CONTROLLER

Temperature/Process Controller

FB900
FB400

RKC INSTRUMENT INC.

FB Series High Performance Control

High Performance Digital controller

1/4 DIN size
FB900

1/8 DIN size
FB400

The FB Series is a high performance process controller with a more advanced Brilliant II PID, autotuning, advanced tuning, selectable sampling cycle time of 0.05/0.1/0.25 second and 0.1 % of accuracy in short depth housing.

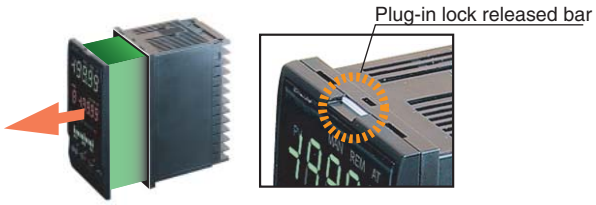
Versatility and easy maintenance in 60mm Depth

1 Panel space saving: 60mm depth

The FB Series has very short depth as a 1/8 or 1/4 DIN size controller. The series was designed with a mounting bracket that allows close horizontal mounting of as many as six units.

2 Easy maintenance

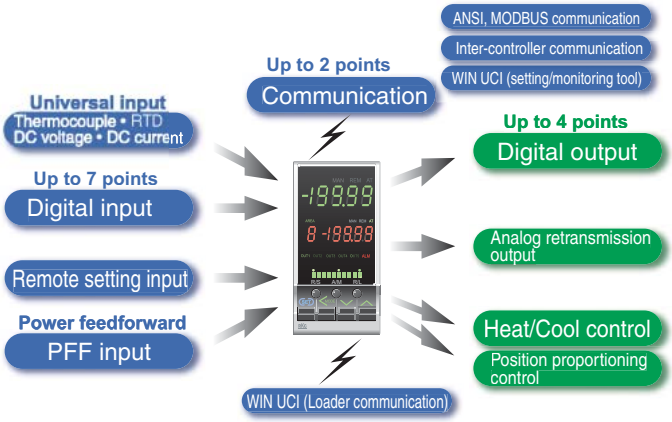
The internal assembly of the FB Series can be removed from the front.



3 Waterproof/Dustproof

NEMA4X and IP66 waterproof and dustproof protection for severe environments.

4 Numerous inputs and outputs

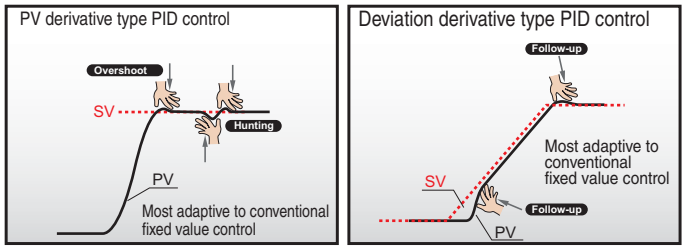


A more advanced Brilliant II PID with Enhanced Autotuning

Brilliant II PID Control

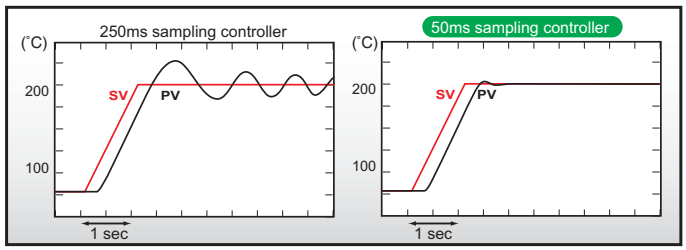
1 Selectable PID control algorithm

PID control algorithm is selectable in the FB Series to achieve the most precise control for various applications.
PV Derivative PID : suitable for fixed setpoint control (Factory setting)
Deviation Derivative PID : suitable for ramp control using ramp-to-setpoint function and cascade control.



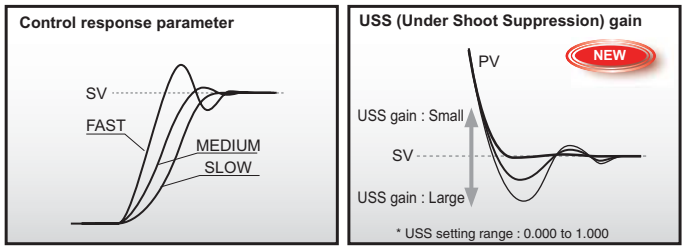
2 Selectable sampling time among 50ms, 100ms, and 250ms.

Selectable sampling time makes the FB Series suitable for any application ranging from pressure control requiring fast response to precise control requiring highest resolution. The selections are 100ms (factory setting) usually suitable for most of standard applications, 50ms for fast response applications, and 250ms for precise control requiring high-resolution. The PID parameters can be set in 1/10 unit which supports fast and accurate control. Ramp-to-setpoint and output-change-limiter functions are each settable for UP and DOWN so that a special heater can be controlled precisely.



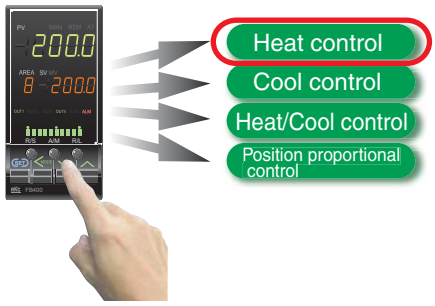
3 Advanced Heat/Cool PID algorithm with Undershoot Suppression

Advanced Heat/Cool PID algorithm achieves stable control by the Undershoot Suppression (USS) function, and independent P-I-D settings for both Heat and Cool which are effective for applications with strong cooling gain. Control Response type selection is settable to avoid overshoot at start-up and against external disturbance. The FB Series also offers selection of water cool and air cool PID control algorithm.



4 Configurable control type

The control type is configurable among Heat, Cool, Heat/Cool, and position proportioning.



Autotuning

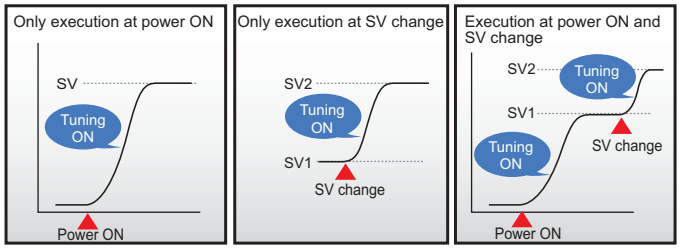
1 Autotuning to calculate optimum PID parameters

The improved Autotuning alrogithm calculates optimum PID parameters. For Heat/Cool control, PID parameters for both sides (Heat and Cool) are calculated.

2 Start-up tuning to eliminate time for autotuning

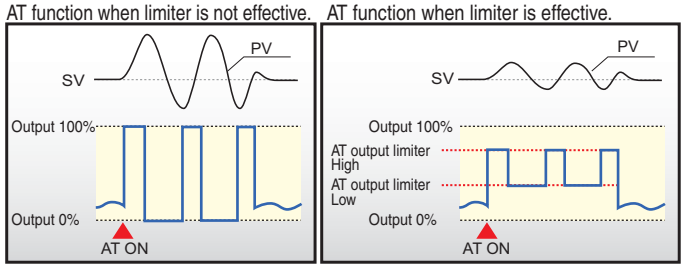
Start-up tuning eliminates time required for conventional autotuning as it calculates optimum PID values by temperature characteristics at start up. It is useful in applications which require a long time for conventional autotuning. The timing of activation of start-up tuning can be selected from at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

- Startup tuning is not available with Heat/Cool PID control type.
- Validity/invalidity of the startup tuning function can be set.
- Heater power needs to be turned on simultaneously with or before turning on power to the temperature controller.
- If start-up tuning does not calculate suitable PID values due to characteristics of application, use Autotuning function.



