AH3000 SERIES 180MM CHART
MULTI-POINT TYPE HYBRID RECORDER

MODEL AH3 7 □ □ - □ □ □

AH3000 series conforming to CE, UL and CSA are 180mm multi-point type hybrid recorders for 6-point, 12-point and 24-point with a simultaneous display of multi-channel data, universal input, alarm display/printing and other unique features. Software packages of "KIDS" for data processing of measured values and "PASS" for programming parameters are available.

■ FEATURES

• Simultaneous digital displays of multipoint data
  Simultaneous digital display of 6 or 12 points allows measured data to be viewed at a glance.

• Universal input
  The recorders accept total 56 ranges of 10 DC voltage ranges, 35 thermocouple ranges and 11 resistance thermometer ranges, and these ranges can be programmed for each channel.

• Data acquisition software package "KIDS"
  The data acquisition software package "KIDS" is available for data processing by a personal computer.

• Engineering software package "PASS"
  Parameters (including inputs and printings) and message printings can be executed through a personal computer by the engineering software package "PASS".

• Communications interface (option)
  RS-232C, RS-422A or RS-485 with MODBUS protocol for easy configuration with your personal computer.

• Clear trend and digital printings
  Cassette type wire-dotting system 6-color ink ribbon for clear trend and digital printings

• Universal power voltage
  100VAC to 240VAC, 50/60Hz

• Chart illumination
  Convenient to confirm printed data in night or dark places

• CE, UL and CSA
  The recorder conforms to the rules of safety standards of CE, UL and CSA (C-UL). The front panel is the structure with water-proof and dust-proof (IP54).

■ DIMENSIONS

* 236mm for adding alarm output of MOS relay or Form C mechanical relay, and communications interface
* 247mm for adding Form A mechanical relay

Panel cutout and minimum clearance for installation

Unit: mm
MODELS

AH3 7 □ □ - □ □ □

Input point
6: 6 points/5 seconds, 2: 12 points/10 seconds, 4: 24 points/20 seconds
Option (Note 1):
A: 6 points/1 second, B: 12 points/2 seconds, D: 24 points/4 seconds
0: Multi-point sequential display
5: Multi-point simultaneous display
(6-/12-point input: Simultaneous display of all points, 24-point input: Alternative display of 2 groups for 12-point simultaneous display)

Display

Communications interface (option)
N: None
A: RS-422A
R: RS-232C
S: RS-485

Alarm output/remote contacts (option)
0: None, 1: 6 (MOS relay) alarm outputs + remote contacts
2: 6 (Form C mechanical relay) outputs + remote contact (Note 2)
3: 12 (MOS relay) alarm outputs + remote contacts
4: 12 (Form C mechanical relay) outputs + remote contact (Note 2)
5: 24 (MOS relay) alarm outputs + remote contacts
6: 24 (Form C mechanical relay) outputs + remote contact (Note 2)
A: 6 (Form A mechanical relay) outputs + remote contacts
B: 12 (Form A mechanical relay) outputs + remote contacts
D: 24 (Form A mechanical relay) outputs + remote contacts

Others (option)
0: None
1: Printing format + high-speed trace printing

Note 1: The options of A, B and D: Multi-point simultaneous digital display only
Note 2: Not conforming to CE, UL and CSA

INPUT SPECIFICATIONS

Number of measuring points: 6 points, 12 points, 24 points

Input signals:
Universal input
DC voltage, thermocouple, resistance thermometer
DC current (by adding shunt resistors)

Range setup:
Programming of input types and ranges by keys

Scale setup:
Programming of maximum values, minimum values and engineering units by keys

Accuracy rating: Refer to the table of inputs.

Temperature drift:
±0.01% of full scale/ºC
[Input signals except resistance thermometer inputs:
Converted into reference ranges (reference: the table of inputs)]

Measuring cycle:
About 5 seconds/6 points, about 10 second/12 points, About 20 seconds/24 points

Reference junction compensation accuracy:
K, E, J, T, N, Platinel II ......... ±0.5ºC or less
R, S, NiMo-Ni, CR-AuFe, W-FeRe26, WRe5-FeRe26
U, L ...................................... ±1.0ºC or less
(The above errors are added to the accuracy ratings for internal reference junction compensation.)

Burnout:
For thermocouple inputs and resistance thermometer inputs
Up-scale burnout, down-scale burnout or burnout disable is selectable for each input.

