CONTROLLER

Temperature/Process Controller
FB100

Green — RoHS compliant

CE c ℞ℓ us ⓥ

◻ Reinforced Insulation

RKC® RKC INSTRUMENT INC.

High Performance 1/16 DIN size Controller

A 1/16 DIN unit (48x48mm) has been added to the FB series high performance and highly reliable controllers.
High performance control is achieved in a small installation space.

*Some functions on FB100 may be limited compared to FB900/400

Green RoHS compliant

CE c RU us

Reinforced Insulation

NEW

Temperature/Process Controller
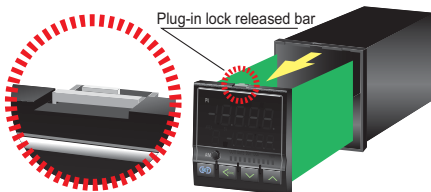
FB100

High Performance Controller

(Actual size)

● High performance

High accuracy : 0.1%
Selectable sampling time:
  50msec (Fast response) /100ms (Standard) /250msec (High resolution)
Brilliant II PID Control
  • Selectable PID control algorithm
    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
  • Ramp-to-setpoint/Output change rate limiter
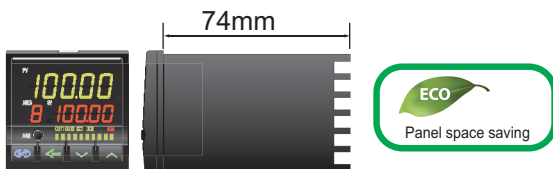 • Advanced Heat/Cool PID algorithm with Undershoot Suppression

● Easy maintenance

The internal assembly of the FB100 can be removed from the front.
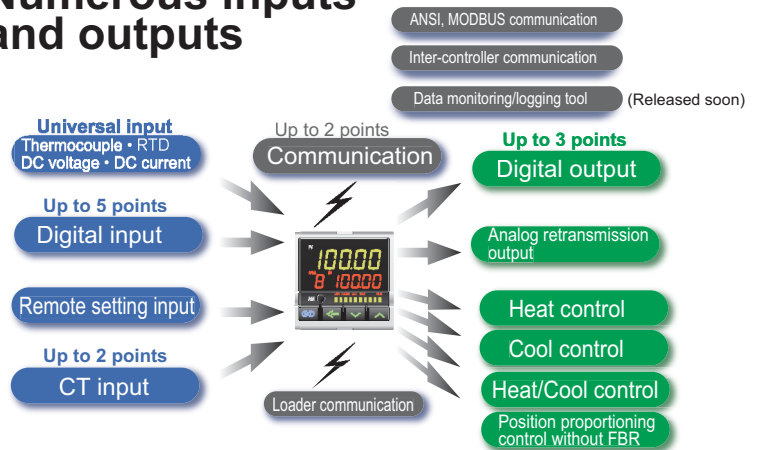
Plug-in lock released bar

● Panel space saving: 74mm depth

The FB100 has very short depth as a 1/16 DIN size controller. The FB100 was designed with a mounting bracket that allows close horizontal mounting of as many as six units.

74mm

ECO
Panel space saving
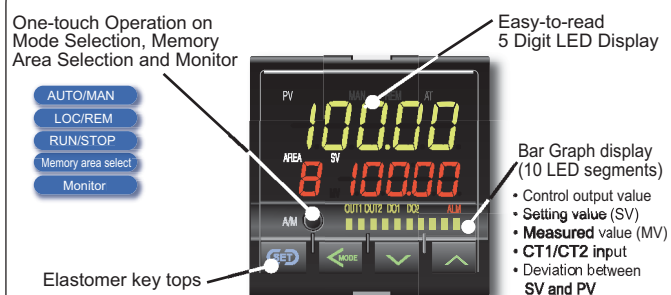
□ Reinforced Insulation

Reinforced insulation retains its insulating ability even when basic insulation breaks down. The power circuits in our instruments are designed with reinforced insulation and will save costs by eliminating the need for additional safety measures to prevent break-down shock.