3 Output limiters high and low for autotuning

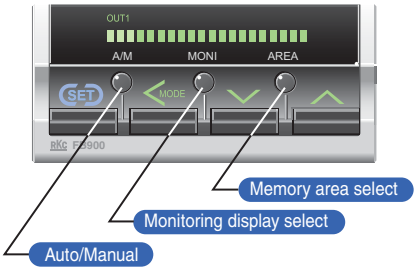
Output limiters high and low for autotuning enables autotuning to be used with any application in which the output has to be within limited range, even during autotuning. High and low are independently settable.



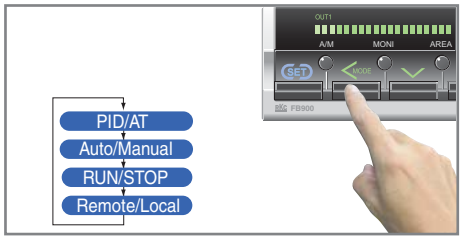
User-friendly key-operation and display

1 Direct Function Keys

Three direct function keys enable one-touch operation on frequently used functions such as Auto/Manual, Monitoring display scroll, and Memory area selection.
The keys can also be configured as RUN/STOP, Remote/Local, and Auto/Manual keys.



Pressing the MODE select key for 2 sec enables the same mode selection as in the conventional REX-F900/F400.



• Can be set to any of the following selection modes.

RUN/STOP
Remote/Local
Auto/Manual

(Also possible to invalidate the direct mode selection key function.)

2 Large, Crystal Clear 5-Digit Display Unit

The FB Series features an easy-to-read 20mm height five digit display which can show a range between -19999 and 19999.
(The display range varies depending on the input type.)

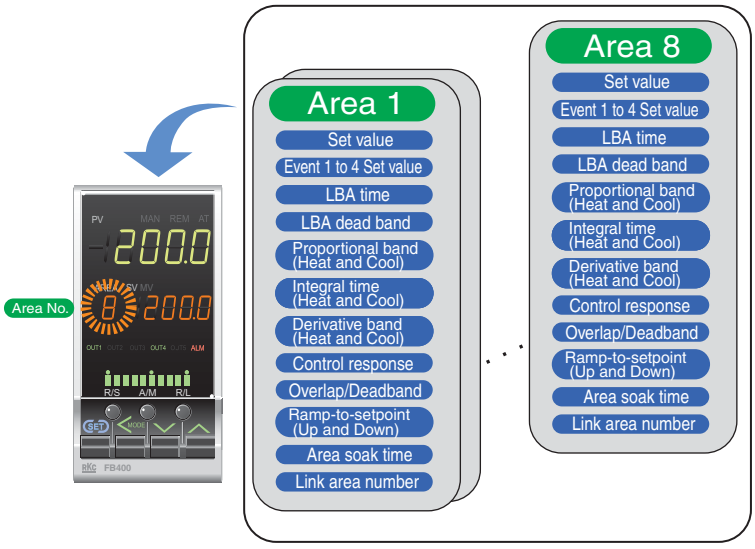
3 Bar Graph Display

The bar graph on the front panel can display control output value (factory setting), deviation between SV and PV, measured value, or CT1/CT2 input value. The FB900 bar graph display resolution is 20 LED segments and there are 10 LED segments for the FB400.

• Resolution can be set.

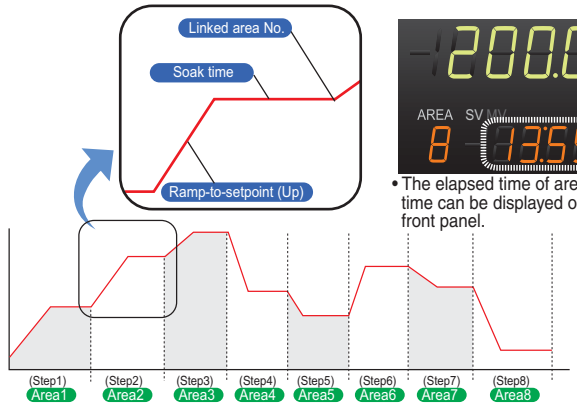
4 Recipe (Multi-memory Area) Function

The FB Series has Multi-memory Area function which stores up to 8 sets of control parameters. Parameters in a memory area can be changed at one time by selecting the memory area number through key operation, DI, or communication.



5 Ramp/Soak Program Control

Up to 16-segment ramp/soak control is available by using the Memory Area function (area soak time, link area number, ramp-to-setpoint Up and Down).

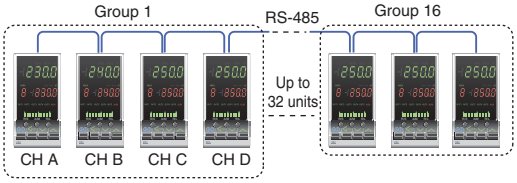


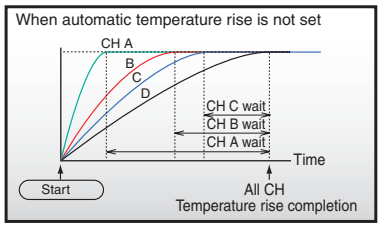
• The elapsed time of area soak time can be displayed on the front panel.

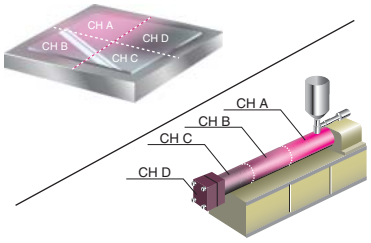
Temperature uniformity and stability

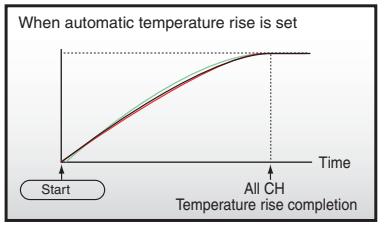
1 Temperature Uniformity at Ramp-up

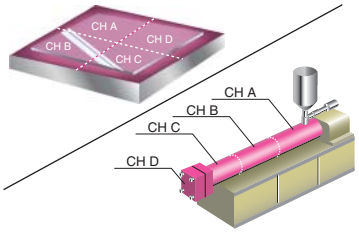
Auto-temperature-rise with learning function achieves temperature uniformity at ramp-up without partial thermal expansion even when multiple FB Series controllers are connected. Inter-controller communication by COM port 2 is used to send or receive information among controllers. At start-up, the learning function monitors and evaluates a heat-up balance among channels. Then it calculates ramp-up-rate for each channel to make all heaters follow the temperature-rise-curve of a channel with the longest time to reach setpoint. Up to 32 controllers with 16 groups can be configured.





