

°C	Series <b>SR23</b>
%RH	
<b>SHIMADEN</b>	

# SHIMADEN DIGITAL CONTROLLER



**CE** approved **UL** applied

## BASIC FEATURES

- 2-channel controller (Basic type: 1-channel controller)
- Independent 2-loop / Internal Cascade / 2-input operation control
- High accuracy  $\pm (0.1\% \text{ FS} + 1 \text{ digit})$
- 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)
- Auto-Tuning PID / Expert PID / Self-Tuning PID
- Multi-Setting of 10 Set Values
- 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 m<sup>3</sup>/s, etc.

High-performance digital controller

## SR23 Series



**High accuracy:**

± (0.1% FS+1 digit)

**High sampling cycle:**

100 msec.

(100 msec./loop even for 2-loop control)

**High resolution:**

1/1000°C display achieved

\* This indication is available only for 0.000~30.000°C at R.T.D.

### Dual 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

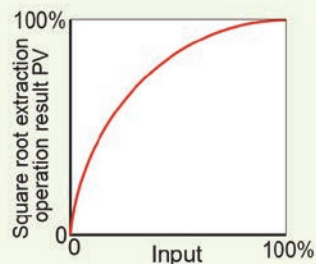
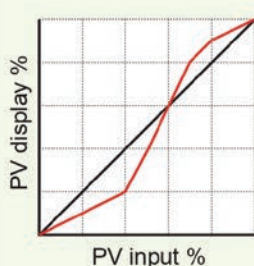


- Easy initial setting and easy maintenance thanks to dedicated setup program
- Reading and writing of various parameters are possible.
- Files may be saved in CSV format.

### 10-segment linearization approximation and square root extraction operation functions

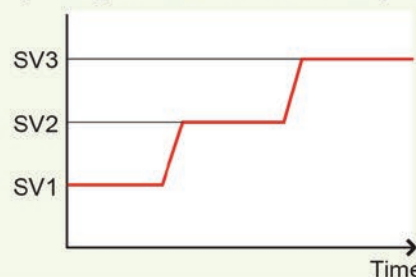
Linearising nonlinear signal input  
Number of approximation point:  
Max. 11

Linearisation of signals with  
square characteristic such as  
flow rate



### Setting of SV is allowed up to 10 points.

- Controllability is improved thanks to individual PID setting allowed for each SV.
- Control by zone PID is also available (Max. 10 zones).
- Ramp setting is available when SV changed.



# 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
- CH2 PV is indicated when CH2 lamp is illuminated.
- Error message display

## ■SV Display Panel

- Target value (SV) display
- CH2 SV is indicated when CH2 lamp is illuminated. (only 2-input model)
- Error message display

## ■LCD Display Panel

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



## ■Status Lamp Display Panel

- STBY: Control action not in execution: Flashing
- RMP: Ramp control in execution: Flashing
- MAN: Manual control in execution: Flashing
- REM: Remote SV in execution: Flashing
- EV1~3: Event output being on: ON
- DO1~5: External control output being on: ON
- EXT: External SV switch setting: ON
- COM: In communication mode: ON
- AT: Auto tuning in execution: Flashing
- OUT 1, 2: Control output monitor lamp

## ■Infra-red Communication Display Panel

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

## ■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
- ⌚** : Selection of editing and setting parameters
- ⬅️⬇️⬆️** : Increase/decrease of numeric value and scaling factor
- ENT** : Registration of numeric value and/or data
- SV** : Switching of SV No.
- MAN** : Used when switching to manual control mode

