Remote I/O R8 Series

TEMPERATURE CONTROL MODULE

Functions & Features
• Two PID controllers
• Universal input x 2 points, control output x 2 points, clamp-on current sensor input x 2 points
• 2 universal inputs configurable to T/C, RTD, DC current or voltage independently
• Clamp-on current sensor input enables to detect heater wire break or over current
• Auto tuning function
• Configurable with PC configurator (model: R8CFG)
• Mixed installation with other I/O modules

ORDERING INFORMATION
• Code number: R8-TC2[1][2]
  Specify a code from below for each [1] and [2].
  (e.g. R8-TC2A/Q)
• Specify the specification for option code /Q
  (e.g. /C01)

CONTROL LOOP
2: 2 loops

[1] CONTROL OUTPUT
A: 0 - 20 mA DC (Load resistance 450 Ω max.) 2 points
V: 0 - 10 V DC (Load resistance 2 kΩ max.) 2 points
P: 12 V voltage pulse (Load resistance 600 Ω max.) 2 points

[2] OPTIONS
blank: none
/Q: With options (specify the specification)

SPECIFICATIONS OF OPTION: Q
COATING (For the detail, refer to M-System’s web site.)
/C01: Silicone coating
/C02: Polyurethane coating

RELATED PRODUCTS
• PC configurator software (model: R8CFG)
  A dedicated cable is required to connect the module to the PC. Please refer to the users manual for the PC configurator for applicable cable types.
• Clamp-on current sensor (model: CLSE)
  (Used for detecting the heater wire break)
  Note: When using with Power/Network module (model: R8-NECT1), firmware version Ver1.30 or later is supported.

GENERAL SPECIFICATIONS
Connection
• I/O: 4-pin e-CON connector
  Unit side connector XN2D-1474-S002 (Omron)
  Recommended cable side connector XN2A-1470 (Omron)
  Applicable wire size: 0.08 - 0.5 mm² (AWG28 - 20)
  Outer sheath diameter: max. 1.5 dia
  (The cable connector is not included in the package.
  Refer to the specifications of the product.)
• Excitation supply, internal bus:
  Connected to internal bus connector
• Internal power: Supplied from internal bus connector
  Isolation: Pv1 to Pv2 to Mv1 to Mv2 to exc.supply to CT1 or CT2 or internal bus or internal power

CT Input waveform
  RMS sensing: Up to 15 % of 3rd harmonic content
  Input Selection: Selectable with the side DIP SW
  Cold Junction Compensation: CJC sensor incorporated
  Module address: With DIP switch
  Terminating resistor: Built-in (DIP Switch, default: disable)
  Indicator LEDs: Bi-color (red/green) LED;
  Other indicator LEDs: Green LED
  Refer to the instruction manual.
  Control mode: Standard PID, heating and cooling control PID
  Proportional band (P): 0.1 to 3200.0 (temperature unit)
  Integral time (I): 0 to 3999 sec.
  Derivative time (D): 0.0 to 999.9 sec.
  Auto-tuning: Limit cycle method
  Sampling cycle: 100 msec.
  Control cycle: 1.0 to 99.9 sec.
  (100 msec. fixed for Mv output 0 - 20 mA DC and 0 - 10 V DC)
  Mv output range: -5 - +105 % for output scale
  Parameters: Stored in non-volatile memory; write/erase cycle endurance: less than 1 000 000
  Parameter setting: With PC configurator software (model: R8CFG)
INPUT SPECIFICATIONS

Universal input 1, 2 (Pv1, Pv2)
For input type and range configuration, refer to the instruction manual.

- DC Current:
  Input range: 0 - 20 mA DC
  Input resistance: 49.9 Ω resistor incorporated

- DC voltage input
  Input resistance: ≥ 10 kΩ (-1000 to +1000 mV DC)
  Input resistance: ≥ 1 MΩ (-10 to +10 V DC)

- Thermocouple
  Input resistance: ≥ 10 kΩ
  Input range: Refer to the table

- RTD (2-wire or 3-wire)
  Excitation: ≤ 0.33 mA
  Input range: Refer to the table
  Allowable leadwire resistance: 20 Ω per wire

- Resistor (2-wire or 3-wire)
  Excitation: ≤ 0.33 mA
  Input range: 0 - 4000 Ω
  Allowable leadwire resistance: 20 Ω per wire

- Potentiometer
  Excitation: ≤ 0.33 mA
  Input range: Refer to the table
  Allowable leadwire resistance: 20 Ω per wire

Clamp-on current sensor (CT1, CT2)
(Sensor model No.: AC input)

- CLSE-R5: 0 - 5 A
- CLSE-05: 0 - 50 A
- CLSE-10: 0 - 100 A
- CLSE-20: 0 - 200 A
- CLSE-40: 0 - 400 A
- CLSE-60: 0 - 600 A

Frequency: 50 / 60 Hz (45 - 65 Hz)
Operational range: 0 - 120 % of rating
Overload capacity:

- CLSE-R5: 10 A continuous
- CLSE-05: 60 A continuous
- CLSE-10: 120 A continuous
- CLSE-20: 240 A continuous
- CLSE-40: 480 A continuous
- CLSE-60: 720 A continuous

Be sure that the input voltage is of 480 V or less.