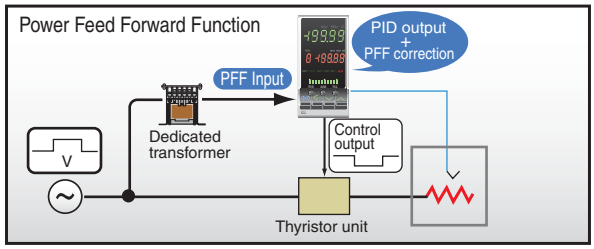






2 Power Feed Forward Function (Optional)

Power feed forward function constantly monitors the electrical load through a dedicated transformer. It then adjusts control output relative to power supply fluctuations to prevent sudden load output changes to the electrical heating elements.



Reinforced Insulation, Lead-free PCBs, Low Power Consumption

1 Reinforcement Insulated Power Supply Circuit

Power supply circuit of the FB Series has been designed to be reinforcement insulated. It saves cost to perform basic insulation on the equipment side.

<Requirements for electrical equipment according to safety standards>

The safety standards on electrical equipment (IEC 61010-1 and JISC 1010-1) request that the secondary side of the equipment which may be touched by the operator should be double insulated or reinforcement insulated* from high voltage causing electric shock.

• Insulation safeguarding personnel from electric shock which is equal to double insulation or higher is called "reinforced insulation".

2 Lead-free Design complying with EU Directive

The FB Series uses lead-free PCBs complying with EU Directive *.

* WEEE Directive (Waste Electrons/Electrical Equipment Directive) and RoHS Directive (Directive of Restricting the use of Harmful Materials for Electrical Products)

3 Low Power Consumption, Low Heat Generation

The power consumption is 30% less than the equivalent model of RKC REX-F900. The saving is 5VA per controller at 240VAC. It also generates less heat and it helps keep temperature low inside the control cabinet.

Easy-setup and Data Monitoring via a standard data port

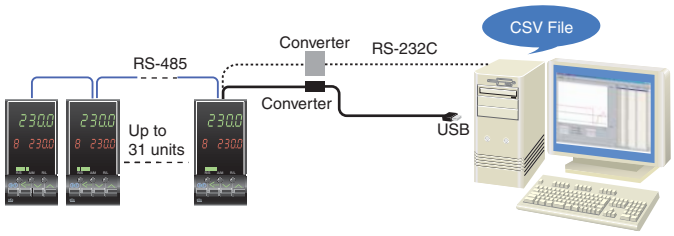
1 Communicate with a PC via USB port

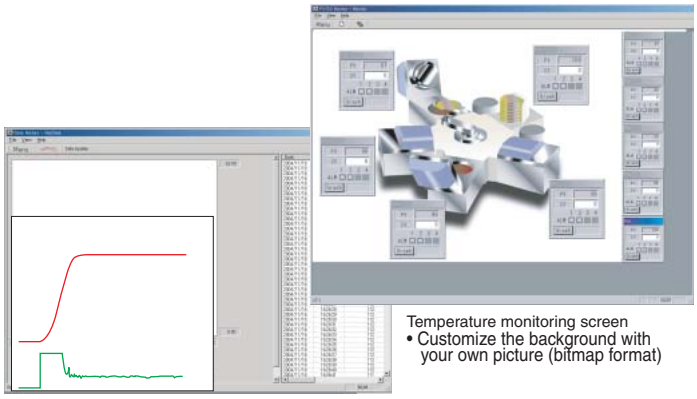
The FB Series has the loader port (provided as standard) to connect to a PC USB port with Windows2000/XP. The standard port allows setup and data logging to be managed by the PC. The FB Series is recognized as an external device on the PC.

"Win-UCI" software for setup & data logging is free.
Simply download "Win-UCI" from the RKC Instrument website (www.rkcinst.com).

Easy data monitoring/logging withWin-UCI.

The Win-UCI can store maximum 8,000 points of data. Data can be exported as an electronic file in CSV format. It has a trend graph function and data monitoring function.





Temperature monitoring screen
• Customize the background with your own picture (bitmap format)

Data logging and trend graph screen

Easy setup with Win-UCI

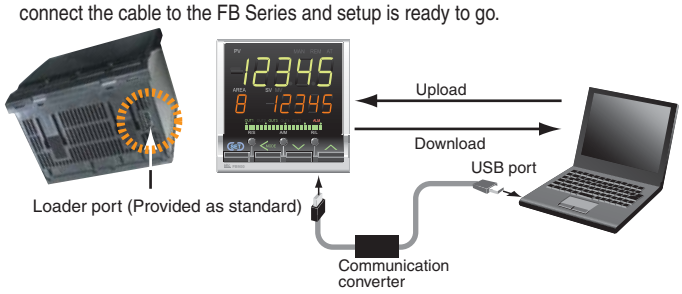
Using the Win-UCI, the controller setup and parameter settings can be done from a PC. The parameter settings can be stored on the PC making it easy to copy the same parameters to other FB Series controllers.

• The instrument must have a hardware required for selected functions.

Data setting screen

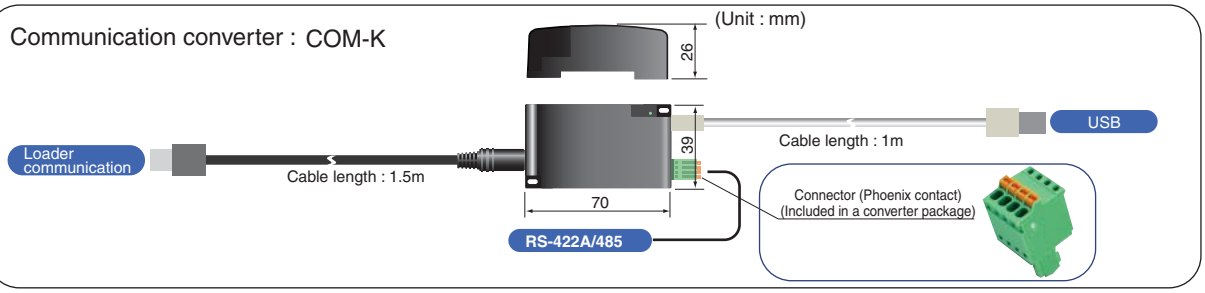
No power supply cable necessary at setup

When setting up the FB Series via the loader port, the power can be supplied from the PC via the USB port so no power supply cable is necessary. Just connect the cable to the FB Series and setup is ready to go.



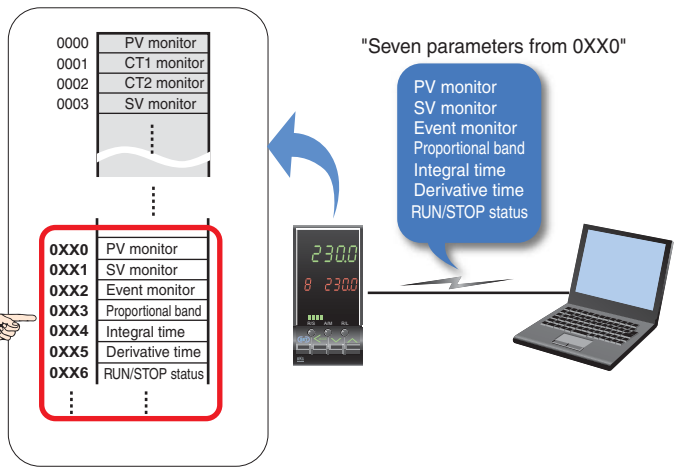
Communication converter : COM-K

(Unit : mm)



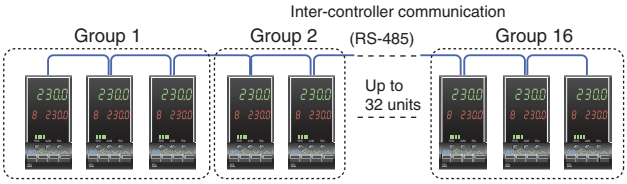
2 Mapping function for faster data update

With Modbus communication, up to 16 communication parameters can be mapped to continuous addresses to achieve the fastest communication. Mapping is configured on Win-UCI.



