

## AL3000 SERIES 100MM CHART PEN TYPE HYBRID RECORDER



MODEL AL3 7 □ P - □ □ □ - □ □ A

AL3000 series conforming to CE, UL and CSA are 100mm pen 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 display/bargraph display up to 4 channels

Simultaneous 5-digit digital displays and analog bargraphs for full scale of 4 channels allow 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.

#### ●Pen-lift function built-in

Pens are automatically lifted when the printing is OFF.

#### ●Pen offset correction function built-in

By correcting the mechanical position difference between each pen, the time gap on a chart paper is corrected.

#### ●Data acquisition software package "KIDS"

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

#### ●Engineering software package "PASS"

The engineering software package "PASS" is available for programming parameters by using an engineering port.

#### ●CE, UL and CSA

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

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

#### ●Communications interface

The communications interface of RS-232C, RS-422A or RS-485 with MODBUS protocol is available as an optional specification.

#### ●Alarm display/printing function built-in

Up to 4 kinds of alarm can be set in each input independently.. The digital display blinks for alarm activation, and the information of alarm activation/reset is printed on a chart paper.

#### ●Other features

The pen speed is 100mm/second.

The illumination is built-in for easy confirmation of printed data in night or dark places.

Universal power supply

Detachable terminal board for easy wirings

The transmitter power supply unit (separate purchase required) attached to the rear side of the recorder is prepared.

## MODELS

AL37 □ P - □ □ □ - □ □ A

### Input point

1: 1 point, 2: 2 points, 3: 3 points, 4: 4 points

### 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 (mechanical relay "c" contact) outputs + remote contact (\*see note)

A: 6 (mechanical relay "a" contact) outputs + remote contacts

### Others (option)

0: None, 1: Printing format

### Math function (Option)

0: None, 1: Basic, 2: Totalizing/flow correction, 3: Basic + Totalizing/flow correction

### Door/case (option)

0: Standard, 1: With handle and rubber stands (\*see note), 2: Die-case door,

3: With handle and rubber stands + Die-case door (\*see note)

Note : Not conforming to CE, UL and CSA

## INPUT SPECIFICATIONS

Number of measuring points: 1 to 4 points

Input signals:

Universal input

DC voltage, thermocouple, resistance thermometer

DC current (by adding shunt resistors)

Contacts input [remote contacts input (option – up to 4 points) for operation printing for inputs]

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/°C (converted into reference ranges)

Measuring cycle: About 100msec

Reference junction compensation accuracy:

K, E, J, T, N, Platinel II ..... ±0.5°C or less

R, S, NiMo-Ni, CR-AuFe, W-Wre26, WRe5-WRe26

U, L ..... ±1.0°C or less

(At the measurement higher than 0°C, the above errors are added to the accuracy ratings for an 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 disabled is selectable for each input.

Allowable signal source resistance:

Thermocouple inputs, DC voltage inputs ...

1kΩ (burnout disabled) or less

Resistance thermometer inputs ...

10Ω or less (per wire)

(same resistance for 3 wires)

Input resistance:

Thermocouple inputs, DC voltage inputs ... about 8MΩ

DC voltage more than ±5 V ... about 1MΩ

Maximum input voltage:

Thermocouple inputs, DC voltage inputs (for ±2VDC range or lower) ...

±10VDC or less

DC voltage inputs (for ±5VDC range or higher) ...

±60VDC or less

Resistance thermometer inputs ...

±6VDC or less

Input correction:

Zero/span correction and shift correction for each channel

Input first-order lag filter:

Time constant of 0 and 1 to 10 seconds can be set in each channel.

Common mode rejection ratio:

140dB or more (50/60Hz)

Series mode rejection ratio:

50dB or more (50/60Hz)

Terminal board:

Detachable type, removable for wirings

## ■ PRINTING SPECIFICATIONS

Printing deadband: 0.2% (of printing span)

Printing system:

Analog tracing ... Disposal cartridge pen

Digital printing ... Plotter pen

Step response: 1 second or shorter (90% response)

Printing color:

Analog tracing ... 1<sup>st</sup> pen red, 2<sup>nd</sup> pen green,  
3<sup>rd</sup> pen blue, 4<sup>th</sup> pen brown

Digital printing ... purple (Printing are limited by chart speed.)

