VOL. 20151008

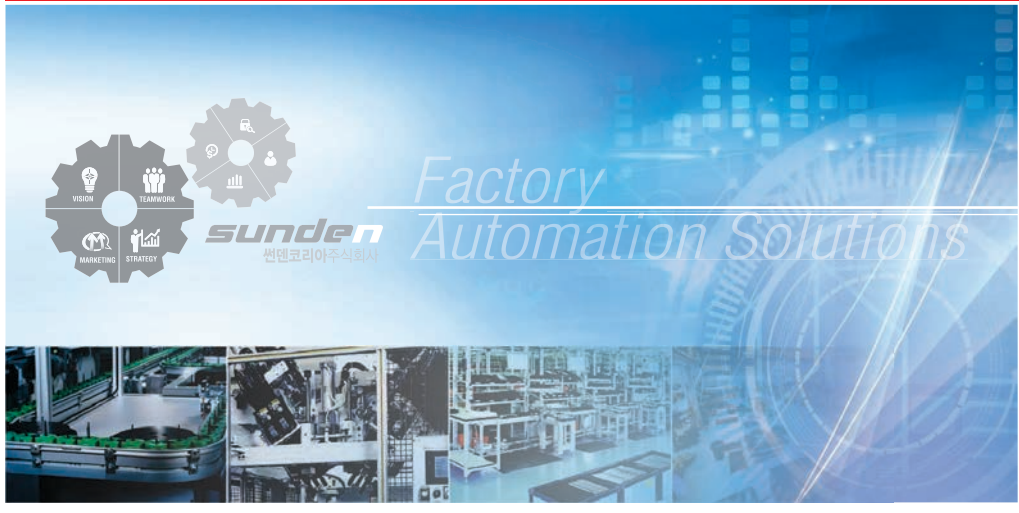
Factory Automation Solutions

sunden

SUNDEN KOREA Co., LTD.

썬덴코리아 제품 브로슈어

"대한민국 대표 공장자동화 전문기업"



OVERSEAS Distributors

Website introduction

http://www.watanabe-electric.co.jp/en/

For more information, please visit our website!

Product Search by Keywords or Categories

New Product / Featured Product

Watanabe's Vision

Global Sales Network

Leading company of measuring instruments

Watanabe Electric Industry Co. Ltd.

Quality Assurance Measures (ISO 9001)
Environmental Activities (ISO 14001)

*Specification is subject to change without notice

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2016

Products Guide

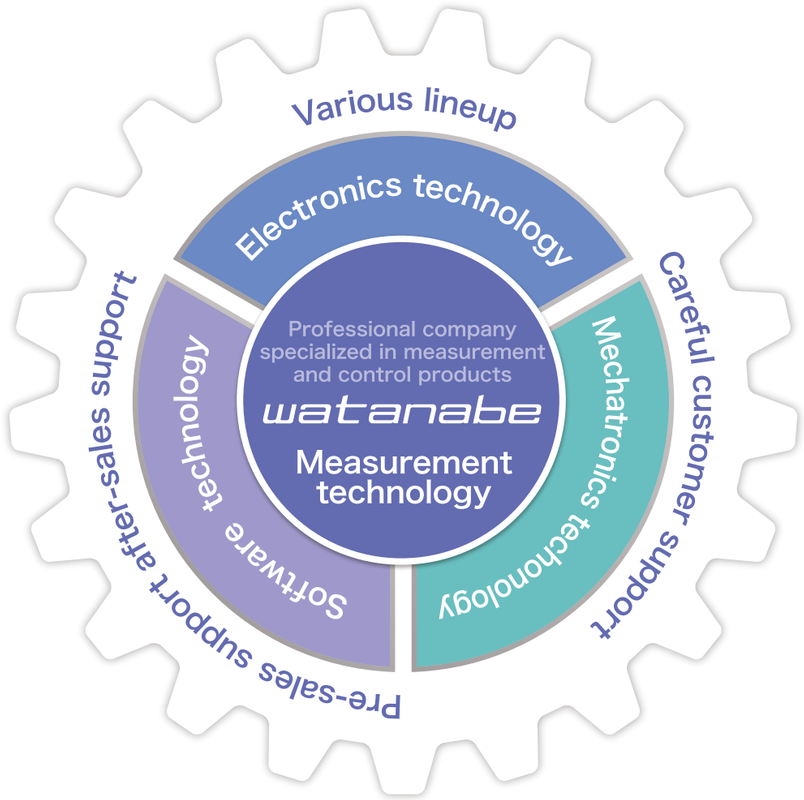
watanabe 75th Anniversary

Leading company of measuring instruments

watanabe

About watanabe

We will provide customer's maximum satisfaction by being aware of the needs of the age



Products

Signal Converters

We have been developing and selling Signal converters since 1974, widely in the fields of FA, PA and VA.There are 2 types, 'Plug-in type' which is easy to maintain and compact 'Terminal block type' available.We can provide various models which meets the needs of customers, quick delivery and good after support.

