with Hold (Common high/low setting)
H	Process High
J	Process Low
K	Process High with Hold
L	Process Low with Hold
Q	Deviation High with Alarm Re-hold
R	Deviation Low with Alarm Re-hold
T	Deviation High/Low with Re-Hold (Common high/low setting)
U	Band (Individual high and low settings)
V	Set value High
W	Set value Low
X	Deviation High/Low (Individual high and low settings)
Y	Deviation High/Low with Alarm Hold (Individual high and low settings)
Z	Deviation High/Low with Alarm Re-Hold (Individual high and low settings)
2	Loop break alarm
3	FAIL
4	RUN status

Input Range Code Table (Field-programmable)

Thermocouple

Input	Code	Range	
K (JIS/IEC)	K 01	0 to 200°C	
	K 02	0 to 400°C	
	K 03	0 to 600°C	
	K 04	0 to 800°C	
	K 05	0 to 1000°C	
	K 06	0 to 1200°C	
	K 41	-200 to +1372°C	
	K 09	0.0 to 400.0°C	
	K 10	0.0 to 800.0°C	
	K 43	-199.9 to +400.0°C	
	K A1	0 to 800°F	
	K A2	0 to 1600°F	
	K C7	-328 to +2501°F	
	K C8	-100.0 to +752.0°F	
	J (JIS/IEC)	J 01	0 to 200°C
J 02		0 to 400°C	
J 03		0 to 600°C	
J 04		0 to 800°C	
J 05		0 to 1000°C	
J 06		0 to 1200°C	
J 15		-200 to +1200°C	
J 07		-199.9 to +300.0°C	
J A1		0 to 800°F	
J A2		0 to 1600°F	
J B9		-328 to +2192°F	
J C8		-199.9 to +550.0°F	
R (JIS/IEC)		R 02	0 to 1769°C
		R A2	0 to 3216°F

Input	Code	Range	
S (JIS/IEC)	S 02	0 to 1769°C	
	S A2	0 to 3216°F	
	B (JIS/IEC)	B 01	400 to 1800°C
		B A1	800 to 3200°F
E (JIS/IEC)	E 01	0 to 800°C	
	E A1	0 to 1600°F	
N (JIS/IEC)	N 01	0 to 1200°C	
	N A1	0 to 2300°F	
T (JIS/IEC)	T 02	-199.9 to +100.0°C	
	T 03	-100.0 to +200.0°C	
	T 05	-199.9 to +300.0°C	
	T 06	0.0 to 400.0°C	
	T C7	0.0 to 600.0°F	
	T C8	-199.9 to +300.0°F	
	T C9	-328 to +752°F	
	T A1	0 to 2000°C	
W5Re/W26Re (ASTM)	W 02	0 to 2320°C	
	W A4	0 to 4208°F	
PLII (NBS)	A 01	0 to 1300°C	
	A 02	0 to 1390°C	
A	A A1	0 to 2400°F	
	A A2	0 to 2534°F	

RTD

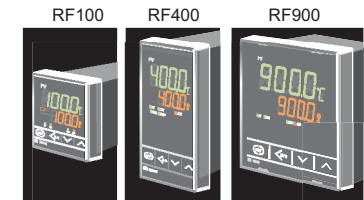
Input	Code	Range
Pt100 (JIS/IEC)	D 01	-199.9 to +649.0°C
	D 02	-199.9 to +200.0°C
	D 03	-100.0 to +50.0°C
	D 04	-100.0 to +100.0°C
	D 05	-100.0 to +200.0°C
	D 06	0.0 to 50.0°C
	D 07	0.0 to 100.0°C
	D 08	0.0 to 200.0°C
	D 09	0.0 to 300.0°C
	D 10	0.0 to 500.0°C
JpT100 (JIS)	D A2	-199.9 to +400.0°F
	D A3	-199.9 to +200.0°F
	D A4	-199.9 to +100.0°F
	D A5	-199.9 to +300.0°F
	D A6	0.0 to 100.0°F
	D A7	0.0 to 200.0°F
	D A8	0.0 to 400.0°F
	D A9	0.0 to 500.0°F
	D B2	-199.9 to +900.0°F
	P 01	-199.9 to +649.0°C
P 02	-199.9 to +200.0°C	
P 03	-100.0 to +50.0°C	
P 04	-100.0 to +100.0°C	
P 05	-100.0 to +200.0°C	
P 06	0.0 to 50.0°C	
P 07	0.0 to 100.0°C	
P 08	0.0 to 200.0°C	
P 09	0.0 to 300.0°C	
P 10	0.0 to 500.0°C	

*1 : Accuracy is not guaranteed for less than -100°C (-146°F).

*2 : Accuracy is not guaranteed for less than 400°C (752°F) for Input Type R, S, B, and W5Re/W26Re.

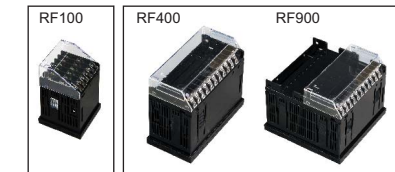
Accessory

Front Cover



Model Code : KRB100-36A Model Code : KRB400-36 Model Code : KRB900-36

Terminal Cover



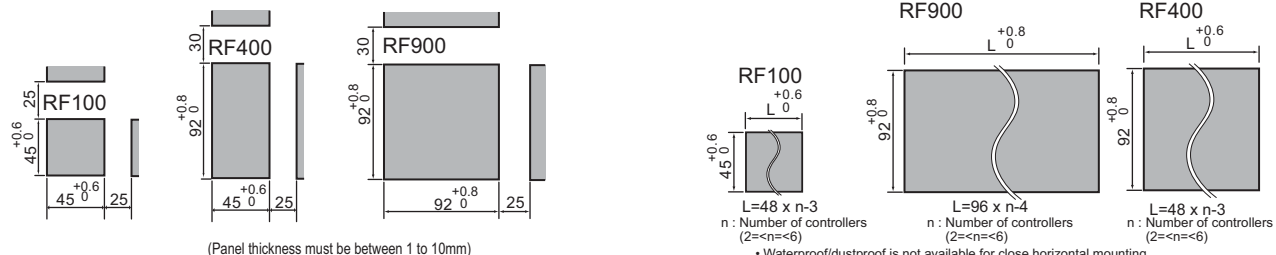
Model Code : KCA100-517 Model Code : KFB400-58

Panel Cutout Dimensions

Unit : mm

< Close horizontal mounting >

• Up to 6 units



(Panel thickness must be between 1 to 10mm)

* Waterproof/dustproof is not available for close horizontal mounting.



- Before operating this product, read the instruction manual carefully to avoid incorrect operation.
- This product is intended for use with industrial machines, test and measuring equipment. It is not designed for use with medical equipment.
- If it is possible that an accident may occur as a result of the failure of the product or some other abnormality, an appropriate independent protection device must be installed.

Caution for the export trade

All transactions must comply with laws, regulations, and treaties.

Caution for imitated products

As products imitating our product now appear on the market, be careful that you don't purchase these imitated products. We will not warrant such products nor bear the responsibility for any damage and/or accident caused by their use.

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