Periodic printing, Digital data printing (analog tracing continuance/ interruption), Date and time printing (at power on, every hour), Chart speed printing, Scale, unit and tag printing, Alarm activation/reset printing, Programming change mark, POC (pen offset correction) mark, List printing

Printing ON/OFF function:

ON or OFF programming can be set in the following printings.

Date and time, Scale, unit and tag, Chart speed, Alarm activation/reset, POC mark

Chart: Fan-fold type, effective width 100mm, total width 114mm, total length 10m

Chart speed:

1 to 600 mm/hr, 1 to 200mm/min (Default: 20mm/hr)

Chart speed accuracy:

±0.1% or less (to the reference of time line of chart-feeding longer than 1000mm)

Skip function:

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

Printing correction:

Zero and span correction of analog tracing

Phase synchronizing correction:

Time axis pen offset correction (POC)

Subtract printing:

Printing of difference between two channels or between a channel and a referenced value (programmed value)

Message printing:

Letters pre-programmed are printed by a key or a remote contacts (option).

5 kinds of message (time + message of maximum 15 letters)

Pen-lift function:

By RECORD OFF key, all pens are lifted up simultaneously.

At the power OFF, the pen status just before the power OFF is kept.

## ■ DISPLAY SPECIFICATIONS

Analog indication:

100mm bargraph per each input point (51 segments, Same color as analog tracing is indicated at each 5 segments.)

Digital display:

16 segments LCD 1 digit, character height 7.5mm, orange

7 segments LCD 20 digits, character height 6.5mm, white

-9999 to 99999 [optional decimal place, with cursor (by each analog tracing color)]

Display items:

Simultaneous display of 4-channel measured values, hour/minute, chart speed and alarm activated channel

Status display:

Printing status, key lock, alarm-activation, chart end, fail and pen offset correction

## ■ ALARM SPECIFICATIONS

Alarm display:

"ALARM" illumination, flashing of measured value at an alarm-activated channel and alarm type

Alarm types:

Absolute value alarm, differential alarm, rate-of- change alarm, absolute value/standby alarm and differential/standby alarm, each 2 levels

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, password (Options: Communications, printing format, message printing, math function)

Printing operation:

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

Pen replacement:

Pens are replaced by moving them in the pen replacement mode.

Engineering port:

By using the engineering software package (PASS), all parameters can be programmed by a personal computer.

## ■ GENERAL SPECIFICATIONS

Rated power voltage:

100 to 240VAC, 50/60Hz

Power consumption: Maximum 60VA

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: More than 30 minutes

• Normal operating condition ...

Ambient temperature/humidity range:

0 to 50°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/s<sup>2</sup> or less

Impact: Less than 392m/s<sup>2</sup> 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 ...

More than 20MΩ at 500VDC

Between primary terminals and protective conductor terminal ...

More than 20MΩ at 500VDC

Between primary terminals and secondary terminals ...

More than 20MΩ at 500VDC

Between alarm terminals (mechanical relay contact "c") and other secondary terminals ...

More than 20MΩ at 500VDC

Note: Primary terminals:

Power (L, N), Alarm (MOS relay, mechanical relay contact "a")

Secondary terminals:

Input, Alarm (mechanical relay contact "c"), 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 (mechanical relay contact "c") and other secondary terminals ... 1 minute at 1000VAC

Note: Primary terminals:

Power (L, N), Alarm (MOS relay, mechanical relay contact "a")

Secondary terminals:

Input, Alarm (mechanical relay contact "c"), Remote contacts, Communications

Power failure protection:

Programmed parameters stored into EEPROM memory

Clock circuit and POC data sustained for minimum 8 years by a lithium battery (at the operation more than 8 hours/day)

Case assembly material:

Door ... ABS resin (frame) with glass

Enclosure ... Steel

Color: Door ... Black (frame - equivalent to Munsell N3.0)

Enclosure ..... Gray (equivalent to Munsell N7.0)

Mounting: Panel mounting

Weight: About 4.0kg (full options)

Clock accuracy:

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

Power voltage fluctuation:

Indication fluctuation 0.1% or less (converted into reference ranges) at 90 to 264VAC

Display startup characteristics: Indication difference between 30 minutes and 4 hours after power on is 0.1% or less.