P4～7

Digital Instruments

By being aware of the needs of the age, our digital instruments made rapid development. We have one of the most largest product line-up of Digital panel meters (Voltage/Current, Temperature, tachometer, pressure, resistance, frequency etc.) in the industry, which can support wide range of fields of digital measurement of equipment and production.

P8～11

Company Outline

Company Name	Watanabe Electric Industry Co.Ltd.
Trademark	watanabe
Headquarters Address	6-16-19 Jingumae, Shibuya-ku, Tokyo 150-0001
Representative	Hideki Watanabe, President
Founded	November 3, 1940
Capital Funds	45 million yen
Total Employees	182

Products

Component Products
1) Digital panel meter
2) Signal converter
3) Graphic multi meter

System Products
1) Power multi-meter
2) Energy monitoring
3) Headlight tester

All products made in Japan factory

Business Bases

Headquarter & Tokyo Sales Office
6-6-19, Jingumae, Shibuya-ku, Tokyo 150-0001, Japan
TEL : +81-3-3400-6147
FAX : +81-3-3409-3156
E-mail : support@watanabe-electric.co.jp

Tokyo Factory
1-1-10 Nishi-Tsutsujigaoka, Chofu-shi, Tokyo 182-0006, Japan

Fukushima Factory
55 Kuwajimaichi, Kori-machi, Date-gun, Fukushima 969-1613, Japan

Osaka Sales Office
TCS Bldg. 5F, 1-14-33 Esaka-cho, Suita-shi, Osaka 564-0063, Japan

Nagoya Sales Office
Fushimi IT Bldg. 5F, 1-4-25 Nishiki, Naka-ku, Nagoya-shi, Aichi 460-0003, Japan

Location

Headquarter (Tokyo,Shibuya)

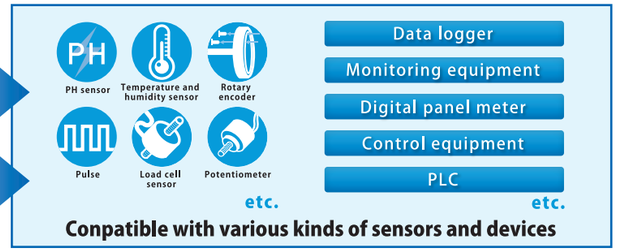
Fukushima Factory
1. Number of Employees : 61
2. Site area : 3,733m²
3. Building area : 1,557m²
4. Main line of products :
Signal converter (WSPF,TZ,TW,TH series),
Digital panel meter, Graphic meter

Tokyo Factory
1. Number of Employees : 37
2. Site area : 1,152m²
3. Building area : 683m²
4. Main line of products :
Signal converter (WSP,WVP,WAP series)

Signal converter isolates and converts various signals for FA & BA. High quality & Excellent service! Wide varieties!

Large number of products! Supports all sorts of sensors and equipped devices

333 products Extensive lineup



Plug-in type, Terminal block type available

"Plug-in type' and 'Terminal block type' available.
'Plug-in type' can take off the body part from the socket.
Therefore mounting and maintenance is easy.
'Terminal block type' saves space and costs."

Plug-in type

Terminal block type

Watanabe Electric Industry is 'Manufacturer specializing in measuring and instrumentation instruments' and has history of over 75 years since foundation.
Especially among them, we have made many sales results of Signal converters.
Signal converter converts various electrical signals to standardized signal which can use with various kinds of equipment.

1 Long term stable supply

As a manufacturer specializing in signal converters, we supply our products stably as long as possible. Also, we consider about compatibility when we re-design the product so that can replace smoothly.

2 Quick delivery

Short delivery date for signal converters. Please contact us if you have any request about shipment.

Made in Japan

Signal Converter Introduction

Functions conformed to the actual sites, high usability

New Compact Plug-in Signal Converter
WSPF Series New Product

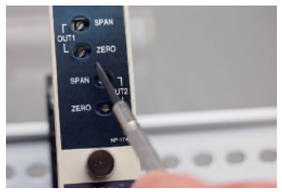
1. Wide zero & span adjustment

±5% → ±10%

2. Improved adjustment sensitivity

・Time saving by improving adjustment trimmer

1turn → 15turn



Easy and fine adjustment by using precision screwdriver

3. Safe design by high dielectric strength

・Compatible with 3kV stable operation

2kV → 3kV

4. Long warranty period

5 years long warranty period

5. Extended range of power supply

・Can be used for Automotive batteries

DC30V Power supply compatible

New WSPF series line up list

Isolator

WSPF-IS	Isolator
WSPF-DS	Isolator
WSPF-DSW	Dual-output Isolator
WSPF-DE	High-speed Response Isolator
WSPF-DEW	Dual-output High-speed Response Isolator

Distributor (Current Loop Supply)

WSPF-DBZ	Distributor (Current Loop Supply)
WSPF-DBZW	Dual-output Distributor (Current Loop Supply)