3 Inter-controller Communication

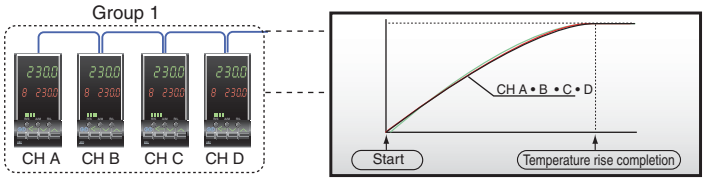
The FB Series has a second communication port (COM2) for inter-controller communication. It achieves more precise cascade control and ratio control by sending data via digital communication while conventional cascade controllers send data to slave controllers by analog signal with less resolution.



Auto-temperature-rise with Learning Function

Auto-temperature-rise with learning function achieves temperature uniformity at ramp-up without partial thermal expansion even when using multiple FB Series controllers.

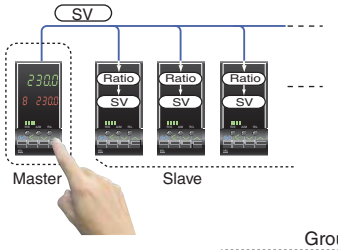
- Up to 32 controllers with 16 groups can be configured.



Temperature Ratio Setting

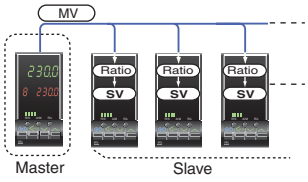
If the master controller changes the control set value, the slave controllers will also change the set values by following preset ratios to the master.

- Up to 32 controllers with 16 groups can be configured.



Cascade control

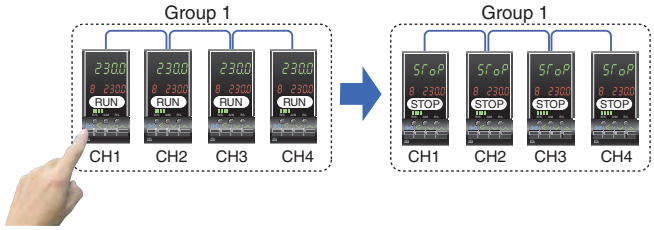
It is effective when a thermal time-delay exists between the heat source and a control point. A maximum of 30 slave controllers can be connected to one master controller.



Group RUN/STOP Function

When RUN/STOP mode is changed on one controller in a group, the mode of all the other controllers in the same group will be also automatically changed.

- Up to 32 controllers with 16 groups can be configured.



(Note) Time lag among controllers caused by inter-controller communication is (Max.70ms) x (number of controllers connected).
Please consider the time lag of inter-controller communication for high-speed process control in which process changes rapidly.

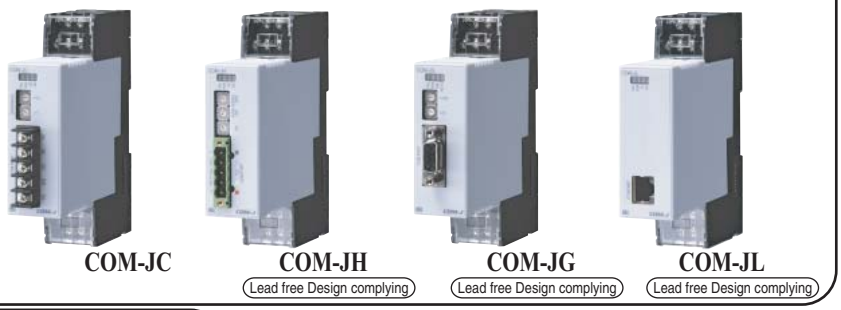
4 Open Network Connectivity

The FB Series can be connected to various Open Networks, such as PROFIBUS, DeviceNet, CC-Link, and Ethernet via a gateway. A gateway with the MAPMAN function is available with the FB Series. The MAPMAN function requires no PLC programming and automatically writes process data into the PLC registers and updates parameters continuously.

RS-485
MODBUS protocol

CC-Link
DeviceNet
PROFIBUS
Ethernet
• Released soon

CC-Link Communication Converter
DeviceNet Communication Converter
PROFIBUS Communication Converter
Ethernet Communication Converter



COM-JC
COM-JH (Lead free Design complying)
COM-JG (Lead free Design complying)
COM-JL (Lead free Design complying)

Communication protocol converter

COM-JE (Lead free Design complying)

MAPMAN
Program free

PLC

Mitsubishi MELSEC series

Omron SYSMAC series

Specifications

Input

Input	• Universal input a) Temperature, Current, Low voltage input group Thermocouple : K, J, E, T, R, S, B, N (JIS/IEC) PLII (NBS), W5Re/W26Re (ASTM) U, L (DIN) RTD : Pt100 (JIS/IEC), JPt100 (JIS) • 3-wire system Low voltage (Input impedance : More than 1MΩ) 0 to 1V DC, 0 to 100mV, 0 to 10mV DC -100 to +100mV DC, -10 to +10mV DC Current (Input impedance : 1MΩ) 4 to 20mA, 0 to 20mA b) High voltage input group High voltage (Input impedance : 1MΩ) -1 to +1V DC, 0 to 5V DC, 1 to 5V DC, 0 to 10V DC (Use dip switch to change input group.)
Sampling time	0.1sec • 0.05sec/0.25sec is selectable.
Influence of external resistance	0.2μV/Ω (Thermocouple input)
Influence of lead resistance	0.01% of reading/Ω (RTD input) • Maximum 10Ω per wire
Input break action	Thermocouple input : Up-scale/Down-scale (Selectable) RTD input : Up-scale Low voltage input : Up-scale/Down-scale (Selectable) Current input : Value around 0mA High voltage input : Value around 0V
Input short action	Down-scale (RTD input)
Input digital filter	0.1 to 100.0 sec. (OFF when 0 is set.)
PV bias	-span to +span
PV ratio	0.500 to 1.500
Square root extraction	PV = $\sqrt{}$(Input value x PV ratio + PV bias) Low level cut off : 0.00 to 25.00% of span