<Requirements for electrical equipment according to safety standards>

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

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

● Numerous inputs and outputs

ANSI, MODBUS communication
Inter-controller communication
Data monitoring/logging tool (Released soon)

Universal input
Thermocouple • RTD
DC voltage • DC current

Up to 2 points
Communication

Up to 3 points
Digital output

Up to 5 points
Digital input

Analog retransmission output

Remote setting input

Heat control

Up to 2 points
CT input

Loader communication

Cool control

Heat/Cool control

Position proportioning control without FBR

User-friendly Keys and Display

One-touch Operation on Mode Selection, Memory Area Selection and Monitor

AUTO/MAN
LOC/REM
RUN/STOP
Memory area select
Monitor

Easy-to-read 5 Digit LED Display

Bar Graph display (10 LED segments)
  • Control output value
  • Setting value (SV)
  • Measured value (MV)
  • CT1/CT2 input
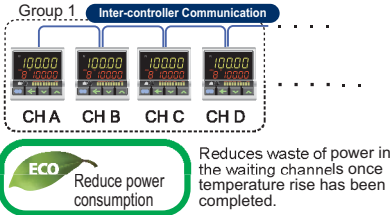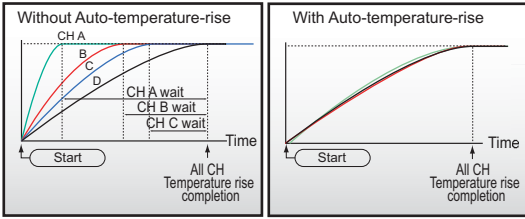 • Deviation between SV and PV

Elastomer key tops

Inter-controller Communication

Inter-controller communication 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 FB100 controllers.
- Up to 32 controllers with 16 groups can be configured.
- Auto-temperature-rise function is not available with position proportional PID control type.

Group 1 — Inter-controller Communication
CH A CH B CH C CH D

ECO Reduce power consumption
Reduces waste of power in the waiting channels once temperature rise has been completed.

## 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.

SV — Inter-controller Communication
Master   Slave
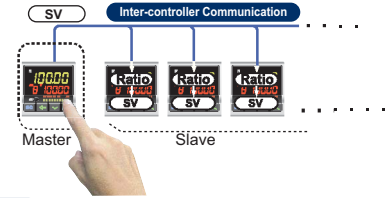
Cascade Control

It is effective when a thermal time-delay exists between the heat source and a control point. A maximum of 31 slave controllers can be connected to one master controller.

MV — Inter-controller Communication
Master   Slave
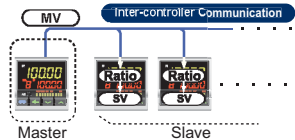
Group RUN/STOP Function

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.

Group 1 — Inter-controller Communication
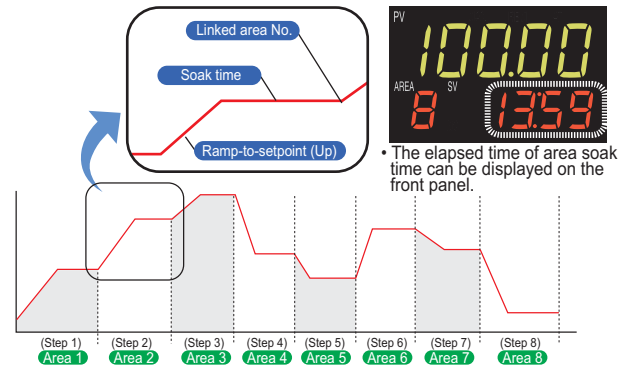CH1 CH2 CH3 CH4   CH1 CH2 CH3 CH4
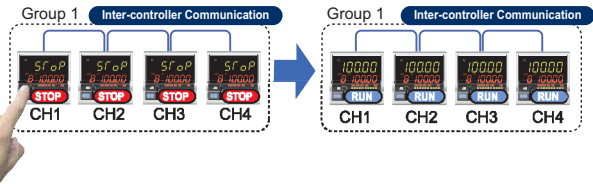
(Note) Time lag among controllers caused by inter-controller communication is Max.70ms x number of controllers connected.
Please consider the time lag of inter-controller communication for high-speed process control in which process changes rapidly.

Recipe (Multi-memory Area) Function

The FB100 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.

Area 1
- Set value
- Event 1 to 4 Set value
- LBA time
- LBA dead band
- Proportional band (Heat and Cool)
- Integral time (Heat and Cool)
- Derivative band (Heat and Cool)
- Control response
- Overlap/Deadband
- Manual reset
- Ramp-to-setpoint (Up and Down)
- Area soak time
- Link area number

Area 8
- Set value
- Event 1 to 4 Set value
- LBA time
- LBA dead band
- Proportional band (Heat and Cool)
- Integral time (Heat and Cool)
- Derivative band (Heat and Cool)
- Control response
- Overlap/Deadband
- Manual reset
- Ramp-to-setpoint (Up and Down)
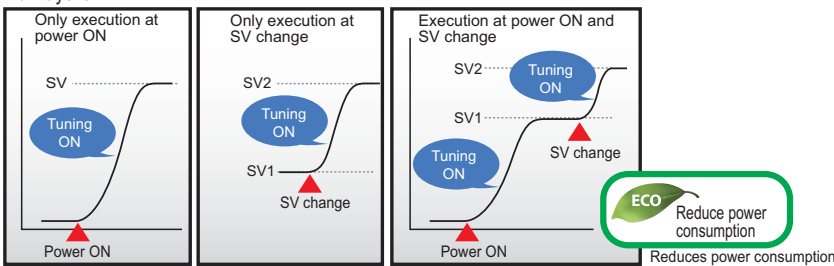- Area soak time
- Link area number

Area No

● 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.

