

°C	Series FP23 PROGRAMMABLE CONTROLLER
%RH	
SHIMADEN	



BASIC FEATURES

- 2-channel controller (Basic type: 1-channel controller)**
- Independent 2-loop / 2-input operation control**
- High accuracy $\pm (0.1\% FS + 1 \text{ digit})$**
- High Sampling Cycle 0.1 sec.**
- High resolution 1/1000 °C display achieved**
**Only for R.T.D. input (scale: 0.000~30.000 °C)*
- Programmable Max. 400 steps (400 steps x 1 pattern to 20 steps x 20 patterns)**
- Auto-Tuning PID / Expert PID**
- Max. 10 Zone PID control available**
- Independent Universal-Input**
- User Friendly Operation (Menu Driven: 4 Lines LCD Display)**
- Easy Setting & Maintenance via Infrared COM port on the front panel**
- Interface RS-232C/RS-485 (MODBUS / Shimaden)**
- The front dust/splash-proof IP66**
- Universal Power Supply (100~240V AC $\pm 10\%$)**
- Sensor power supply**

COPING WITH ADVANCED PROCESS CONTROL

Temperature °C, Pressure MPa, Flowrate m³/s, etc.

Two types of programs can be executed at the same time.

High-performance programmable controller

FP23 Series



Number of program patterns:

Max. 20

Number of program steps:

Max. 400

High accuracy:

± (0.1% FS+1 digit)

High sampling cycle:

100 msec.

(100 msec. even at 2-loop specification)

Universal-Input

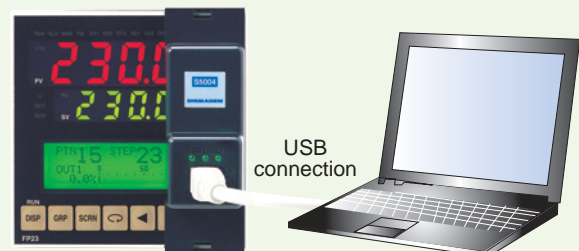
Thermocouple
R.T.D.
DC voltage
DC current

→
All of them are acceptable.



- * Individual setting is allowed for each channel at 2-loop specification.
- * Current input is executed through externally attached shunt resistor with 250Ω.

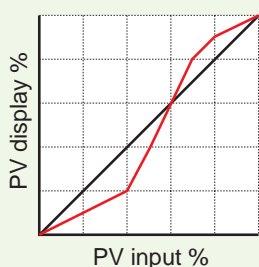
Easy setup through infra-red communication



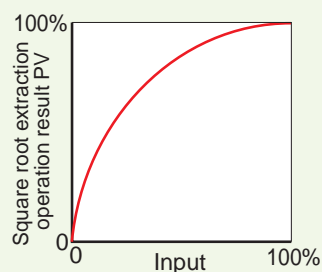
- Easy setting thanks to dedicated setup program
- Reading and writing of various parameters are possible.
- Saving and reading to files are possible.

10-segment linear approximation and square root extraction operation functions

Linearising nonlinear signal input
Number of approximation point:
Max. 11

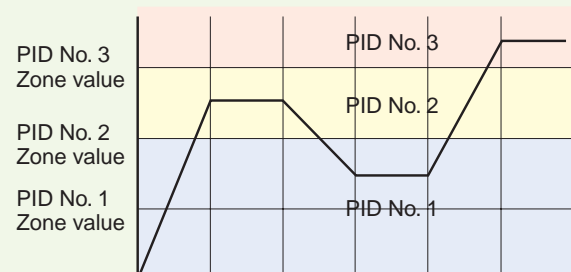


Linearisation of signals with square characteristic such as flow rate



Multiple PID

- Selectable from 10 PID Nos. for each step
- Control by zone PID is also available (Max. 10 zones).



EASY READABILITY AND USABILITY ARE RADICALLY PURSUED.

Excellent visibility thanks to the large LED with 5 digits x 2 lines and LCD with 128 x 32 dots

■PV Display Panel


- Measured value (PV) display
- CH2PV is indicated when CH2 lamp is illuminated.
- Error message display

■SV Display Panel

- Target value (SV) display
- CH2SV is indicated when CH2 lamp is illuminated.
- CH2PV is indicated when PV2 lamp is illuminated.
- Error message display

■LCD Display Panel

- Pattern / Step No. display
- Output display (numerical value and bar graph)
- Channel display
- Various setting parameters display



■Status Lamp Display Panel

RUN: Program on standby: Flashing
Program in execution: ON

HLD: Program suspended: ON

MAN: Manual operation (MAN) in execution: Flashing

FIX: During FIX mode: ON

EV1-3: Event output being on: ON

DO1-5: External control output being on: ON

EXT: When start pattern No. by DI is selected: ON

COM: In communication mode: ON

AT: Auto tuning in execution: Flashing

OUT 1, 2: Control output monitor lamp

■Infra-red Communication Display Panel

- Infra-red communication through dedicated adaptor
- Receptacle/illuminator

■Key Switch Display Panel

DISP : Return to the basic screen
: Switching to display mode

GRP : Go to screen group

SCRN : Go to any screen within the group

ENT : Selection of editing and setting parameters

STEP : Increase/decrease of numeric value and scaling factor

PTN : Registration of numeric value and/or data

STEP : Switching of step No.

PTN : Switching of pattern No.