Input resolution:
About 1/56000 (converted into reference ranges)

Allowable signal source resistance:
Thermocouple inputs, DC voltage inputs ... 1kΩ (burnout disabled) or lower
Resistance thermometer inputs ... 10Ω or lower (per wire)
(same resistance for 3 wires)

Input resistance:
Thermocouple inputs, DC voltage inputs ... about 8MΩ
DC voltage ±5 V or higher ... about 1MΩ

Maximum input voltage:
Thermocouple inputs, DC voltage inputs (for ±2VDC or lower range) ...
±10VDC or lower
DC voltage inputs (for ±5VDC or higher range) ...
±60VDC or lower
Resistance thermometer inputs ...
±6VDC or lower

Input correction:
Zero/span correction and shift correction for each channel

Maximum common mode voltage: 30VAC
Common mode rejection ratio:
130dB or more (50/60Hz)
Series mode rejection ratio:
50dB or more (50/60Hz)
Terminal board:
Detachable type, removable for wirings
**PRINTING SPECIFICATIONS**

- **Printing interval:** About 5 seconds/point
- **Printing deadband:** 0.1%
- **Printing system:** Wire-dot type 6-color ribbon
- **Printing color:**
  - **Trace printing**
    - Channel No.: 1, 7, 13, 19, 2, 8, 14, 20, 3, 9, 15, 21, 4, 10, 16, 22, 5, 11, 17, 23, 6, 12, 18, 24
  - Colors: Red, Black, Blue, Green, Brown, Purple
- **Digital printing**
  - Periodic data printing, digital data printing:
    - Repetition of red, black, blue, green, brown and purple
  - Channel number printing:
    - Same color as trace printing
  - Periodic printing:
    - Range (scale), tag, engineering unit ... Same color as trace printing
    - Month/day or year/month/day, time, time line, chart speed ... black
  - List printing:
    - Programmed parameters ... Same color as trace printing
    - Others ... black
    - Programming change mark: Black
  - Chart: Fan-fold type, total width 200mm, total length 20m
  - Effective chart width: 180mm
  - Chart speed: 1 to 1500 mm/hr (Default ... 25mm/hr)
  - Periodic data printing:
    - Digital printing of time, channel numbers and measured values on trace printing
    - Interval time (hour, minute) ... optional programming (limited by chart speeds)
  - Digital data printing:
    - Digital printing of time and measured values by interrupting trace printing on demand.
  - Alarm printing:
    - Alarm activated ... Time, channel number, alarm type and level (alarm setpoint No.) in right side of a chart
    - Alarm reset... Time, channel number and level (alarm setpoint No.) in right side of a chart
  - Memory capacity ... Maximum 48 data
  - Programming change mark:
    - Marking a black in right side of chart when a parameter is changed
  - Subtract printing:
    - Printing of difference between two channels or between a channel and a referenced value (programmed value)

**DISPLAY SPECIFICATIONS**

- **Display items:**
  - Multi-point simultaneous display (LCD):
    - Simultaneous display of 6-12–channel measured values, or time (year/month/day/hour/minute), alarm-activated channel, and chart speed
  - Multi-point sequential display (fluorescent vacuum display tube):
    - Channel number, measured value (multi-point sequential display or 1-point continuous display), time, and chart speed
- **Status display:**
  - Multi-point simultaneous display:
    - Printing status, key lock, and alarm activation
  - Multi-point sequential display:
    - Printing status, key lock, digital print condition, alarm-activation condition, and programming error information

**ALARM SPECIFICATIONS**

- **Alarm display:**
  - Multi-point simultaneous display:
    - "ALARM" illumination and flushing of measured values on alarm activated channels
  - Multi-point sequential display:
    - "ALARM" illumination and flushing of alarm activated channel number display.
- **Alarm types:**
  - Absolute value alarm, differential alarm, rate-of-change alarm
- **Alarm programming:**
  - Individual programming for each channel
  - Maximum 4 levels/channel
- **Alarm deadband:**
  - 0.1 to 9.9% of scale programming range (Default: 0.1%)
- **Alarm output:**
  - Option (Refer to the list of options.)
PROGRAMMING/OPERATION

Programming parameters:
Time, chart speed, periodic data printing, ranges, scales, engineering units, tags, alarms, burnout, subtract printing, ºC/ ºF, passcode (key lock)
(Options: Communications, printing format)

Printing operation:
RECORD ON/OFF  ..  Printing on/off
FEED ..............  Fast-feeding of chart
LIST ..............  List printing
DATA PRINT ........  Digital data printing

Data display selection: (Key selection):
Multi-point simultaneous display:
Simultaneous display of 6-/12-channel measured values
Multi-point sequential display:
Multi-point sequential or 1-point continuous display