Linked area No.
Soak time
Ramp-to-setpoint (Up)

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

(Step 1) Area 1 (Step 2) Area 2 (Step 3) Area 3 (Step 4) Area 4 (Step 5) Area 5 (Step 6) Area 6 (Step 7) Area 7 (Step 8) Area 8
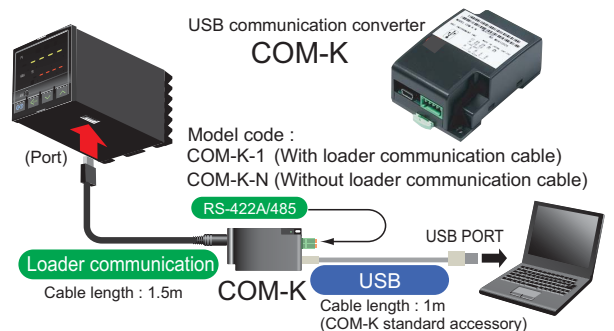
Start-up tuning to eliminate time for autotuning

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.

Only execution at power ON
SV — Tuning ON — Power ON

Only execution at SV change
SV2 — Tuning ON — SV1 — SV change

Execution at power ON and SV change
SV2 — Tuning ON — SV1 — Tuning ON — SV change — Power ON

ECO Reduce power consumption
Reduces power consumption during AT execution

- Start-up 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.
- Start-up tuning (ST) is when the temperature differential of the measured value (PV) and set value (SV) is at least twice the proportional band at the start of start-up tuning (ST).
- If start-up tuning does not calculate suitable PID values due to characteristics of application, use Autotuning function.
- Start-up tuning function is not available with position proportional PID control type.

Easy parameter setup via USB loader port

The FB series has a standard loader port to connect to a PC USB port via COM-K: USB communication converter.
Using Win-UCI software on the PC, parameter settings can be easily saved on the PC in CSV format, and the same parameter settings are easily copied to other controllers.

USB communication converter
COM-K

(Port)

Model code :
COM-K-1 (With loader communication cable)
COM-K-N (Without loader communication cable)

RS-422A/485

USB PORT

Loader communication
Cable length : 1.5m

COM-K

USB
Cable length : 1m (COM-K standard accessory)

- The loader port is only for parameter setup.
- The power to COM-K is supplied from the PC via the USB port so no power supply is necessary.

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 : 50Ω) 　　　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 = √(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
Start-up tuning	The condition to activate Start-up 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 : 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 : 0.1 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 250.0% 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	1500V 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, HBA output, FAIL output • See output allocation table (page 7)
Output signal	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 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)

Digital Output (DO)　　　　　　　　　(Standard)

Number of outputs	Up to 2 points (DO 1 to 2)
Output function	Event output, Heater break alarm (HBA), FAIL
Output signal	Relay contact output, Form a contact 250V AC 1A (Resistive load)

Multi-Memory Area (recipe)

Number of areas	8 areas (recipes)
Stored parameters	Set value (SV), Event set values 1 to 4, LBA time, LBA dead band, Proportional band, Integral time, Derivative time, Cool side proportional band, Cool side integral time Cool side derivative time, Overlap/Deadband, Manual reset Control response parameter, Ramp-to-setpoint (Up/Down) Soak time, Linking area number
Soak time	0 min 00 sec to 199 min 59 sec or 0 hr 0 min to 99 hr 59 min (selectable)
Linking area number	OFF, 1 to 8

Specifications

Event (Alarm) (Standard)

Number of events	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 2) or Output 2 (OUT2) • See output allocation table (page 7)

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 + 1 digit) or 2A (whichever is larger)
Output terminals	Assignable to output 2 or digital output (DO 1 to 2) • See output allocation table (page 7)

Digital Input (DI) (Optional)

Number of inputs	Up to 5 points (DI 1 to 5)
Input method	Non-voltage contact input
Function	Memory area selection (Area set/No area set is selectable) RUN/STOP, Remote/Local, Auto/Manual, Alarm interlock reset • Selectable • See digital input allocation table (page 7)

Remote Setpoint Input (Optional)