EASY PARAMETER SETTING THANKS TO THE INTERACTIVE MODE THROUGH 4 LINE LCD DISPLAY

DISPLAY MODE CORRESPONDING TO EACH SPECIFICATION

◆ Independent 2-loop control



CH1...PV
CH2...PV
CH1...PTN No. STEP No. SV
CH2...PTN No. STEP No. SV

◆ 2-input operation control



Operation result PV
SV
Input 1
Input 2

◆ Positioning proportional control (servo output)

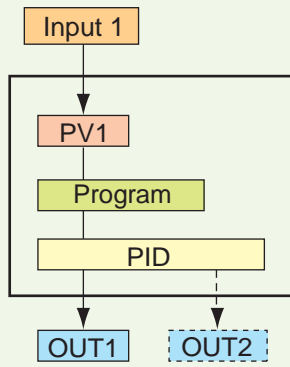


PV
SV
Opening

COPING WITH MULTIFARIOUS

1 Loop / 2 Loop Control

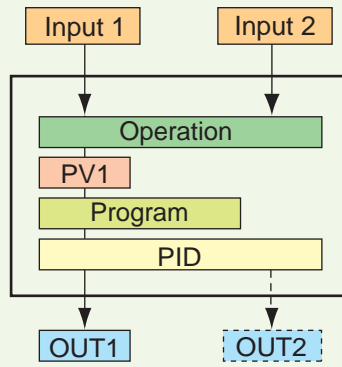
1-input control



* 1 output (for heating/cooling control) may also be provided.

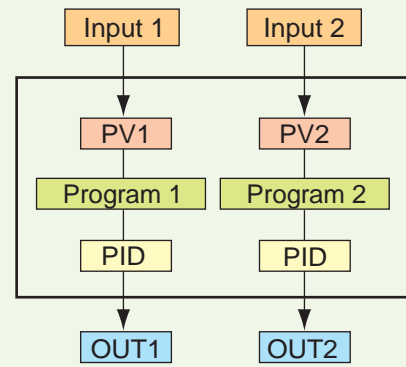
2-input operation control

(max. value, min. value, deviation value, average value)



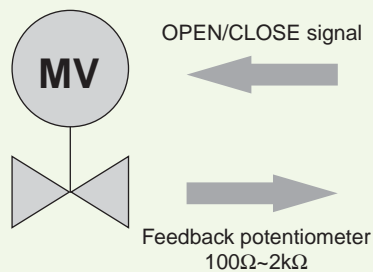
* 2 outputs (for heating/cooling control) may also be provided.

Independent 2-loop control

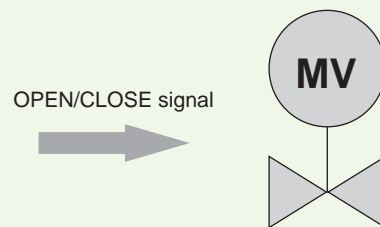


Servo Output Specification (Control motor/motor valve control)

With feedback potentiometer



Without feedback potentiometer



* Proportional control may be executed both with and without feedback potentiometer.

Easily Connectable with External Equipment such as PLC thanks to Abundant Number of Input/Output Points

• External Control Input (DI): Max. 10

Execution/stop of program control
Stop of program control
Suspension of program control
Postponement of program step
FIX mode
Manual control operation
Logical operation input
Selection of start pattern No.



• Event Output: 3 External Control Output: Max. 13

27 alarm actions, various status output and logical operation output

• Sensor power supply

24V DC

• Analog Output: Max. 2

Externally output PV, SV, deviation value, output value, limit value for each channel by means of analog signal

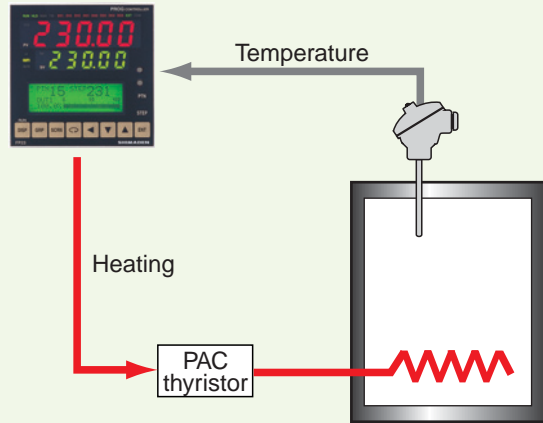
• Communication function

Both Shimaden standard protocol and MODBUS (RTU/ASCII) communication protocol are equipped.

APPLICATIONS

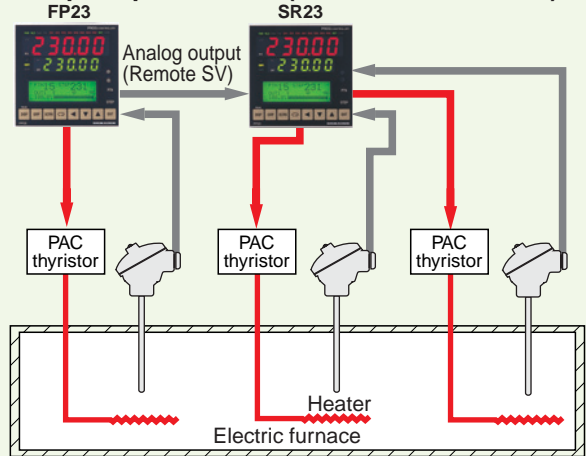
Heating Control

1-input Specification



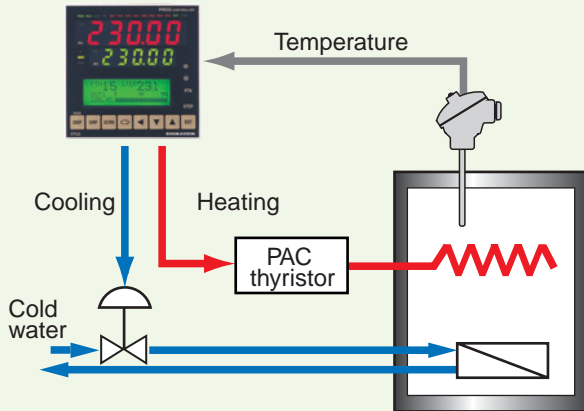
3-Zone Program Temperature Control of Electric Furnace

