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.

Module Configuration

- Temperature Control Module (Basic Type) V-TIO-A
- Temperature Control Module (Extension Type) V-TIO-B
- Heat/Cool type Temperature Control Module (Basic Type) V-TIO-C
- Heat/Cool type Temperature Control Module (Extension Type) V-TIO-D

V-TIO-A and V-TIO-B (or V-TIO-C and V-TIO-D) 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-C and V-TIO-D.
Module type Digital Temperature Controller

Specifications

Input

Number of Inputs
2 points (V-TIO-A/B)
1 point (V-TIO-C/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 (JIS/IEC), PLJ (NBS), W5Fe/W6Fe (ASTM)
• Input impedance: Approx. 1MΩ
• Influence of external resistance: Approx. 0.15μV/Ω
• Input break action: Up-scale
DC Low voltage: 0 to 100mV DC
DC High voltage: 0 to 10V DC
• Input break action: Value around 0V

b) RTD group
Pt100 (JIS/IEC), Pi100 (JIS)
• Maximum 100 per wire
• Input break action: Up-scale
DC High voltage: 0 to 10V DC
• 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, PLJ
Less than -100°C (-148°F): ±2.0% (±3.6°F)
100 to 300°C (-148 to 632°F): ±1.0% (±1.8°F)
More than 334°C (633.2°F): ±(0.3% of Reading + 1 digit)
Type : N, B, R, W5Fe/W6Fe
Less than 667°C (1232.6°F): ±2.0% (±3.6°F)
More than 667°C (1232.6°F): ±(0.3% of Reading + 1 digit)
Type : B
Less than 400°C (752°F): ±7.0% (±12°F)
400 to 666°C (752 to 1232.6°F): ±0.7% (±3.6°F)
More than 667°C (1232.6°F): ±(0.3% of Reading + 1 digit)
Cold junction temperature compensation error
±0.1°C (1.8°F) [at 23°C (73°F)]
Within ±1.5°C (±2.7°F) [between -10 and 50°C (14 and 122°F)]
b) RTD
Less than 265°C (510.8°F): ±0.8°C (±1.4°F)
More than 265°C (510.8°F): ±(0.3% of Reading + 1 digit)
c) DC voltage and DC current
±0.3% of span

Insulation Resistance
More than 20MΩ (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)
Cool-side proportional band: 0 to input span (Temperature)
(ON/OFF action when P=0)
Integral time: 1 to 3600 sec.
Derivative time: 0 to 3600 sec.
Control response: Slow, Medium, Fast

Output
-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
Current output:
0 to 2mA, 4 to 20mA DC
(Load resistance: More than 600Ω)
Continuous voltage output:
0 to 5V, 0 to 10V, 1 to 5V DC
(Load resistance: More than 1kΩ)

Alarms

Event (Alarm) Output
a) Number of alarms: Up to 2 points /ch
b) Type: Deviation High, Low, High/Low, Band,
• Hold function is available except for Band.
• Alarm is interlock and delay timer is available.
• Alarm is interlock and delay timer is available.
c) Setting range: Deviation alarm: span to +span
Deviation High/Low, Band: 0 to 10V DC
Process alarm: Same as input range
• Differential gap: 0 to 10V DC
• Input impedance: ±(0.3% of Reading + 1 digit)
• Input break action: Value around 0V
d) Output: Communication data or event output (Option)

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

Heater Break Alarm (HBA)
Number of alarms: 2 points (1 point/ch)
CT type: 1A, 5A, 15A, 20A, 25A, 30A, 50A, 60A, 500A
(List when ordering)
• Heater break alarm function is OFF when 0.0 setting.
• Accuracy: ±5% of input value or ±2A (whichever is larger)
• Output: Communication data or event output (Option)

Communications

Communication method: Based on RS-485 (2-wire)
Communication speed: 2400, 9600, 19200, 38400 BPS
Protocol: ANSI X3.28(1976) 2.5A MODBUS

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: 500Ω or more, CLOSE: 10Ω 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)
Module type Digital Temperature Controller  SRV

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/C/D, With event input/output : Maximum 120mA
- V-TIO-A/B/C/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/m³ 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/C, With event input/output : 210g
- V-TIO-A/C, 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

System Configuration

Host Computer

Temperature control module
- Basic type
- Extension type

Control output
2 points

Temperature control module
- Basic type
- Extension type

CT input
2 points

CT input
2 points

Control output
2 points

Control output
2 points

Event output
1 point

Event output
2 points

Power supply and communication are available through connector between V-TIO-A/V-TIO-C and combined modules.

Example of distributed installation

Host Computer

Operation panel

Max 31 modules

Communication (RS-485)

Net Weight
V-TIO-A/C, With event input/output : 210g
V-TIO-A/C, 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 Recognized
- CSA Certified
- C-Tick Mark

Net Weight
V-TIO-A/C, With event input/output : 210g
V-TIO-A/C, 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
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Net Weight
V-TIO-A/C, With event input/output : 210g
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External Dimensions
See external dimensions.