Input	a) Low voltage group
	    0 to 1V DC, 0 to 100mV DC, 0 to 10mV DC
	b) High voltage group
	    0 to 5V DC, 1 to 5V DC, 0 to 10V DC
	c) Current group
	    4 to 20mA DC, 0 to 20mA DC
	• Universal input
	• Not isolated from measured 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

Analog Retransmission Output (AO) (Optional)

Number of outputs	1 point
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)

Resolution	Approx. 1/4000
Output accuracy	±0.1% of span

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)

Communications (Optional)

Communication method	COM1 : RS-485
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

Maximum connection	32 units (Including host)

Inter-controller Communication (Optional)

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

Loader communication

Protocol	ANSI X3.28 sub-category 2.5A4 (RKC standard)
Communication speed	38400bps
Bit format	Start bit : 1, Data bit : 8, Parity bit : none, Stop bit : 1
Maximum connection	1 unit (Address : 0)

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
	    5.4VA (240V), 8.1VA (100V)
	b) 24V AC type
	    5.3VA
	c) 24V DC type
	    142mA

Rush current	Less than 12A
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/m^3 dry air at 101.3kPa
Weight	Approx. 150g
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

Model and Suffix Code

Specifications				Hardware coding only ① ② ③ ④ ⑤ ⑥	Quick start code 1 ⑦ ⑧	⑨
		(48 × 48mm 1/16 DIN size)	**FB100** –	☐☐–☐–*☐/☐☐ –	☐☐☐	/Y
①	Output 1 (OUT 1)	Relay contact output	M			
		Voltage pulse output (0/12V DC)	V			
		DC mA, V See Output Code Table	☐			
		Triac output	T			
		Open collector output	D			
②	Output 2 (OUT 2) *1	Not supplied	N			
		Relay contact output	M			
		Voltage pulse output (0/12V DC)	V			
		DC mA, V See Output Code Table	☐			
		Triac output	T			
		Open collector output	D			
③	Power Supply	24V AC/DC	3			
		100 to 240V AC	4			
④	Optional function *2, *3	Not supplied	N			
		Digital input 5 points	A			
		Digital input 2 points + Remote setpoint input	B			
		Digital input 2 points + Feedback resistance input	C			
		Digital input 2 points + CT input 2 points	D			
		Digital input 3 points + Communication 1 point	E			
		Digital input 1 point + Communication 1 point + CT input 1 point	F			
		Communication 2 points	G			
		Communication 1 point + CT input 2 points	H			
		Digital input 1 point + Remote setpoint input + Analog retransmission output 0 to 1V DC	3			
		Digital input 1 point + Remote setpoint input + Analog retransmission output 0 to 5V DC	4			
		Digital input 1 point + Remote setpoint input + Analog retransmission output 0 to 10V DC	5			
		Digital input 1 point + Remote setpoint input + Analog retransmission output 1 to 5V DC	6			
		Digital input 1 point + Remote setpoint input + Analog retransmission output 0 to 20mA	7			
		Digital input 1 point + Remote setpoint input + Analog retransmission output 4 to 20mA	8			
⑤	Case color	White case	N			
		Black case	A			
⑥	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			
⑦	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		
⑧	Input and range	No quick start code		No Code		
		See Input range Code Table		☐☐☐		
⑨	Instrument version	Version symbol				/Y

♦ Default setting
• Digital output (DO1, DO2) : Standard function
*1 : When Heat Control or Cool Control is selected, output 2 is available for Event Output, HBA Output and FAIL Output.
     See Output Allocation Table (page 7).
*2 :See Digital Input (DI) Allocation Table (page 7).
*3 :When HBA (heater break alarm) is used , select the "CT input" from the model code.

Accessories (Sold separately)

● Current transformer for heater break alarm (HBA)

(Unit : mm)

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

CTL–6–P–N
Approx.130 25 14.5 21 φ 5.8 10

CTL–12–S56–10L–N
Approx.100 40 30 40 φ 12 M3 Depth 4 7.5 15
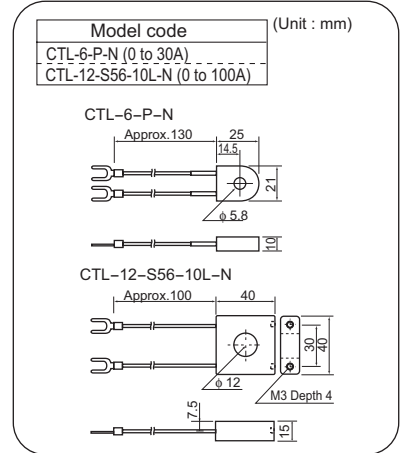
● Terminal Cover