Thermocouple Converter

WSPF-THZ	Thermocouple Converter
WSPF-THW	Dual-output Thermocouple Converter

RTD converter

WSPF-RTS	RTD converter
WSPF-RTW	Dual-output RTD Converter

Potentiometer Converter

WSPF-MS	Potentiometer Converter
WSPF-MSW	Dual-output Potentiometer Converter

More models coming soon

Quality and Service are the advantage of Watanabe based on the long history over 75 years

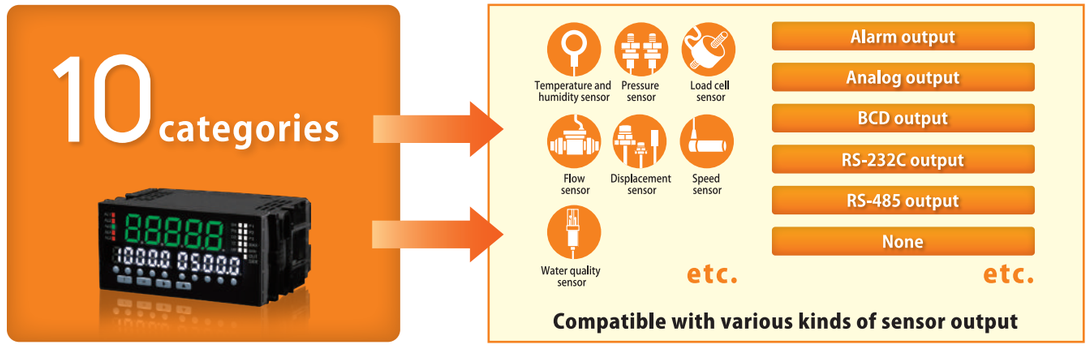
[Signal Converter] Matrix

Function type	Number of models	New Product							
	Series	New Compact Plug-in Signal Converter **WSPF**	Compact Plug-in Signal Converter **WSP**	Plug-in Signal Converter **WVP**	Plug-in Signal Converter **WAP**	Compact Terminal Block Signal Converter **TZ**	Terminal Block Signal Converter **TW**	Ultra-slim Terminal Block Signal Converter **TH**
	Number of models	13 models	52 models	96 models	74 models	16 models	13 models	15 models
Isolator	・1 output/2 output ・High-speed response type etc.	●	–	●	●	●	●	●
Distributor (Current Loop Supply)	・1 output/2 output ・With extraction of square root etc.	●	–	●	●	●	●	●
Temperature Converter	・Thermocouple ・RTD (Pt) etc.	●	–	●	●	●	●	●
Sensor Signal Input Converter	・Potentiometer ・Load cell etc.	●	●	●	●	●	●	●
Power/AC Input Converter	・CT/PT Converter ・Power Converter etc.	–	●	●	●	●	–	–
Pulse/Frequency Converter	・Pulse scaler ・2-phase pulse etc.	–	●	●	●	–	●	–
Alarm Setter	・1 output/2 output ・With LCD type etc.	–	●	●	●	–	●	–
Functional Unit	・Ratio/bias converters ・with extraction of square root etc.	–	●	●	●	–	–	–
Function Modules	・Peak hold ・Limiter etc.	–	●	●	●	–	–	–
AD/DA Converter	・A/D Converters ・D/A Converters	–	–	●	●	–	–	–
Signal Generator	・Signal generator ・Parameter generator etc.	–	–	–	●	–	–	–

Supports all kinds of sensors by 10categories

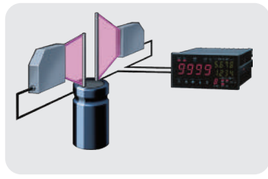
Visualization by measurement, monitoring and inspection of production line

Product Line Up

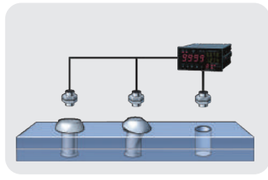


Three functions of Digital panel meter which are essential for FA.

1. Measurement and determination



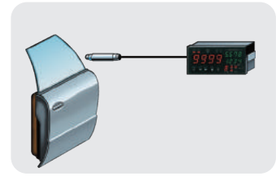
Measurement and determination of lead length of condenser



Determination of rivet mounting state

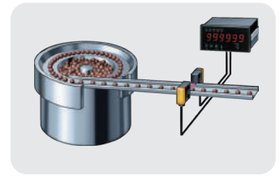
2. Inspection and detection

High-speed determination by high-speed mode

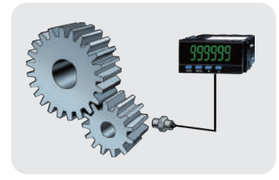


Detection of warp condition of door glass by differential transformer

3. Process management



Detection of number and poor shape of materials



Display gear revs

High-brightness LED & Large capacity sensor power supply

Input signal DC Process signal

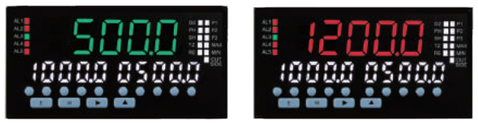
High-brightness Digital Panel meter
WPM Series New Product