1-input Specification (Master-slave control)



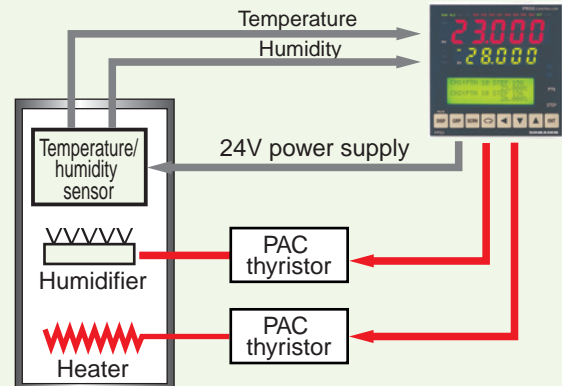
Heating/Cooling Control

1-input Specification



Constant-temperature/constant-humidity control

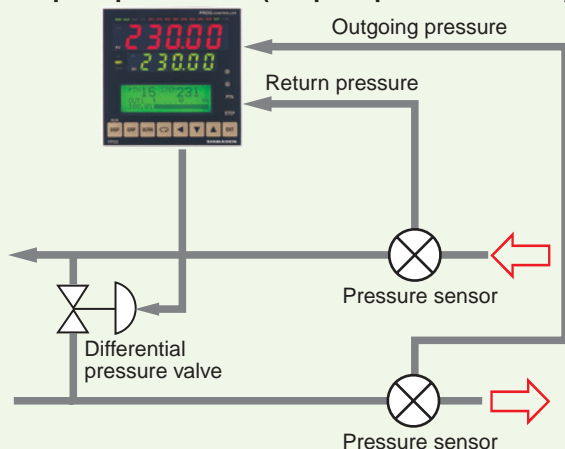
2-input Specification (Independent 2-loop control)



* Cooling (dehumidifying) may be achievable by using event output as well.

Differential Pressure Control

2-input Specification (2-input operation control)



Widely Coping with Various Usages

- Semiconductor manufacturing equipment
- Electrical/electronic parts/components manufacturing-related equipment
- Various industrial furnaces
- Vacuum heating furnaces
- Environmental test equipment
- Food processing machines
- Plastic processing/molding machines
- Sterilization/pasteurization equipment for pharmaceuticals

