



# SRV



## General Description

The SRV is a DIN rail mounted module type temperature controller. Dual loop control can be performed with a single compact module. A maximum of 31 modules can be connected for 62-loop control. Power supply and communication lines are via a connector on the side, no wiring required. Distributed installation via RS-485 is possible, enabling multi-zone distributed control system in a compact size.

## Features

- ☆ Multi-zone space-saving and less wiring
- ☆ Safe, and easy to use
- ☆ Heat/Cool action
- ☆ Heater/Loop break alarms
- ☆ DIN rail mounting

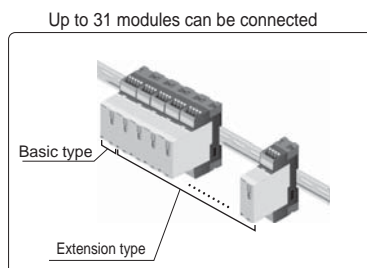
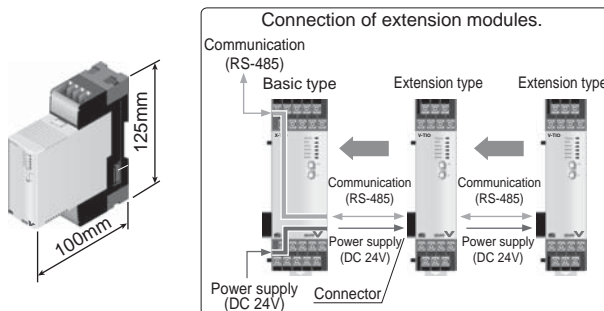
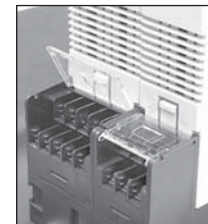
### Space-Saving and Less Wiring

Dual loop control can be performed with a single compact module. Separated installation by control zones is possible. Wiring to sensors and output devices is minimized. Modules can be installed separately inside a control panel or a machine to reduce the physical size of the housing.

### Safe, and Easy to Use

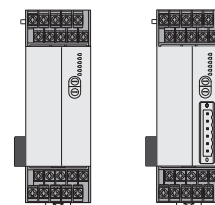
Hinged terminal cover is supplied as standard.

Interleave terminal arrangement for easy wiring.



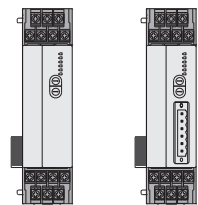
### Module Configuration

Temperature Control Module (Basic Type) V-TIO-A



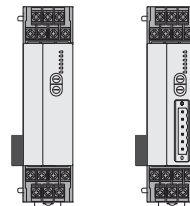
(With Digital input/output)

Temperature Control Module (Extension Type) V-TIO-B



(With Digital input/output)

Heat/Cool type Temperature Control Module (Extension Type) V-TIO-D



(With Digital input/output)

V-TIO-A and V-TIO-B have similar control functions and specifications. V-TIO-A and V-TIO-B can accept maximum of two inputs. (A single input only for V-TIO-D).

## Specifications

### Input

#### Number of inputs

- 2 points (V-TIO-A/B)
- 1 point (V-TIO-D)
- 2 points type : Isolated between each channel (Only thermocouple)

#### Input

- a) Thermocouple, DC low voltage group
  - Thermocouple : K, J, R, S, B, E, T, N (JIS/IEC), PLII (NBS), W5Re/W26Re (ASTM)
  - Input impedance : Approx. 1M $\Omega$
  - Influence of external resistance : Approx. 0.15 $\mu$ V/ $\Omega$
  - Input break action : Up-scale
  - DC Low voltage : 0-100mV DC
  - Input break action : Up-scale
- b) RTD group
  - Pt100 (JIS/IEC), JPt100 (JIS)
  - Maximum 10 $\Omega$  per wire
  - Input break action : Up-scale
- c) DC High voltage, DC current group
  - DC High voltage : 0 to 5V DC, 1 to 5V DC, 0 to 10V DC
  - Input break action : Value around 0V
  - DC current : 0 to 20mA DC, 4 to 20mA DC
  - Input impedance : 250 $\Omega$
  - Input break action : Value around 0V

#### Sampling Time

0.5 sec

#### PV Bias

-span to +span

#### Digital Filter

1 to 100 sec. (OFF when 0 is set.)