GOOD DESIGN AWARD 2014

Single display type Multi display type

1. Pure green LED

- Easy to see by pure green and red LED which is selectable by setting



2. Large capacity sensor power supply

- DC12V(100mA), DC24V(50mA) large capacity power supply for sensor

3. Auto-range function

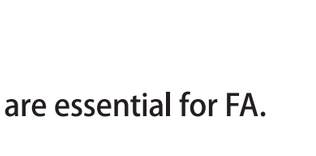
- Unnecessary to switch range setting by Auto-range function

Friendly operation by LCD display

Input signal Pulse

LCD digital panel meter
WPMZ Series New Product

Tachometer/Speedmeter(WPMZ-5)
Flow rate/Flow totalizer (WPMZ-6)



2ch Dual display setting

Vertical display setting

1. TFT 2.4 inch full-color LCD display

- Display selectable. Single/dual display, vertical display, digits/bar graph/trend graph display

2. Language selection

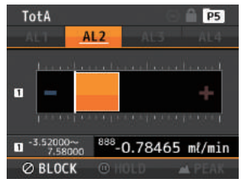
- English and Japanese selectable

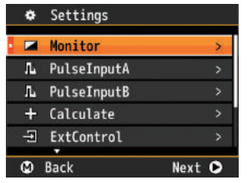
3. Various types of optional output

- Optional output : 4 point comparative output, Analog, BCD, RS232C, RS485 (Modbus)

4. 2-channel input dual display available

- Cost reduction by 2-channel dual display
- WPMZ can calculate between 2 inputs





* Coming soon 2016

A Series

Input signal: DC AC Temperature Frequency Resistance Load cell Process signal

A1000
Dimensions : 48 (H) ×96 (W) ×65.5 (D) mm
Display : 1999

A2000
Dimensions : 24 (H) ×48 (W) ×40 (D) mm
Display : 1999/19999

A5000
Dimensions : 48 (H)×96 (W) ×146.5 (D) mm
Display : 9999
● Comparative output

Multi display type

A6000
Dimensions : 48 (H) ×96 (W) ×97.5 (D) mm
Display : 9999
● Comparative output

Multi display type

A7000
Dimensions : 36 (H) ×72 (W) ×118 (D) mm
Display : 9999
● Comparative output

A8000
Dimensions : 24 (H) ×48 (W) × 85.5 (D) mm
Display : 19999
● Comparative output

With sheet switch

A9000
Dimensions : 48 (H) ×96 (W) ×75 (D) mm
Display : 19999

Thermometer

ATC-217
Dimensions : 24 (H) ×48 (W) ×98 (D) mm
Display : 1999

AT-501
Dimensions : 48 (H) ×96 (W) ×22 (D) mm
Display : 1999

Counter/Frequency meter

AC-911
Dimensions : 48 (H) ×96 (W) ×97.5 (D) mm
Display : 999999
● Comparative output

AC-116B
Dimensions : 48 (H) ×96 (W) ×95 (D) mm
Display : 999999

Load cell meter

ASG-158
Dimensions : 48 (H) ×96 (W) ×144 (D) mm
Display : 9999
● Comparative output

DC Voltmeters/Ammeters

AM-123
Dimensions : 48 (H) ×96 (W) ×98 (D) mm
Display : 9999
● Comparative output

AM-147
Dimensions : 48 (H) ×96 (W) ×148 (D) mm
Display : 9999
● Comparative output

AM-215A
Dimensions : 24 (H) ×48 (W) ×87.8 (D) mm
Display : 9999
● Comparative output

AM-332
Dimensions : 36 (H) ×72 (W) ×118 (D) mm
Display : 9999
● Comparative output

AM-756
Dimensions : 48 (H) ×96 (W) ×97.5 (D) mm
Display : 199999
● Comparative output

AMH-148
Dimensions : 48 (H) ×96 (W) ×148 (D) mm
Display : 9999
● Comparative output

AMH-763
Dimensions : 48 (H) ×96 (W) ×144.5 (D) mm
Display : 99999
● Comparative output

AP-101
Dimensions : 48 (H) ×96 (W) ×73 (D) mm
Display : 1999

AP-301
Dimensions : 36 (H) ×72 (W) ×29 (D) mm
Display : 1999

AP-501B
Dimensions : 48 (H) ×96 (W) ×34.5 (D) mm
Display : 1999

AP-502A
Dimensions : 48 (H) ×96 (W) ×33 (D) mm
Display : 1999

AP-520A
Dimensions : 48 (H) ×96 (W) ×34.5 (D) mm
Display : 1999

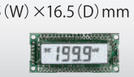
AP-540
Dimensions : 48 (H) ×96 (W) ×34.5 (D) mm
Display : 199999