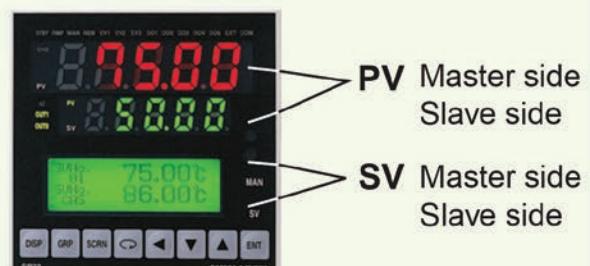
EASY PARAMETER SETTING THANKS TO THE DIALOG METHOD THROUGH 4 LINES LCD DISPLAY

## DISPLAY MODE CORRESPONDING TO EACH SPECIFICATION

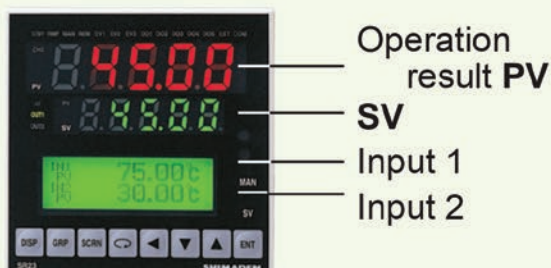
### ◆ Independent 2-loop control



### ◆ Internal cascade control



### ◆ 2-input operation control



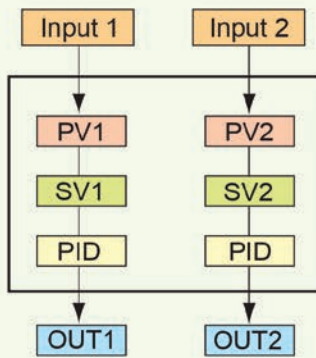
### ◆ Positioning proportional control (servo output)



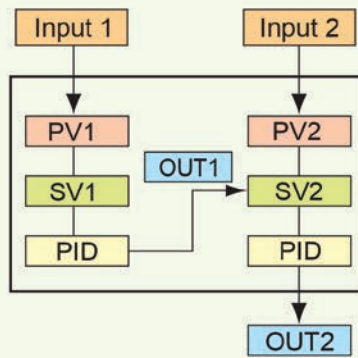
# COPING WITH MULTIFARIOUS

## 2-Input Control by One Unit

### Independent 2-loop control

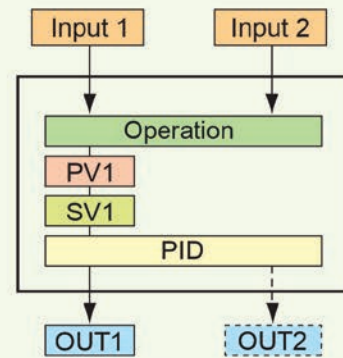


### Internal cascade control



### 2-input operation control

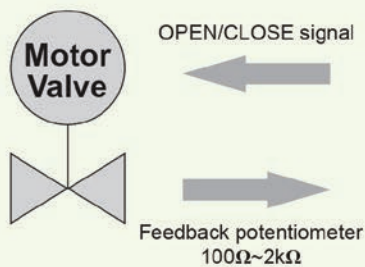
(max. value, min. value, deviation value, average value)



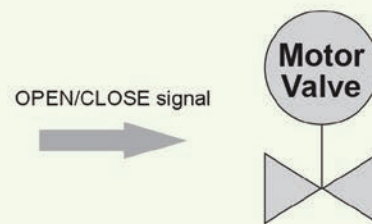
\* 2-outputs (for heat & cool/heat & heat/cool & cool) may also be provided.

## 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.

## Easy Connection with PLC, etc. thanks to increased Input/Output Points

### External Control Input (DI): Max. 10

Auto/Manual switching  
SV No. switching  
AT execution  
Execution/Standby of control  
Switching of output characteristics  
Execution of logical operation

### Remote Setting Input

SV value may be set by external analog signal.



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

8 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 and position value per channel in analog signal