(converted into reference ranges except resistance thermometer input)

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: By CFL

## ■ STANDARDS

CE: EN61326 A1 Class A  
EN61010-1 A2

UL: UL3111-1 (approval pending)

CSA (C-UL): C22.2, No.1010 (approval pending)

Front protection: Conforming to IEC529 IP54

NEMA250 type 13 (approval pending)

## INPUT

Input signals	Measuring Ranges	Reference ranges	Accuracy ratings	Display resolutions	Input signals	Measuring Ranges	Reference ranges	Accuracy ratings	Display resolutions	
DC voltage	-13.8 to 13.8mV	±13.8mV	±0.1% ± 1 digit	10μV	Thermocouple	W-WRe26	0 to 2315°C	±69.0mV	±0.15% ± 1 digit	1°C
	-27.6 to 27.6mV	±27.6mV		10μV		WRe5-WRe26	0 to 2315°C	±69.0mV	±0.2% ± 1 digit	1°C
	-200 to 200mV	±200mV		100μV		PtRh40-PtRh20	0 to 1888°C	±13.8mV		1°C
	-500 to 500mV	±500mV		100μV		NiMo-Ni	-50 to 290°C	±13.8mV		0.1°C
	-2 to 2V	±2V		1mV			-50 to 600°C	±27.6mV	0.1°C	
	-5 to 5V	±5V		1mV			-50 to 1310°C	±69.0mV	1°C	
	-10 to 10V	±10V		10mV		CR-AuFe	0 to 280K	±13.8mV	0.1K	
	-20 to 20V	±20V		10mV		Platinel II	0 to 350°C	±13.8mV	±0.15% ± 1 digit	0.1°C
	-50 to 50V	±50V		10mV			0 to 650°C	±27.6mV		0.1°C
0 to 1390°C			±69.0mV		1°C					
Thermocouple	K	-200 to 300°C	±13.8mV	0.1°C	U	-200 to 250°C	±13.8mV	±0.15% ± 1 digit	0.1°C	
		-200 to 600°C	±27.6mV	0.1°C		-200 to 500°C	±27.6mV		0.1°C	
		-200 to 1370°C	±69.0mV	1°C		-200 to 600°C	±69.0mV		0.1°C	
	E	-200 to 200°C	±13.8mV	0.1°C		L	-200 to 250°C	±13.8mV	±0.1% ± 1 digit	0.1°C
		-200 to 350°C	±27.6mV	0.1°C			-200 to 500°C	±27.6mV		0.1°C
		-200 to 900°C	±69.0mV	1°C			-200 to 900°C	±69.0mV		1°C
	J	-200 to 250°C	±13.8mV	0.1°C	Pt100 (1)	-140 to 150°C	160Ω	±0.15% ± 1 digit	0.1°C	
		-200 to 500°C	±27.6mV	0.1°C		-200 to 300°C	220Ω		±0.1% ± 1 digit	0.1°C
		-200 to 1200°C	±69.0mV	1°C		-200 to 850°C	400Ω	0.1°C		
	T	-200 to 250°C	±13.8mV	0.1°C	Pt100 (2)	-140 to 150°C	160Ω	±0.15% ± 1 digit	0.1°C	
		-200 to 400°C	±27.6mV	0.1°C		-200 to 300°C	220Ω		±0.1% ± 1 digit	0.1°C
	R	0 to 1200°C	±13.8mV	1°C		-200 to 649°C	400Ω	0.1°C		
		0 to 1760°C	±27.6mV	1°C	JPt100	-140 to 150°C	160Ω	±0.15% ± 1 digit	0.1°C	
	S	0 to 1300°C	±13.8mV	1°C		-200 to 300°C	220Ω		±0.1% ± 1 digit	0.1°C
		0 to 1760°C	±27.6mV	1°C		-200 to 649°C	400Ω	0.1°C		
	B	0 to 1820°C	±13.8mV	1°C	Pt50	-200 to 649°C	220Ω	±0.1% ± 1 digit	0.1°C	
		N	-200 to 400°C	±13.8mV		0.1°C	Pt-Co		4 to 374K	220Ω
	-200 to 750°C		±27.6mV	0.1°C						
-200 to 1300°C	±69.0mV		1°C							

Note) Accuracy ratings are of measuring ranges at reference operation conditions. The reference junction compensation accuracy is not included with the accuracy ratings of thermocouple inputs.