AS-101
Dimensions : 48 (H) ×96 (W) ×71 (D) mm
Display : 1999

AH-231
Dimensions : 24 (H) ×48 (W) ×24 (D) mm
Display : 1999

AH-330/331
Dimensions : 29.5 (H) ×65 (W) ×18.2 (D) mm
Display : 999/1999

AH-381
Dimensions : 29.5 (H) ×65 (W) ×16.5 (D) mm
Display : 1999



AC Voltmeters/Ammeters

AP-560
Dimensions : 48 (H) ×96 (W) ×22 (D) mm
Display : 999

AM-332
Dimensions : 36 (H) ×72 (W) ×118 (D) mm
Display : 9999
● Comparative output

BCD Input Remote Display

AI-105A
Dimensions : 48 (H) ×96 (W) ×73 (D) mm
Display : 99999

AI-204
Dimensions : 24 (H) ×48 (W) ×73 (D) mm
Display : 9999

AI-304
Dimensions : 36 (H) ×72 (W) ×119 (D) mm
Display : 9999

AI-404
Dimensions : 24 (H) ×96 (W) ×97 (D) mm
Display : 9999

AI-406
Dimensions : 24 (H) ×96 (W) ×96.5 (D) mm
Display : 999999

AI-416
Dimensions : 24 (H) ×96 (W) ×96.5 (D) mm
Display : 999999

2-wire Loop-powered Meter

AL-203
Dimensions : 24 (H) ×48 (W) ×24 (D) mm
Display : 1999

AL-213
Dimensions : 24 (H) ×48 (W) ×40 (D) mm
Display : 1999

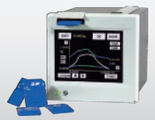
AL-501A
Dimensions : 48 (H) ×96 (W) ×22 (D) mm
Display : 1999

AL-512
Dimensions : 48 (H) ×96 (W) ×22 (D) mm
Display : 1999

Graphic Load Cell Meter

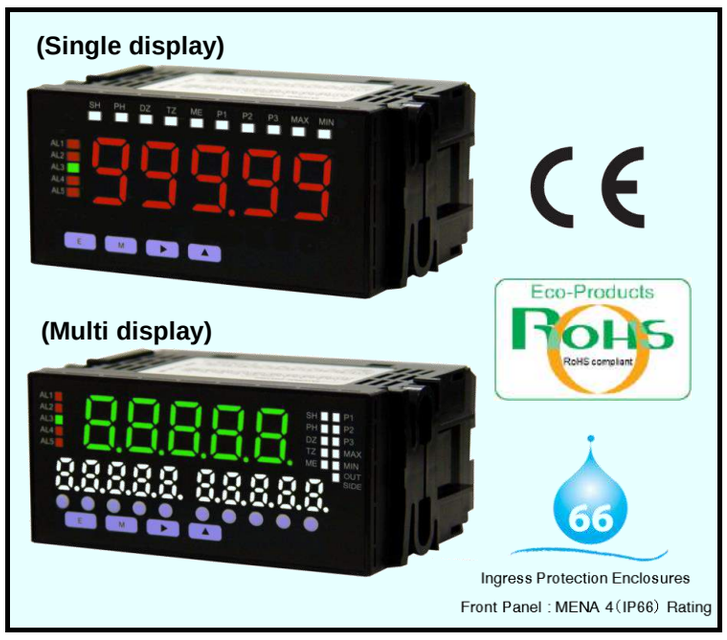
Input signal: Load cell Process signal

G1000 Series
Dimensions : 96 (H) ×100 (W) ×153 (D) mm



1/8 DIN Digital Panel Meter for DC Voltage, DC Current, Process

WPM-1



Features

★ Auto range from ±1.9999V to ±199.99V.
★ Built in excitation (sensor power supply) when process signal input.
12Vdc ±10% 100mA, 24Vdc ±10% 50mA selectable.
★ Two color display Green and Red.
★ Main LED height 18mm.
★ Easy to set setpoints by push button.
★ Power supply 100 to 240Vac.
★ DC voltage, current, Process input available.
★ 2 setpoints and 4 setpoints available.
★ D/A analog output (high response time).
★ NEMA 4 (IP66) Front bezel.
★ CE approved, RoHS compliant.

Ordering code

WPM - 1 - □□ - □□□ - □ 0 0

Code	Power supply
1	100 to 240Vac

Code	Display
1	Single
2	Multi

Code	Input range
1	DC voltage (11 to 14 range)
2	DC high voltage (15 range)
3	DC current (21 to 24 range)
4	DC large current (25 range)
B	Process signal

Code	Output
0	Display only
1	Analog output

Code	Comparative output
0	None
1	2 setpoints Relay output
2	4 setpoints Relay output
3	2 setpoints Photocoupler output
4	4 setpoints Photocoupler output

Code	Test report
0	None
1	With Test report

Input Specifications

◆DC voltage

Range	Measurement range	Auto range	Display Range (Scaling)	Resolution	Impedance	Max. allowable input	Accuracy (23±5°C 35 to 85%RH)
11	±199.99mV	Not available	Offset: : -19999 to 99999 Full scale : -19999 to 99999 Resolution : ±19999	10μV	Approx. 10M Ω	±250V	±(0.1% of FS +1 digit)
12	±1.9999V	Available		100μV			
13	±19.999V			1mV			
14	±199.99V			10mV			
15	±600.0V	Not available		100mV		±600V	

Note : ‘Accuracy’ is when the sampling rate is 60 times per sec or less.