- 1-output control

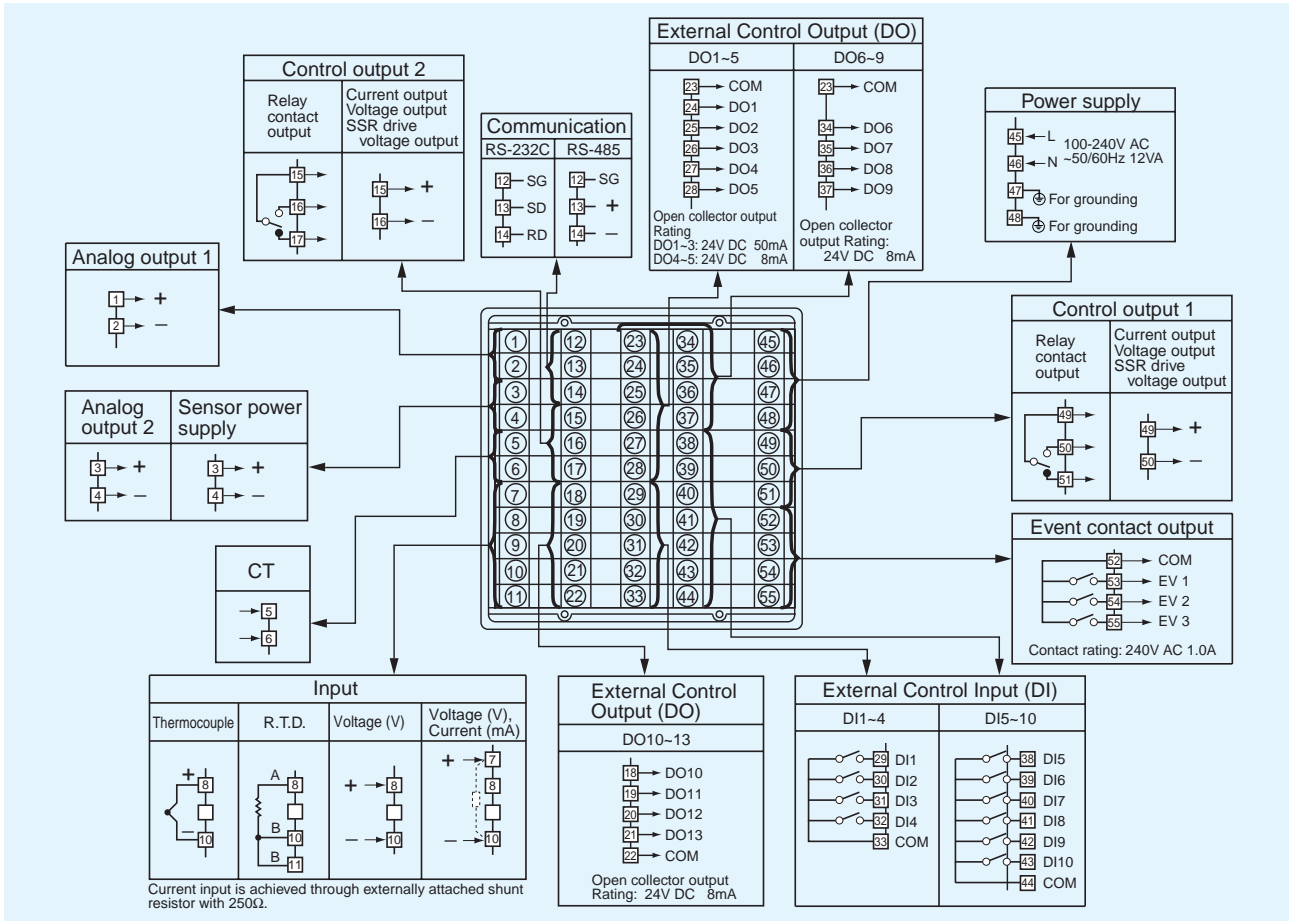
Ordering Information

ITEM	CODE		Specifications
SERIES	FP23-		96 × 96 DIN size, high-performance programmable controller
BASIC FUNCTIONS	SS		Universal-input, 1-input/1-output control, 3 event outputs
CONTROL OUTPUT 1	Y	I	Contact 1c, contact rating: 240V AC 2.5A/resistive load, 1A/inductive load
		I	Current 4 ~ 20mA DC, Load resistance: max. 600Ω
		P	SSR drive voltage output 12V±1.5V DC, Load current: max. 30mA
		V	Voltage 0 ~ 10V DC, Load current: max. 2mA
CONTROL OUTPUT 2	N-		None
HEATER BREAK ALARM (FOR SINGLE-PHASE)		00	None
		31	Heater break alarm* (heater current 30A with CT)
		32	Heater break alarm* (heater current 50A with CT)
			* Selectable only when Control Output 1 is Y or P
ANALOG OUTPUT 1		0	None
		3	0 ~ 10mV DC, Output resistance: 10Ω
		4	4 ~ 20mA DC, Load resistance: max. 300Ω
		6	0 ~ 10V DC, Load current: max. 2mA
ANALOG OUTPUT 2/ SENSOR POWER SUPPLY		0	None
		3	0 ~ 10mV DC, Output resistance: 10Ω
		4	4 ~ 20mA DC, Load resistance: max. 300Ω
		6	0 ~ 10V DC, Load current: max. 2mA
		8	Sensor power supply 24V DC 25mA
EXTERNAL INPUT/ OUTPUT CONTROL SIGNAL (DI/DO) *1	standard	0	DI 4 points, DO 5 points (start pattern No. switching not available)
		1	DI 10 points, DO 9 points (start pattern No. switching available)
		2	DI 10 points, DO 13 points (start pattern No. switching available)
COMMUNICATION FUNCTION		0	None
		5	RS-485
		7	RS-232C
			Shimaden standard protocol / MODBUS (RTU/ASCII) communication protocol
REMARKS		A	Without
		9	With

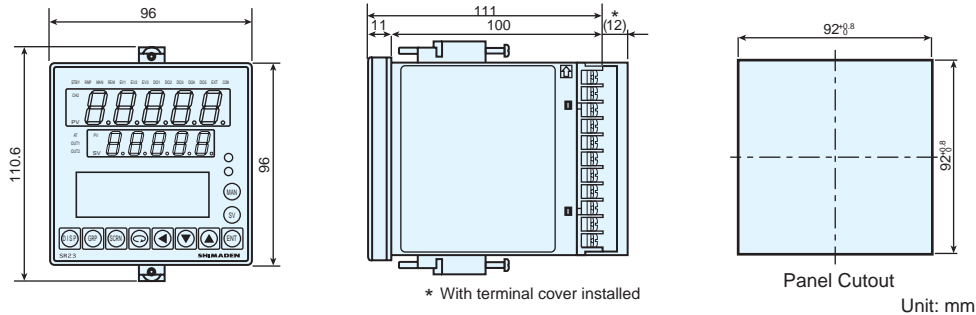
*1 When switching the start pattern No. by DI, 10 points of DI (CODE 1 or 2) are required.

Optional Accessories

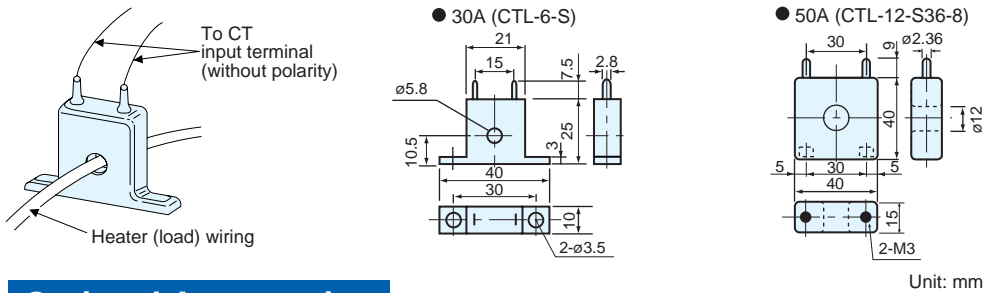
Name	Model	Description
Infra-red Communication Adapter	S5004	USB connector cable (2m), Setup Software (CD-ROM)
Shunt Resistor	QCS002	250Ω ±0.1%, external input resistance at current input
Relay Unit	AP2MC	Converts open collector output to contact output. 2 circuits built-in



External Dimensions & Panel Cutout



Accessories Required for Heater Break Alarm Function



Optional Accessories

Relay Unit Model AP2MC
 (Converts open collector output to contact output. 2 circuits built-in)



Infra-red Communication Adapter Model S5004 with USB connector cable



- 2-output control (Heating/cooling control)

