The µR20000 is a compact recorder with a recording width of 180mm. The model family consists of 1, 2, 3, 4 pen and a 6,12,18, 24 dot models. Pen model realizes continuous recording for each channel, whereas the dot model realizes a high speed of 6 dot / 10 sec, 12 dot / 15 sec, 18 dot / 20 sec, 24 dot / 30 sec. The input is universal input. High reliability is realized by contact-free technology, such as self-developed high withstand voltage semiconductor relays, and pen servo unit using an ultra-small stepping motor. The versatile display such as multi-channel digital display, bar graph display, flag display, DI/DO status display, and date/time display are provided with 181 × 16 VFD dot display.

The µR20000 can be used as a monitoring device and as a quality control instrument in many applications (such as process temperature monitoring, pollution, construction, furnaces, field of medical diagnosis, field of refrigerating, etc.).

STANDARD SPECIFICATIONS

General Specifications

Construction
Mounting: Flush Panel Mounting (vertical).
Mounting may be inclined up to 30˚, rear below front (with horizontal base).
Allowable panel thickness: 2 to 26mm
Material:
Case: Steel, front door: aluminium die casting.
Case color: Case and door-frame: Charcoal gray light
(Mansell 10B 3.6 / 0.3 or equivalent)
Door: Splash and dust-proof (based on DIN 40050-IP54).
Dimensions: 288 × 288 × 220mm (see dimensional drawings)
Weight (approx.): 1 pen 7.5kg 6 dot 8.4kg 2 pen 7.5kg 12 dot 8.6kg 3 pen 7.6kg 18 dot 8.8kg 4 pen 7.6kg 24 dot 9.0kg

Input
Inputs:
DCV: Direct Current Voltage input
20mV to 50V, 1-5V range.
TC: Thermo couple.
RTD: Resistance Temperature Detector.
DI: Digital Input (contact or DC Voltage, TTL level).
DCA: Direct Current Input (using external shunt resistor (10Ω, 100Ω, 250Ω))

Measuring range: selectable per channel

<table>
<thead>
<tr>
<th>Input Type</th>
<th>Range</th>
<th>Measuring Range</th>
</tr>
</thead>
<tbody>
<tr>
<td>DC V</td>
<td></td>
<td></td>
</tr>
<tr>
<td>20 mV</td>
<td>–20.00 to 20.00mV</td>
<td></td>
</tr>
<tr>
<td>60 mV</td>
<td>–60.00 to 60.00mV</td>
<td></td>
</tr>
<tr>
<td>200 mV</td>
<td>–200.0 to 200.0mV</td>
<td></td>
</tr>
<tr>
<td>2 V</td>
<td>–2.000 to 2.000V</td>
<td></td>
</tr>
<tr>
<td>6 V</td>
<td>–6.000 to 6.000V</td>
<td></td>
</tr>
<tr>
<td>20 V</td>
<td>–20.00 to 20.00V</td>
<td></td>
</tr>
<tr>
<td>50V</td>
<td>–50.00 to 50.00V</td>
<td></td>
</tr>
<tr>
<td>1-5V*1</td>
<td></td>
<td>1.000 to 5.000V</td>
</tr>
</tbody>
</table>

*1: Only linear scaling can be used (burnout is available)
### Measurement Interval:

<table>
<thead>
<tr>
<th>Input</th>
<th>Range</th>
<th>Measuring Range</th>
<th>°C</th>
<th>Measuring Range</th>
<th>°F</th>
</tr>
</thead>
<tbody>
<tr>
<td>TC</td>
<td>R²</td>
<td>0.0 to 1760.0°C</td>
<td>32 to 3200°F</td>
<td>S²</td>
<td>0.0 to 1760.0°C</td>
</tr>
<tr>
<td></td>
<td>B²</td>
<td>0.0 to 1820.0°C</td>
<td>32 to 3308°F</td>
<td>K²</td>
<td>–200.0 to 1370.0°C</td>
</tr>
<tr>
<td></td>
<td>E²</td>
<td>–200.0 to 800.0°C</td>
<td>32 to 1472.0°F</td>
<td>J²</td>
<td>–200.0 to 1100.0°C</td>
</tr>
<tr>
<td></td>
<td>T²</td>
<td>–200.0 to 400.0°C</td>
<td>32 to 752.0°F</td>
<td>N²</td>
<td>0.0 to 1300.0°C</td>
</tr>
<tr>
<td></td>
<td>W²</td>
<td>0.0 to 2315.0°C</td>
<td>32 to 4199°F</td>
<td>L⁴</td>
<td>–200.0 to 900.0°C</td>
</tr>
<tr>
<td></td>
<td>U⁴</td>
<td>–200.0 to 400.0°C</td>
<td>32 to 752.0°F</td>
<td>WRe⁵</td>
<td>0.0 to 2400.0°C</td>
</tr>
<tr>
<td></td>
<td>Pt100⁶</td>
<td>–200.0 to 600.0°C</td>
<td>–328.0 to 1112.0°F</td>
<td>JPt100⁶</td>
<td>–200.0 to 550.0°C</td>
</tr>
<tr>
<td>RTD*⁶</td>
<td>DCV input</td>
<td>OFF: 2.4V less ON: 2.4V or greater</td>
<td>Contact input</td>
<td>Contact input</td>
<td>ON/OFF</td>
</tr>
</tbody>
</table>

#### Computation:
- **Differential computation:**
  - Between any two channels, however reference channel number must be smaller than measuring channel number.
  - Available for DCV, TC, and RTD range.
  - Both channels must have same range.

#### Linear scaling:
- Available for DCV, TC, RTD and DI range.
- Scaling range: –20000 to 30000
- Data display & printout range: –19999 to 30000
- Decimal point: User selectable
- Unit: User settable, up to 6 characters (alphanumerical & special characters).

#### Square root:
- Available for DCV range.
- Scaling range: –20000 to 30000
- Data display & printout range: –19999 to 30000
- Decimal point: User selectable
- Unit: User settable, up to 6 characters (alphanumerical & special characters).