OUTPUT SPECIFICATIONS

Control Output (Mv1, Mv2)
Specify the type of output with the code number.

- DC Current: 0 - 20 mA DC
- Operational range: 0 - 23 mA DC
- Load resistance: ≤ 450 Ω
- DC Voltage: 0 - 10 V DC
- Operational range: 0 - 11.5 V DC
- Load resistance: ≥ 2 kΩ

Voltage Pulse
- Maximum frequency: 1 Hz
- Minimum pulse width: 1 msec.
- Hi level: 12 V ±15 %
- Lo level: ≤ 0.5 V
- Load resistance: 600 Ω min.

INSTALLATION

Max. current consumption: 200 mA
Exc. supply current consumption: 60 mA
Operating temperature: -10 to +55°C (14 to 131°F)
Operating humidity: 30 to 90 %RH (non-condensing)
Atmosphere: No corrosive gas or heavy dust
Mounting: DIN rail
Weight: 110 g (0.24 lb)

PERFORMANCE in percentage of span

Accuracy
- Pv1 or Pv2: Refer to "Input type, range & conversion accuracy" section.
- CT1 or CT2: ±2 % (sensor error margin not included)
- Mv1 or Mv2: ±0.5 %

Data allocation: 2
Module addresses in use: 8
Communication data:
- Loop 1 Pv1
- Loop 1 Sp1
- Loop 1 Mv1
- Loop 1 Proportional band (P1)
- Loop 1 Integral time (I1)
- Loop 1 Derivative time (D1)
- CT input 1 Current value (CT1)
- Loop 2 Pv2
- Loop 2 Sp2
- Loop 2 Mv2
- Loop 2 Proportional band (P2)
- Loop 2 Integral time (I2)
- Loop 2 Derivative time (D2)
- CT input 2 Current value (CT2)

Cold junction compensation error:
±3°C at -10 - +55°C
±5.4°F at 14 - 131°F
(The described accuracy may be partially not satisfied when the input temperature is below 0°C. Consult factory.)

**Temp. coefficient**
- \( \text{Pv1 or Pv2}: \pm 0.03\%/°C (\pm 0.02\%/°F) \)
- \( \text{CT1 or CT2}: \pm 0.03\%/°C (\pm 0.02\%/°F) \)

**Response time**
- \( \text{CT1 or CT2}: \leq 2\text{ sec. (0 - 90 \%)} \)
- \( \text{Mv1 or Mv2}: \leq 1\text{ sec. (0 - 90 \%, DC output)} \)

**Burnout response time:** \( \leq 1\text{ sec.} \)

**Insulation resistance:** \( \geq 100 \text{ MΩ with 500 V DC} \)

**Dielectric strength:** 1000 V AC @1 minute (Pv1 to Pv2 to Mv1 to Mv2 to exc.supply to CT1 or CT2 or internal bus or internal power to ground)

### STANDARDS & APPROVALS

EU conformity:
- EMC Directive
  - EMI EN 61000-6-4
  - EMS EN 61000-6-2
- RoHS Directive
  - EN 50581

### CONTROL MODE

Choose from two control mode shown below with configurator software.

- **Standard PID control**
  - It is available to control two independent loops.
  - Loop 1: Control by Pv1 and Mv1.
  - Loop 2: Control by Pv2 and Mv2.

- **Heating and cooling PID control**
  - It is available to control one loop.
  - Loop 1: Control by Pv1, heating Mv1 and cooling Mv2.
  - Loop 2 is not available.
## INPUT TYPE, RANGE & CONVERSION ACCURACY

<table>
<thead>
<tr>
<th>INPUT TYPE</th>
<th>INPUT RANGE</th>
<th>ACCURACY</th>
</tr>
</thead>
<tbody>
<tr>
<td>DC Current</td>
<td>0 – 20mA DC</td>
<td>±20μA</td>
</tr>
<tr>
<td>DC Voltage</td>
<td>-1000 – +1000mV DC</td>
<td></td>
</tr>
<tr>
<td></td>
<td>-10 – +10V DC</td>
<td>±200μV</td>
</tr>
<tr>
<td>Potentiometer</td>
<td>0 – 150Ω, 0 – 300Ω, 0 – 600Ω, 0 – 1200Ω, 0 – 2500Ω, 0 – 4000Ω</td>
<td>Larger value of either ±0.1 Ω or ±0.1 %</td>
</tr>
<tr>
<td>Resistor</td>
<td>0 – 4000Ω</td>
<td>Larger value of either ±0.1 Ω or ±0.1 %</td>
</tr>
</tbody>
</table>