Control

Control method	a) Brilliant II PID control • Direct action/Reverse action is selectable b) Brilliant II PID control (Heat/Cool type) c) Position proportioning control without feedback resistance • a), b), c) is selectable
Autotuning	a) For PID control (Direct action/Reverse action) b) For Heat/Cool PID control (For extruder, air cooling) c) For heat/Cool PID control (For extruder, water cooling) d) For heat/Cool PID control
Startup tuning	The condition to activate Startup Tuning is selectable among a) to g). a) At power-on, one-time tuning b) At SV change, one-time tuning c) At power-on and SV change, one-time tuning d) At power-on, always on e) At SV change, always on f) At power-on and SV change, always on g) Function off (Not available for Heat/Cool PID control type)
Setting range	a) Proportional band : Temperature input : 0 to input span (˚C,˚F) Voltage/Current input : 0.0 to 1000.0% of input span (ON/OFF control when P = 0) • Differential gap at ON/OFF control (High/Low individual setting) : Temperature input : 0 to input span (˚C,˚F) Voltage/Current input : 0.0 to 10.0% of input span b) Integral time : 0 to 3600 sec or 0.0 to 1999.9 sec (selectable) (PD control when I = 0) c) Derivative time : 0 to 3600 sec or 0.0 to 1999.9 sec (selectable) (PI control when D = 0) d) Cool side proportional band : Temperature input : 1(0.1, 0.01) to input span (˚C,˚F) Voltage/Current input : 0.0 to 1000.0% of input span e) Cool side Integral time : 0 to 3600 sec or 0.0 to 1999.9 sec (selectable) (PD control when I = 0) f) Cool side Derivative time : 0 to 3600 sec or 0.0 to 1999.9 sec (selectable) (PI control when I = 0) g) Overlap/Deadband Temperature input : -span to +span (˚C,˚F) Voltage/Current input : -100.0 to +100.0% of input span h) Control response : Slow, Medium, Fast i) Ramp-to-setpoint 0 to span per Time (Time is settable between 1 and 3600 sec) Up/Down individual setting j) Output limiter : -5.0 to +105.0% (High/Low individual setting) k) Output change rate limiter : 0.0 to 100.0%/sec (Up/Down individual setting) l) Proportional cycle time : 0.1 to 100.0 sec m) Cool side proportional cycle time : 0.1 to 100.0 sec n) Manual reset : -100.0 to +100.0% o) Output at Control Stop mode : -5.0 to +105.0% (Heat side/Cool side individual setting)

Position Proportional Control

Motor time	5 to 1000 sec
Integral output limiter	OFF, 0.1 to 200.0% of motor time
Neutral zone	0.1 to 10.0%
Differential gap	0.1 to 5.0%
Output at Control Stop mode	Selectable from the following : a) Close : Output off, Open : Output off b) Close : Output on, Open : Output off c) Close : Output off, Open : Output on

Performance

Measuring accuracy	a)Thermocouple Type : K, J, T, E, PLII, U, L Less than -100˚C (-148˚F) : ±1.0˚C (±1.8˚F) -100 to +500˚C (-148 to 932˚F) : ±0.5˚C (±0.9˚F) More than 500˚C (932˚F) : ±(0.1% of reading + 1 digit) Type : N, S, R, W5Re/W26Re Less than 0˚C (32˚F) : ±2.0˚C (±3.6˚F) 0 to 1000˚C (32 to 1832˚F) : ±1.0˚C (±1.8˚F) More than 1000˚C (1832˚F) : ±(0.1% of reading + 1 digit) Type B Less than 400˚C (752˚F) : ±70.0˚C (±126˚F) 400 to 1000˚C (752 to 1832˚F) : ±1.0˚C (±1.8˚F) More than 1000˚C (1832˚F) : ±(0.1% of reading + 1 digit) • Cold junction temperature compensation error ±1.0˚C (1.8˚F) [Between 5 and 40˚C (41 and 104˚F)] ±1.5˚C (2.7˚F) [Between -10 and 5˚C (16 and 41˚F), and 40 and 50˚C (104 and 122˚F)] b) RTD Less than 200˚C (392˚F) : ±0.2˚C (±0.4˚F) More than 200˚C (392˚F) : ±(0.1% of reading + 1 digit) c) DC voltage and DC current ±(0.1% of span)
Close horizontal mounting error	±1.5˚C (2.7˚F)
Insulation resistance	More than 20MΩ (500V DC) between measured terminals and ground More than 20MΩ (500V DC) between power terminals and ground More than 20MΩ (500V DC) between measured and power terminals
Dielectric voltage	1000V AC for one minute between measured terminals and ground 1500V AC for one minute between power terminals and ground 2300V AC for one minute between measured and power terminals

Output

Number of outputs	Up to 2 points (OUT1, OUT2)
Output function	Control output, analog retransmission output, event output • See output allocation table (page 11)
Output signal	a) Relay contact output, Form a contact 250V AC 3A (Resistive load) • Electric life : 300,000 cycles or more b) Voltage pulse output, 0/12V DC (Load resistance : More than 600Ω) c) Current output, 4 to 20mA DC, 0 to 20mA DC (Load resistance : Less than 600Ω) d) Continuous voltage output, 0 to 5V DC, 1 to 5V DC, 0 to 10V DC (Load resistance : More than 1kΩ) e) SSR (Triac) output, Rated current : 0.5A f) Open collector output (Sink type) Load voltage : Less than 30V DC Load current : Less than 100mA ON voltage : Less than 2V (at maximum load current)

Multi-Memory Area (recipe)

Number of areas	8 areas (recipes)
Stored parameters	a) Set value (SV) b) Event set values 1 to 4 c) LBA time d) LBA dead band e) Proportional band f) Integral time g) Derivative time h) Cool side proportional band i) Cool side integral time j) Cool side derivative time k) Overlap/Deadband l) Control response parameter m) Ramp-to-setpoint (Up/Down) n) Soak time 0 min 00 sec to 199 min 59 sec or 0 hr 0 min to 99 hr 59 min (selectable) o) Linking area number : OFF, 1 to 8

Specifications

Digital Input (DI) (DI 1 to 4 : Optional, DI 5 to 7 : Standard)

Number of inputs	Up to 7 points (DI 1 to 4, DI 5 to 7)
Input method	Non-voltage contact input
Function	DI 1 to 4 : Memory area selection + Area set DI 5 to 7 : RUN/STOP, Remote/Local, Auto/Manual Alarm interlock reset, • Selectable

Remote Setpoint Input (Standard)

Input	a) Low voltage, current group 0 to 1V DC, 0 to 100mV DC, 0 to 10mV DC 4 to 20mA DC, 0 to 20mA DC b) High voltage group 0 to 5V DC, 1 to 5V DC, 0 to 10V DC • Universal input
Sampling time	0.1 sec (with measuring input sampling time of 0.05 sec) 0.2 sec (with measuring input sampling time of 0.1 sec) 0.5 sec (with measuring input sampling time of 0.25 sec)
Accuracy	±0.1% of span

Digital Output (DO) (Optional)

Number of outputs	Up to 4 points (DO 1 to 4)
Output function	Event output, Heater break alarm (HBA), FAIL
Output signal	Relay contact output, Form a contact 250V AC 1A (Resistive load)

Event (Alarm) (Optional)

Number of event	Up to 4 points
Event type	Process high, Process low, Deviation high, Deviation low, Deviation high/low, Band, Set value high, Set value low, MV value high, MV value low, Cool side MV value high, Cool side MV value low, FBR value high, FBR value low, LBA (Control loop break alarm) • LBA is assignable to event 4.
Setting range	a) Deviation alarm Event set value : -input span to +input span Event action differential gap : 0 to input span b) Process alarm/Set value alarm Event set value : Same as input range Event action differential gap : 0 to input span c) MV alarm, FBR alarm -5.0 to +105.0% d) LBA LBA time : 0 to 7200 sec (LBA is OFF when 0 is set.) Dead band : 0 to input span
Output terminals	Assignable to digital output (DO 1 to 4) • See output allocation table (page 11)
Other functions	a) Hold/Re-hold action (Valid for deviation/band/process alarm only) • Hold action is activated at Power-up and STOP to RUN. Re-hold action is activated at Power-up, STOP to RUN, and the control set value change. b) Event action is configurable in case of input abnormality. c) Energized/de-energized action is configurable. d) Delay timer : 0.0 to 600.0 sec e) Interlock (latch) function is configurable.