◆DC current

Range	Measurement range	Display Range (Scaling)	Resolution	Impedance	Max. allowable input	Accuracy (23±5°C 35 to 85%RH)
21	±199.99μA	Offset: : -19999 to 99999 Full scale : -19999 to 99999 Resolution : ±19999	10nA	Approx. 1KΩ	±10mA	±(0.1% of FS +1 digit)
22	±1.9999mA		100nA	Approx. 100Ω		
23	±19.999mA		1μA	Approx. 10Ω	±50mA	
24	±199.99mA		10μA	Approx. 1Ω	±500mA	
25	±1.9999A		100μA	Approx. 0.1Ω	±3A	

Note : ‘Accuracy’ is when the sampling rate is 60 times per sec or less.

◆Process signal

Range	Measurement range	Display Range (Scaling)	Impedance	Max. allowable input	Accuracy (23±5°C 35 to 85%RH)
1V	1 to 5V	Offset: : -19999 to 99999 Full scale : -19999 to 99999 Resolution : ±19999	Approx. 1MΩ	±100V	±(0.1% of FS +1 digit)
2V	±5V				
3V	±10V				
2A	4 to 20mA		Approx. 10Ω	±50mA	
3A	±20mA				

Note : ‘Accuracy’ is when the sampling rate is 60 times per sec or less.

Specifications

◆Common specifications

Input Configuration	Single ended
A/D conversion	ΔΣ conversion
Sampling rate	Max. 250 times per second
Over range display	When input exceeds the maximum display, 'ovEr' or '-ovEr'
Decimal point	Able to set to any digit
Display	Single display main display: red or green 7 segment LED (height 18mm) Multi display main display: red or green 7 segment LED (height 14.9mm) sub display: white 7 segment LED (height 9mm)
Polarity	'-' is displayed automatically at negative polarity
Display range	-19999 to 99999 (5 digits)
Zero display	Leading zero suppression
External control	Select 4 external control and set parameter 1. Pattern select 2. Sample hold 3. Peak hold 4. Digital zero 5. Relay reset
Operating temperature	-5 to 50°C
Operating relative humidity	35 to 85% (non-condensing)
Storage temperature/humidity	-10 to 70°C 60%RH or less
Power supply	100 to 240Vac ±10% 50/60Hz
Built in excitation (Sensor power supply)	12Vdc±10% 100mA, 24Vdc±10% 50mA selectable (when process signal input)
Power consumption	12VA max. at 100Vac 15VA max. at 240Vac
Dimensions	96mm(W) x 48mm(H) x 85.9mm(D) DIN size (with comparative function : 99.7mm(D))
Weight	Approx. 250g
Dielectric strength	AC power supply 2000VAC per 1 min. : Power supply terminal - input terminal / external control / analog output terminal 1500VAC per 1 min. : Power supply terminal - comparative output terminal
Insulation resistance	500Vdc, 100MΩ or more on the above terminals
Vibration strength	10 to 55Hz 0.15mm X,Y,Z 30 min.
Front protection	NEMA 4 (IP66) Front bezel
Installation location	Indoors only
Applicable EN standard	EN61326-1, EN61010-1
Case material	Polycarbonate

