

AL3000 SERIES 100MM CHART MULTI-POINT TYPE HYBRID RECORDER



MODEL AL3 7 □ 5 - □ □ □

AL3000 series conforming to CE, UL and CSA are 100mm multi-point type hybrid recorders with a simultaneous display of multi-channel data, bargraph display, 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 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**

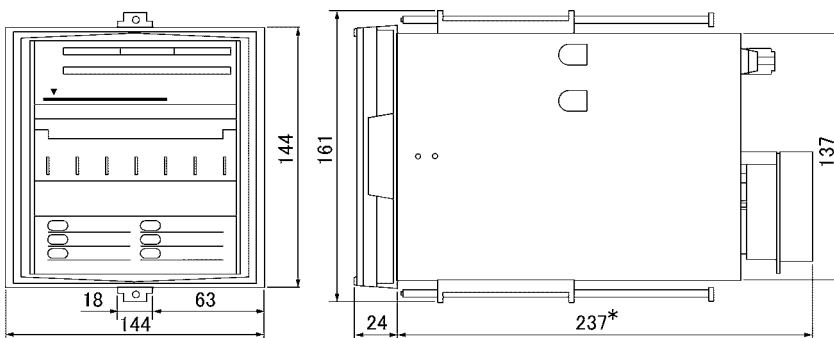
Convenient to confirm printed data in night or dark places

- **CE, UL and CSA**

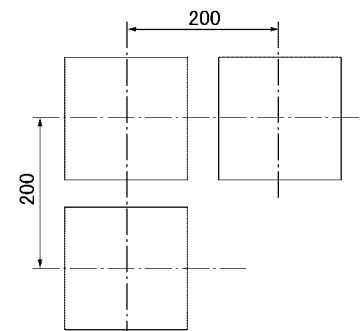
The recorder conforms to the rules of safety standards of CE, UL and CSA (C-UL).

The front panel is the structure with water-proof and dust-proof (IP54).

■ DIMENSIONS



Panel cutout and minimum clearance for installation



* 243mm for adding Form A mechanical relay

Unit: mm

■ MODELS

AL3 7 □ 5 - □ □ □

Input point

- 6: 6 points/5 seconds
- A: 6 points/1 second (option)

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 1)
- A: 6 (Form A mechanical relay) outputs + remote contacts

Others (option)

- 0: None
- 1: Printing format + high-speed trace printing

Note 1: Not conforming to CE, UL and CSA

■ INPUT SPECIFICATIONS

Number of measuring points: 6 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:

$\pm 0.01\%$ of full scale/ $^{\circ}\text{C}$

[Input signals except resistance thermometer inputs: Converted into reference ranges (reference: the table of inputs)]

Measuring cycle:

About 5 seconds/6 points

Reference junction compensation accuracy:

- K, E, J, T, N, Platinel II $\pm 0.5^{\circ}\text{C}$ or less
 - R, S, NiMo-Ni, CR-AuFe, W-WRe26, WRe5-WRe26
 - U, L $\pm 1.0^{\circ}\text{C}$ or less
- (The above errors are added to the accuracy ratings for internal reference junction compensation.)

Input resolution:

About 1/56000 (converted into reference ranges)

Burnout:

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

Allowable signal source resistance:

- Thermocouple inputs, DC voltage inputs ... $1\text{k}\Omega$ (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 $8\text{M}\Omega$
- DC voltage $\pm 5\text{V}$ or higher ... about $1\text{M}\Omega$

Maximum input voltage:

- Thermocouple inputs, DC voltage inputs (for $\pm 2\text{VDC}$ or lower range) ... $\pm 10\text{VDC}$ or lower
- DC voltage inputs (for $\pm 5\text{VDC}$ or higher range) ... $\pm 60\text{VDC}$ or lower
- Resistance thermometer inputs ... $\pm 6\text{VDC}$ 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: 0.2%

Printing system: Wire-dot type 6-color ribbon

Printing color:

Trace printing

Channel No.	1	2	3	4	5	6
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

Alarm printing: Red

Chart: Fan-fold type, total width 114mm, total length 10m

Effective chart width: 100mm

Chart speed: 1 to 1500 mm/hr (Default ... 20mm/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)

List printing:

Printing of year/month/day, chart speed, parameters of each channel and others.