- Low level cut off: 0.0 to 5.0% of recording span
- Bias addition: –10.0 to 10.0% of recording span

#### Recording and Printing
- **Recording Method:**
  - Pen model: Disposable felt pens, Plotter pen
  - Dot printing model: 6 color wire dot.
- **Pen Offset Compensation:**
  - ON / OFF selectable
- **Effective Recording Width:** 180mm
- **Chart:** Plain-paper Z-fold chart (20m)
- **Step Response Time (pen):** Approx. 1.5s / IEC 61143 method
- **Recording Period:**
  - Pen model: Continuous for each channel.
  - Dot printing model*: Max. 6 channel / 10sec (the shortest recording period)
    7 to 12 channels / 15sec (the shortest recording period)
    13 to 18 channels / 20sec (the shortest recording period)
    19 to 24 channels / 30sec (the shortest recording period)
    25 to 48 channels / 60sec (the shortest recording period)
  - * The model with /M1 option includes analog recording of mathematical channel.
- **AUTO / FIX selectable**
  - AUTO: Analog recording interval is depending on the chart speed

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3: W: W-5% Re/W-26% Re(Hoskins Mfg. Co.), ASTM E988
4: L: Fe-CuNi, DIN43710, U: Cu-CuNi, DIN43710
5: WRe: W-3% Re/W-25% Re(Hoskins Mfg. Co.)
JPt100: JIS C1604-1989, JIS C1606-1989

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*3: W: W-5% Re/W-26% Re(Hoskins Mfg. Co.), ASTM E988
*4: L: Fe-CuNi, DIN43710, U: Cu-CuNi, DIN43710
*5: WRe: W-3% Re/W-25% Re(Hoskins Mfg. Co.)
JPt100: JIS C1604-1989, JIS C1606-1989
**FIX:** Analog recording interval is set to the shortest period

**Chart Speed:**
- Pen model: 5 to 12000mm/h (82 increments)
- Dot printing model: 1 to 1500mm/h (1mm step)

**Chart Speed Change:**
- Speed 1, speed 2 change by remote control signals (option)

**Chart Speed Accuracy:**
- Within \( \pm 0.1\% \) (for recordings longer than 1000mm, related to the grid of the chart paper)

**Relation between Chart Speed and Printout:**

- **(Pen-model)**
  - 5 to 9mm/h
  - 10 to 1500mm/h
  - 1600 to 12000mm/h

- **6, 12 dot model**
  - 1 to 9mm/h
  - 10 to 100mm/h
  - 101 to 1500mm/h

- **18, 24 dot model**
  - 1 to 9mm/h
  - 10 to 50mm/h
  - 51 to 1500mm/h

**Chart Speed Printing Interval of Periodic Printout**

<table>
<thead>
<tr>
<th>Chart Speed</th>
<th>6 dot</th>
<th>12 dot</th>
<th>18 dot</th>
<th>24 dot</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 to 9mm/h</td>
<td>NA</td>
<td>NA</td>
<td>NA</td>
<td>NA</td>
</tr>
<tr>
<td>10 to 19mm/h</td>
<td>8 hours</td>
<td>12 hours</td>
<td>24 hours</td>
<td></td>
</tr>
<tr>
<td>20 to 39mm/h</td>
<td>4 hours</td>
<td>8 hours</td>
<td>12 hours</td>
<td></td>
</tr>
<tr>
<td>40 to 50mm/h</td>
<td>2 hours</td>
<td>4 hours</td>
<td>8 hours</td>
<td></td>
</tr>
<tr>
<td>51 to 79mm/h</td>
<td>2 hours</td>
<td>4 hours</td>
<td>NA</td>
<td></td>
</tr>
<tr>
<td>80 to 100mm/h</td>
<td>1 hour</td>
<td>2 hours</td>
<td>NA</td>
<td></td>
</tr>
<tr>
<td>101 to 1500mm/h</td>
<td>NA</td>
<td>NA</td>
<td>NA</td>
<td></td>
</tr>
</tbody>
</table>

**Recording Colors:**
- **Pen model:**
  - 1pen=red, 2pen=green, 3pen=blue, 4pen=violet, plotter pen=purple
- **Dot model:**
  - ch.1,7,13,19=purple, ch.2,8,14,20=red, ch.3,9,15,21=green, ch.4,10,16,22=blue, ch.5,11,17,23=brown, ch.6,12,18,24=black
  (color can be assigned to any channels)

**Recording Format:**

1. Analog recording:
   - Analog recording ON/OFF selectable for each channel of dot model
   - Zone recording:
     - Span: 5mm or more (1mm step)
     - Partial expanded recording:
       - Boundary position: 1 to 99%
       - Boundary value: Within recording span

2. Digital printout:
   - Channel (dot model only):
     - Channel number or TAG will be printed during analog recording. Approx. every 25mm this print will occur.
     - ON/OFF selectable (common for all channels)
   - Alarm:
     - At the right side of the chart, CH. No. or TAG, Type of alarm, (date*4 /time)*2 of alarm ON/OFF will be printed. Time of alarm ON/OFF, time of alarm ON, OFF selectable (common for all channels).
   - Periodic printout contents:
     - Date (mm/dd/yy)*4, time(hh:mm), measurement data of each channel, scale printout, recording color, chart speed
     - Measurement data of each channel:
       - a. ON/OFF selectable
       - b. Channel No. or tag, alarm status (for instantaneous mode), measuring value (according to instantaneous mode or report mode), measuring unit (up to 6 characters)
     - Scale printout:
       - a. ON/OFF selectable (common for all channels)
       - b. 0 and 100% scale value (when using partial expanded recording, boundary value is recorded)
     - Printout available for recording span of 40 mm or more
- Recording color:
  Only for pen model (OFF selectable)
- Periodic print interval:
  a. Using internal timer
  b. Standard time 00:00 to 23:00 (on the hour)
  c. Print interval setting (AUTO/MAN)*5
    AUTO: Automatically set as chart speed
    MAN: 10, 12, 15, 20, 30 minute, 1, 2, 3, 4, 6, 8, 12, 24 hour
- Periodic printout mode:
  Selectable from Instantaneous value mode / report mode/OFF mode
  a. Instantaneous value mode:
     Measuring value for each channel
  b. Report mode:
     Selectable from MIN, MAX, AVE, MIX(MIN/MAX/AVE), SUM, INST
     Report interval: Same as periodic printout interval
  c. OFF mode: Periodic printout is not executed.