Ordering Information

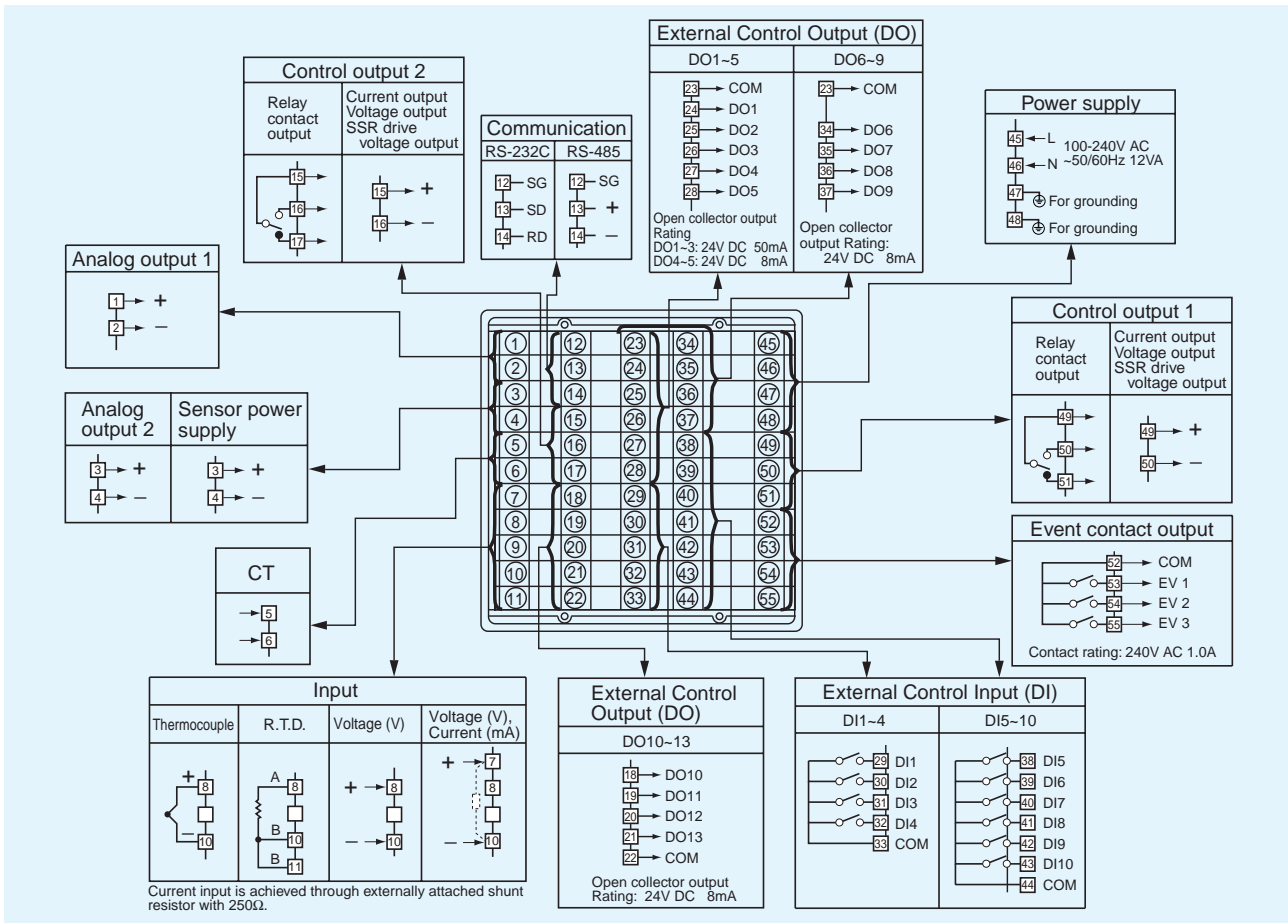
ITEM	CODE		Specifications	
SERIES	FP23-		96 × 96 DIN size, high-performance programmable controller	
BASIC FUNCTIONS	SD		Universal-input, 1-input/2-output control, 3 event outputs	
CONTROL OUTPUT 1		Y	Contact 1c, contact rating: 240V AC 2.5A/resistive load, 1A/inductive load	
		I	Current 4 ~ 20mA DC, Load resistance: max. 600Ω	
		P	SSR drive voltage output 12V±1.5V DC, Load current: max. 30mA	
		V	Voltage 0 ~ 10V DC, Load current: max. 2mA	
CONTROL OUTPUT 2		Y-	Contact 1c, contact rating: 240V AC 2.5A/resistive load, 1A/inductive load	
		I-	Current 4 ~ 20mA DC, Load resistance: max. 600Ω	
		P-	SSR drive voltage output 12V±1.5V DC, Load current: max. 30mA	
		V-	Voltage 0 ~ 10V DC, Load current: max. 2mA	
HEATER BREAK ALARM (FOR SINGLE-PHASE) *1		00	None	
		31	Heater break alarm* (heater current 30A with CT)	* Selectable only when Control Output 1 or 2 is Y or P
		32	Heater break alarm* (heater current 50A with CT)	
ANALOG OUTPUT 1		0	None	
		3	0 ~ 10mV DC, Output resistance: 10Ω	
		4	4 ~ 20mA DC, Load resistance: max. 300Ω	
		6	0 ~ 10V DC, Load current: max. 2mA	
ANALOG OUTPUT 2/ SENSOR POWER SUPPLY		0	None	
		3	0 ~ 10mV DC, Output resistance: 10Ω	
		4	4 ~ 20mA DC, Load resistance: max. 300Ω	
		6	0 ~ 10V DC, Load current: max. 2mA	
		8	Sensor power supply 24V DC 25mA	
EXTERNAL INPUT /OUTPUT CONTROL SIGNAL (DI/DO) *2	standard	0	DI 4 points, DO 5 points (start pattern No. switching not available)	
		1	DI 10 points, DO 9 points (start pattern No. switching available)	
		2	DI 10 points, DO 13 points (start pattern No. switching available)	
COMMUNICATION FUNCTION		0	None	
		5	RS-485	Shimaden standard protocol / MODBUS (RTU/ASCII) communication protocol
		7	RS-232C	
REMARKS		A	Without	
		9	With	

*1 In a 2-output specification, the heater break alarm is used by either of Control Output 1 or 2.