Fixed-time printing:

Printing of month/day, time, time line, ranges (scales), tags and engineering units every fixed-time (interlocking to chart speed)

Skip function:

No display or printing of channels of which ranges are not programmed.

■ DISPLAY SPECIFICATIONS

Display items:

LCD display

"Simultaneous display of 6-channel measured values", or "time (year/month/day/hour/minute), alarm activated channels and chart speed"

Status display:

Printing status, key lock and alarm activation

■ ALARM SPECIFICATIONS

Alarm judgment cycle: Same as measuring cycle

Alarm display:

Status display "ALARM" and flashing of measured value at an alarm activated channel

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, °C/ °F, 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):

- Measured values display and multi-point sequential bargraph display
- Measured values display and 1-point continuous bargraph display
- Time/other displays and 1-point continuous bargraph 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, 20 to 80%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

Between primary terminals and secondary terminals ...

20MΩ or more at 500VDC

Between alarm terminals (Form C mechanical relay) and other secondary terminals ...

20MΩ or more at 500VDC

Note: Primary terminals:

Power (L, N), Alarm (MOS relay, Form A mechanical relay)

Secondary terminals:

Input, Alarm (Form C mechanical relay), Remote contacts, Communications

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 3.0kg (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 terminals M4.0

Protective conductor terminals.. M4.0

Measuring input terminals M3.5

Alarm terminals M3.5

Remote contact terminals M3.5

Communications terminals M3.5

Chart illumination: CFL (Cold cathode fluorescent lamp)

■ 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 200 μ V or 5 $^{\circ}$ C may vary under the test environment by EMC directives.

[Reference operating condition] Ambient temperature/humidity range: 21 to 25 $^{\circ}$ C, 45 to 65%RH
 Power voltage: 100VAC \pm 1%
 Power frequency: 50/60Hz \pm 0.5%
 Attitude: Left/right 0 $^{\circ}$, Forward tilting 0 $^{\circ}$, Backward tilting 0 $^{\circ}$
 Warm up time: 30 minutes or longer