The indication equivalent to 200μV or 5°C may vary under the test environment requested by EMC directive.

K, E, J, T, R, S, B, N: IEC584, JIS C1602-1995

U(Cu-CuNi), L (Fe-CuNi): DIN43710

W-WRe26, Wre5-WRe26, Platinel II, CR-AuFe, PtRh40-PtRh20, NiMo-Ni: ASTM Vol.14.03

Pt100(1): IEC751(1995), JIS C1604-1997

Pt100(2): IEC751(1983), JIS C1604-1989, JIS C1606-1989

JPt100: JIS C1604-1981, JIS C1606-1986

## ■ OPTIONS

Options	Explanations
Alarm output + remote contacts	Alarm output Three kinds of output (alarm, FAIL and chart-end) are possible. Output: 6 points Maximum contact rating: MOS relay output ... 240V (AC, DC), 50mA (AC, DC), resistive load "a" contact mechanical relay output ... 240V AC 0.2A, resistive load "c" contact mechanical relay output ... 240V AC 0.2A, resistive load ("c" contact: not conforming to CE, UL and CSA.)
	Remote contacts By 4-point contact input (2-point common) signal, the following 6 kinds of operation are selectable. Chart speed 3-speed/chart stop, digital data print, list print, 4-point operation printing (printing of contact ON/OFF status), totalizing start/stop, 5-kind of message printing
Printing format *	Zone printing ... Printing area is divided into 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) Two kinds of protocol, MODBUS and private, are built-in.
Basic mathematics	The following math-function can be executed in time order or between channels.. Arithmetic, Absolute value, Square root, Logarithm, Natural Logarithm, Exponential, Maximum, Minimum, Average, Temperature/humidity
Totalizing/ flow correction	Totalizing of measured data and calculated results and correction of flow by pressure, temperature, etc.
Handle and rubber stands	Handle and rubber stands are mounted for easy carrying (not conforming to CE, UL and CSA.)
Aluminum die-cast door	Case for horizontal high-density panel installation and aluminum die-cast door
16m chart	Total length of 15.6m

## ■ ACCESSORIES (Separate purchase is required.)

Article	Content
Shunt resistor for current input	250Ω (for 20mA) and 100Ω (for 50mA)
Transmitter power supply unit RZ-TPS01	Power supply unit for transmitters The unit is mounted on backside of recorder.

## ■ 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: Can be exported 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.

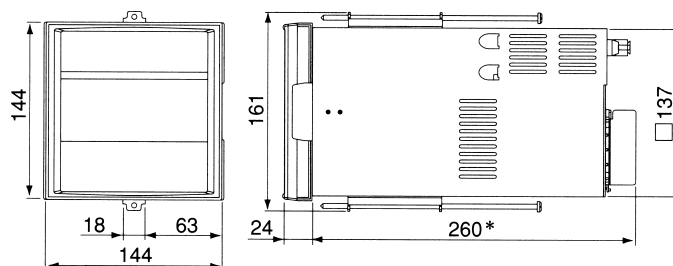
Main functions and features

- 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

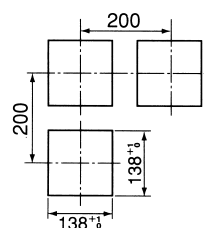
## ■ DIMENSIONS

274mm for adding alarm output of MOS relay or "c" contact mechanical relay, and communications interface

\* 285mm for adding "a" contact mechanical relay



Panel cutout and minimum clearance for installation



Specifications subject to change without notice.

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