Model Code : KCA100-517

● Front Cover

Model Code : KRB100-36A

Output Code Table

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

Input Range Code Table

Thermocouple

Input	Code	Range	Input	Code	Range	Input	Code	Range
K	35	-200.0 to +400.0℃	J	C7	-200.0 to +700.0℉	PLII (NBS)	A	02	0 to 1390℃
K	40	-200.0 to +800.0℃	J	C6	-328.0 to +1200.0℉		A	A2	0 to 2534℉
K	09	0.0 to 400.0℃	J	B6	0.0 to 800.0℉	W5Re/W26Re (ASTM)	W	03	0 to 2300℃
K	10	0.0 to 800.0℃	J	B9	-328 to +2192℉		W	A2	0 to 4200℉
K	41 ♦	-200 to +1372℃	J	A1	0 to 800℉	U (DIN)	U	04	0.0 to 600.0℃
K	02	0 to 400℃	J	A2	0 to 1600℉		U	B2	32.0 to 1112.0℉
K	04	0 to 800℃	T	19	-200.0 to +400.0℃	L (DIN)	L	04	0.0 to 900.0℃
K	C6	-250.0 to +800.0℉	T	C2	-328.0 to +752.0℉		L	A9	32.0 to 1652.0℉
K	C4	-328.0 to +400.0℉	S	06	-50 to +1768℃				
K	A4	0 to 800.0℉	S	A7	-58 to +3214℉				
K	C5	-328 to +2502℉	R	07	-50 to +1768℃				
K	A1	0 to 800℉	R	A7	-58 to +3214℉				
K	A2	0 to 1600℉	E	21	-200.0 to +700.0℃				
J	27	-200.0 to +400.0℃	E	06	-200 to +1000℃				
J	32	-200.0 to +800.0℃	E	A9	-328.0 to +1292.0℉				
J	08	0.0 to 400.0℃	E	B1	-328 to +1832℉				
J	09	0.0 to 800.0℃	B	03	0 to 1800℃				
J	15	-200 to +1200℃	B	B2	0 to 3272℉				
J	02	0 to 400℃	N	02	0 to 1300℃				
J	04	0 to 800℃	N	A7	0 to 2372℉				

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℉
	D	D1	-200.0 to +200.0℉
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 to 100mV	2 01	
0 to 1V	3 01	0.0 to 100.0%
0 to 5V	4 01	
0 to 10V	5 01	
1 to 5V	6 01	

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

*1 : Shunt resistor is not required for current input.

♦ Default setting

6

Quick start code

- Quick start code 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	Quick start code	①	②	③	④	⑤	⑥	⑦	⑧	⑨
①	Output allocation	(See output allocation table)	□□								
②	Digital input allocation	(See Digital input allocation table)		□□							
③	Remote setpoint input signal	No Remote setpoint input signal			N						
		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						
④	Event 1 type	No event 1				N					
		(See event type code table)				□					
⑤	Event 2 type	No event 2					N				
		(See event type code table)					□				
⑥	Event 3 type	No event 3						N			
		(See event type code table)						□			
⑦	Event 4 type	No event 4							N		
		(See event type code table)							□		
		Control loop break alarm (LBA)							5		
⑧	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	
⑨	Communication 1	No communication 1 (COM1)									N
		ANSI/RKC standard protocol									1
		MODBUS protocol									2
		Inter-controller protocol									A

Event Code Table
(Programmable)

Code	Event type
A	Deviation High
B	Deviation Low
C	Deviation High/Low
D	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
Q	Deviation High with Alarm Re-Hold
R	Deviation Low with Alarm Re-Hold
T	Deviation High/Low with Alarm Re-Hold
V	Set value High
W	Set value Low
1	MV value High
2	MV value Low
3	Cool side MV value High
4	Cool side MV value Low

- Default setting when no quick start code is specified.
  CT type : CTL-6-P-N
  Communication 2 : ANSI/RKC standard protocol
- Communication 2 is for inter-controller communication.

Output Allocation Table

♦ Default setting

Code	Output 1 (OUT 1)	Output 2 (OUT 2)	Digital Output 1 (DO 1)	Digital Output 2 (DO 2)
01 ♦	Control output 1	Control output 2	Event 1	Event 2
02	Control output 1	Control output 2	Event 1	Event 4
03	Control output 1	Control output 2	Event 1	HBA
04	Control output 1	Control output 2	Event 1	FAIL (De-energized)
05	Control output 1	Control output 2	Event 4	HBA
06	Control output 1	Control output 2	Event 4	FAIL (De-energized)
07	Control output 1	Control output 2	HBA	FAIL (De-energized)
08	Control output 1	HBA	Event 1	Event 2
09	Control output 1	HBA	Event 1	Event 4
10	Control output 1	HBA	Event 1	FAIL (De-energized)
11	Control output 1	HBA	Event 4	FAIL (De-energized)
12	Control output 1	FAIL (De-energized)	Event 1	Event 2
13	Control output 1	FAIL (De-energized)	Event 1	Event 4
14	Control output 1	Event 1	Event 2	Event 3
15	Control output 1	Event 4	Event 1	Event 2

- Energized/De-energized is configurable except for the FAIL output.
  (Factory default setting: Energized)
(Caution)
- Invalid for a non-existing output/input function.
- When used as heating/cooling control/position proportioning control, select any code of 01 to 07.
- Remote/Local transfer can be done during cascade control and ratio control by inter-controller communication.