Input kinds	Measuring ranges	Reference ranges	Accuracy ratings	Display resolution	
Thermocouple	K	-200 to 300 $^{\circ}$ C	\pm 13.8mV	0.1 $^{\circ}$ C	
		-200 to 600 $^{\circ}$ C	\pm 27.6mV	0.1 $^{\circ}$ C	
		-200 to 1370 $^{\circ}$ C	\pm 69.0mV	1 $^{\circ}$ C	
	E	-200 to 200 $^{\circ}$ C	\pm 13.8mV	\pm 0.1% \pm 1 digit	0.1 $^{\circ}$ C
		-200 to 350 $^{\circ}$ C	\pm 27.6mV		0.1 $^{\circ}$ C
		-200 to 900 $^{\circ}$ C	\pm 69.0mV		1 $^{\circ}$ C
	J	-200 to 250 $^{\circ}$ C	\pm 13.8mV		0.1 $^{\circ}$ C
		-200 to 500 $^{\circ}$ C	\pm 27.6mV		0.1 $^{\circ}$ C
		-200 to 1200 $^{\circ}$ C	\pm 69.0mV		1 $^{\circ}$ C
	T	-200 to 250 $^{\circ}$ C	\pm 13.8mV		0.1 $^{\circ}$ C
		-200 to 400 $^{\circ}$ C	\pm 27.6mV		0.1 $^{\circ}$ C
	R	0 to 1200 $^{\circ}$ C	\pm 13.8mV		1 $^{\circ}$ C
		0 to 1760 $^{\circ}$ C	\pm 27.6mV		1 $^{\circ}$ C
	S	0 to 1300 $^{\circ}$ C	\pm 13.8mV		1 $^{\circ}$ C
		0 to 1760 $^{\circ}$ C	\pm 27.6mV		1 $^{\circ}$ C
	B	0 to 1820 $^{\circ}$ C	\pm 13.8mV		1 $^{\circ}$ C
	N	-200 to 400 $^{\circ}$ C	\pm 13.8mV	\pm 0.15% \pm 1 digit	0.1 $^{\circ}$ C
		-200 to 750 $^{\circ}$ C	\pm 27.6mV		0.1 $^{\circ}$ C
		-200 to 1300 $^{\circ}$ C	\pm 69.0mV		1 $^{\circ}$ C
W-WRe26	0 to 2315 $^{\circ}$ C	\pm 69.0mV		1 $^{\circ}$ C	
WRe5-WRe26	0 to 2315 $^{\circ}$ C	\pm 69.0mV		1 $^{\circ}$ C	
PtRh40-PtRh20	0 to 1880 $^{\circ}$ C	\pm 13.8mV	\pm 0.2% \pm 1 digit	1 $^{\circ}$ C	
NiMo-Ni	-50 to 290 $^{\circ}$ C	\pm 13.8mV		0.1 $^{\circ}$ C	
	-50 to 600 $^{\circ}$ C	\pm 27.6mV		0.1 $^{\circ}$ C	
	-50 to 1310 $^{\circ}$ C	\pm 69.0mV		1 $^{\circ}$ C	
CR-AuFe	0 to 280 K	\pm 13.8mV		0.1 K	
Platinel II	0 to 350 $^{\circ}$ C	\pm 13.8mV		0.1 $^{\circ}$ C	
	0 to 650 $^{\circ}$ C	\pm 27.6mV		0.1 $^{\circ}$ C	
	0 to 1395 $^{\circ}$ C	\pm 69.0mV	\pm 0.15% \pm 1 digit	1 $^{\circ}$ C	
U	-200 to 250 $^{\circ}$ C	\pm 13.8mV		0.1 $^{\circ}$ C	
	-200 to 500 $^{\circ}$ C	\pm 27.6mV		0.1 $^{\circ}$ C	
	-200 to 600 $^{\circ}$ C	\pm 69.0mV		0.1 $^{\circ}$ C	
L	-200 to 250 $^{\circ}$ C	\pm 13.8mV	\pm 0.1% \pm 1 digit	0.1 $^{\circ}$ C	
	-200 to 500 $^{\circ}$ C	\pm 27.6mV		0.1 $^{\circ}$ C	
	-200 to 900 $^{\circ}$ C	\pm 69.0mV		1 $^{\circ}$ C	

K, E, J, T, R, S, B, N: IEC584, JIS C1602-1995
 U (Cu-CuNi), L (Fe-CuNi): DIN43710
 W-WRe26, WRe5-WRe26, PtRh20-PtRh5, PtRh40-PtRh20, NiMo-Ni, CR-AuFe, Platinel II: ASTM Vol. 14.03