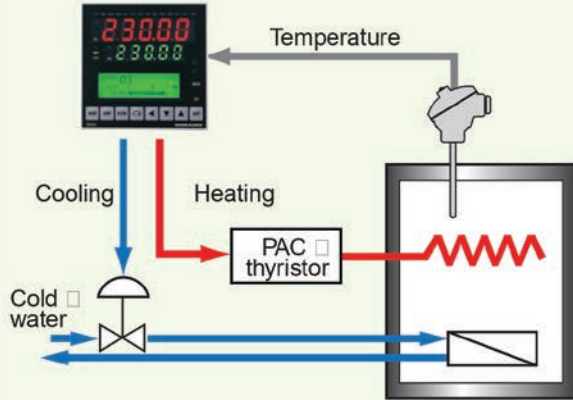
### Communication function

Shimaden standard protocol  
MODBUS (RTU/ASCII)  
communication protocol

# APPLICATIONS

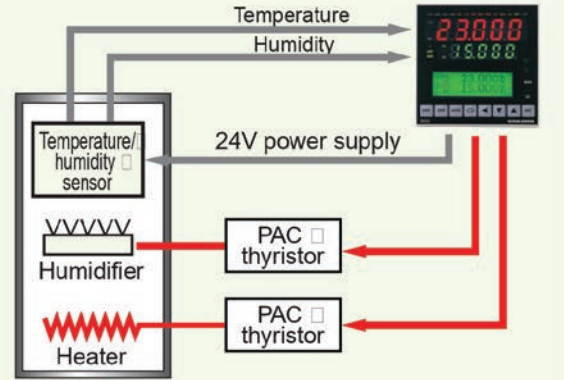
## Heating/Cooling Control

### 1-input Specification



## Constant-temperature/constant-humidity control

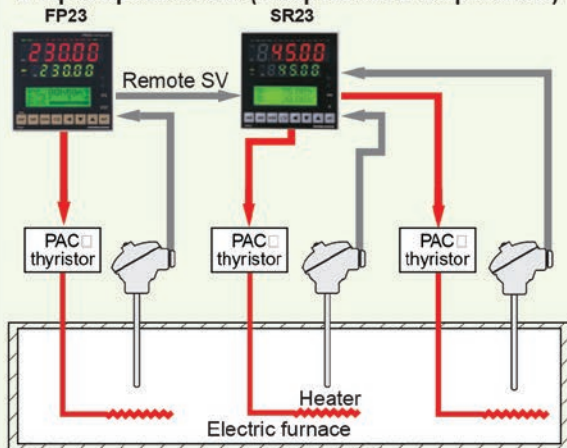
### 2-input Specification (Independent 2-loop control)



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

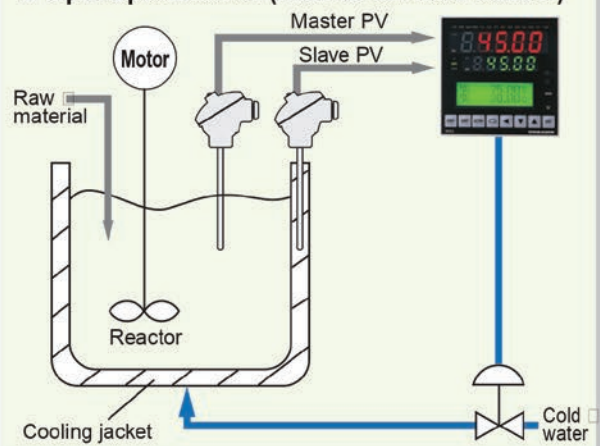
## 3-Zone Program Temperature Control of Electric Furnace

### 2-input Specification (Independent 2-loop control)



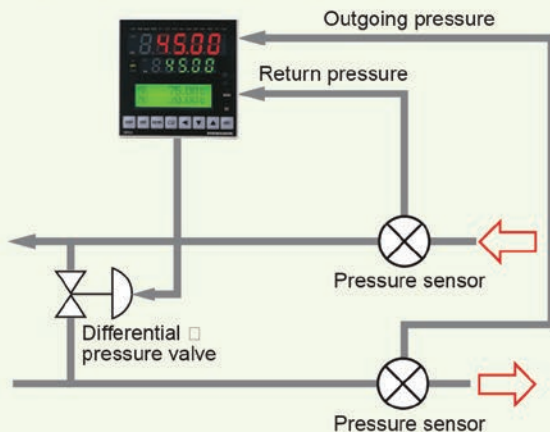
## Cascade Control of Temperature inside Reactor