Message printout:
With panel key or remote control option, up to 5 messages can be printed.
Contents: (Date*4/time)*1 and message (up to 16 characters).
Record start time:
(Date*4/time)*2 will be printed when recording starts, ON / OFF selectable.
Chart speed printout:
(Date*4/time)*2 when chart speed is changed will be printed, ON / OFF selectable.
List printout*3:
Listings of range and alarm setting, etc. will be printed.
Manual printout*5:
With panel key or remote control option, measuring value will be printed.
SET UP List printout*5:
Listings of settings in SET UP Mode will be printed.
  *1 Selectable from hh:mm, hh:mm:ss, mm/dd hh:mm, mm/dd hh:mm:ss, mm/dd/yy hh:mm:ss, OFF.
  *2 Selectable from hh:mm, hh:mm:ss, mm/dd hh:mm, mm/dd hh:mm:ss, mm/dd/yy hh:mm:ss
  *3 During printout trend recording will be interrupted.
  *4 Selectable from mm.dd.yy, yy/mm/dd, mm/dd/yy, dd/mm/yy or dd.mm.yy
  *5 According to print settings all the items are not printed.

Display
Display Method:
VFD 181 x 16 dot matrix
15 display screens can be selected from the any of followings (default display is 6 screens)
- 1 channel digital display*1,*2; AUTO*2/MAN*3
- 2 channel digital display*1,*2; AUTO*2/MAN*3
- 3 channel digital display*4,*5; AUTO*2/MAN*3
- 4 channel digital display*4; Channel No., alarm type, measuring value, with measuring unit (3digits)*6 are displayed
- 6 channel digital display*4; Channel No., alarm type, measuring value are displayed (only for dot model)
- 12 channel digital display*4; measuring value are displayed (only for 12, 18, 24 dot model)
- 1 channel digital display*4 + 1 channel bar graph display:
  AUTO*2/MAN*3
- 1 channel digital display*4 + 4 channel bar graph display (only for pen model):
  AUTO*2/MAN*3
- 2 channel digital*4 + 2 channel bar graph display:
  AUTO*2/MAN*3
- 4 channel bar graph display (only for 4 pen model)
- Flag display
- DI/DO display (Available for model with /R1 or /A1, /A2, /A3, /A4, /A5 option)
- Alarm status*1
  - Date/time display (mm/dd/yy hh:mm)+Chart speed display*1
  - Status display*1
- System display
  - Display Off (light out)*1
  - Split display: Upper/lower position display
  - Tag 1 channel digital display*1,*4; AUTO*2/MAN*3
  - Tag 2 channel digital display*4; AUTO*2/MAN*3
  - Tag 1 channel digital display*4 + 1 channel bar graph display:
    AUTO*2/MAN*3
  - Tag 1 channel digital display + 4 channel bar graph display*4 (4 pen model only)

Status display:
Recording in progress (RECORD)
Shared alarm display (ALARM)
Alarm occurrence No. display (1 to 24)
Chart end indicator (CHART END)....For the model with /F1 option
Computation in progress(MATH)......For the model with /M1 option
Key lock display (KEY LOCK)

*1 The displays can be specified for split display.
*2 AUTO: Channel No., alarm type, measuring value, and measuring unit (6 digits) are displayed in order of channel No.
For 2 channel digital display + 2 channel bar graph display, the unit display is 3 digits.
No unit display for 3 channel digital display
*3 MAN: The same contents of AUTO for the specified channel are displayed.
*4 Display updated interval can be selected from AUTO / MAN.
AUTO: 1s / 2s / 3s / 4s / 5s
MAN: 2s (pen model), same as measurement interval (dot model)
*5 The display can be specified only for split display.
*6 For computation channel display, the unit display is 2 digits

**Power Supply**
Rated Power Voltage:
100 to 240VAC, automatically selected depending on the power supply voltage
Usable power voltage ranges:
90 to 132, 180 to 264VAC
Rated Power Frequency:
50 / 60 Hz, automatically selected
Power Consumption:
(approx.)

<table>
<thead>
<tr>
<th>1-4 pen Power Source</th>
<th>240VAC Power Source</th>
<th>Maximum</th>
</tr>
</thead>
<tbody>
<tr>
<td>17VA*</td>
<td>25VA*</td>
<td>55VA</td>
</tr>
<tr>
<td>6-24 dot Power Source</td>
<td>23VA*</td>
<td>55VA</td>
</tr>
</tbody>
</table>

*: In Balance

**Alarm**
Number of alarm levels:
Up to four levels for each channel
Alarm types:
High and low, limits, differential high and low limits, high and low rate-of-change limits and delay high and low
Alarm delay time: 1 to 3600s
Interval time of rate-of-change alarms:
The measurement interval times 1 to 15
Display:
Alarm value is indicated as a point on the bar graph.
In occurring an alarm:
- On bar graph display, a point indicator is flashing.
- On digital display, an alarm type indicator is shown.
- A channel number of occurring alarm is displayed.
- Shared alarm display
Hysteresis:
0.0 to 1.0% (0.1% step) of recording span (only High, Low alarm, common for all channels and all levels).
Alarm indication when ALARM ACK-key is pressed:
Non-hold-type:
Alarm display is not affected when the ALARM ACK-key is pressed.
Hold-type:
When alarm occurs, alarm indicator will start flashing. After ALARM ACK-key is pressed, indicator will show status of the alarm.