GENERAL SPECIFICATIONS

Rated power voltage:
100 to 240VAC, 50/60Hz
Maximum power consumption: 45VA

Environmental conditions:
• Reference operating condition ...
  Ambient temperature/humidity range: 21 to 25°C, 45 to 65%RH
  Power voltage: 100VAC ± 1%
  Power frequency: 50/60Hz ± 0.5%
  Attitude: Left/right 0°, Forward tilting 0°, Backward tilting 0°
  Warm-up time: 30 minutes or longer
• Normal operating condition ...
  Ambient temperature/humidity range: 0 to 40°C, 20 to 80%RH
  Power voltage: 90 to 264VAC
  Power frequency: 50/60Hz ± 2%
  Attitude: Left/right 0 to 10°, Forward tilting 0°, Backward tilting 0 to 30°
• Transportation condition (at the packed condition on shipment from our factory) ...
  Ambient temperature/humidity range: -20 to 60°C, 5 to 90%RH
  (No dew condensation)
  Vibration: 10 to 60Hz, 4.9m/s² or less
  Impact: 392m/s² or less
• Storage condition ...
  Ambient temperature/humidity range: -20 to 60°C, 5 to 90%RH
  (No dew condensation)

Insulation resistance:
Between secondary terminals and protective conductor terminal ... 20MΩ or more at 500VDC
Between primary terminals and protective conductor terminal ............... 20MΩ or more at 500VDC

Dielectric strength:
Between secondary terminals and protective conductor terminal 1 minute at 500VAC
Between primary terminals and protective conductor terminal 1 minute at 1500VAC
Between primary terminals and secondary terminals 1 minute at 2300VAC
Between alarm terminals (Form C mechanical relay) and other secondary terminals 1 minute at 1000VAC
Note: Primary terminals: Power (L, N), Alarm (MOS relay, Form A mechanical relay)
Secondary terminals: Input, Alarm (Form C mechanical relay), Remote contacts, Communications

Power failure protection:
Programmed parameters stored into EEPROM memory
Clock circuit sustained for 10 years or longer by a lithium battery (at the operation of 8 hours or longer per day)

Case assembly material:
Door  ...  ABS resin (frame) with glass
Enclosure  ...  Steel
Color: Door (frame)  ...  Black (frame - equivalent to Munsell N3.0)
Enclosure .....  Gray (equivalent to Munsell N7.0)

Mounting: Panel mounting
Weight: About 8.5kg (full options)

Clock accuracy:
±2 minutes or shorter per 30-day (under reference operating conditions, except errors by turning power supply on or off)

Terminal screws:
Power, Protective conductor terminals...  M4.0
Measuring, Alarm, Remote contact terminals,
Communications terminals .................  M3.5

STANDARDS

CE:  EN61326 + A1 Class A,
     EN61000-3-2 + A14
     EN61000-3-3, EN61010-1 + A2
UL:  UL3111-1
CSA (C-UL):  C22.2, No.1010
Front protection: Conforming to IEC529 IP54
MEASURING RANGES/ACCURACY RATING/DISPLAY RESOLUTION

The accuracy ratings are based on the measuring ranges (under the reference operating condition). For thermocouple inputs, the accuracy of reference junction compensation is not included with the accuracy ratings. The indication equivalent to maximum 200µV or 5ºC may vary under the test environment by EMC directives.

[Reference operating condition]  Ambient temperature/humidity range: 21 to 25ºC, 45 to 65%RH  
Power voltage: 100VAC ± 1%  
Power frequency: 50/60Hz ± 0.5%  
Attitude: Left/right 0º, Forward tilting 0º, Backward tilting 0º  
Warm up time: 30 minutes or longer

<table>
<thead>
<tr>
<th>Input kinds</th>
<th>Measuring ranges</th>
<th>Reference ranges</th>
<th>Accuracy ratings</th>
<th>Display resolution</th>
</tr>
</thead>
<tbody>
<tr>
<td>K, E, J, T, L</td>
<td>-200 to 0ºC</td>
<td>±0.2% ± 1 digit</td>
<td>0.1ºC</td>
<td></td>
</tr>
<tr>
<td>R, S</td>
<td>0 to 100ºC</td>
<td>±0.2% ± 1 digit</td>
<td>0.1ºC</td>
<td></td>
</tr>
<tr>
<td>B</td>
<td>0 to 400ºC</td>
<td>Not specified</td>
<td>±0.15% ± 1 digit</td>
<td></td>
</tr>
<tr>
<td>N, U</td>
<td>-200 to 0ºC</td>
<td>±0.3% ± 1 digit</td>
<td>0.1ºC</td>
<td></td>
</tr>
</tbody>
</table>