Heater Break Alarm (HBA) (Optional)

Number of alarms	2 points (1 point per CT input)
CT Type and input range	CTL-6-P-N : 0 to 30A CTL-12-S56-10L-N : 0 to 100A
Display range	0.0 to 100.0A
Display accuracy	±5% of input value or 2A (whichever is larger)
Output terminals	Assignable to output 2 or digital output (DO 2 to 4) • See output allocation table (page 11)

Analog Retransmission Output (AO) (Optional)

Number of outputs	Up to 1 point • Assignable to AO (For analog output), output 1 or output 2
Output terminals	AO terminal
Output type	Measured value (PV), Set value (SV) Manipulated value (MV), Deviation (between PV and SV) • Selectable
Output signal	4 to 20mA DC, 0 to 20mA DC (Load resistance : Less than 600Ω) 0 to 1V DC, 0 to 5V DC, 1 to 5V DC, 0 to 10V DC (Load resistance : More than 1kΩ)

Power Feed Forward (PFF) Input (Optional)

• Exclusive power feed transformer is required.

Feedback Resistance (FBR) Input (Optional)

Resistance value	Standard : 100 to 10kΩ (factory default 135Ω)
Sampling time	0.1 sec (with measuring input sampling time of 0.05 sec) 0.2 sec (with measuring input sampling time of 0.1 sec) 0.5 sec (with measuring input sampling time of 0.25 sec)

• Not available with PFF or CT 2 input.

Communications (Optional)

Number of Communications	Up to 2 points
Communication method	COM1 : RS-485/RS-422A/RS-232C COM2 : RS-485 (Can be used for Inter-controller communication)
Communication speed	2400bps, 4800bps, 9600bps, 19200bps, 38400bps
Protocol	a) ANSI X3.28 sub-category 2.5A4 (RKC standard) b) MODBUS-RTU
Bit format	a) RKC standard protocol Start bit : 1 Data bit : 7 or 8 Parity bit : 1 (odd or even) or none Stop bit : 1 or 2 b) MODBUS protocol Start bit : 1 Data bit : 8 (binary or byte data) Parity bit : 1 (odd or even) or none Stop bit : 1 or 2 (Fixed to 1 bit for parity 1)
Maximum connection	RS-485 : 32 units (Including host) RS-422A : 16 units (Including host) RS-232C : 1 unit

Inter-controller Communication (Optional)

• Use communication port 2

Function : Automatic temperature rise, Cascade control, Temperature ratio setting, Group STOP/RUN

Waterproof/Dustproof (Standard)

NEMA4X, IP66

• Waterproof/Dustproof protection only effective from the front in panel mounted installation.

General Specifications

Supply voltage	a) 90 to 264V AC (50/60Hz, Selectable) Rating : 100 to 240V AC b) 24V AC ±10% (50/60Hz, Selectable) Rating : 24V AC c) 24V DC ±10% Rating : 24V DC
Power consumption	a) 100 to 240V AC type FB900 : 13.0VA (240V), 8.7VA(100V) FB400 : 11.9VA (240V), 7.8VA(100V) b) 24V AC type FB900 : 9.3VA FB400 : 8.2VA b) 24V DC type FB900 : 300mA FB400 : 250mA
Power failure	A power failure of 20m sec or less will not affect the control action. If power failure of more than 20m sec occurs, controller will restart with the state of HOT start 1, HOT start 2 or COLD start (selectable)
Memory backup	Backed up by non-volatile memory (FRAM) • Data retaining period : Approx. 10 years • Number of writing : Approx. 1,000,000,000,000,000 times. (Depending on storage and operating conditions.)
Ambient temperature	-10 to +50˚C (14 to 122˚F)
Ambient humidity	5 to 95% RH (Non condensing) • Absolute humidity : MAX.W.C 29g/cm^3 dry air at 101.3kPa
Weight	FB900 : Approx. 290g FB400 : Approx. 230g
Operating environment	Free from corrosive and flammable gas and dust. Free from external noise, vibration, shock and exposure to direct sunlight.
Compliance with Standards	CE Mark, UL, C-UL, C-Tick mark

Model and Suffix Code

★ : Required ☆ : Selectable

Specifications	Model and Suffix Code		Control output			Digital output		
	Hardware coding only	Quick start code 1	PID control	Heat/Cool PID control	Position proportioning control	Alarm	LBA	HBA
	(96 x 96mm 1/4 DIN size) FB900 / (48 x 96mm 1/8 DIN size) FB400 - □ □ - * □ □ □ / □ □ - □ □□□ / Y							
Output 1 (OUT 1)	Relay contact output	M	★	★	★ (Relay contact output)			
	Voltage pulse output (0/12V DC)	V						
	DC mA, mV, V (See Output Code Table)	□						
	Triac output	T						
	Open collector output	D						
Output 2 (OUT 2)	Not supplied	N						
	Relay contact output	M		★	★ (Relay contact output)			☆
	Voltage pulse output (0/12V DC)	V						
	DC mA, mV, V (See Output Code Table)	□						
	Triac output	T						
	Open collector output	D						
Power Supply	24V AC/DC	3						
	100 to 240V AC	4						
Digital output	Not supplied	N						
	DO 4 points (DO1 to DO4)	4				☆	☆	☆
* CT input Power feed forward (PFF) input Feedback resistance	Not supplied	N						
	CT input 2 points	T						☆
	PFF input (With transformer 100 to 120V AC type)	1						
	PFF input (With transformer 200 to 240V AC type)	2						
	CT input 1 point + PFF input (With transformer 100 to 120V AC type)	3						☆
	CT input 1 point + PFF input (With transformer 200 to 240V AC type)	4						☆
	Feedback resistance input	F						
Analog retransmission output (AO)	Not supplied	N						
	DC mA, mV, V (See Output Code Table) • With digital input (DI 1 to 4) Area selection	□						
** Communication and Digital input (DI 1 to 4) <Area selection>	Not supplied	N						
	COM1 : RS-232C COM2 : Not supplied • With digital input (DI 1 to 4) Area selection	1						
	COM1 : RS-422A COM2 : Not supplied • With digital input (DI 1 to 4) Area selection	4						
	COM1 : RS-485 COM2 : Not supplied • With digital input (DI 1 to 4) Area selection	5						
	COM1 : RS-232C COM2 : RS-485 • With digital input (DI 1 to 4) Area selection	W						
	COM1 : RS-485 COM2 : RS-485 • With digital input (DI 1 to 4) Area selection	X						
	COM1 : Not supplied COM2 : RS-485 • With digital input (DI 1 to 4) Area selection	Y						
	Digital input (DI 1 to 4) Area selection	D						
Case color	White case	N						
	Black case	A						
Quick start code	No quick start code (Default setting)	N						
	Specify quick start code 1	1						
	Specify quick start code 1 and 2 (See page 11)	2						

Quick start code 1	Control Method	No quick start code	No Code
		PID control with AT (Reverse action)	F
		PID control with AT (Direct action)	D
		Heat/Cool PID control with AT	G
		Heat/Cool PID control with AT for extruder (Air cooling type)	A
		Heat/Cool PID control with AT for extruder (Water cooling type)	W
		Position proportional PID control without FBR	Z
	Input and range	No quick start code	No Code
		See Input range Code Table	□□□
Instrument version		Version symbol	Y

• Universal input, no model code required on hardware code.
* When HBA (heater break alarm) is used, select the "CT input" from the model code.
** When inter-controller communication is used, please specify code "W, X or Y (COM2 : RS-485). Remote setpoint input is not available with inter-controller communication.