**Other Specifications**
Clock:
With calendar function
Summer time:
Summer time can be set.
Clock Accuracy:
100 ppm, however not including error due to turning ON / OFF power
Panel Key Lock:
Protection by password
(Any of RCD, MENU, FEED key and functions (Alarm ACK, Math, Printout, Message, Buffer clear, Digital PRT, Pen exchange (only for pen model), Ribbon exchange (only for dot model) can be locked).
Internal illumination:
White LED
Memory backup:
Lithium battery to protect setting parameters.
Life is approx. ten years (at room temperature, and for standard model) and is installed inside the recorder.
Insulation Resistance:
Each terminal to ground terminal: More than 20MΩ (measured at 500VDC).
Dielectric Strength:
Power supply to ground terminal:
1500V AC (50 / 60Hz), 1 min
Contact output terminal to ground:
1500V AC (50 / 60Hz), 1 min
Measuring input terminal to ground:
1000V AC (50 / 60Hz), 1 min
Between measuring input terminals:
1000V AC (50 / 60Hz), 1 min (except for RTD, since b-terminal is common).
Between remote control terminal to ground:
500V DC, 1 min.
Mechanical noise:
Machine Noise Information Ordinance 3. GSGV, Jan. 18, 1991:
The maximum sound pressure level is equal or less than 60dB (A) according to ISO7779.

**Safety and EMC standards**
CSA
CSA22.2 No.61010-1 (NRTL/C*) installation category II, measurement category II pollution degree 2
For marking that includes NRTL, a mark with "US" (USA) printed on the right side of the CSA mark, and "C" (Canada) printed on the left side appears on this instrument.

CE

EMC directive:
- EN61326 compliance (Emission: Class A, Immunity: Annex A)
- EN61000-3-2 compliant
- EN61000-3-3 compliant
- EN55011 compliant, Class A Group 1

Low voltage directive:
- EN61010-1 compliant, installation category II measurement category II, pollution degree 2

C-Tick
- AS/NZS CISPR11 compliant, Class A Group 1

Normal Operating Conditions

Power voltage: 90 to 132, 180 to 264VAC
Power frequency: 50Hz ± 2%, 60Hz ± 2%
Ambient temperature: 0 to 50°C
Ambient humidity: 20 to 80% RH (at 5 to 40°C)
Vibration: 10 to 60Hz, 0.2m/s² or less
Shock: Not acceptable
Magnetic field: Less than 400A/m (DC and 50, 60Hz)

Noise:
- Normal Mode (50 / 60Hz):
  - DCV  Peak value including signal must be less than 1.2 times the measuring range.
  - TC   Peak value including signal must be less than 1.2 times the measuring thermal electromotive force.
  - RTD  less than 50mV.

- Common Mode (50 / 60Hz):
  - Less than 250VAC rms, for the whole range

- Maximum noise voltage between channels (50 / 60Hz):
  - 250VAC rms or less for pen model and 6,12 dot model
  - 200VAC rms or less for 18, 24 dot model
  - *When /N2 (3 leg RTD) option is specified,
    - 200VAC rms or less for 6 dot,
    - 100VAC rms or less for 12, 18, and 24 dot model

Operating Position:
- Frontwards: 0° Backwards: Within 30° from horizontal

Warm-up Time:
- Min. 30 minutes after power has been turned ON.
Standard Performance

Measuring and Recording Accuracy:

(Following specifications apply to operation of the recorder under standard operation conditions: temperature 23 ± 2°C, humidity 55 ± 10%RH, power supply voltage 90 to 132V, 180 to 264V AC, power supply frequency 50/60Hz ± 1%, warm-up time at least 30 minutes, other ambient conditions like vibration should not adversely affect the recording operation).

<table>
<thead>
<tr>
<th>Input</th>
<th>Range</th>
<th>Measuring (digital display)</th>
<th>Recording (analog)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Measurement Accuracy</td>
<td>Max. Resolution</td>
</tr>
<tr>
<td>DC V</td>
<td>20mV</td>
<td>± (0.1% of rdg+2 digits)</td>
<td>10µV</td>
</tr>
<tr>
<td></td>
<td>60mV</td>
<td>10µV</td>
<td>100µV</td>
</tr>
<tr>
<td></td>
<td>200mV</td>
<td>1mV</td>
<td>10mV</td>
</tr>
<tr>
<td></td>
<td>2V</td>
<td>± (0.1% of rdg+3 digits)</td>
<td>10mV</td>
</tr>
<tr>
<td></td>
<td>6V</td>
<td>10mV</td>
<td></td>
</tr>
<tr>
<td></td>
<td>20V</td>
<td>± (0.1% of rdg+2 digits)</td>
<td>1mV</td>
</tr>
<tr>
<td></td>
<td>50V</td>
<td>1mV</td>
<td></td>
</tr>
<tr>
<td></td>
<td>1-5V</td>
<td>1mV</td>
<td></td>
</tr>
<tr>
<td>TC</td>
<td>R</td>
<td>± (0.15% of rdg+1°C)</td>
<td>0.1°C</td>
</tr>
<tr>
<td></td>
<td>± (0.15% of rdg+0.7°C)</td>
<td>but R, S: 0 to 100°C, ± 3.7°C</td>
<td></td>
</tr>
<tr>
<td></td>
<td>± (0.15% of rdg+1°C)</td>
<td>100 to 300°C, ± 1.5°C</td>
<td></td>
</tr>
<tr>
<td></td>
<td>± (0.15% of rdg+0.7°C)</td>
<td>B: 400 to 600°C, ± 2°C, and is not guaranteed below 400°C</td>
<td></td>
</tr>
<tr>
<td></td>
<td>S</td>
<td>± (0.15% of rdg+0.5°C)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>± (0.15% of rdg+0.7°C)</td>
<td>but J: −200 to −100°C</td>
<td></td>
</tr>
<tr>
<td></td>
<td>± (0.15% of rdg+0.7°C)</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>B</td>
<td>± (0.15% of rdg+1°C)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>± (0.15% of rdg+0.5°C)</td>
<td>but L: −200 to −100°C</td>
<td></td>
</tr>
<tr>
<td></td>
<td>± (0.15% of rdg+0.7°C)</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>± (0.15% of rdg+0.5°C)</td>
<td>but W: −200 to −100°C</td>
<td></td>
</tr>
<tr>
<td></td>
<td>± (0.15% of rdg+1°C)</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>± (0.15% of rdg+0.7°C)</td>
<td>but Re: −200 to −100°C</td>
<td></td>
</tr>
<tr>
<td></td>
<td>± (0.15% of rdg+1°C)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>RTD</td>
<td>Pt100</td>
<td>± (0.15% of rdg+0.3°C)</td>
<td>0.1°C</td>
</tr>
<tr>
<td></td>
<td>JPt100</td>
<td>± (0.15% of rdg+0.3°C)</td>
<td></td>
</tr>
</tbody>
</table>

NOTE: Recording span is 180 mm.