## Thermocouple

<table>
<thead>
<tr>
<th>Input kinds</th>
<th>Measuring ranges</th>
<th>Reference ranges</th>
<th>Accuracy ratings</th>
<th>Display resolution</th>
</tr>
</thead>
<tbody>
<tr>
<td>K, E, J, T, L</td>
<td>-200 to 300ºC</td>
<td>±13.8mV</td>
<td>0.1ºC</td>
<td></td>
</tr>
<tr>
<td>-200 to 600ºC</td>
<td>±27.6mV</td>
<td>0.1ºC</td>
<td></td>
<td></td>
</tr>
<tr>
<td>-200 to 1370ºC</td>
<td>±69.0mV</td>
<td>1ºC</td>
<td></td>
<td></td>
</tr>
<tr>
<td>E</td>
<td>-200 to 200ºC</td>
<td>±13.8mV</td>
<td>0.1ºC</td>
<td></td>
</tr>
<tr>
<td>-200 to 350ºC</td>
<td>±27.6mV</td>
<td>0.1ºC</td>
<td></td>
<td></td>
</tr>
<tr>
<td>-200 to 900ºC</td>
<td>±69.0mV</td>
<td>1ºC</td>
<td></td>
<td></td>
</tr>
<tr>
<td>J</td>
<td>-200 to 250ºC</td>
<td>±13.8mV</td>
<td>±0.1% ± 1 digit</td>
<td></td>
</tr>
<tr>
<td>-200 to 500ºC</td>
<td>±27.6mV</td>
<td>0.1ºC</td>
<td></td>
<td></td>
</tr>
<tr>
<td>-200 to 1200ºC</td>
<td>±69.0mV</td>
<td>1ºC</td>
<td></td>
<td></td>
</tr>
<tr>
<td>T</td>
<td>-200 to 250ºC</td>
<td>±13.8mV</td>
<td>±0.1% ± 1 digit</td>
<td></td>
</tr>
<tr>
<td>-200 to 400ºC</td>
<td>±27.6mV</td>
<td>0.1ºC</td>
<td></td>
<td></td>
</tr>
<tr>
<td>R</td>
<td>0 to 1200ºC</td>
<td>±13.8mV</td>
<td>0.1ºC</td>
<td></td>
</tr>
<tr>
<td>S</td>
<td>0 to 1300ºC</td>
<td>±13.8mV</td>
<td>0.1ºC</td>
<td></td>
</tr>
<tr>
<td>N</td>
<td>0 to 1820ºC</td>
<td>±13.8mV</td>
<td>±0.15% ± 1 digit</td>
<td></td>
</tr>
<tr>
<td>200 to 200mV</td>
<td>±200.0mV</td>
<td>100µV</td>
<td></td>
<td></td>
</tr>
<tr>
<td>-27.6 to 27.6mV</td>
<td>±0.1% ± 1 digit</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>-69.0 to 69.0mV</td>
<td>±0.1% ± 1 digit</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>-200 to 200mV</td>
<td>±0.1% ± 1 digit</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>-500 mV to 500mV</td>
<td>±10% ± 0.1% ± 1 digit</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>-2 to 2V</td>
<td>±5V</td>
<td>0.1ºC</td>
<td></td>
<td></td>
</tr>
<tr>
<td>-5 to 5V</td>
<td>±10V</td>
<td>0.1ºC</td>
<td></td>
<td></td>
</tr>
<tr>
<td>-10 to 10V</td>
<td>±20V</td>
<td>0.1ºC</td>
<td></td>
<td></td>
</tr>
<tr>
<td>-20 to 20V</td>
<td>±50V</td>
<td>0.1ºC</td>
<td></td>
<td></td>
</tr>
<tr>
<td>-50 to 50V</td>
<td>±100V</td>
<td>0.1ºC</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

## DC voltage

<table>
<thead>
<tr>
<th>Input kinds</th>
<th>Measuring ranges</th>
<th>Reference ranges</th>
<th>Accuracy ratings</th>
<th>Display resolution</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pr100(1)</td>
<td>-140 to 150ºC</td>
<td>100Ω</td>
<td>±0.15% ± 1 digit</td>
<td>0.1ºC</td>
</tr>
<tr>
<td>-200 to 300ºC</td>
<td>±0.1% ± 1 digit</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>-200 to 850ºC</td>
<td>±1% ± 1 digit</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>0 to 20 K</td>
<td>±0.5% ± 1 digit</td>
<td>0.1 K</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Pt100(2)</td>
<td>-140 to 150ºC</td>
<td>100Ω</td>
<td>±0.15% ± 1 digit</td>
<td>0.1ºC</td>
</tr>
<tr>
<td>-200 to 300ºC</td>
<td>±0.1% ± 1 digit</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>-200 to 649ºC</td>
<td>±1% ± 1 digit</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Pt50</td>
<td>-200 to 649ºC</td>
<td>100Ω</td>
<td>±0.15% ± 1 digit</td>
<td>0.1ºC</td>
</tr>
<tr>
<td>-200 to 300ºC</td>
<td>±0.1% ± 1 digit</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>-200 to 649ºC</td>
<td>±1% ± 1 digit</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Pt-Co</td>
<td>4 to 374K</td>
<td>100Ω</td>
<td>±0.15% ± 1 digit</td>
<td>0.1 K</td>
</tr>
</tbody>
</table>