◆Comparative output specifications

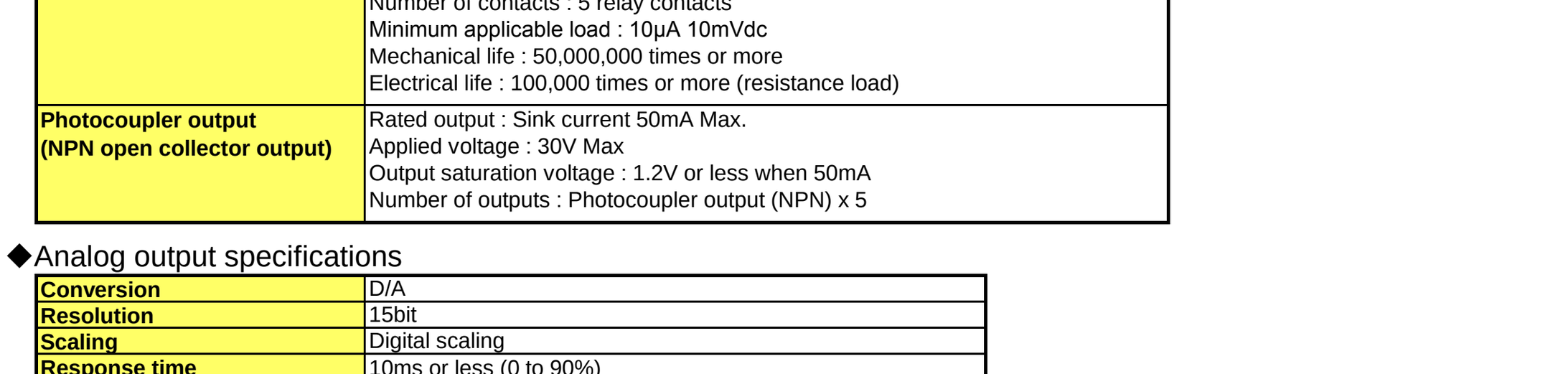
Setting range	-19999 to 99999	
Hysteresis	1 to 9999 digit for each setpoints	
Setting condition	HH set value > HI set value > LO set value > LL set valuepoint	
Comparative condition	Comparative condition	Result
	Display value > HH set value > HI set value	AL1(HH), AL2(HI)
	HH set value ≥ Display value > HI set value	AL2(HI)
	HI set value ≥ Display value ≥ LO set value	AL3(GO)
	LO set value > display value ≥ LL set value	AL4(LO)
	LO set value > LL set value > Display value	AL4(LO), AL5(LL)
Comparative condition	8 patterns stored in the internal memory	
Comparative relay output	Contact rating : 125Vac 0.3A (resistance load) 30Vdc 1A (resistance load) Number of contacts : 5 relay contacts Minimum applicable load : 10μA 10mVdc Mechanical life : 50,000,000 times or more Electrical life : 100,000 times or more (resistance load)	
Photocoupler output (NPN open collector output)	Rated output : Sink current 50mA Max. Applied voltage : 30V Max Output saturation voltage : 1.2V or less when 50mA Number of outputs : Photocoupler output (NPN) x 5	

◆Analog output specifications

Conversion	D/A			
Resolution	15bit			
Scaling	Digital scaling			
Response time	10ms or less (0 to 90%)			
	Analog output	Load resistance	Accuracy	Ripple
	0 to 2V	10kΩ or more	±(0.1% of FS)	±50mVp-p
	0 to 10V			
	-10 to +10V			
	1 to 5V			
	0 to 20mA	550Ω or more		±25mVp-p
	4 to 20mA			

Note : 'Ripple' is when load resistance is 250Ω and current output is 20mA.

Dimensions



(Unit : mm)

∗ **Specification is subject to change without notice**

Universal Type Digital Panel Meter

A5000 SERIES

watanabe

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Input Specifications(A5XXX-□□)

• DC voltage, current

	Range	Measurement range	Display	Maximum Resolution	Input Impedance	Input Protection	Accuracy
01	11	±99.99 mV	offset ±9999 full scale 0 to ±9999	10 µV	100 MΩ	±100 V	±(0.1% of FS)

	Range	Measurement range	Display	Maximum Resolution	Input Impedance	Input Protection	Accuracy
02	12	±999.9 mV	offset ±9999 full scale 0 to ±9999	10 µV	100 MΩ	±100 V	±(0.1% of FS)
	13	±9.999 V		1 mV	1 MΩ	±250 V	±(0.1% of FS)
	14	±99.99 V		10 mV	10 MΩ	±250 V	±(0.1% of FS)
	15	±600 V		100 mV	10 MΩ	±600 V	±(0.15% of FS)

	Range	Measurement range	Display	Maximum Resolution	Input Impedance	Input Protection	Accuracy
03	23	±9.999 mA	offset ±9999 full scale 0 to ±9999	1 µA	10 Ω	±100 mA	±(0.2% of FS)
	24	±99.99 mA		10 µA	1 Ω	±500 mA	±(0.2% of FS)
	25	±999.9 mA		100 µA	0.1 Ω	±3 A	±(0.3% of FS)

Input configuration : Single ended
Measuring method : ΔΣtype
Normal mode rejection : More than NMR 50dB (50/60 Hz)

• AC voltage, current (Average)

	Range	Measurement range	Input Frequency	Display	Maximum Resolution	Input Impedance	Input Protection	Accuracy
04	11	99.99 mV	40 Hz to 1 kHz	offset ±9999 full scale 0 to ±9999	10 µV	more than 1 MΩ	100 V	±(0.2% of rdg + 10 digit)
	12	999.9 mV			100 µV		100 V	±(0.2% of rdg + 10 digit)
	13	9.999 V			1 mV		250 V	±(0.2% of rdg + 10 digit)

	Range	Measurement range	Input Frequency	Display	Maximum Resolution	Input Impedance	Input Protection	Accuracy
05	14	99.99 V	40 Hz to 1 kHz	offset ±9999 full scale 0 to ±9999	10 mV	more than 1 MΩ	250 V	±(0.2% of rdg + 10 digit)
	15	600 V			100 mV		600 V	±(0.2% of rdg + 10 digit)