### 2-input Specification (Internal cascade control)



## 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

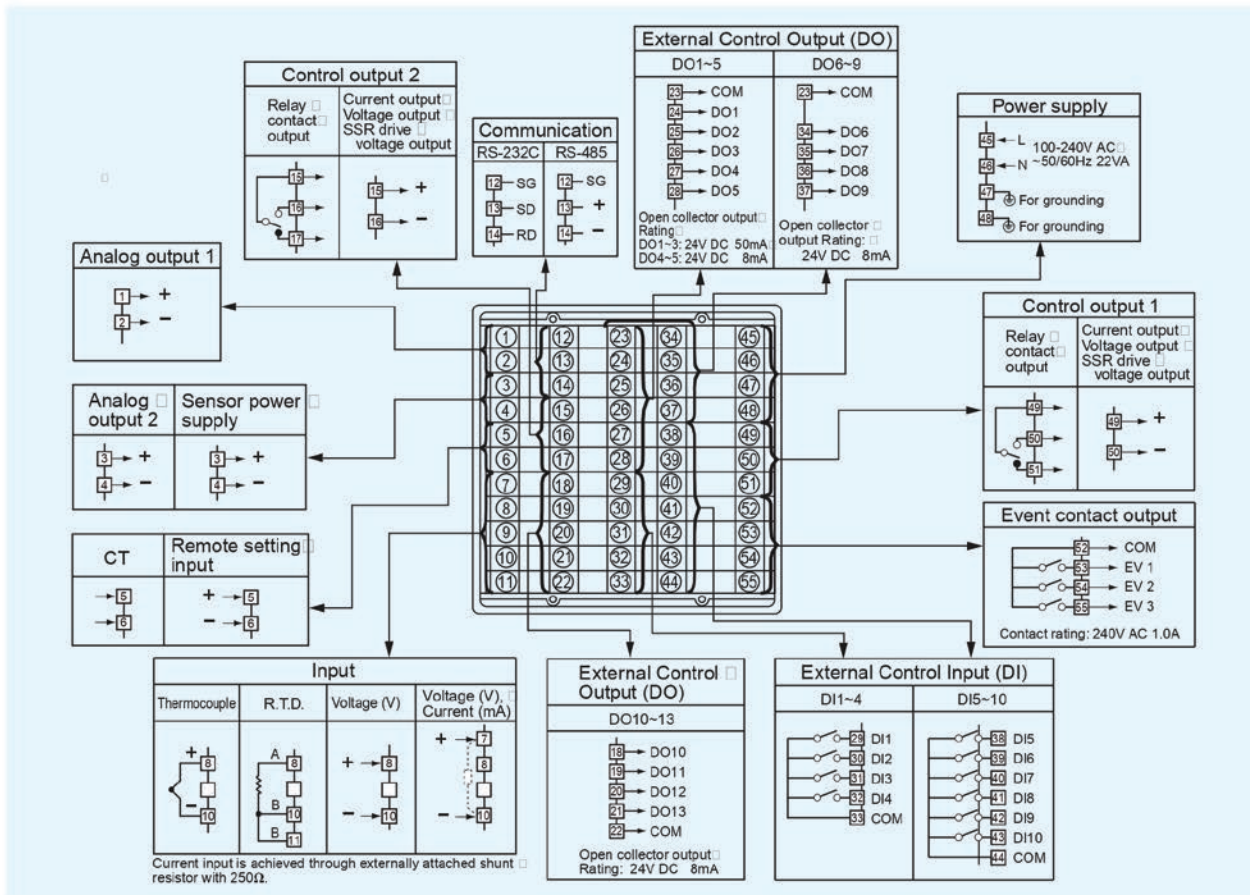
ITEM	CODE		SPECIFICATIONS	
SERIES	SR23-		96 × 96 DIN size, high-performance digital controller	
BASIC FUNCTIONS	SS		Universal-input, 1-input/1-output control, 3 event outputs	
CONTROL OUTPUT 1		Y	Contact 1c, contact rating: 240V AC 2.5A/resistive load, 1A/inductive load	
		I	Current 4 ~ 20mA DC, Load 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	N-		None	
REMOTE SETTING INPUT /HEATER BREAK ALARM (FOR SINGLE-PHASE)	standard	06	0 ~ 10V DC, Input resistance: approx. 500kΩ	
		04	4 ~ 20mA DC, Input resistance: 250Ω	
		05	1 ~ 5V DC, Input resistance: approx. 500kΩ	
		14	4 ~ 20mA DC, Input resistance: 250Ω	
		15	1 ~ 5V DC, Input resistance: approx. 500kΩ	
		16	0 ~ 10V DC, Input resistance: approx. 500kΩ	
		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 (SV No. switching not available)	
		1	DI 10 points, DO 9 points (SV No. switching available)	
		2	DI 10 points, DO 13 points (SV 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 When switching the SV No. by DI, 10 points of DI (CODE 1 or 2) are required.

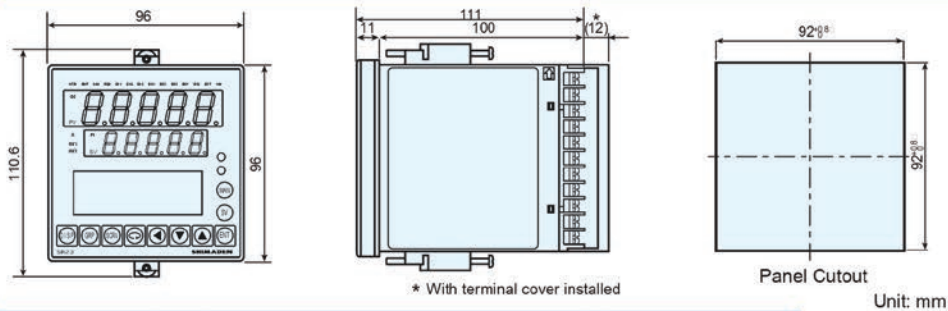
\*2 Ten DI points (code 1 or 2) are required for switching the SV No. by DI.