**Note:** The accuracy ratings of thermocouple input are the converted accuracy into reference ranges.
<table>
<thead>
<tr>
<th>Options</th>
<th>Explanations</th>
</tr>
</thead>
<tbody>
<tr>
<td>Measuring interval</td>
<td>About 1 second/6 points, about 2 seconds/12 points, about 4 seconds/24 points, CE conformance for multi-point simultaneous display only, (UL approval pending). Common mode rejection ratio: 120db or more (50/60Hz), Series mode rejection ratio: 50db or more (50/60Hz) Condition: Peak value of noise including signal is limited to 1.5 times or more of reference range. The indication equivalent to maximum 2mV or 25ºC may vary under the test environment by EMC directives.</td>
</tr>
<tr>
<td>Remote contacts</td>
<td>By 4-point contact input (2-point common) signal, the following operations are selectable. Chart speed 3-speed/record off, digital data print, list print</td>
</tr>
<tr>
<td>Alarm output</td>
<td>Alarm output: 6 points independent output, OR output enabled Maximum contact rating: MOS relay output ……………… 240V (AC, DC), 50mA (AC, DC), resistive load Mechanical relay output ……………… 100VAC 0.5A, 240VAC 0.2A, (common to Form A and Form C) 100VDC 0.3A, resistive load (Form C: not conforming to CE, UL and CSA.)</td>
</tr>
<tr>
<td>Printing format (Note)</td>
<td>Zone printing: Printing area is divided into maximum 4 zones. Compressed/ expanded printing: A part of printing area of each channel is printing compressed or expanded. Automatic range-shift printing: Printing range is automatically changed into a new printing area in the event of over-range or under-range</td>
</tr>
<tr>
<td>Communications interface</td>
<td>3 kinds of RS-232C, RS-422A, RS-485 (to be specified) Parameter programming, operation, data acquisition (MODBUS protocol)</td>
</tr>
<tr>
<td>High-speed trace printing</td>
<td>Printing interval about 2.5 seconds (standard: 5 seconds)</td>
</tr>
<tr>
<td>Shunt resistor for current</td>
<td>Measurement of current by adding a resistor of 250Ω (for 20mA) or 100Ω (for 50mA)</td>
</tr>
<tr>
<td>Basic mathematics</td>
<td>The following math-function can be executed in time order or between channels. Arithmetic, Square root, Logarithm, Natural Logarithm, Exponential, Maximum, Minimum, Average, Temperature/humidity</td>
</tr>
<tr>
<td>Totalizing</td>
<td>Totalizing of measured data and calculated results Interval: 00:01 to 24:00, or none</td>
</tr>
</tbody>
</table>

Note: One from 4 printing formats is to be specified.

■ Data acquisition software package "KIDS"
The "KIDS" is a software package for storing data being measured by AL3000 and AH3000 series recorders and for replaying of the stored data.

Main function and features:
- Data processing: Up to 5 sets (max. 100 channels)
- Real-time data, real-time trend, historical data, historical trend and daily report
- Communications interfaces: RS-232C, RS-422A or RS-485
- Stored data: Enable to export to Microsoft Excel, Lotus 1-2-3 and other application software.
- OS: Windows 95/98, Windows NT4.0

■ Engineering software package "PASS"
The "PASS" is a software package, through a communications interface (optional) or a configuration port, for programming parameters of AL3000 and AH3000 series recorders by a personal computer.

Main functions and features
- Input parameters:
  - Ranges, scales, tags, engineering units, alarms, burnout
- Printing parameters:
  - Chart speed, data interval, subtract printing, zone printing, compressed/expanded printing, automatic range-shift printing
- Operation: Message printing
- Others:
  - Clock setting, temperature units (ºC, ºF), alarm deadband, communications specification (for programming through a configuration port only)
- OS: Windows95/98, WindowsNT4.0

Specifications subject to change without notice. Printed in Japan (I) 2002.1