Digital input (DI) Allocation Table

♦ Default setting

Code	DI 1	DI 2	DI 3	DI4	DI 5	Selectable optional Code
01 ♦	Unused					———
02	Memory area selection (1 to 8)			Area set	RUN/STOP	A
03	Memory area selection (1 to 8)			Area set		A
04	Memory area selection (1 to 8)			Area set	AUTO/MANUAL	A
05	Memory area selection (1 to 8)			Area set	Alarm interlock reset	A
06	Memory area selection (1 to 8)			RUN/STOP	———	A
07	Memory area selection (1 to 8)			RUN/STOP	AUTO/MANUAL	A
08	Memory area selection (1 to 8)			RUN/STOP	Alarm interlock reset	A
09	Memory area selection (1 to 8)			———	AUTO/MANUAL	A
10	Memory area selection (1 to 8)			———	Alarm interlock reset	A
11	Memory area selection (1 to 8)			AUTO/MANUAL	Alarm interlock reset	A
12	Memory area selection (1 to 8)			———	———	A
13	RUN/STOP	REMOTE/LOCAL	AUTO/MANUAL			A, E
14	RUN/STOP	REMOTE/LOCAL	Alarm interlock reset			A, E
15	RUN/STOP	AUTO/MANUAL	Alarm interlock reset			A, E
16	REMOTE/LOCAL	AUTO/MANUAL	Alarm interlock reset			A, E
17	RUN/STOP	REMOTE/LOCAL	———			A, B, C, D, E
18	RUN/STOP	AUTO/MANUAL	———			A, B, C, D, E
19	RUN/STOP	Alarm interlock reset	———			A, B, C, D, E
20	REMOTE/LOCAL	AUTO/MANUAL	———			A, B, C, D, E
21	REMOTE/LOCAL	Alarm interlock reset	———			A, B, C, D, E
22	AUTO/MANUAL	Alarm interlock reset	———			A, B, C, D, E
23	RUN/STOP	———	———			A, B, C, D, E, F 3, 4, 5, 6, 7, 8
24	REMOTE/LOCAL	———	———			A, B, C, D, E, F 3, 4, 5, 6, 7, 8
25	AUTO/MANUAL	———	———			A, B, C, D, E, F 3, 4, 5, 6, 7, 8
26	Alarm interlock reset	———	———			A, B, C, D, E, F 3, 4, 5, 6, 7, 8

Example of Model Code and Quick start code

Specifications

Input : Thermocouple K 0.0 to 400.0℃
Control method : PID control for heating (Output : 4 to 20mA DC)
Digital Output (Alarm) : 2 points (Deviation High, Deviation Low)
Analog retransmission output : 0 to 10V DC
Digital input : 1 point (RUM/STOP)

Model code

FB100-8N-□*5/□-2FK09

- Output 1 (Heat output): 4 - 20mA DC
- Output 2 (Cool output): None
- Optional function: Digital input : 1 point / Remote setpoint input : 1 point / Analog retransmission output 0 to 10V DC
- Quick start code: Specify quick start code 1 and 2
- Control Method: PID control with AT (Reverse action)
- Input and range: K 0.0 to 400.0℃
- Power supply voltage
- Case color