## Optional Accessories

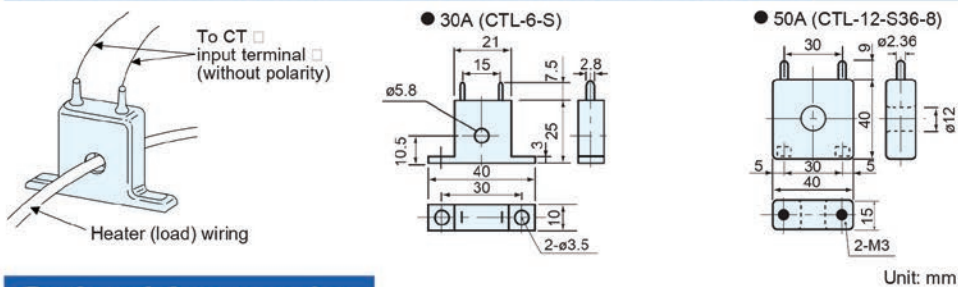
Name	Model	Description
Infra-red Communication Adapter	S5004	USB connector cable (2m), Setup Software (CD-ROM)
Shunt Resistor	QCS002	250Ω ±0.1%, external input resistance at current input
Relay Unit	AP2MC	Converts open collector output to contact output. 2 circuits built-in
SV No. Selector	KA251	BIN code. SV1 ~ SV10 can be switched and selected.



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)



SV No. Selector Model KA251 (BIN code. SV1 ~ SV10 can be switched and selected.)



Infra-red Communication Adapter Model S5004 with USB connector cable



- 2-output control (Heat & Cool/Heat & Heat/Cool & Cool)

## Ordering Information

ITEM	CODE	SPECIFICATIONS
SERIES	SR23-	96 × 96 DIN size, high-performance digital 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
REMOTE SETTING INPUT/ HEATER BREAK ALARM (FOR SINGLE-PHASE) *1	standard 06	0 ~ 10V DC, Input resistance: approx. 500kΩ
	04	4 ~ 20mA DC, Input resistance: 250Ω
	05	1 ~ 5V DC, Input resistance: approx. 500kΩ
	14	4 ~ 20mA DC, Input resistance: 250Ω
	15	1 ~ 5V DC, Input resistance: approx. 500kΩ
	16	0 ~ 10V DC, Input resistance: approx. 500kΩ
	31	Heater break alarm* (heater current 30A with CT)
	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 or 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 (SV No. switching not available)
	1	DI 10 points, DO 9 points (SV No. switching available)
	2	DI 10 points, DO 13 points (SV No. switching available)
COMMUNICATION FUNCTION	0	None
	5	RS-485
	7	RS-232C
REMARKS	A	Without
	9	With