### Performance

#### Measuring Accuracy

- Type : K, J, T, E, PLII
  - Less than -100°C (-148°F) :  $\pm 2.0^{\circ}\text{C}$  ( $\pm 3.6^{\circ}\text{F}$ )
  - 100 to 333°C (-148 to 633.2°F) :  $\pm 1.0^{\circ}\text{C}$  ( $\pm 1.8^{\circ}\text{F}$ )
  - More than 334°C (633.2°F) :  $\pm (0.3\%$  of Reading + 1 digit)
- Type : N, S, R, W5Re/W26Re
  - Less than 667°C (1232.6°F) :  $\pm 2.0^{\circ}\text{C}$  ( $\pm 3.6^{\circ}\text{F}$ )
  - More than 667°C (1232.6°F) :  $\pm (0.3\%$  of Reading + 1 digit)
- Type : B
  - Less than 400°C (752°F) :  $\pm 70.0^{\circ}\text{C}$  ( $\pm 126^{\circ}\text{F}$ )
  - 400 to 666°C (752 to 1232.6°F) :  $\pm 2.0^{\circ}\text{C}$  (3.6°F)
  - More than 667°C (1232.6°F) :  $\pm (0.3\%$  of Reading + 1 digit)
- Cold junction temperature compensation error
  - $\pm 1.0^{\circ}\text{C}$  (1.8°F) [at 23°C  $\pm 2^{\circ}\text{C}$  (73.4°F  $\pm 3.6^{\circ}\text{F}$ )]
  - Within  $\pm 1.5^{\circ}\text{C}$  ( $\pm 2.7^{\circ}\text{F}$ ) [Between -10 and 50°C (14 and 122°F)]
- b) RTD
  - Less than 266°C (510.8°F) :  $\pm 0.8^{\circ}\text{C}$  ( $\pm 1.4^{\circ}\text{F}$ )
  - More than 267°C (512.6°F) :  $\pm (0.3\%$  of Reading + 1 digit)
- c) DC voltage and DC current
  - $\pm 0.3\%$  of span

#### Insulation Resistance

More than 20M $\Omega$  (500V DC) between each isolation block

#### Dielectric Strength

More than 600V AC for one minute between each isolation block

### Control

#### Control Method

- Brilliant PID control (with autotuning)
- Direct action/Reverse action is selectable.
- ON/OFF action is selectable.
- Heat/Cool Brilliant PID control (with autotuning)
- Air cooling/Water cooling is selectable.

#### Major Setting Range

- Set value : Same as input range.
- Proportional band : 0 to input span (Temperature)
- 0.0 to 100.0% of input span (Voltage, Current)
- (ON/OFF action when P=0)
- Cool side proportional band : 0 to input span (Temperature)
- 0.0 to 100.0% of input span (Voltage, Current)
- Integral time : 1 to 3600 sec.
- Derivative time : 0 to 3600 sec.
- Control response : Slow, Medium, Fast

- Output limiter : -5.0 to +105.0% (High/Low individual setting)
- Proportional cycle time : 1 to 100 sec. (Heat/Cool individual setting)
- Other setting : Auto/Manual selectable

#### Control Output

- Relay output : Form A contact, 250V AC 3A (resistive load)
- Voltage pulse output : 0/12V DC
- (Load resistance : More than 600 $\Omega$ )
- 0 to 20mA, 4 to 20mA DC
- (Load resistance : Less than 600 $\Omega$ )
- Continuous voltage output : 0 to 5V, 0 to 10V, 1 to 5V DC
- (Load resistance : More than 1k $\Omega$ )

### Alarms

#### Event (Alarm) Output

- a) Number of alarms : Up to 2 points / ch
- b) Type : Deviation High, Low, High/Low, Band, Process High, Low
  - Hold action is available except for Band.
  - Alarm is interlock and delay timer is available.
- c) Setting range : Deviation alarm : -span to +span
- Deviation High/Low, Band : 0 to span
- Process alarm : Same as input range
- d) Differential gap : 0 to input span
- e) Output : Communication data or event output (Option)

#### Loop break alarm (LBA)

- a) Number of alarms : 2 points (1 point/ch)
- b) LBA time setting : 0 to 7200 sec. (LBA is OFF when 0 is set)
- c) LBA deadband : 0 to input span
- d) Output : Communication data or event output (Option)