Accuracy in case of scaling:

Accuracy during scaling (digits) = measuring accuracy (digits) × multiplier + 2 digits (rounded up)

Where the multiplier = scaling span digits / recording span digits

Example:

DCV 6V range

recording span : 1.000 to 5.000V
scaling span : 0.000 to 2.000
measuring accuracy = ± (0.3% × 5V + 2 digits)
= ± (0.015V (15 digits) + 2)
= ± (17 digits)
multiplier = 2000 digits (0.000 to 2.000 / 4000 digits)
= 0.5
Accuracy during scaling = 17 digits × 0.5 + 2 = 11 digits (rounded up)
Maximum Allowable Input Voltage:

±10VDC (cont.) for 200mVDC ranges or less and TC, RTD, DI ranges
±60VDC (cont.) for 2VDC or more

Reference Junction Compensation:

INT / EXT selectable (per channel)

Reference Junction Compensation Accuracy (when measuring 0°C or up):
- Type R, S, B, W, WRe: ±1°C
- Type K, J, E, T, N, L, U: ±0.5°C

Input Resistance:
10MΩ or more (TC, 20mV, 60mV, 200mV range)
Approx. 1MΩ (2V range or more).

Input Source Resistance:
DCV, TC: 2kΩ or less
RTD: 10Ω or less / wire (The resistance of all three wires must be equal)

Input Bias Current:
10nA or less (except when burnout is specified).

Maximum Common Mode Voltage:
250VAC rms (50 / 60Hz)

Maximum Differential Noise between Channels:
250VAC rms (50 / 60Hz) or less for pen model and 6,12 dot model
200VAC rms (50 / 60Hz) or less for 18, 24 dot model

*When /N2 (3 leg RTD) option is specified,
200VAC rms (50 / 60Hz) or less for 6 dot,
100VAC rms (50 / 60Hz) or less for 12, 18, and 24 dot model

Interference between Channels:
120dB (Input external resistance 500Ω; the deviation in the case that 60V is applied to another channel)

Common Mode Rejection Ratio:
120dB (50/60Hz ± 0.1%, 500Ω imbalance between ‘–’ terminal and ground)

Normal Mode Rejection Ratio:
40dB (50 / 60Hz ± 0.1%)

Effect of Operating Conditions

Effect of Ambient Temperature:
Effect of ambient temperature variation of 10°C.
- Digital display: Within ± (0.1% of rdg+1 digit)
- Recording: Within Digital display ± 0.2% of recording span (excluding RJC error)

Effect of Power Supply:
Effect of variation within 90 to 132V or 180 to 264VAC in rated power supply voltage:
(50 or 60Hz)
- Digital display: Within ± 1 digit
- Recording: Within ± 0.1% of recording span

Effect of rated power frequency variation of ±2Hz
(at 100VAC):
- Digital display: Within ± (0.1% of rdg+1 digit)
- Recording: Same as digital display

Effect of Magnetic Field:
Effect of AC (50 / 60Hz) or DC 400A/m field:
- Digital display: Within ± (0.1% of rdg+10 digits)
- Recording: Less than ± 0.5% of recording span

Effect of Input Source Resistance:
Effect of Input Source Resistance variation of +1kΩ:

DCV range:
- 200mV or lower range: Within ± 10µV
- 2V or higher range: Within ~0.1% of rdg

RTD range:
- Effect of 10Ω per wire (resistances of three wires must be equal):
  - Digital display: Within ± (0.1% of rdg+1 digit)
  - Recording: Within Digital display ± 0.1% of recording span
- Effect of difference of three wires:
  - Digital display: 0.1°C per 40 mΩ (approx.) for Pt100 range.

Effect of Operating Position:
Digital display: Within ± (0.1% of rdg+1 digit)
(within 30° backwards)
Recording: Within Digital display ± 0.1% of recording span (within 30° backwards)

Vibration:
Effect when sine-wave motion of frequency 10 to 60Hz and acceleration of 0.2m/s² is applied to the instrument in the direction of three axes for two hours:
- Digital display: Within ± (0.1% of rdg+1 digit)
- Recording: Within Digital display ± 0.1% of recording span

Transport and Storage Conditions

No malfunction will occur under these conditions, however when returning to normal operation conditions, calibration might be necessary.
Temperature: –25°C to 60°C
Humidity: 5 to 95% RH (no condensation)
Vibration: 10 to 60Hz, 4.9m/s²
Shock: 392m/s² or less (while being packed)
OPTIONAL SPECIFICATIONS

/ A1: Alarm Output Relay (2 contacts)
/ A2: Alarm Output Relay (4 contacts)
/ A3: Alarm Output Relay (6 contacts)
/ A4: Alarm Output Relay (12 contacts)
/ A5: Alarm Output Relay (24 contacts)
When alarm occurs, output relay on rear terminal will be activated.
- AND / OR selectable.
- Energized/ deenergized selectable (common for all relays).
- Hold type/ non-hold type selectable (common for all relays).
- Reflash relay:
  Alarms can be assigned to an output relay (I01-I03)
- Relay contact rating:  DC 250V / 0.1A
  AC 250V / 3A
- Type of relay output: NO-C-NC
Note : Alarm ACK key:
  Non-Hold type:
    No effect when ALARM ACK-key is pressed (no effect on output relay).
  Hold type:
    When ALARM ACK-key is pressed, the output relay will be reset.