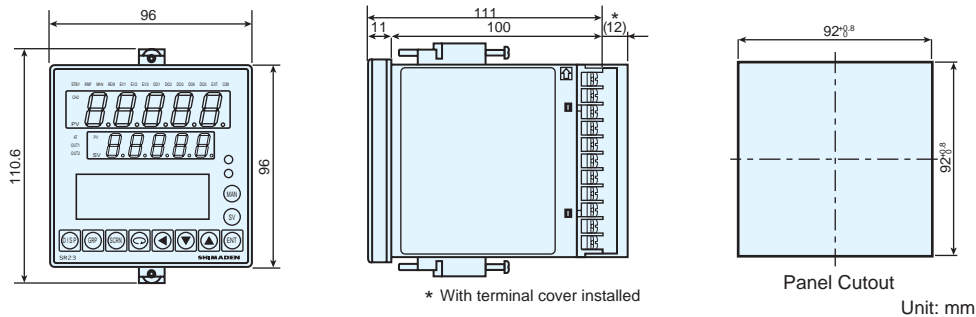
*2 When switching the SV No. by DI, 10 points of DI (CODE 1 or 2) are required.

Optional Accessories

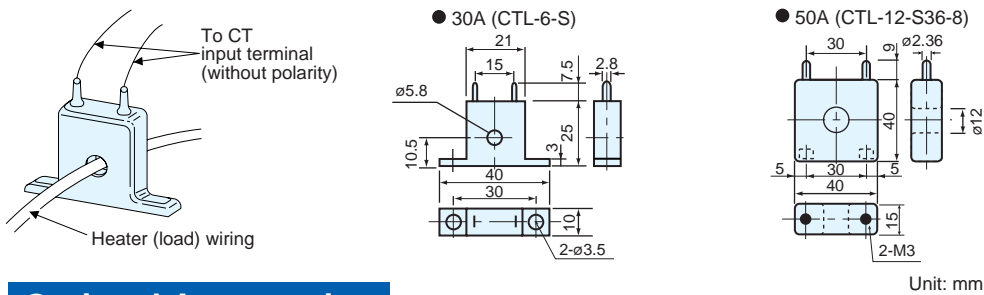
Name	Model	Description
Infra-red Communication Adapter	S5004	USB connector cable (2m), Setup Software (CD-ROM)
Shunt Resistor	QCS002	250Ω ±0.1%, external input resistance at current input
Relay Unit	AP2MC	Converts open collector output to contact output. 2 circuits built-in



External Dimensions & Panel Cutout



Accessories Required for Heater Break Alarm Function



Optional Accessories

Relay Unit Model AP2MC
(Converts open collector output to contact output. 2 circuits built-in)



Infra-red Communication Adapter Model S5004 with USB connector cable



- 2-input/2-output control (independent 2-loop control)
- 2-input operation/1-output control (1-loop control by max. value, min. value, average value, deviation value operation)
- 2-input operation/2-output control (1-loop heating/cooling control by max. value, min. value, average value, deviation value operation)

Ordering Information

ITEM	CODE		Specifications	
SERIES	FP23-		96 × 96 DIN size, high-performance digital controller	
BASIC FUNCTIONS *1	DL		Universal-input, independent 2-loop control, 3 event outputs	
	DS		Universal-input, 2-input operation/1-output control, 3 event outputs *2	
	DD		Universal-input, 2-input operation/2-output control, 3 event outputs	
CONTROL OUTPUT 1 *2	Y		Contact 1c, contact rating: 240V AC 2.5A/resistive load, 1A/inductive load	
	I		Current 4 ~ 20mA DC, Load resistance: max. 600Ω	
	P		SSR drive voltage output 12V±1.5V DC, Load current: max. 30mA	
	V		Voltage 0 ~ 10V DC, Load current: max. 2mA	
CONTROL OUTPUT 2	Y-		Contact 1c, contact rating: 240V AC 2.5A/resistive load, 1A/inductive load	
	I-		Current 4 ~ 20mA DC, Load resistance: max. 600Ω	
	P-		SSR drive voltage 12V±1.5V DC, Load current: max. 30mA	
	V-		Voltage 0 ~ 10V DC, Load current: max. 2mA	
HEATER BREAK ALARM (FOR SINGLE-PHASE) *3	00		None	
	31		Heater break alarm (heater current 30A with CT)	Selectable only when Control Output 1 or 2 is Y or P
	32		Heater break alarm (heater current 50A with CT)	
ANALOG OUTPUT 1	0		None	
	3		0 ~ 10mV DC, Output resistance: 10Ω	
	4		4 ~ 20mA DC, Load resistance: max. 300Ω	
	6		0 ~ 10V DC, Load current: max. 2mA	
ANALOG OUTPUT 2/ SENSOR POWER SUPPLY	0		None	
	3		0 ~ 10mV DC, Output resistance: 10Ω	
	4		4 ~ 20mA DC, Load resistance: max. 300Ω	
	6		0 ~ 10V DC, Load current: max. 2mA	
	8		Sensor power supply 24V DC 25mA	
EXTERNAL INPUT/OUTPUT CONTROL SIGNAL (DI/DO) *4	standard	0	DI 4 points, DO 5 points (start pattern No. switching not available)	
		1	DI 10 points, DO 9 points (start pattern No. switching available)	
COMMUNICATION FUNCTION		0	None	
		5	RS-485	Shimaden standard protocol/MODBUS (RTU/ASCII) communication protocol
		7	RS-232C	
REMARKS		A	Without	
		9	With	

*1 Independent 2-loop control, 2-input operation/1-output control and 2-input operation/2-output control are all supported in the 2-output specification. This controller is shipped with the function selected at BASIC FUNCTION set.