#### Heater Break Alarm (HBA)

- a) Number of alarms : 2 points (1 point/ch)
- b) CT type : CTL-6-P-N (30A), CTL-12-S56-10L-N (100A)
- (Specify when ordering)
- c) Display range : 0.0 to 100.0A
  - Heater break alarm function is OFF when 0.0 setting.
- d) Accuracy :  $\pm 5\%$  of input value or  $\pm 2\text{A}$  (whichever is larger)
- e) Output : Communication data or event output (Option)

### Communications

- a) Communication method : Based on RS-485 (2-wire)
- b) Communication speed : 2400, 9600, 19200, 38400 BPS
- c) Protocol : ANSI X3.28(1976) 2.5 A4 MODBUS
- d) Bit format
  - Start bit : 1
  - Data bit : 7 or 8 •For MODBUS 8 bit only
  - Parity bit : Without, Odd or Even
  - Stop bit : 1
- e) Communication code : ASCII(JIS) 7-bit code
- f) Maximum connection : 31 (Address can be set from 0 to 99.)

### Event Inputs

(Optional)

- Number of Inputs : 1 point

#### Event Input Type

- a) RUN/STOP switching (OPEN : STOP, CLOSE : RUN)
- b) Alarm interlock release (CLOSE : Interlock release)

#### Input Rating

- Non-voltage contact input (Source type)
- OPEN : 500k $\Omega$  or more, CLOSE : 10 $\Omega$  or less
- Rating voltage : 24VDC, Rating current : Approx. 6mA

### Event Outputs

(Optional)

- Number of Inputs : 2 points

#### Event Output Type

- Temperature alarm output, Heater break alarm output,
- Control loop break alarm output, Burnout output,
- Temperature rise completion

#### Output Rating

- Relay contact output, Form A contact, 250V AC 1A (resistive load)

## Specifications

### General Specifications

#### Supply Voltage

21.6 to 26.4V DC (Ripple rate 10% p-p or less) [ Rating : 24V DC ]

#### Power Consumption

V-TIO-A/B/D, With event input/output : Maximum 120mA  
 V-TIO-A/B/D, Without event input/output : Maximum 90mA

#### Power Failure Effect

A power failure of 20 msec or less will not affect the control action.

#### Operating Environments

-10 to 50°C [14 to 122°F] , 5 to 95% RH (No dew condensation)  
 • Absolute humidity : MAX.W.C 29g/m<sup>3</sup> dry air at 101.3kPa  
 Free from corrosive gas, flammable gas and dust.

#### Memory Backup:

Backed up by non-volatile memory (EEPROM)  
 Data retaining period : Approx. 10 years.  
 Number of writing : Approx. 1,000,000 times

• Depending on storage and operating conditions.

#### Net Weight

V-TIO-A, With event input/output : 210g  
 V-TIO-A, Without event input/output : 180g  
 V-TIO-B/D, With event input/output : 200g  
 V-TIO-B/D, Without event input/output : 170g

#### External Dimensions

See external dimensions.