/ C3: RS-422A / 485 Communication Interface
By using this communication function, setting and control of data can be done by a host-computer.
Data can also be output to the host-computer.
- Synchronization method:
  start-stop asynchronous transmission
- Specifications:
  Conform to EIA RS-422A / 485 standard
- Protocols:
  YOKOGAWA private protocol, Modbus protocol
- Communication method:
  4-wire half-duplex multi-drop connection
  (1: N (N=1 to 32))
- Transfer rate:
  1200, 2400, 4800, 9600, 19200, 38400bps
- Data length: 7 or 8 bit
- Stop bit: 1 bit
- Parity: Odd, even or none
- Communication distance: Up to 1.2km
- Communication mode:
  ASCII (control / setting / measured data) or
  Binary (measured data)
Modbus: RTU SLAVE

/ C7: Ethernet Interface
Electrical and mechanical specifications:
  Conforms to IEEE 802.3
Transmission media: 10 Base-T
Protocol: TCP, IP, UDP, ICMP, ARP

/ F1: FAIL / Chart End Detection and Output
If an error in the CPU board occurs, or when the chart reaches its end, output relay on the rear terminal will be activated. Besides, when the chart reaches its end, ‘CHART END’ indicator will be shown on the display.
Relay contact rating:
  DC 250V / 0.1A, AC 250V / 3A
Chart end: Energized
FAIL: Deenergized

/ H2: Clamped Input Terminal
Using clamped input terminals as input terminal.

/ H3: Non-glare Door Glass
Provides non-reflective glass in the front door.

/ M1: Mathematical Functions
- Computation channel recording
  Pen model: Measurement and computation channel can be assigned to 1-4pen.
Dot model: ON/OFF selectable for each channel
Zone recording
Partial expanded recording
- Alarm for computation channel
  Number of levels: Up to four levels for every channel (High and low limits, delay High and low)
- Number of computation channel: 8 (pen model) 24 (dot model)
- Computation expression: Up to 120 characters can be used
- Types:
  Four arithmetic operations, square root, absolute, common logarithm, exponential, power, relational operations (> , ≥, <, ≤, ≠, =), logic operations (AND, OR, NOT, XOR)
- Constant*: Up to 30 constants can be used
- Number of communication digital input*: Pen model: 8 Dot model: 24
- Remote input*: Up to 5 remote inputs status (I/O) can be used in computation expression
* It cannot be used in statistical computation expression.

Statistical computation
The following computation can be executed for the specified internal timer
- Types of statistics: MAX, MIN, AVE, SUM, MAX-MIN (Totalization)
- Type of interval timer: 3 type
  Timer types: Interval of periodic printout, absolute time, relative time

/N1: Cu10, Cu25 RTD input
This option allows Cu10 and Cu25 RTD inputs to be added to the standard input types.

Cu10, Cu25 Measurement Range

<table>
<thead>
<tr>
<th>Input Type</th>
<th>Measurement Range</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cu10(GE)</td>
<td></td>
</tr>
<tr>
<td>Cu10(L&amp;N)</td>
<td></td>
</tr>
<tr>
<td>Cu10(WEED)</td>
<td></td>
</tr>
<tr>
<td>Cu10(BAILEY)</td>
<td></td>
</tr>
<tr>
<td>Cu10 : α = 0.00392 at 20°C</td>
<td>~200.0 to 300.0°C (~328.0 to 572.0°F)</td>
</tr>
<tr>
<td>Cu10 : α = 0.00393 at 20°C</td>
<td></td>
</tr>
<tr>
<td>Cu25 : α = 0.00425 at 0°C</td>
<td></td>
</tr>
</tbody>
</table>

/N2: 3 Leg Isolated RTD Input
A, B, b legs are isolated input type

/N3: Expansion Inputs
This option allows 14 types of inputs such as Pt50, PR40-20, PLATINEL inputs to be supported besides the standard input types.

/N3 Measurement Range

<table>
<thead>
<tr>
<th>Input</th>
<th>Measuring Range</th>
</tr>
</thead>
<tbody>
<tr>
<td>TC</td>
<td>PR40-20 0.0 to 1900.0°C 32 to 3452°F</td>
</tr>
<tr>
<td></td>
<td>PLATINEL 0.0 to 1400.0°C 32 to 2552°F</td>
</tr>
<tr>
<td></td>
<td>NiNiMo 0.0 to 1310.0°C 32 to 2390°F</td>
</tr>
<tr>
<td></td>
<td>WWRFe26 0.0 to 2400.0°C 32 to 4352°F</td>
</tr>
<tr>
<td></td>
<td>Type NAWG14 0.0 to 1300.0°C 32 to 2372°F</td>
</tr>
<tr>
<td></td>
<td>Kp vs Au7Fe 0.0 to 300.0K —</td>
</tr>
<tr>
<td>RTD</td>
<td>Pt25 -200.0 to 550.0°C -328.0 to 1022.0°F</td>
</tr>
<tr>
<td></td>
<td>Pt50 -200.0 to 600.0°C -328.0 to 1112.0°F</td>
</tr>
<tr>
<td></td>
<td>Ni100(SAMA) -200.0 to 250.0°C -328.0 to 482.0°F</td>
</tr>
<tr>
<td></td>
<td>Ni100(DIN) -60.0 to 180.0°C -76.0 to 356.0°F</td>
</tr>
<tr>
<td></td>
<td>Ni120 -70.0 to 200.0°C -94.0 to 392.0°F</td>
</tr>
<tr>
<td></td>
<td>J263*B 0.0 to 300.0K —</td>
</tr>
<tr>
<td></td>
<td>Cu53 -50.0 to 150.0°C -58.0 to 302.0°F</td>
</tr>
<tr>
<td></td>
<td>Cu100*1 -50.0 to 150.0°C -58.0 to 302.0°F</td>
</tr>
</tbody>
</table>

* Measuring current i = 1mA

1: Cu100: α = 0.00425 at 0°C

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Measurement / Recording Accuracy