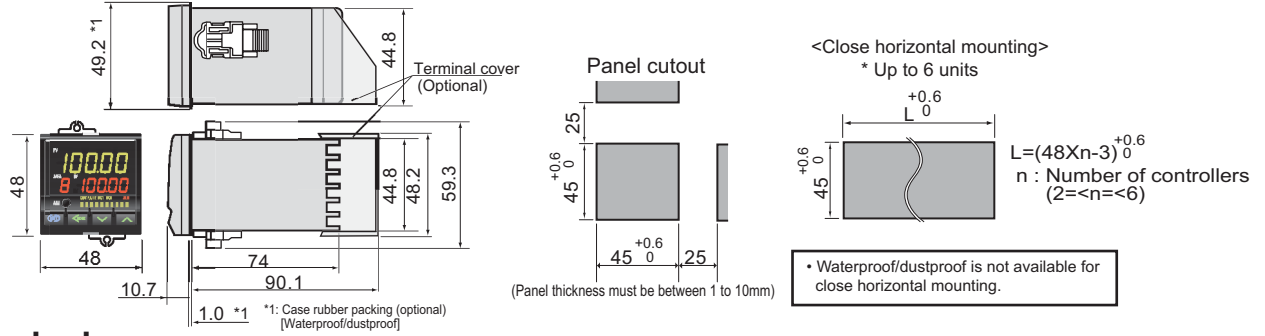**Quick start code**

0123-□ABNN-NN

- Output Allocation: OUT1: Control output 1, OUT2: Control output 2 / DO1: Event 1, DO2: Event 2
  * OUT2 : Unused
  * Digital output (DO1, DO2) : Standard function
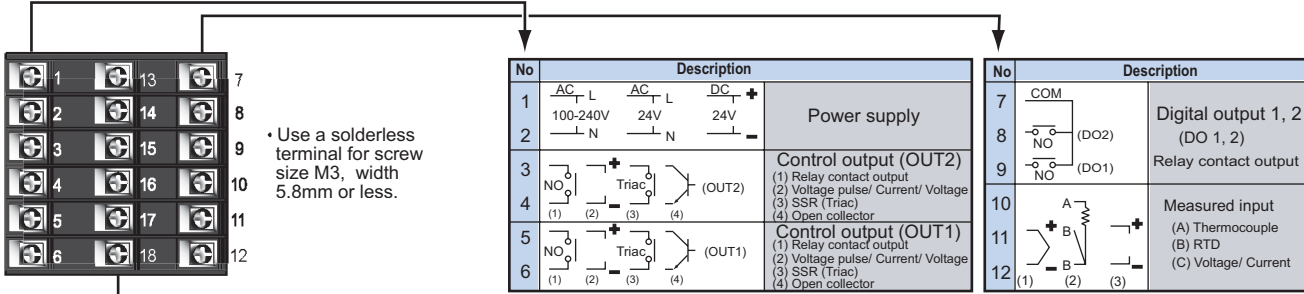- Digital Input Allocation: DI1: RUN/STOP
- Event 1: Deviation High
- Event 2: Deviation Low
- Event 3: None
- Event 4: None
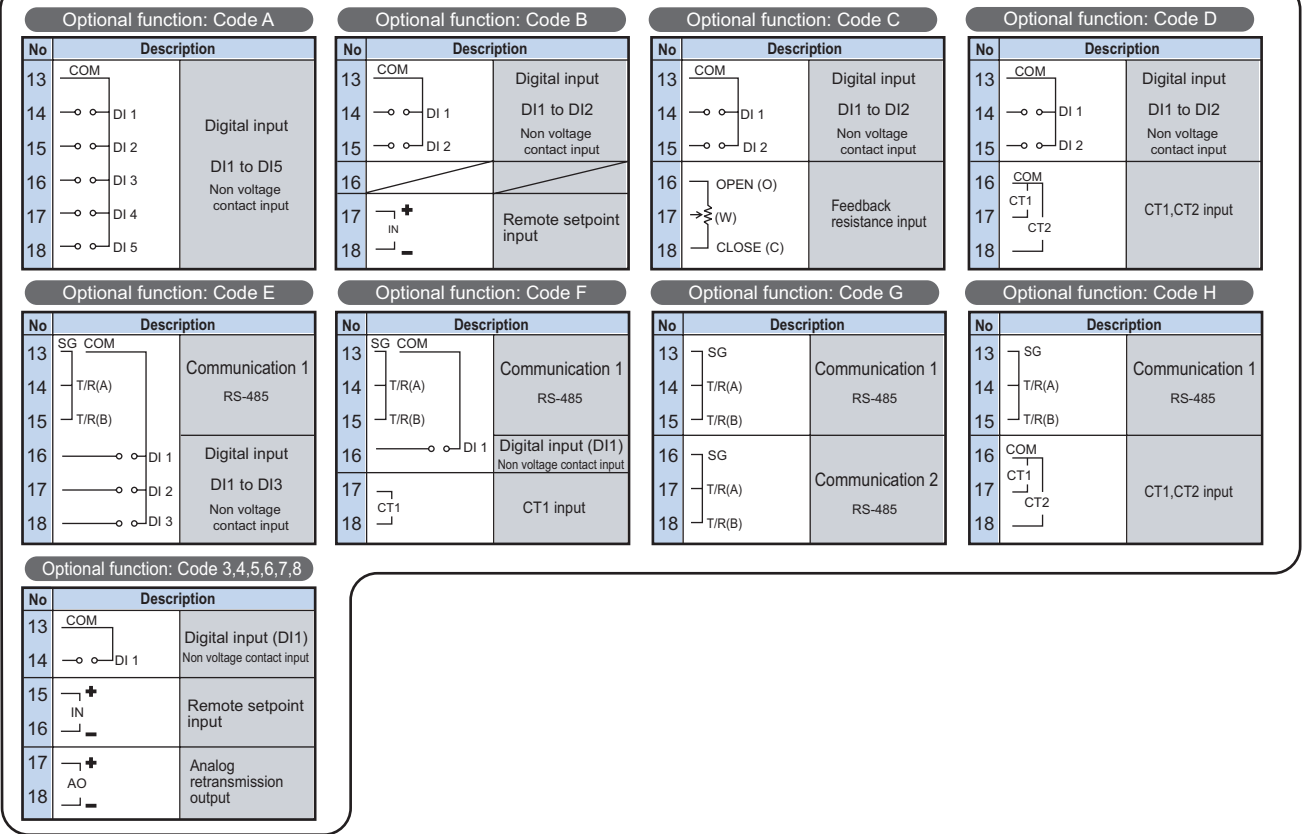- CT type: None
- Communication 1 protocol: None
- Remote setpoint input