#### Other Conditions

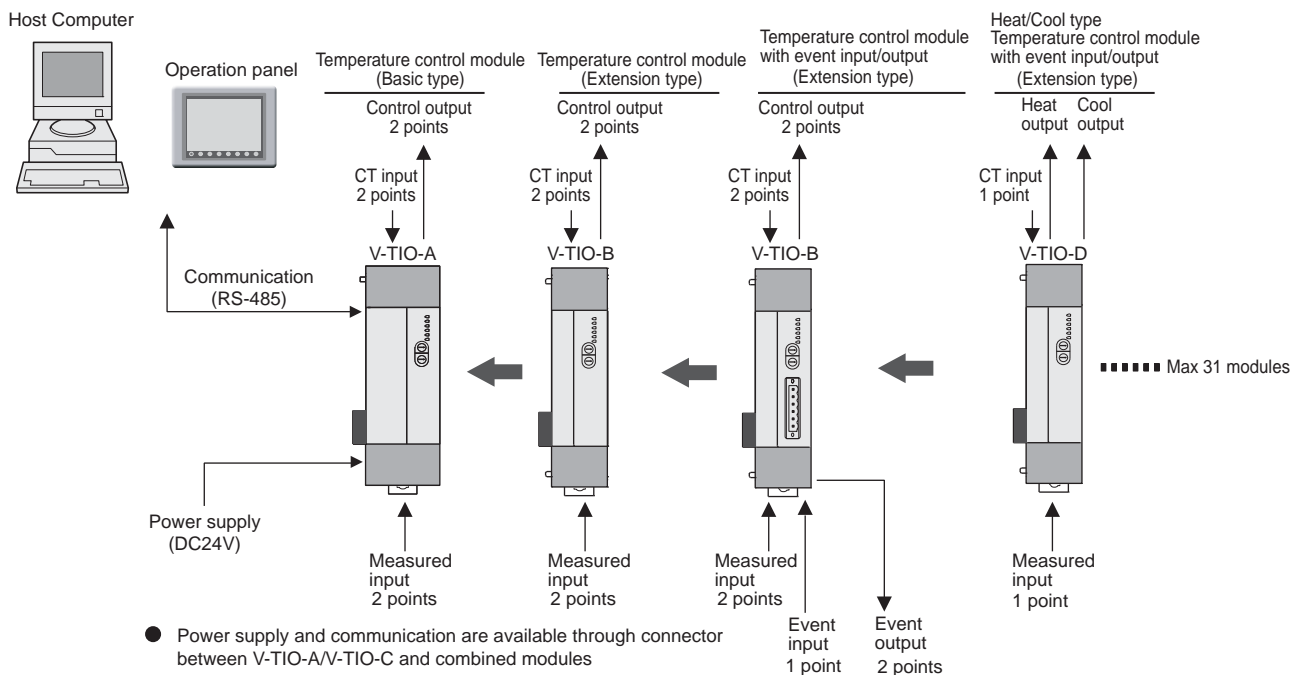
Free from external noise, vibration, shock and exposure to direct sunlight

### Compliance with Standards

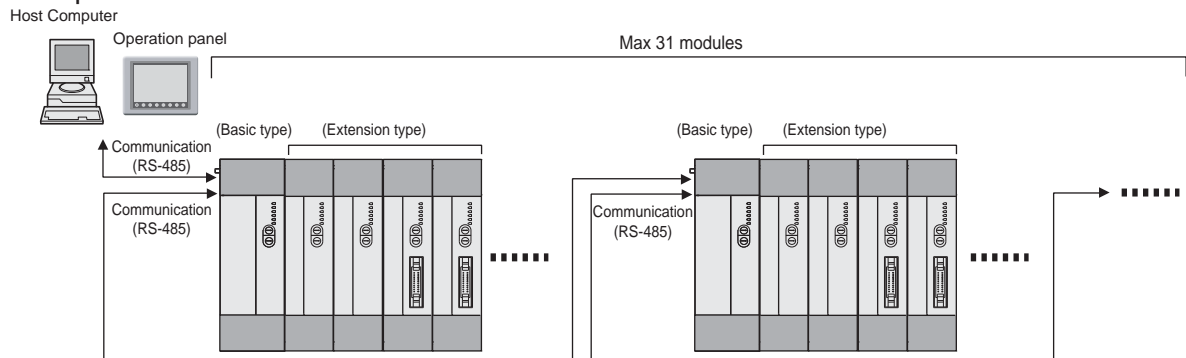
- CE Mark
- UL/cUL Recognized
- C-Tick Mark



## System Configuration



### Example of distributed installation



## Model and Suffix Code

### ● Temperature Control Module

Specifications	Model and Suffix Code									
Model	V-TIO -□-□ □□□-□ □ * □ □□-□□-□-□									
Type	Basic type	A								
	Extension type	B								
Control method	PID control with AT (reverse action)	F								
	PID control with AT (direct action)	D								
Measured input	See Range and Input Code Table (Common to CH1 and CH2) □□□:									
Control output 1 (CH1)	Relay output									
	Voltage pulse	M								
	DC voltage : 0 to 5V	V								
	DC voltage : 0 to 10V	4								
	DC voltage : 1 to 5V	5								
	DC current : 0 to 20mA	6								
	DC current : 4 to 20mA	7								
		8								
Control output 2 (CH2)	See control output 1 code									
Event input (DI)	No event input									
	RUN/STOP							N		
	Alarm interlock release							1		
Event output (DO1)	No event output									
	See event output code table								N	N
Event output (DO2)	No event output									
	See event output code table									N
CT type *1	CTL-6-P-N (0 to 30A)									P
	CTL-12-S56-10L-N (0 to 100A)									S
Digital communications	RS-485 (RKC standard/ANSI)									5
	RS-485 (MODBUS)									6

\*1 Please specify "P" for CT type selection when control output is DC voltage or DC current. HBA does not operate with DC voltage or DC current outputs.