<table>
<thead>
<tr>
<th>Input</th>
<th>Measuring Accuracy</th>
<th>Recording Accuracy</th>
</tr>
</thead>
<tbody>
<tr>
<td>PR40-20*1</td>
<td>Not guaranteed</td>
<td>±(0.9% of rdg+3.2˚C)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>±(0.9% of rdg+1.3˚C)</td>
</tr>
<tr>
<td>PLATINEL</td>
<td>±(0.25% of rdg+2.3˚C)</td>
<td>±(0.25% of rdg+0.7˚C)</td>
</tr>
<tr>
<td>NiMo</td>
<td>±(0.25% of rdg+2.3˚C)</td>
<td>±(0.25% of rdg+1.3˚C)</td>
</tr>
<tr>
<td>W/WRs26</td>
<td>0 to 400˚C, within ±15.0˚C</td>
<td>±(0.2% of rdg+2.0˚C)</td>
</tr>
<tr>
<td>Type N(AWG314)</td>
<td>±(0.2% of rdg+1.3˚C)</td>
<td>±(0.2% of rdg+2.0˚C)</td>
</tr>
<tr>
<td>Kp vs Au7Fe</td>
<td>0 to 20K, 20 to 300K</td>
<td>±4.5K</td>
</tr>
<tr>
<td>Pt25</td>
<td>±(0.15% of rdg+0.6˚C)</td>
<td>±(0.15% of rdg+0.6˚C)</td>
</tr>
<tr>
<td>Pt50</td>
<td>±(0.3% of rdg+0.6˚C)</td>
<td>±(0.3% of rdg+0.6˚C)</td>
</tr>
<tr>
<td>Ni100(SAMA)</td>
<td>±(0.15% of rdg+0.4˚C)</td>
<td>±(0.15% of rdg+0.4˚C)</td>
</tr>
<tr>
<td>Ni100(DIN)</td>
<td>±(0.15% of rdg+0.4˚C)</td>
<td>±(0.15% of rdg+0.4˚C)</td>
</tr>
<tr>
<td>Ni120</td>
<td>±(0.15% of rdg+0.4˚C)</td>
<td>±(0.15% of rdg+0.4˚C)</td>
</tr>
<tr>
<td>J263*</td>
<td>0 to 40K, 40 to 300K</td>
<td>±3.0K</td>
</tr>
<tr>
<td>Cu53</td>
<td>±(0.15% of rdg+0.8˚C)</td>
<td>±(0.15% of rdg+0.8˚C)</td>
</tr>
<tr>
<td>Cu100</td>
<td>±(0.2% of rdg+1.0˚C)</td>
<td>±(0.2% of rdg+1.0˚C)</td>
</tr>
</tbody>
</table>

*1: PR40-20 : No reference junction compensation ( 0˚C fix)  
*2: Up to 5 messages can be set  
*3: / M1 option is necessary

APPLICATION SOFTWARE

With Ethernet (/C7), RS-422A/485 (/C3), or Interface unit, μR20000 setting can be configured.

- **Configuration Software**
  - System requirements:
    - OS: Windows 2000/XP
    - Processor: Pentium III/600 MHz or superior (Pentium III/800 MHz or any other superior processor is recommended.)
    - Memory: 256 MB min. (512 MB or larger memory is recommended)
    - Disk device: CD-ROM drive compatible with Windows 2000/XP
    - Hard disk capacity: Free space of at least 10 MB (100 MB or larger free space is recommended)
  - Display unit:
    - A model provided with a display module compatible with Windows 2000/XP and capable of handling at least 32000 colors (a display module capable of handling at least 64000 colors is recommended)

- **Main functions (as a package):**
  - Configuration software:
    - Configuration via communication: Configures the station, excluding the communication setting, or sets it in set mode.
  - Note: This software applies for μR20000 from R2.01 version.

- **Interface unit (attached with configuration software)**
  - Method of power supply: Power supply from μR20000
  - Connector type: D-Sub 9-pin plug (male)
  - Electrical and mechanical specifications:
    - Conforms to EIA-574 (9-pin EIA-232 (RS232))
  - RS422A/485 communication interface (/C3) and interface unit cannot work together.
## Model Codes

<table>
<thead>
<tr>
<th>Model code</th>
<th>Suffix code</th>
<th>Option code</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>437101</td>
<td></td>
<td>/A1</td>
<td>Alarm output relay (2 contacts)</td>
</tr>
<tr>
<td>437102</td>
<td></td>
<td>/A2</td>
<td>Alarm output relay (4 contacts)</td>
</tr>
<tr>
<td>437103</td>
<td></td>
<td>/A3</td>
<td>Alarm output relay (6 contacts)</td>
</tr>
<tr>
<td>437104</td>
<td></td>
<td>/A4</td>
<td>Alarm output relay (12 contacts)</td>
</tr>
<tr>
<td>437106</td>
<td></td>
<td>/A5</td>
<td>Alarm output relay (24 contacts)</td>
</tr>
<tr>
<td>437112</td>
<td></td>
<td>/C3</td>
<td>RS-422A/485 Interface</td>
</tr>
<tr>
<td>437118</td>
<td></td>
<td>/C7</td>
<td>Ethernet communication interface</td>
</tr>
<tr>
<td>437124</td>
<td>-2</td>
<td></td>
<td>English, degF &amp; DST</td>
</tr>
</tbody>
</table>

### Option

<table>
<thead>
<tr>
<th>Option</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>/A1</td>
<td>Alarm output relay (2 contacts)</td>
</tr>
<tr>
<td>/A2</td>
<td>Alarm output relay (4 contacts)</td>
</tr>
<tr>
<td>/A3</td>
<td>Alarm output relay (6 contacts)</td>
</tr>
<tr>
<td>/A4</td>
<td>Alarm output relay (12 contacts)</td>
</tr>
<tr>
<td>/A5</td>
<td>Alarm output relay (24 contacts)</td>
</tr>
<tr>
<td>/C3</td>
<td>RS-422A/485 Interface</td>
</tr>
<tr>
<td>/C7</td>
<td>Ethernet communication interface</td>
</tr>
<tr>
<td>/F1</td>
<td>FAIL / Chart end detection and output</td>
</tr>
<tr>
<td>/H2</td>
<td>Clamped input terminal</td>
</tr>
<tr>
<td>/H3</td>
<td>Non-glare door glass</td>
</tr>
<tr>
<td>/M1</td>
<td>Mathematical Computations</td>
</tr>
<tr>
<td>/N1</td>
<td>Cu10, Cu25 RTD input</td>
</tr>
<tr>
<td>/N2</td>
<td>3 leg RTD (dot printing model only)</td>
</tr>
<tr>
<td>/N3</td>
<td>Expansion inputs</td>
</tr>
<tr>
<td>/R1</td>
<td>Remote controls (5 contacts)</td>
</tr>
</tbody>
</table>

*1: only one of /A1, /A2, /A3, /A4, /A5 can be selected
*2: /A4 and /F1 can not be specified together for pen model
*3: /A5 and /F1 can not be specified together
*4: /A5 can be specified only for dot model
*5: /C3 and /C7 can not be specified together
*6: /H2 and /N2 can not be specified together
*7: /N2 can be specified only for dot model
*8: 14 types inputs: Pt50 RTD, PR40-20, PLTINEL TC etc.