External Dimensions

Unit : mm

49.2 *1   44.8   Terminal cover (Optional)

Panel cutout

\<Close horizontal mounting\>
* Up to 6 units

48   44.8   48.2   59.3

25

$L=(48Xn-3)^{+0.6}_{0}$

n : Number of controllers (2=\<n=\<6)

48
74
90.1
10.7
1.0 *1

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

45 +0.6 / 0
45 +0.6 / 0
45 +0.6 / 0

25
L +0.6 / 0

(Panel thickness must be between 1 to 10mm)

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

Rear Terminals

• Use a solderless terminal for screw size M3, width 5.8mm or less.

No		Description
1	AC ⌐ L AC ⌐ L DC ⌐ + 100-240V 24V 24V	Power supply
2	⌐ N ⌐ N ⌐ −	
3	NO Triac (OUT2)	Control output (OUT2) (1) Relay contact output
4	(1) (2) (3) (4)	(2) Voltage pulse/ Current/ Voltage (3) SSR (Triac) (4) Open collector
5	NO Triac (OUT1)	Control output (OUT1) (1) Relay contact output
6	(1) (2) (3) (4)	(2) Voltage pulse/ Current/ Voltage (3) SSR (Triac) (4) Open collector

No		Description
7	COM	Digital output 1, 2 (DO 1, 2)
8	(DO2) NO	Relay contact output
9	(DO1) NO	
10	A	Measured input
11	B	(A) Thermocouple (B) RTD
12	B (1) (2) (3)	(C) Voltage/ Current

Optional function terminals

Optional function: Code A		
No		Description
13	COM	Digital input
14	DI 1	DI1 to DI5
15	DI 2	
16	DI 3	Non voltage contact input
17	DI 4	
18	DI 5	

Optional function: Code B		
No		Description
13	COM	Digital input
14	DI 1	DI1 to DI2
15	DI 2	Non voltage contact input
16		
17	+	Remote setpoint
18	IN −	input

Optional function: Code C		
No		Description
13	COM	Digital input
14	DI 1	DI1 to DI2
15	DI 2	Non voltage contact input
16	OPEN (O)	
17	(W)	Feedback resistance input
18	CLOSE (C)	

Optional function: Code D		
No		Description
13	COM	Digital input
14	DI 1	DI1 to DI2
15	DI 2	Non voltage contact input
16	COM	
17	CT1	CT1,CT2 input
18	CT2	

Optional function: Code E		
No		Description
13	SG COM	Communication 1
14	T/R(A)	RS-485
15	T/R(B)	
16	DI 1	Digital input
17	DI 2	DI1 to DI3
18	DI 3	Non voltage contact input

Optional function: Code F		
No		Description
13	SG COM	Communication 1
14	T/R(A)	RS-485
15	T/R(B)	
16	DI 1	Digital input (DI1) Non voltage contact input
17	CT1	CT1 input
18		

Optional function: Code G		
No		Description
13	SG	Communication 1
14	T/R(A)	RS-485
15	T/R(B)	
16	SG	Communication 2
17	T/R(A)	RS-485
18	T/R(B)	

Optional function: Code H		
No		Description
13	SG	Communication 1
14	T/R(A)	RS-485
15	T/R(B)	
16	COM	
17	CT1	CT1,CT2 input
18	CT2	

Optional function: Code 3,4,5,6,7,8		
No		Description
13	COM	Digital input (DI1)
14	DI 1	Non voltage contact input
15	+	Remote setpoint
16	IN	input
17	+	Analog retransmission
18	AO −	output