Output Code Table

Output Type	Code	Output Type	Code
0 to 1V DC	3	1 to 5V DC	6
0 to 5V DC	4	0 to 20mA DC	7
0 to 10V DC	5	4 to 20mA DC	8

* 0 to 1 VDC output can be specified only for analog retransmission output.

Input Range Code Table

Thermocouple

Input	Code	Range
K	K 35	-200.0 to +400.0℃
	K 40	-200.0 to +800.0℃
	K 09	0.0 to 400.0℃
	K 10	0.0 to 800.0℃
	K 41	-200 to +1372℃
	K 02	0 to 400℃
	K 04	0 to 800℃
	K C6	-250.0 to +800.0℉
	K C4	-328.0 to +400.0℉
	K A4	0.0 to 800.0℉
	K B2	0.0 to 1600.0℉
	K C5	-328 to +2502℉
	K A1	0 to 800℉
	K A2	0 to 1600℉
J	J 27	-200.0 to +400.0℃
	J 32	-200.0 to +800.0℃
	J 08	0.0 to 400.0℃
	J 09	0.0 to 800.0℃
	J 15	-200 to +1200℃
	J 02	0 to 400℃
	J 04	0 to 800℃

Input	Code	Range
J	J C7	-200.0 to +700.0℉
	J C6	-328.0 to +1200.0℉
	J B6	0.0 to 800.0℉
	J B2	0.0 to 1600.0℉
	J B9	-328 to +2192℉
	J A1	0 to 800℉
	J A2	0 to 1600℉
T	T 19	-200.0 to +400.0℃
	T C2	-328.0 to +752.0℉
S	S 06	-50 to +1768℃
	S A7	-58 to +3214℉
R	R 07	-50 to +1768℃
	R A7	-58 to +3214℉
E	E 21	-200.0 to +700.0℃
	E 06	-200 to +1000℃
	E A9	-328.0 to +1292.0℉
	E B1	-328 to +1832℉
B	B 03	0 to 1800℃
	B B2	0 to 3272℉
N	N 02	0 to 1300℃
	N A7	0 to 2372℉

Input	Code	Range
PLII (NBS)	A 02	0 to 1390℃
	A A2	0 to 2534℉
W5Re/W26Re (ASTM)	W 03	0 to 2300℃
	W A2	0 to 4200℉
U (DIN)	U 04	0.0 to 600.0℃
	U B2	0.0 to 1112.0℉
L (DIN)	L 04	0.0 to 900.0℃
	L A3	0.0 to 1652.0℉

RTD

Input	Code	Range
Pt100	D 34	-100.00 to +100.00℃
	D 35	-200.0 to +850.0℃
	D 21	-200.0 to +200.0℃
	D C8	-199.99 to +199.99℉
	D C9	-328.0 to +1562.0℉
JPt100	P 29	-100.00 to +100.00℃
	P 30	-200.0 to +640.0℃
	P C8	-199.99 to +199.99℉
	P C9	-328.0 to +1184.0℉
	P D1	-200.0 to +200.0℉

DC Current • voltage

Input	Code	Range
0 to 10mV	1 01	0.0 to 100.0%
0 to 100mV	2 01	
0 to 1V	3 01	
0 to 5V	4 01	
0 to 10V	5 01	
1 to 5V	6 01	

Input	Code	Range
0 to 20mA	7 01	0.0 to 100.0%
4 to 20mA	8 01	
-100 to +100mV	9 01	
-1 to +1V	9 02	
-10 to 10mV	9 03	

Quick start code 2

- Quick start code 2 tells the factory to ship with each parameter preset to the values detailed as specified by the customer. Quick start code is not necessarily specified when ordering, unless the preset is requested. These parameters are software selectable items and can be re-programmed in the field via the manual.

Specifications	Initial set code	□	□	-	□	□	□	-	□	□	□
Output allocation	See output allocation table	□									
* Remote setpoint input signal	0 to 10mV DC	1									
	0 to 100mV DC	2									
	0 to 1V DC	3									
	0 to 5V DC	4									
	0 to 10V DC	5									
	1 to 5V DC	6									
	0 to 20mA DC	7									
	4 to 20mA DC	8									
Event 1 type	No event 1		N								
	See event type code table		□								
Event 2 type	No event 2				N						
	See event type code table				□						
Event 3 type	No event 3					N					
	See event type code table					□					
Event 4 type	No event 4						N				
	See event type code table						□				
	Control loop break alarm (LBA)						5				
CT type	No CT1 and CT2							N			
	CT1 : CTL-6-P-N, CT2 : No use							P			
	CT1 : CTL-12-S56-10L-N, CT2 : No use							S			
	CT1 : CTL-6-P-N, CT2 : CTL-6-P-N							T			
	CT1 : CTL-12-S56-10L-N, CT2 : CTL-12-S56-10L-N							U			
Communication 1	No communication 1 (COM1)								N		
	ANSI/RKC standard protocol								1		
	MODBUS protocol								2		
Communication 2	No communication 2 (COM2)										N
	ANSI/RKC standard protocol										1
	MODBUS protocol										2

* Please specify "8" when the remote setpoint input signal is not used.

Event Type Code Table

Event type	Code
Deviation High	A
Deviation Low	B
Deviation High/Low	C
Band	D
Deviation High with Alarm Hold	E
Deviation Low with Alarm Hold	F
Deviation High/Low with Alarm Hold	G
Process High	H
Process Low	J
Process High with Alarm Hold	K
Process Low with Alarm Hold	L
Deviation High with Alarm Re-Hold	Q
Deviation Low with Alarm Re-Hold	R
Deviation High/Low with Alarm Re-Hold	T
Set value High	V
Set value Low	W
MV value High	1
MV value Low	2
Cool side MV value High	3
Cool side MV value Low	4

Output Allocation Table

Output 1 (OUT 1)	Output 2 (OUT 2)	Digital Output 1 (DO 1)	Digital Output 2 (DO 2)	Digital Output 3 (DO 3)	Digital Output 4 (DO 4)	Code
Control output 1	Control output 2	Event 1	Event 2	Event 3	Event 4	1
Control output 1	Control output 2	Event 1	Event 2	Event 3	HBA	2
Control output 1	Control output 2	Event 1	Event 2	HBA	FAIL (De-energized)	3
Control output 1	Control output 2	Event 1	HBA	Event 3	Event 4	4
Control output 1	HBA	Event 1	Event 2	Event 3	Event 4	5
Control output 1	HBA	Event 1	Event 2	Event 3	FAIL (De-energized)	6
Control output 1	FAIL (De-energized)	Event 1	Event 2	Event 3	Event 4	7

- Energized/De-energized is configurable except for the FAIL output. (Factory default setting: Energized)
- Invalid for a non-existing output/event function.

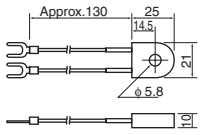
(Caution)
- When used as heating/cooling control/position proportioning control, select any code of 1 to 4.