### Table 1

<table>
<thead>
<tr>
<th>Thernocouple</th>
<th>°C</th>
<th>°F</th>
<th>CONFORMANCE RANGE</th>
<th>INPUT RANGE</th>
<th>ACCURACY</th>
<th>ACCURACY</th>
<th>CONFORMANCE RANGE</th>
</tr>
</thead>
<tbody>
<tr>
<td>(PR)</td>
<td></td>
<td></td>
<td></td>
<td>0 – 1760</td>
<td>±1.80</td>
<td>±3.24</td>
<td>32 – 3200</td>
</tr>
<tr>
<td>K (CA)</td>
<td>-270 – +1370</td>
<td>±0.40</td>
<td></td>
<td>-150 – +1370</td>
<td>±0.72</td>
<td>-238 – +2498</td>
<td></td>
</tr>
<tr>
<td>E (CRC)</td>
<td>-270 – +1000</td>
<td>±0.60</td>
<td></td>
<td>-170 – +1000</td>
<td>±1.08</td>
<td>-274 – +1832</td>
<td></td>
</tr>
<tr>
<td>J (IC)</td>
<td>-210 – +1200</td>
<td>±0.70</td>
<td></td>
<td>-180 – +1200</td>
<td>±1.26</td>
<td>-292 – +2192</td>
<td></td>
</tr>
<tr>
<td>T (CC)</td>
<td>-270 – +400</td>
<td>±0.50</td>
<td></td>
<td>-170 – +400</td>
<td>±0.90</td>
<td>-274 – +752</td>
<td></td>
</tr>
<tr>
<td>B (RH)</td>
<td>100 – 1820</td>
<td>±2.00</td>
<td></td>
<td>400 – 1760</td>
<td>±3.60</td>
<td>752 – 3200</td>
<td></td>
</tr>
<tr>
<td>R</td>
<td>-50 – +1760</td>
<td>±1.00</td>
<td></td>
<td>200 – 1760</td>
<td>±1.80</td>
<td>392 – 3200</td>
<td></td>
</tr>
<tr>
<td>S</td>
<td>-50 – +1760</td>
<td>±1.00</td>
<td></td>
<td>0 – 1760</td>
<td>±1.80</td>
<td>32 – 3200</td>
<td></td>
</tr>
<tr>
<td>C (WRe 5-26)</td>
<td>0 – 2315</td>
<td>±1.00</td>
<td></td>
<td>0 – 2315</td>
<td>±1.80</td>
<td>32 – 4199</td>
<td></td>
</tr>
<tr>
<td>N</td>
<td>-270 – +1300</td>
<td>±0.50</td>
<td></td>
<td>-130 – +1300</td>
<td>±0.90</td>
<td>-202 – +2372</td>
<td></td>
</tr>
<tr>
<td>U</td>
<td>-200 – +600</td>
<td>±0.50</td>
<td></td>
<td>-200 – +600</td>
<td>±0.90</td>
<td>-328 – +1112</td>
<td></td>
</tr>
<tr>
<td>L</td>
<td>-200 – +900</td>
<td>±0.30</td>
<td></td>
<td>-200 – +900</td>
<td>±0.54</td>
<td>-328 – +1652</td>
<td></td>
</tr>
<tr>
<td>P (Platinel II)</td>
<td>0 – 1395</td>
<td>±0.30</td>
<td></td>
<td>0 – 1395</td>
<td>±0.54</td>
<td>32 – 2543</td>
<td></td>
</tr>
</tbody>
</table>

### RTD

<table>
<thead>
<tr>
<th>RTD</th>
<th>°C</th>
<th>°F</th>
<th>ACCURACY</th>
<th>INPUT RANGE</th>
<th>ACCURACY</th>
<th>INPUT RANGE</th>
<th>ACCURACY</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pt 100 (JIS '97, IEC)</td>
<td>-200 – +850</td>
<td>±0.40</td>
<td>-328 – +1562</td>
<td>±0.72</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Pt 500</td>
<td>-200 – +850</td>
<td>±0.40</td>
<td>-328 – +1562</td>
<td>±0.72</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Pt 1000</td>
<td>-200 – +850</td>
<td>±0.40</td>
<td>-328 – +1562</td>
<td>±0.72</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Pt 50Ω (JIS '81)</td>
<td>-200 – +649</td>
<td>±0.60</td>
<td>-328 – +1200</td>
<td>±1.08</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>JPt 100 (JIS '89)</td>
<td>-200 – +510</td>
<td>±0.40</td>
<td>-328 – +950</td>
<td>±0.72</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Ni 508.4 Ω</td>
<td>-50 – +200</td>
<td>±0.60</td>
<td>-58 – +392</td>
<td>±1.08</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Cu 10 @ 25°C</td>
<td>-50 – +250</td>
<td>±2.00</td>
<td>-58 – +482</td>
<td>±3.60</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