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

Compliance with Standards

- CE Mark
- UL Recognized
- CSA Certified
- C-Tick Mark
### Temperature Control Module

<table>
<thead>
<tr>
<th>Specifications</th>
<th>Model and Suffix Code</th>
</tr>
</thead>
<tbody>
<tr>
<td>Model</td>
<td>V-TIO</td>
</tr>
<tr>
<td>Type</td>
<td>-</td>
</tr>
<tr>
<td>Control method</td>
<td>PID control with AT (reverse action)</td>
</tr>
<tr>
<td>Measured input</td>
<td>See Range and Input Code Table (Common to CH1 and CH2)</td>
</tr>
</tbody>
</table>

#### Control output 1 (CH1)

<table>
<thead>
<tr>
<th>Control method</th>
<th>PID control with AT (direct action)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Measured input</td>
<td>See Range and Input Code Table (Common to CH1 and CH2)</td>
</tr>
</tbody>
</table>

#### Control output 2 (CH2)

<table>
<thead>
<tr>
<th>Event input (DI)</th>
<th>No event input</th>
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</thead>
<tbody>
<tr>
<td>Event output (DO1)</td>
<td>No event output</td>
</tr>
<tr>
<td>Event output (DO2)</td>
<td>No event output</td>
</tr>
</tbody>
</table>

#### CT type

- CTL-6-P-N (0 to 30A)
- CTL-12-SSE-10L-N (0 to 100A)

#### Digital communications

- RS-485 (RKC standard/ANSI)
- RS-485 (MODBUS)

* *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)

<table>
<thead>
<tr>
<th>Specifications</th>
<th>Model and Suffix Code</th>
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</thead>
<tbody>
<tr>
<td>Model</td>
<td>V-TIO</td>
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<tr>
<td>Type</td>
<td>-</td>
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<tr>
<td>Control method</td>
<td>Heat/Cool PID control with AT (water cooling)</td>
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<tr>
<td>Measured input</td>
<td>See Range and Input Code Table</td>
</tr>
</tbody>
</table>

#### Heat output

<table>
<thead>
<tr>
<th>Heat output</th>
<th>Heat/Cool PID control with AT (water cooling)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Measured input</td>
<td>See Range and Input Code Table</td>
</tr>
</tbody>
</table>

#### Cool output

| Cool output                     | See heat output code |

#### Event input (DI)

| Event input (DI)                | No event input |
| Event output (DO1)              | No event output |
| Event output (DO2)              | No event output |

#### CT type

- CTL-6-P-N (0 to 30A)
- CTL-12-SSE-10L-N (0 to 100A)

#### Digital communications

- RS-485 (RKC standard/ANSI)
- RS-485 (MODBUS)

* *1 Please specify “P” for CT type if control output type is continuous voltage or current output, although heater break alarm available with those types of output.
Module type Digital Temperature Controller  SRV

Range and Suffix Code Table

<table>
<thead>
<tr>
<th>Thermocouple and Low voltage group (Field-programmable)</th>
<th>Range</th>
<th>Input Code</th>
<th>Type</th>
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Event input Code Table

<table>
<thead>
<tr>
<th>CH1 Event type</th>
<th>CH2 Event type</th>
<th>2 V/TO-A/B only</th>
</tr>
</thead>
<tbody>
<tr>
<td>Code</td>
<td>Type</td>
<td></td>
</tr>
<tr>
<td>1A</td>
<td>CH1 Deviation High</td>
<td></td>
</tr>
<tr>
<td>1B</td>
<td>CH1 Deviation Low</td>
<td></td>
</tr>
<tr>
<td>1C</td>
<td>CH1 Deviation High/Low</td>
<td></td>
</tr>
<tr>
<td>1D</td>
<td>CH1 Band Alarm</td>
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</tr>
<tr>
<td>1F</td>
<td>CH1 Deviation High with Hold</td>
<td></td>
</tr>
<tr>
<td>1G</td>
<td>CH1 Deviation Low with Hold</td>
<td></td>
</tr>
<tr>
<td>1H</td>
<td>CH1 Process High</td>
<td></td>
</tr>
<tr>
<td>1J</td>
<td>CH1 Process High with Hold</td>
<td></td>
</tr>
<tr>
<td>1L</td>
<td>CH1 Process Low with Hold</td>
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<tr>
<td>1M</td>
<td>CH1 Deviation High with NC Hold</td>
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<tr>
<td>1N</td>
<td>CH1 Deviation Low with NC Hold</td>
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<tr>
<td>1P</td>
<td>CH1 Heater Break alarm</td>
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</tr>
<tr>
<td>1Q</td>
<td>CH1 Contact Loop Break Alarm</td>
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</tr>
<tr>
<td>1R</td>
<td>CH1 Burnout Alarm</td>
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</tr>
<tr>
<td>1S</td>
<td>CH1 Temperature rise completion</td>
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</tr>
</tbody>
</table>

RTD group (Field-programmable)

<table>
<thead>
<tr>
<th>Input Code</th>
<th>Range</th>
<th>Type</th>
</tr>
</thead>
<tbody>
<tr>
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<tr>
<td>P</td>
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</table>

Voltage and Current group (Field-programmable)

<table>
<thead>
<tr>
<th>Input Code</th>
<th>Range</th>
<th>Programmable</th>
</tr>
</thead>
<tbody>
<tr>
<td>0-5V DC</td>
<td>0</td>
<td>01</td>
</tr>
<tr>
<td>0-10V DC</td>
<td>0</td>
<td>01</td>
</tr>
<tr>
<td>0-20mA DC</td>
<td>0</td>
<td>01</td>
</tr>
<tr>
<td>0-20mA DC</td>
<td>0</td>
<td>01</td>
</tr>
</tbody>
</table>

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

SRVP-01
SRVP-02

CTL 6-P-N : 0 to 30A
CTL-12-556-10L-N : 0 to 100A

1 For heating control, use table 2 to select event type.
2 A current transformer (sold separately, See Accessory) is required to use Heater Break Alarm. HBA can operate with relay or voltage pulse output only.
3 Control Loop Break Alarm is not available with heating/cool control types.
Module type Digital Temperature Controller SRV

External Dimensions and Rear Terminals

Basic Module V-TIO-A, V-TIO-C

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

* Each module is supplied with one mounting bracket as a joint. Additional mounting brackets (KSRX-55) must be ordered separately.

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

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

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