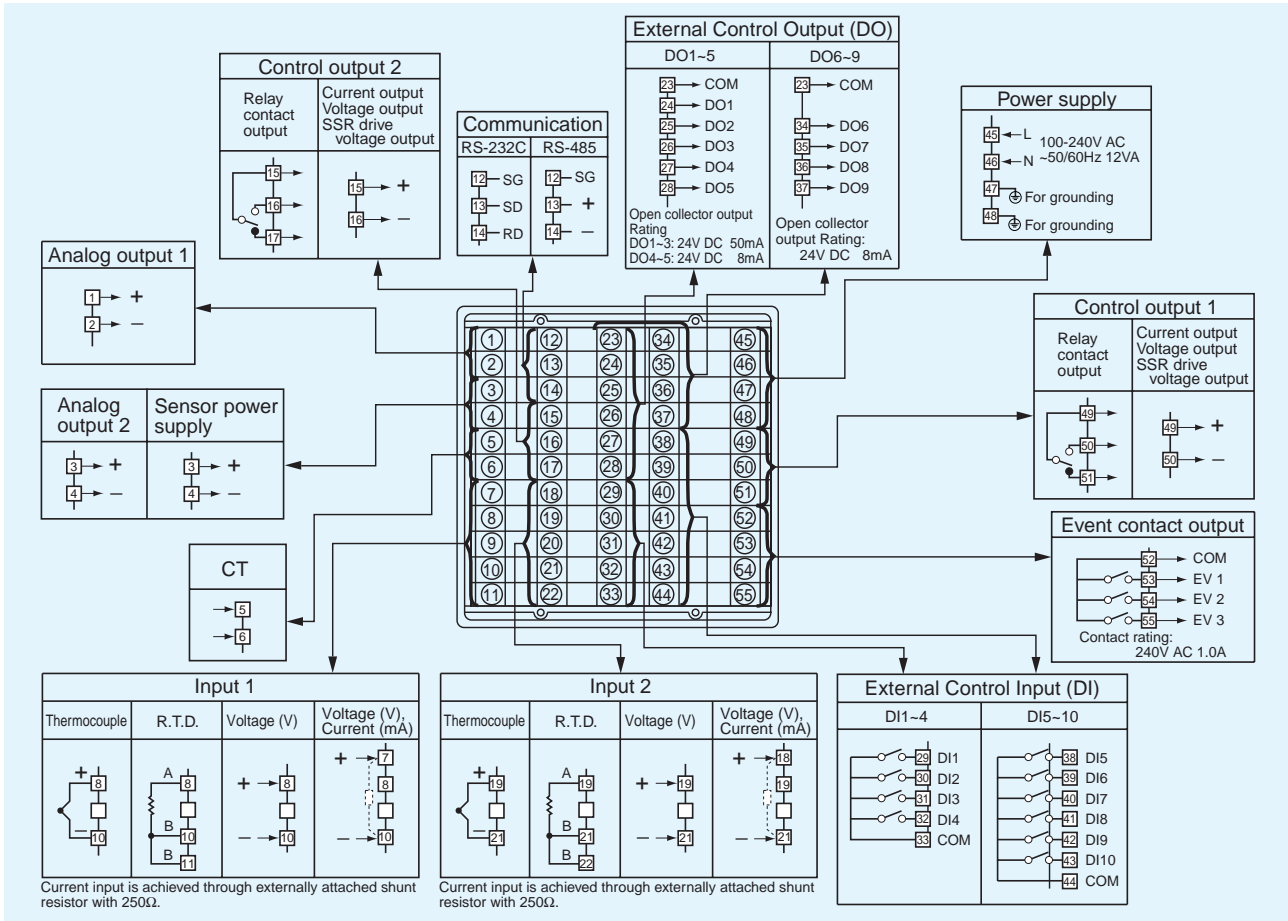
*2 In a 2-input operation/1-output control specification, output for control is output to Control Output 1. Select the same specification as Control Output 2 for Control Output 1.

*3 In a 2-output specification, the heater break alarm is used by either of Control Output 1 or 2.

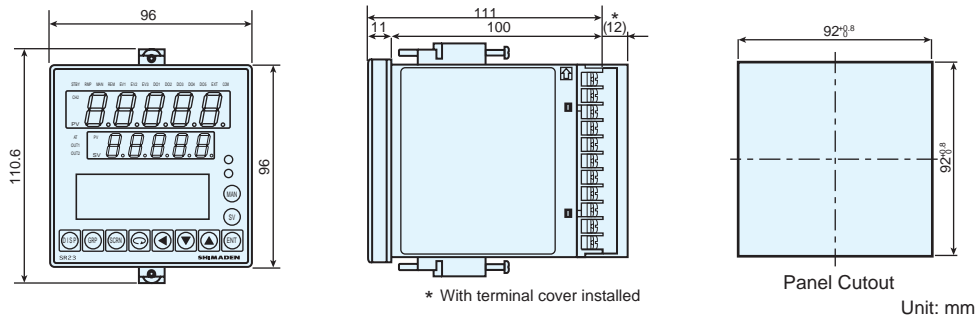
*4 When switching the start pattern No. by DI, 10 points of DI (CODE 1) are required.