### ● Temperature Control Module (Heat/Cool control type)

Specifications	Model and Suffix Code									
Model	V-TIO -□-□ □□□-□ □ * □ □□-□□-□-□									
Type	Extension type	D								
Control method	Heat/Cool PID control with AT (water cooling)	W								
	Heat/Cool PID control with AT (air cooling)	A								
Measured input	See Range and Input Code Table □□□:									
Heat output	Relay output									
	Voltage pulse	M								
	DC voltage : 0 to 5V	V								
	DC voltage : 0 to 10V	4								
	DC voltage : 1 to 5V	5								
	DC current : 0 to 20mA	6								
	DC current : 4 to 20mA	7								
		8								
Cool output	See heat output code									
Event input (DI)	No event input									
	RUN/STOP								N	
	Alarm interlock release								1	
Event output (DO1)	No event output									
	See event output code table									N
Event output (DO2)	No event output									
	See event output code table									N
CT type *1	CTL-6-P-N (0 to 30A)									P
	CTL-12-S56-10L-N (0 to 100A)									S
Digital communications	RS-485 (RKC standard/ANSI)									5
	RS-485 (MODBUS)									6

\*1 Please specify "P" for CT type for control output type is continuous voltage or current output, although Heater break alarm available with those types of output.

## Model and Suffix Code

### Range and Input Code Table

Thermocouple and Low voltage group (Field-programmable)

Input	Code	Range	Input	Code	Range		
K	K 02	0 – 400°C	B	B 03	0 – 1800°C		
	K 04	0 – 800°C		B B1	32 – 3272°F		
	K 16	-200 – 1372°C	E	E 01	0 – 800°C		
	K 09	0.0 – 400.0°C		E 02	0 – 1000°C		
	K 35	-200.0 – 400.0°C		E A8	32 – 1472°F		
	K B9	32 – 752°F	E A7	32 – 1832°F	N	N 02	0 – 1300°C
	K B8	32 – 1472°F	N A6	32 – 2372°F			
	K B7	-328 – 2501°C	T	T 08	0 – 400°C		
	K C2	32.0 – 752.0°C		T 09	0 – 200°C		
	K C1	-328.0 – 752.0°C		T 16	-200 – 400°C		
J	J 02	0 – 400°C		T 06	0.0 – 400.0°C		
	J 04	0 – 800°C		T 19	-200.0 – 400.0°C		
	J 15	-200 – 1200°C		T B9	32 – 752°F		
	J 09	0.0 – 400.0°C		T C1	32 – 392°F		
	J 27	-200.0 – 400.0°C		T B8	-328 – 752°F		
	J C2	32 – 752°F		T C3	32.0 – 752.0°F		
	J C1	32 – 1472°F		T C2	-328.0 – 752.0°C		
	J B9	-328 – 2192°F	W5Re W26Re	W 03	0 – 2300°C		
	J C4	32.0 – 752.0°F		W A9	32 – 4172°F		
	J C3	-328.0 – 752.0°F	PL II	A 02	0 – 1390°C		
R	R 06	0 – 1768°C		A A2	32 – 2534°F		
	R A6	32 – 3214°F	0-100mVDC	2 01	Programmable		
S	S 05	0 – 1768°C					
	S A6	32 – 3214°F					

RTD group (Field-programmable)

Input	Code	Range
Pt100	D 17	0 – 400°C
	D 33	0 – 850°C
	D 16	0.0 – 400.0°C
	D 28	-200.0 – 400.0°C
	D C5	32 – 752°F
	D C4	32 – 1562°F
JPt100	D C7	32.0 – 752.0°F
	D C6	-328.0 – 752.0°F
	P 17	0 – 400°C
	P 23	0 – 600°C
	P 16	0.0 – 400.0°C
	P 28	-200.0 – 400.0°C