Accessories

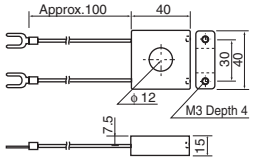
Current transformer for heater break alarm (HBA) (Sold separately)

Model code
CTL-6-P-N (0 to 30A)
CTL-12-S56-10L-N (0 to 100A)

CTL-6-P-N (Unit : mm)



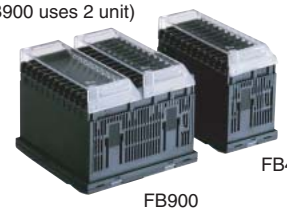
CTL-12-S56-10L-N



Terminal cover (Sold separately)

Model Code : **KFB400-58**

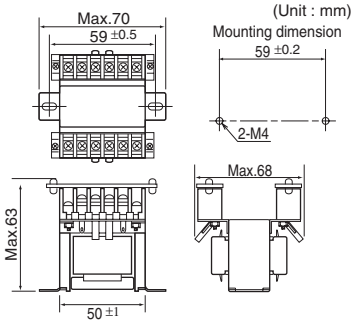
(FB900 uses 2 unit)



(For Power feed forward input)

* Supplied when power feed forward function is specified.

(Unit : mm)

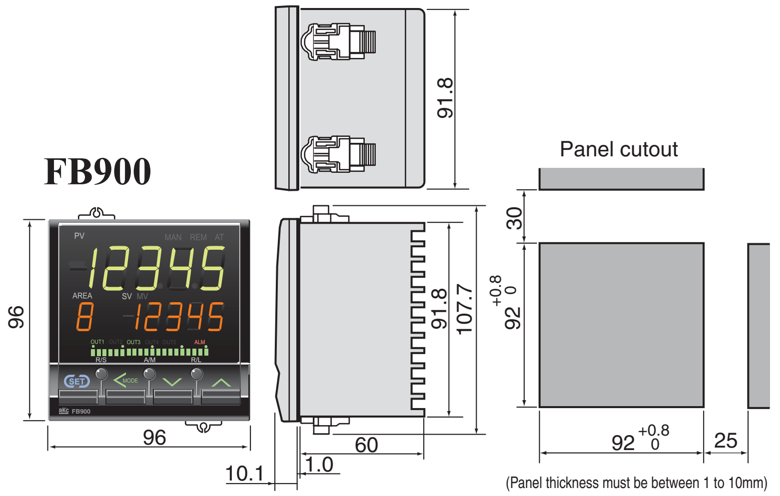


* When ordering transformer for replacement, please specify one of the following model codes.
100 to 120V AC type : PFT-01
200 to 240V AC type : PFT-02

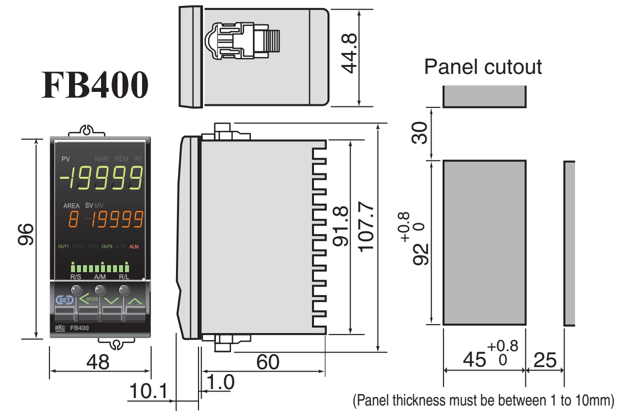
External Dimensions

Unit : mm

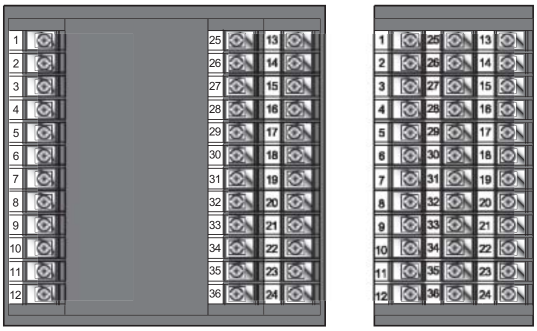
FB900



FB400

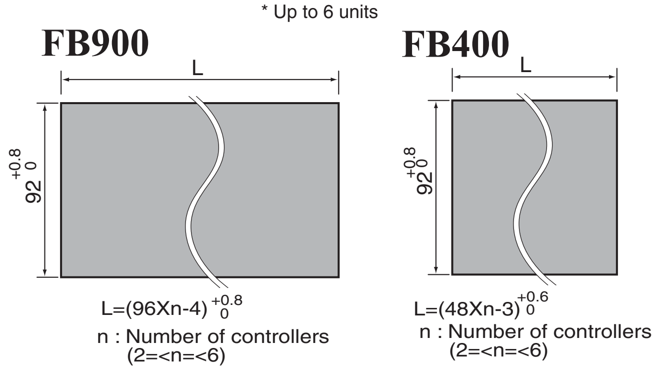


Rear Terminals



• Use a solderless terminal for screw size M3X6.

<Close horizontal mounting>
* Up to 6 units



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

No	Description	
1	AC: L 100-240V / DC: + 24V	Power supply
2	AC: N 24V / DC: −	
3	COM	Digital output 3, 4 (*) (DO 3, 4) Relay contact output
4	NO DO4	
5	NO DO3	
6	COM	Digital output 1, 2 (*) (DO 1, 2) Relay contact output
7	NO DO2	
8	NO DO1	
9	NO (1) / + (2) / (3)	Main output (OUT2) (1) Relay contact output (2) Voltage pulse / Current/Voltage (3) SSR (Triac) / Open collector
10	(1) / − (2) / − (3)	
11	NO (1) / + (2) / (3)	Main output (OUT1) (1) Relay contact output (2) Voltage pulse / Current/Voltage (3) SSR (Triac) / Open collector
12	(1) / − (2) / − (3)	

No	Description	
25	SG / SG / SG	Communication (*) Communication 1 (1) RS-232C (2) RS-485 (3) RS-422A Communication 2 (4) RS-485
26	SD / T/R(A) / T(A)	
27	RD (1) / T/R(B) (2) / T(B)	
28	T/R(A) / R(A)	
29	T/R(B) (4) / R(B) (3)	
30	COM	Digital input (*) (Memory area selection) DI1 to DI4 Non voltage contact input
31	(1) DI 1	
32	(2) DI 2	
33	(4) DI 3	
34	(SET) DI 4	
35	+ AO	Analog (*) retransmission output (AO)
36	−	

(*) Optional

No	Description	
13	COM	Digital input (Mode selection) DI5 to DI7 Non voltage contact input
14	DI 5	
15	DI 6	
16	DI 7	
17	COM (A) / OPEN (B) / COM (C)	(1) CT1,CT2 input (*) (2) Feedback resistance input (3) CT1 input + Power feed forward input
18	CT1 / (O) / CT1	
19	CT2 / (W) / PFF / (C) CLOSE	
20	+	Remote setpoint input
21	−	
22	A	Measured input (A) Thermocouple (B) RTD (C) Voltage/Current
23	+ (1) / B (2) / + (3)	
24	− (1) / B (2) / − (3)	

CT : Current transformer for heater break alarm
PFF : Power feed forward transformer

Safety Warning

- 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 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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