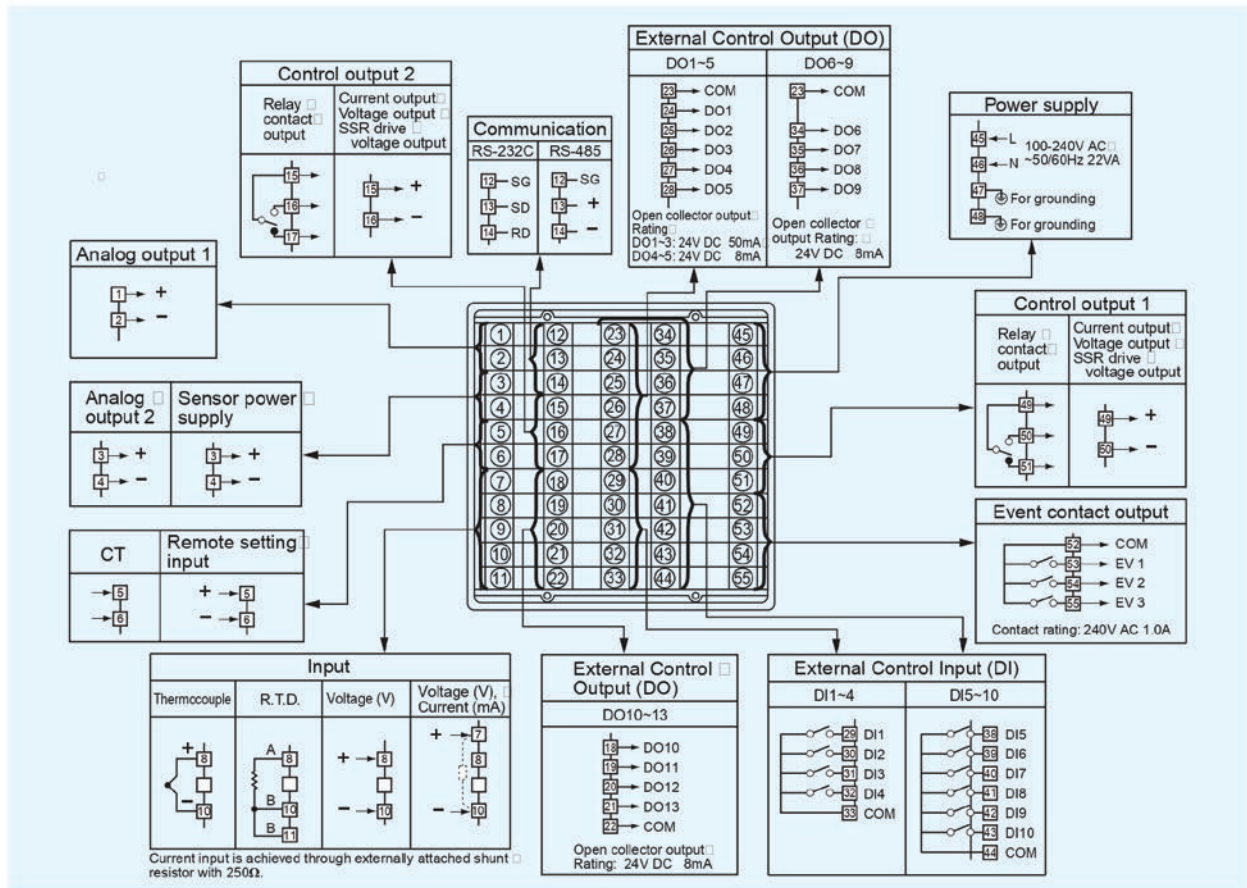
\*1 In a 2-output specification, the heater break alarm is used by either of Control Output 1 or 2.

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

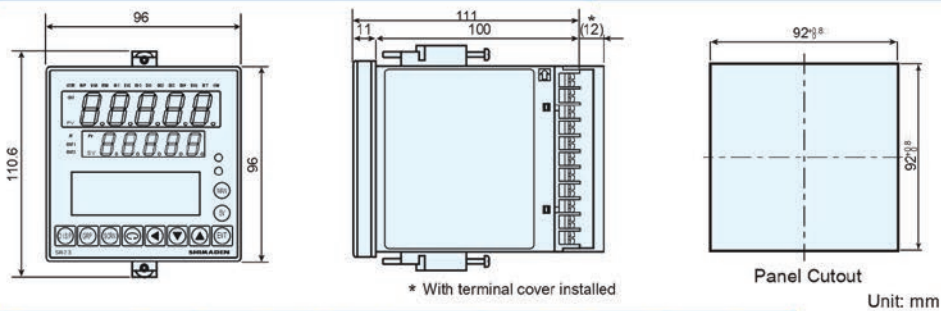
## Optional Accessories

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
SV No. Selector	KA251	BIN code. SV1 ~ SV10 can be switched and selected.

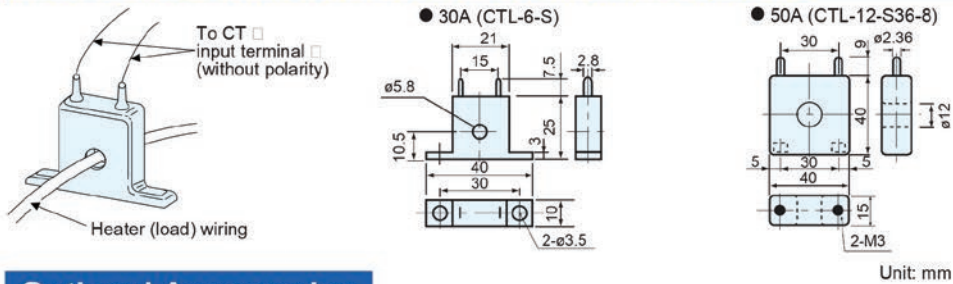




External Dimensions & Panel Cutout



Accessories Required for Heater Break Alarm Function



Optional Accessories

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



SV No. Selector Model KA251   
 (BIN code. SV1 ~ SV10 can be switched and selected.)