Voltage and Current group (Field-programmable)

Input	Code	Range
0 – 5V DC	4 01	Programmable
0 – 10V DC	5 01	
1 – 5V DC	6 01	
0 – 20mADC	7 01	
4 – 20mADC	8 01	

### Event output Code Table

CH1 Event type

Code	Type
1A	CH1 Deviation High
1B	CH1 Deviation Low
1C	CH1 Deviation High/Low
1D	CH1 Band Alarm
1E	CH1 Deviation High with Hold
1F	CH1 Deviation Low with Hold
1G	CH1 Deviation High/Low with Hold
1H	CH1 Process High
1J	CH1 Process Low
1K	CH1 Process High with Hold
1L	CH1 Process Low with Hold
1Q	CH1 Deviation High with Re-Hold
1R	CH1 Deviation Low with Re-Hold
1T	CH1 Deviation High/Low with Re-Hold
1P	CH1 Heater break alarm <sup>2</sup>
11	CH1 Control Loop Break Alarm <sup>3</sup>
12	CH1 Burnout Alarm
13	CH1 Temperature rise completion

CH2 Event type

1 V-TIO-A/B only

Code	Type
2A	CH2 Deviation High
2B	CH2 Deviation Low
2C	CH2 Deviation High/Low
2D	CH2 Band Alarm
2E	CH2 Deviation High with Hold
2F	CH2 Deviation Low with Hold
2G	CH2 Deviation High/Low with Hold
2H	CH2 Process High
2J	CH2 Process Low
2K	CH2 Process High with Hold
2L	CH2 Process Low with Hold
2Q	CH2 Deviation High with Re-Hold
2R	CH2 Deviation Low with Re-Hold
2T	CH2 Deviation High/Low with Re-Hold
2P	CH2 Heater break alarm <sup>2</sup>
21	CH2 Control Loop Break Alarm
22	CH2 Burnout Alarm
23	CH2 Temperature rise completion

<sup>1</sup> For heat/cool control, use table 1 to select event type.

<sup>2</sup> Current transformer (sold separately. See Accessories) is required to use Heater Break Alarm. HBA can operate with relay or voltage pulse output only.

<sup>3</sup> Control Loop Break Alarm is not available with heat/cool PID control type.

### Accessories

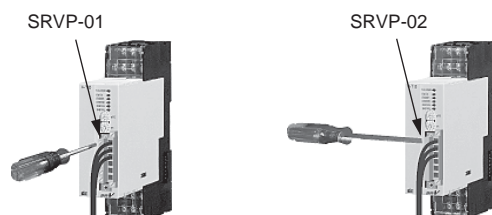
Connector (plug) for event input/output

Front screw type : SRVP-01

(An equivalent product : FRONT-MSTB 2,5/6-STF-5,08, PHOENIX CONTACT)

Side screw type : SRVP-02

(An equivalent product : MSTB 2,5/6-STF-5,08, PHOENIX CONTACT)



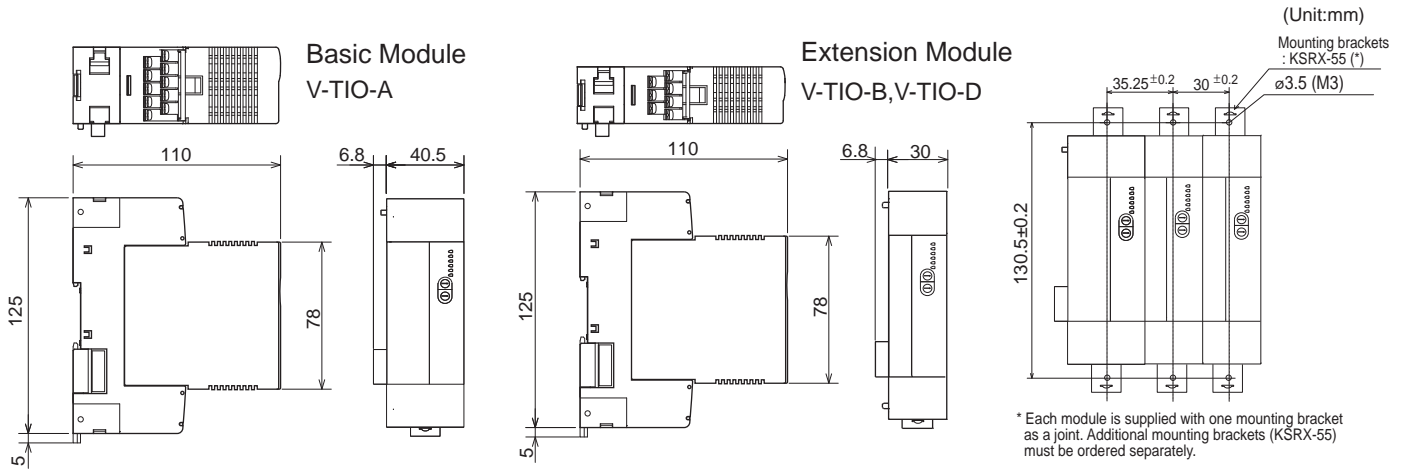
Current transformer for heater break alarm