*1. Thermocouple: CJC error margin (3.0 °C, 5.4 °F) added value indicated above.
*2. Maximum range: Absolute value of 0% or 100% of the input range, whichever is greater.
**EXTERNAL VIEW**

- **LEFT VIEW**
- **FRONT VIEW**
- **RIGHT VIEW**

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**OPERATING MODE SETTING**

(*) Factory default
Be sure to set unused SW 2-1 through 2-5 and 2-7, 2-8 to OFF

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**Module Address**

SW 1-1 through 1-4 determine the tenth place digit, while SW 1-5 through 1-8 do the ones place digit of the address.

Address is selected between 0 to 24.

(Factory setting: 0)

<table>
<thead>
<tr>
<th>MODULE ADDRESS</th>
<th>SW1</th>
</tr>
</thead>
<tbody>
<tr>
<td>x10 1 2 3 4</td>
<td>x1  5 6 7 8</td>
</tr>
<tr>
<td>0   OFF OFF OFF OFF</td>
<td>1   OFF OFF OFF OFF</td>
</tr>
<tr>
<td>1   OFF OFF OFF ON</td>
<td>2   OFF OFF ON OFF</td>
</tr>
<tr>
<td>2   OFF OFF ON ON</td>
<td>3   OFF ON ON ON</td>
</tr>
<tr>
<td>3   OFF ON ON ON</td>
<td>4   OFF OFF OFF OFF</td>
</tr>
<tr>
<td>4   OFF ON ON ON</td>
<td>5   OFF OFF OFF OFF</td>
</tr>
<tr>
<td>5   OFF ON ON ON</td>
<td>6   OFF OFF OFF OFF</td>
</tr>
<tr>
<td>6   OFF ON ON ON</td>
<td>7   OFF OFF OFF OFF</td>
</tr>
<tr>
<td>7   OFF ON ON ON</td>
<td>8   ON OFF OFF OFF</td>
</tr>
<tr>
<td>8   ON OFF OFF OFF</td>
<td>9   ON OFF OFF ON</td>
</tr>
</tbody>
</table>

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**Terminator DIP SW**

<table>
<thead>
<tr>
<th>TERMINATOR SW</th>
<th>SW2-6</th>
</tr>
</thead>
<tbody>
<tr>
<td>Without (*)</td>
<td>OFF</td>
</tr>
<tr>
<td>With</td>
<td>ON</td>
</tr>
</tbody>
</table>

---

**Input Selection**

<table>
<thead>
<tr>
<th>INPUT</th>
<th>UNIVERSAL INPUT1</th>
<th>UNIVERSAL INPUT2</th>
</tr>
</thead>
<tbody>
<tr>
<td>DC Current</td>
<td>ON</td>
<td>OFF</td>
</tr>
<tr>
<td>DC Voltage (V)(^{*1})</td>
<td>OFF</td>
<td>OFF</td>
</tr>
<tr>
<td>DC Voltage (mV)(^{*2})</td>
<td>OFF</td>
<td>ON</td>
</tr>
<tr>
<td>Potentiometer</td>
<td>OFF</td>
<td>OFF</td>
</tr>
<tr>
<td>Resistor</td>
<td>OFF</td>
<td>OFF</td>
</tr>
<tr>
<td>T/C</td>
<td>OFF</td>
<td>OFF</td>
</tr>
<tr>
<td>RTD</td>
<td>OFF</td>
<td>OFF</td>
</tr>
</tbody>
</table>

\(^{*1}\) Input range: -10 – +10V DC

\(^{*2}\) Input range: -1000 – +1000 mV DC

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**Operational Diagram:**

- Function Setting
- Universal Input Connectors
- Control Output Connectors
- Internal Bus Connectors
- Status Indicator LED
- Indicator LEDs
- Universal Input Connectors
- CT Input Connectors
- Internal Bus Connectors

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MSYSTEM
M-SYSTEM CO., LTD.
http://www.m-system.co.jp/

R8-TC2 SPECIFICATIONS

ES-9788 Rev.5  Page 5/7
EXTERNAL DIMENSIONS unit: mm (inch)

DIN RAIL (35 mm wide)

SCHEMATIC CIRCUITRY & CONNECTION DIAGRAM

1. The power supply for control circuit, which is non-isolated from internal power.
2. The power supply for output 1 and output 2, which is isolated from the Exc. supply and the internal power.
Specifications are subject to change without notice.