Infra-red Communication Adapter Model S5004 with USB connector cable



- **2-input/2-output control** (independent 2-loop control)
- **Internal cascade control** \*Output for control is output to Control Output 2.
- **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 heat & cool/heat & heat/cool & cool control by max. value, min. value, average value, deviation value operation)

## Ordering Information

ITEM	CODE		SPECIFICATIONS		
SERIES	SR23-		96 × 96 DIN size, high-performance digital controller		
BASIC FUNCTIONS *1	DL		Universal-input, independent 2-loop control, 3 event outputs		
	DC		Universal-input, internal cascade control, 3 event outputs *2		
	DS		Universal-input, 2-input operation/1-output control, 3 event outputs *3		
	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 *3	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		
REMOTE SETTING INPUT/ HEATER BREAK ALARM (FOR SINGLE-PHASE) *4	standard	06	0 ~ 10V DC, Input resistance: approx. 500kΩ	Non-insulated input	
		04	4 ~ 20mA DC, Input resistance: 250Ω		
		05	1 ~ 5V DC, Input resistance: approx. 500kΩ		
		14	4 ~ 20mA DC, Input resistance: 250Ω		
		15	1 ~ 5V DC, Input resistance: approx. 500kΩ	Insulated input	
		16	0 ~ 10V DC, Input resistance: approx. 500kΩ		
		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) *5	standard	0	DI 4 points, DO 5 points (SV No. switching not available)		
		1	DI 10 points, DO 9 points (SV 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, internal cascade control, 2-input operation/1-output control and 2-input operation/2-output control are all supported in the 2-input specification. This controller is shipped with the function selected at BASIC FUNCTION set.

\*2 In an internal cascade control specification, slave output for control is output to Control Output 2. Select the same specification as Control Output 2 for Control Output 1.

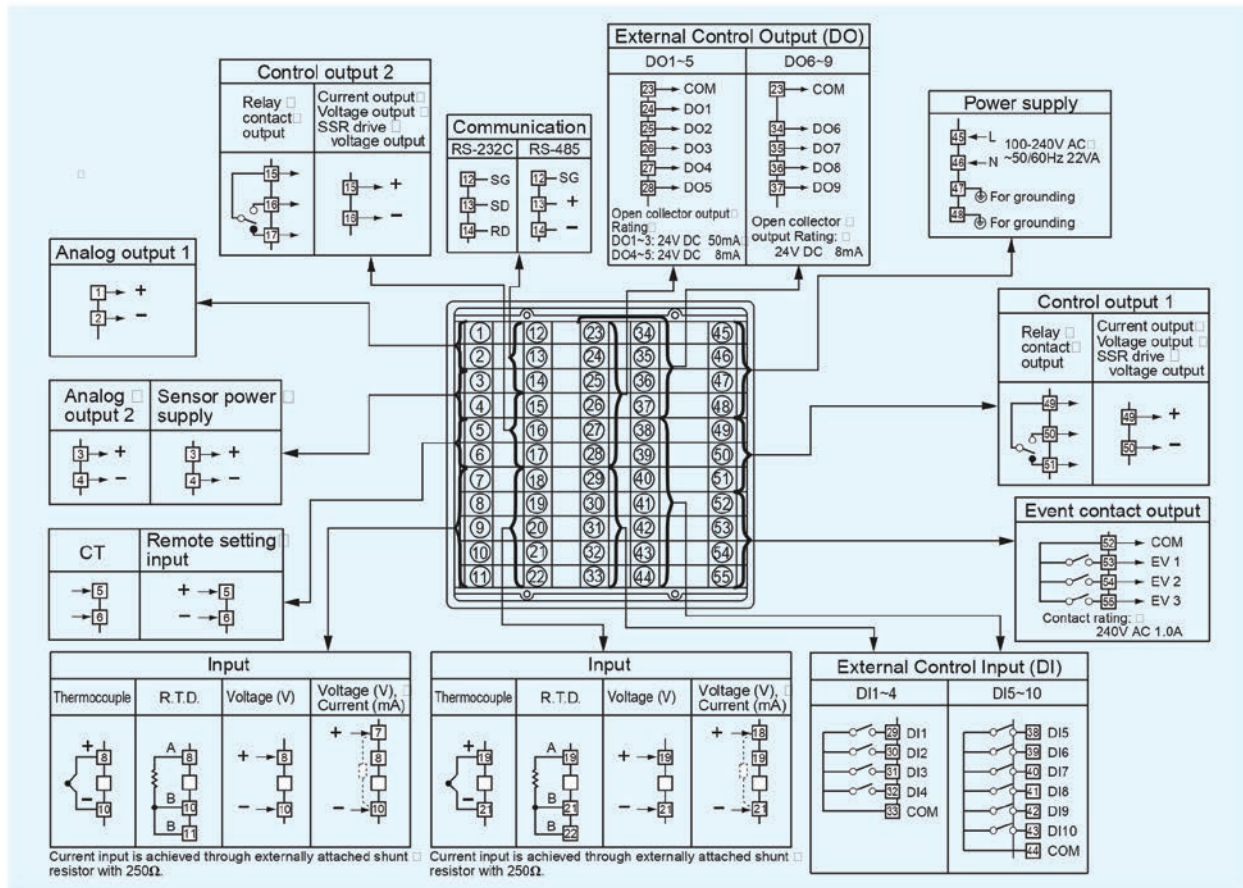
\*3 In a 2-input operation/1-output control specification, the output for control is output to Control Output 1. Select the same specification as Control Output 1 for Control Output 2.