CTL-6-P-N : 0 to 30A

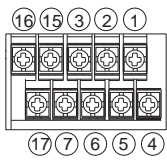
CTL-12-S56-10L-N : 0 to 100A

# Module type Digital Temperature Controller SRV

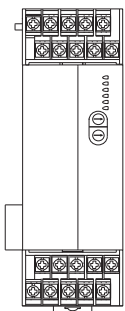
## External Dimensions and Rear Terminals



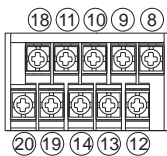
Basic Module V-TIO-A



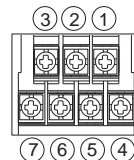
16	17	15	7	3	6	2	5	1	4
T/R(A)		SG	T/R(B)		CT1	CT2	NO	NO	
RS-485					CT1 : CH1	CT2 : CH2	OUT1	OUT2	
Communications			CT input for heater break alarm				Relay contact	Relay contact	
			* CT2 is not available for heat/cool control type.				Voltage pulse/Voltage/Current	Voltage pulse/Voltage/Current	
							+ OUT1 -	+ OUT2 -	
							Control output 1 (CH1)	Control output 2 (CH2)	



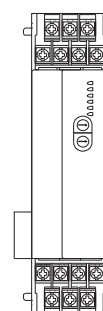
20	18	19	11	14	10	13	9	12	8
FG	DC 24V			A	B	B	B	B	A
				RTD1		RTD2		RTD	
				TC1		TC2			
				Thermocouple		Thermocouple			
				+- IN1-		+- IN2-			
				Voltage/Current		Voltage/Current			
				Measured input 1 (CH1)		Measured input 2 (CH2)			



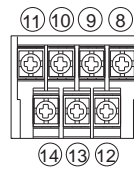
Extension Module V-TIO-B, V-TIO-D



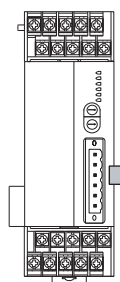
7	3	6	2	5	1	4
CT1		CT2	NO		NO	
CT1 : CH1		CT2 : CH2	OUT1		OUT2	
CT input for heater break alarm			Relay contact		Relay contact	
			Voltage pulse/Voltage/Current		Voltage pulse/Voltage/Current	
			+ OUT1 -		+ OUT2 -	
			Control output 1 (CH1)		Control output 2 (CH2)	
			V-TIO-B		V-TIO-B	
			Heat side Control output		Cool side control output	



11	14	10	13	9	12	8
	A	B	B	B	B	A
	RTD1		RTD2		RTD	
	TC1		TC2			
	Thermocouple		Thermocouple			
	+- IN1-		+- IN2-			
	Voltage/Current		Voltage/Current			
	Measured input 1 (CH1)		Measured input 2 (CH2)			
	V-TIO-B		V-TIO-B			
	Measured input 1 (CH1)		Measured input 2 (CH2)			
	V-TIO-D		V-TIO-D			
	Measured input		Not used			



Connector (Event input/output) V-TIO-A, V-TIO-B, V-TIO-D



1	NO	DI	Event input
2	+		Non-voltage input
3	NO	DO1	Event output 1
4			Relay contact output
5	NO	DO2	Event output 2
6			Relay contact output

(Example: when a connector SRVP-01 is used with a module with digital input/digital output functions).