* Configuration software can be used for both µR10000 / µR20000. This software applies for µR20000 from R2.01 version.

## STANDARD ACCESSORIES

<table>
<thead>
<tr>
<th>Name</th>
<th>1 pen</th>
<th>2 pen</th>
<th>3 pen</th>
<th>4 pen</th>
<th>6, 12, 18, 24 dot</th>
</tr>
</thead>
<tbody>
<tr>
<td>Z-fold chart</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>6 color ribbon cassette</td>
<td>–</td>
<td>–</td>
<td>–</td>
<td>–</td>
<td>1</td>
</tr>
<tr>
<td>Disposable felt-pen cartridge</td>
<td>Red</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>–</td>
</tr>
<tr>
<td></td>
<td>Green</td>
<td>–</td>
<td>1</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td>Blue</td>
<td>–</td>
<td>–</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td>Violet</td>
<td>–</td>
<td>–</td>
<td>–</td>
<td>1</td>
</tr>
<tr>
<td>Plotter pen</td>
<td>Purple</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>–</td>
</tr>
<tr>
<td>Mounting brackets</td>
<td>2</td>
<td>2</td>
<td>2</td>
<td>2</td>
<td>2</td>
</tr>
<tr>
<td>Instruction Manual (CD-ROM)</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>Operation Manual</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
</tr>
</tbody>
</table>
### SPARES/OPTIONAL ACCESSORIES

<table>
<thead>
<tr>
<th>Name</th>
<th>Model Code (Parts No.)</th>
<th>Specification</th>
</tr>
</thead>
<tbody>
<tr>
<td>Z-fold chart</td>
<td>B9573AN</td>
<td>10 (sales unit)</td>
</tr>
<tr>
<td>6 color ribbon cassette</td>
<td>B9906JA</td>
<td>1 (sales unit)</td>
</tr>
<tr>
<td>Disposable felt-pen cartridge</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Red</td>
<td>B9902AM</td>
<td>1 (sales unit, 3 pieces/unit)</td>
</tr>
<tr>
<td>Green</td>
<td>B9902AN</td>
<td>1 (sales unit, 3 pieces/unit)</td>
</tr>
<tr>
<td>Blue</td>
<td>B9902AP</td>
<td>1 (sales unit, 3 pieces/unit)</td>
</tr>
<tr>
<td>Violet</td>
<td>B9902AQ</td>
<td>1 (sales unit, 3 pieces/unit)</td>
</tr>
<tr>
<td>Plotter pen</td>
<td>B9902AR</td>
<td>1 (sales unit, 3 pieces/unit)</td>
</tr>
<tr>
<td>Mounting brackets</td>
<td>B9900BX</td>
<td>2 (sales unit)</td>
</tr>
<tr>
<td>Shunt resistor (for screw input terminal)</td>
<td>4159 20</td>
<td>250Ω ± 0.1%</td>
</tr>
<tr>
<td></td>
<td>4159 21</td>
<td>100Ω ± 0.1%</td>
</tr>
<tr>
<td></td>
<td>4159 22</td>
<td>10Ω ± 0.1%</td>
</tr>
<tr>
<td>Shunt resistor (for clamped input terminal)</td>
<td>4389 20</td>
<td>250Ω ± 0.1%</td>
</tr>
<tr>
<td></td>
<td>4389 21</td>
<td>100Ω ± 0.1%</td>
</tr>
<tr>
<td></td>
<td>4389 22</td>
<td>10Ω ± 0.1%</td>
</tr>
</tbody>
</table>
REAR TERMINAL ARRANGEMENTS

Input Terminals

- 4 Pen Screw Type
- 6 Dot Screw Type
- 4 Pen Clamped Type (H2)
- 6 Dot Clamped Type (H2)

Weight:
- Model 4371 01: Approx. 7.5kg
- Model 4371 02: Approx. 7.5kg
- Model 4371 03: Approx. 7.6kg
- Model 4371 04: Approx. 7.6kg
- Model 4371 06: Approx. 8.4kg
- Model 4371 12: Approx. 8.6kg
- Model 4371 18: Approx. 8.8kg
- Model 4371 24: Approx. 9.0kg

Note: The arrows show the direction in which the wires will be running when connected to the terminal.
Option Terminals

/A2 /C3 /F1 /R1 Combination

NO C NC
NO C NC
NO C NC
NO C NC

1 2 3 4

Alarm Output Relay
Chart End Output
FAIL Output
Remote Control
Communication (RS-422A)

/A4 /C3 /R1 Combination

NO C NC
NO C NC
NO C NC
NO C NC

1 2 3 4

Alarm Output Relay
Chart End Output
FAIL Output
Remote Control
Communication (RS-422A)

/A4

NO C NC
NO C NC
NO C NC
NO C NC

1 2 3 4

Alarm Output Relay
Remote Control
Communication (RS-422A)

/A5

NO C NC
NO C NC
NO C NC
NO C NC

1 2 3 4

Alarm Output Relay
Remote Control
Communication (RS-422A)
Note) The μR20000 should be mounted by only two brackets, either on the top & bottom of the recorder, or on the left & right side of the recorder. If not specified, the tolerance is ±3%. However, in cases of less than 10mm, the tolerance is ±0.3mm.