\*4 In a 2-output specification, the heater break alarm is used by either of Control Output 1 or 2.

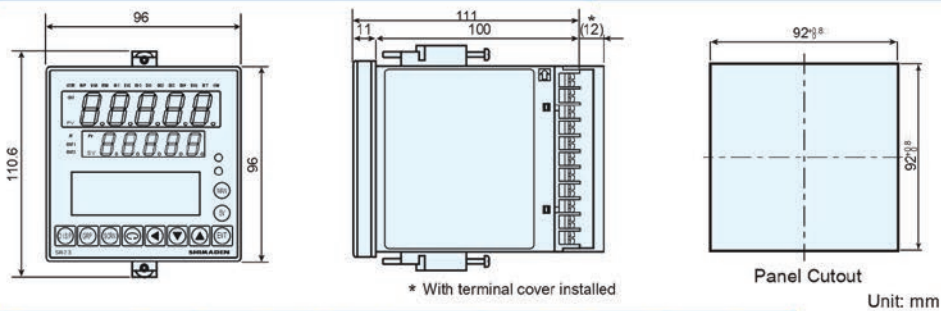
\*5 When switching the SV No. by DI, 10 points of DI (CODE 1) are required.

## Optional Accessories

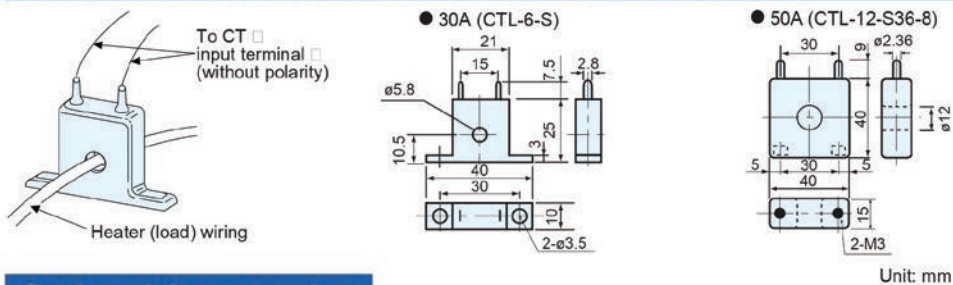
Name	Model	Description
Infra-red Communication Adapter	S5004	USB connector cable (2m), Setup Software (CD-ROM)
Shunt Resistor	QCS002	250Ω ±0.1%, external input resistance at current input
Relay Unit	AP2MC	Converts open collector output to contact output. 2 circuits built-in
SV No. Selector	KA251	BIN code. SV1 ~ SV10 can be switched and selected.



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)



SV No. Selector Model KA251 (BIN code. SV1 ~ SV10 can be switched and selected.)



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		0.0	~	700.0 °C	
	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.	Pt	JPt					
			31	45	*6	-200.0	~
	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, decimal positions: 1, 2, 3 or 4
	1 ~ 5V	85				
	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

**Warning**

- The SR23 series is designed for the control of temperature, humidity and other physical values of general industrial equipment. (It is not to be used for any control purpose when a serious potential effect may result on human life or safety.)

**Caution**

- If the possibility of loss or damage to your system or property as a result of failure of any part of the process exists, proper safety measures must be made before the instrument is put into use so as to prevent the occurrence of trouble.

(The contents of this brochure are subject to change without notice.)

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