Optional Accessories

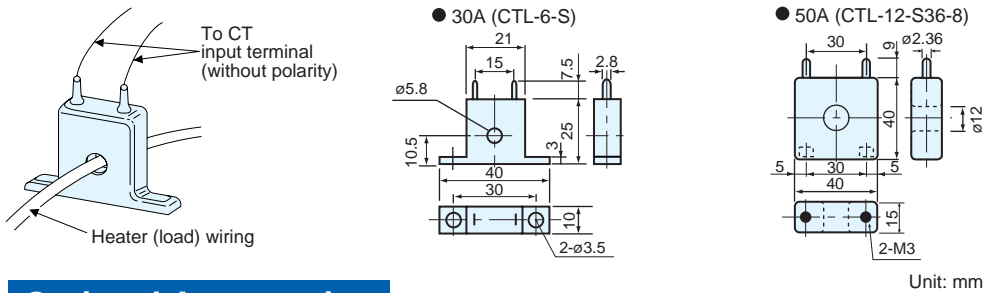
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Shunt Resistor	QCS002	250Ω ±0.1%, external input resistance at current input
Relay Unit	AP2MC	Converts open collector output to contact output. 2 circuits built-in



External Dimensions & Panel Cutout



Accessories Required for Heater Break Alarm Function



Optional Accessories

Relay Unit Model AP2MC
 (Converts open collector output to contact output. 2 circuits built-in)



Infra-red Communication Adapter Model S5004 with USB connector cable



Input type		Code	Measuring range		
Thermocouple	B	01	*1	0.0 ~ 1800.0°C	
	R	02		0.0 ~ 1700.0°C	
	S	03		0.0 ~ 1700.0°C	
	K	04			-100.0 ~ 400.0°C
		05			0.0 ~ 400.0°C
		06			0.0 ~ 800.0°C
		07			0.0 ~ 1370.0°C
		08	*2		-200.0 ~ 200.0°C
		E	09		
	J	10			0.0 ~ 600.0°C
	T	11	*2		-200.0 ~ 200.0°C
	N	12			0.0 ~ 1300.0°C
	PL II	13			0.0 ~ 1300.0°C
	PR40-20	14	*3		0.0 ~ 1800.0°C
	WRe5-26	15			0.0 ~ 2300.0°C
	U	16			-200.0 ~ 200.0°C
	L	17			0.0 ~ 600.0°C
	K	18	*4		10.0 ~ 350.0 K
	Gold and Iron/Chromel	19	*5		0.0 ~ 350.0 K
R.T.D.	Pt100 JPt100	Pt	JPt		
		31	45	*6	-200.0 ~ 600.0 °C
		32	46		-100.00 ~ 100.00 °C
		33	47		-100.0 ~ 300.0 °C
		34	48		-60.00 ~ 40.00 °C
		35	49		-50.00 ~ 50.00 °C
		36	50		-40.00 ~ 60.00 °C
		37	51		-20.00 ~ 80.00 °C
		38	52	*7	0.000 ~ 30.000°C
		39	53		0.00 ~ 50.00 °C
		40	54		0.00 ~ 100.00 °C
		41	55		0.00 ~ 200.00 °C
		42	56	*8	0.0 ~ 300.00 °C
		43	57		0.00 ~ 300.0 °C
44	58		0.0 ~ 500.0 °C		

Input type		Code	Measuring range	
Voltage (mV)	-10 ~ 10mV	71		
	0 ~ 10mV	72		
	0 ~ 20mV	73		Initial value: 0.0~100.0
	0 ~ 50mV	74		
	10 ~ 50mV	75		Measuring range may be arbitrarily set within following range by scaling function.
	0 ~ 100mV	76		
	-100 ~ 100mV	77		
Voltage (V)	-1 ~ 1V	81		Scaling range: -19999-30000 counts
	0 ~ 1V	82		Span: 10-30000 counts
	0 ~ 2V	83		Lower limit value < Higher limit value
	0 ~ 5V	84		Decimal alignment: None,
	1 ~ 5V	85		decimal positions: 1, 2, 3 or 4
	0 ~ 10V	86		
	-10 ~ 10V	87		
Current (mA)	0 ~ 20mA	84		*If you use this with current input, please attach external shunt resistor with 250Ω.
	4 ~ 20mA	85		

Note: Minimal decimal is selectable.

Note:

- *1. Thermocouple B: Accuracy not guaranteed for temperatures below 400°C
- *2. Thermocouple K, T: Accuracy = ± (0.5% FS+1 digit) for -100°C or lower temperature
- *3. Thermocouple PR40-20: Accuracy = ± (0.3% FS +1°C)
- *4. Thermocouple K: 10.0~30.0 K: Accuracy = ± (0.75% FS +1 K)
30.0~70.0 K: Accuracy = ± (0.30% FS +1 K)
70.0~350.0 K: Accuracy = ± (0.25% FS +1 K)
- *5. Thermocouple Gold and Iron/Chromel: Accuracy = ± (0.25% FS +1 K)
- *6. For JPt100, set to -200.0~500.0°C.
- *7. When exceeding higher limit at 30.000°C, indicated as scaleover.
- *8. When exceeding higher limit at 300.00°C, indicated as scaleover.

Note: Unless otherwise specified, the measuring range will be set as listed below during the shipment from the factory.

Input	Standard/Rating	Measuring range
Thermocouple	JIS K	0.0~800.0°C