Input kinds	Measuring ranges	Reference ranges	Accuracy ratings	Display resolution	
DC voltage	-13.8 to 13.8mV	\pm 13.8mV	\pm 0.1% \pm 1 digit	10 μ V	
	-27.6 to 27.6mV	\pm 27.6mV		10 μ V	
	-69.0 to 69.0mV	\pm 69.0mV		10 μ V	
	-200 to 200mV	\pm 200.0mV		100 μ V	
	-500 to 500mV	\pm 500.0mV		100 μ V	
	-2 to 2V	\pm 2V		1mV	
	-5 to 5V	\pm 5V		1mV	
	-10 to 10V	\pm 10V		10mV	
	-20 to 20V	\pm 20V		10mV	
	-50 to 50V	\pm 50V		10mV	
Resistance thermometer	Pt100(1)	-140 to 150 $^{\circ}$ C	160 Ω	\pm 0.15% \pm 1 digit	0.1 $^{\circ}$ C
		-200 to 300 $^{\circ}$ C	220 Ω	\pm 0.1% \pm 1 digit	0.1 $^{\circ}$ C
		-200 to 850 $^{\circ}$ C	400 Ω	\pm 0.1% \pm 1 digit	0.1 $^{\circ}$ C
	Pt100(2)	-140 to 150 $^{\circ}$ C	160 Ω	\pm 0.15% \pm 1 digit	0.1 $^{\circ}$ C
		-200 to 300 $^{\circ}$ C	220 Ω	\pm 0.1% \pm 1 digit	0.1 $^{\circ}$ C
		-200 to 649 $^{\circ}$ C	400 Ω	\pm 0.1% \pm 1 digit	0.1 $^{\circ}$ C
	JPt100	-140 to 150 $^{\circ}$ C	160 Ω	\pm 0.15% \pm 1 digit	0.1 $^{\circ}$ C
		-200 to 300 $^{\circ}$ C	220 Ω	\pm 0.1% \pm 1 digit	0.1 $^{\circ}$ C
		-200 to 649 $^{\circ}$ C	400 Ω	\pm 0.1% \pm 1 digit	0.1 $^{\circ}$ C
	Pt50	-200 to 649 $^{\circ}$ C	220 Ω	\pm 0.1% \pm 1 digit	0.1 $^{\circ}$ C
Pt-Co	4 to 374K	220 Ω	\pm 0.15% \pm 1 digit	0.1 K	

Pt100 (1): IEC751 (1995), JIS C1604-1997
 Pt100 (2): IEC751 (1983), JIS C1604-1989, JIS C1606-1989
 JPt100: JIS C1604-1981, JIS C1606-1986

EXCEPTION OF ACCURACY RATINGS

Input kinds	Measuring range	Accuracy rating
K, E, J, T, L	-200 to 0 $^{\circ}$ C	\pm 0.2% \pm 1 digit
R, S	0 to 400 $^{\circ}$ C	\pm 0.2% \pm 1 digit
B	0 to 400 $^{\circ}$ C	Not specified
	400 to 800 $^{\circ}$ C	\pm 0.15% \pm 1 digit
N, U	-200 to 0 $^{\circ}$ C	\pm 0.3% \pm 1 digit
W-WRe26	0 to 100 $^{\circ}$ C	\pm 4% \pm 1 digit
	100 to 400 $^{\circ}$ C	\pm 0.5% \pm 1 digit
PtRh20-PtRh5	0 to 100 $^{\circ}$ C	\pm 4% \pm 1 digit
	100 to 400 $^{\circ}$ C	\pm 0.5% \pm 1 digit
PtRh40-PtRh20	0 to 300 $^{\circ}$ C	\pm 1.5% \pm 1 digit
	300 to 800 $^{\circ}$ C	\pm 0.8% \pm 1 digit
CR-AuFe	0 to 20 K	\pm 0.5% \pm 1 digit
	20 to 50 K	\pm 0.3% \pm 1 digit
Pt100 (1)	700 to 850 $^{\circ}$ C	\pm 0.15% \pm 1 digit
Pt-Co	4 to 50 K	\pm 0.3% \pm 1 digit

Note) The accuracy ratings of thermocouple input are converted accuracy into reference ranges.

■ OPTIONS

Options	Explanations
Measuring interval	About 1 second/6 points, CE conformance, (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 25°C may vary under the test environment by EMC directives.
Remote contacts	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
Alarm output	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.)
Printing format (Note)	Zone printing ... Printing area is divided into maximum 2 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
Communications interface	3 kinds of RS-232C, RS-422A, RS-485 (to be specified) Parameter programming, operation, data acquisition (MODBUS protocol)
High-speed trace printing	Printing interval about 2.5 seconds (standard: 5 seconds)
Shunt resistor for current	Measurement of current by adding a resistor of 250Ω (for 20mA) or 100Ω (for 50mA)
16m chart	Total length of 15.6m
Basic mathematics	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
Totalizing	Totalizing of measured data and calculated results Interval: 00:01 to 24:00, or none
Aluminum die-cast door	Case for horizontal high-density panel installation and aluminum die-cast door

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 (°C, °F), alarm deadband, communications specification (for programming through a configuration port only)
- OS: Windows95/98, WindowsNT4.0

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