	Range	Measurement range	Input Frequency	Display	Maximum Resolution	Input Impedance	Input Protection	Accuracy
08	23	9.999 mA	40 Hz to 1 kHz	offset ±9999 full scale 0 to ±9999	1 µA	10 Ω	100 mA	±(0.5% of rdg + 10 digit)
	24	99.99 mA			10 µA	1 Ω	500 mA	±(0.5% of rdg + 10 digit)
	25	999.9 mA			100 µA	0.1 Ω	3 A	±(0.5% of rdg + 10 digit)

	Range	Measurement range	Input Frequency	Display	Maximum Resolution	Input Impedance	Input Protection	Accuracy
09	26	5 A	50 Hz or 60 Hz	offset ±9999 full scale 0 to ±9999	1 mA	CT	8 A	±(0.5% of rdg + 10 digit)

• AC voltage, current (TRUE-RMS)

	Range	Measurement range	Input Frequency	Display	Maximum Resolution	Input Impedance	Input Protection	Accuracy
06	11	99.99 mV	40 Hz to 1 kHz	offset ±9999 full scale 0 to ±9999	0 µV	more than 1 MΩ	100 V	±(0.2% of rdg + 20 digit)
	12	999.9 mV			100 µV		100 V	±(0.2% of rdg + 20 digit)
	13	9.999 V			1 mV		250 V	±(0.2% of rdg + 20 digit)

	Range	Measurement range	Input Frequency	Display	Maximum Resolution	Input Impedance	Input Protection	Accuracy
07	14	99.99 V	40 Hz to 1 kHz	offset ±9999 full scale 0 to ±9999	10 mV	more than 1 MΩ	250 V	±(0.2% of rdg + 20 digit)
	15	600 V			100 mV		600 V	±(0.2% of rdg + 20 digit)

	Range	Measurement range	Input Frequency	Display	Maximum Resolution	Input Impedance	Input Protection	Accuracy
10	23	9.999 mA	40 Hz to 1 kHz	offset ±9999 full scale 0 to ±9999	1 µA	10 Ω	100 mA	±(0.5% of rdg + 20 digit)
	24	99.99 mA			10 µA	1 Ω	500 mA	±(0.5% of rdg + 20 digit)
	25	999.9 mA			100 µA	0.1 Ω	3 A	±(0.5% of rdg + 20 digit)

	Range	Measurement range	Input Frequency	Display	Maximum Resolution	Input Impedance	Input Protection	Accuracy
11	26	5 A	50 Hz or 60 Hz	offset ±9999 full scale 0 to ±9999	1 mA	CT	8 A	±(0.5% of rdg + 20 digit)

Input configuration : Single ended
Response time : Approx. 1 sec.
Crest factor : 4:1 at fullscale (only for TRUE-RMS)
Dead zone : 0 to 99 digit

• Resistance

	Range	Measurement range	Display	Maximum Resolution	Current	Accuracy
12	11	99.99 Ω	offset ±9999 full scale 0 to ±9999	10 mΩ	5 mA	±(0.2% of FS)
	12	999.9 Ω		100 mΩ	0.5 mA	±(0.1% of FS)
	13	9.999 kΩ		1 Ω	50 µA	±(0.1% of FS)
	14	99.99 kΩ		10 Ω	5 µA	±(0.1% of FS)

• Thermocouple

	Range	Sensor type	Measurement range	Maximum Resolution	Accuracy
13	KA	K	–50.0 to 199.9°C	0.1°C	±(0.5% of FS)
	KB	K	–50 to 1200°C	1°C	±(0.2% of FS)
	J	J	–50 to 1000°C	1°C	±(0.2% of FS)
	T	T	–50 to 400°C	1°C	±(0.6% of FS)
	S	S	0 to 1700°C	1°C	±(0.4% of FS)
	R	R	–10 to 1700°C	1°C	±(0.4% of FS)
	B	B	100 to 1800°C	1°C	±(0.4% of FS) over 500°C

available Fahrenheit display
Cold junction compensator accuracy : ±1°C (10 to 40°C)
Sensor lead resistance : less than 50Ω
Linearizing method : Digital linearizing
Burn out alarm : -----

• RTD

	Range	Sensor type	Measurement range	Maximum Resolution	Accuracy
14	PA	PT100Ω	–100.0 to 199.9°C	0.1°C	±(0.15% of FS)
	PB	PT100Ω	–100 to 600°C	1°C	±(0.3% of FS)

available Fahrenheit display
Current for resistance : Approx. 1 mA
External lead resistance : Less than 10 Ω/lead
Linearizing method : Digital linearizing
Burn out alarm : -----

• Frequency

Range	Measurement range	Display	Maximum Resolution	Display Renewal time	Accuracy
11	0.1 to 200 Hz	Prescale : 0.001 to 5 1 to 100	0.1 Hz	1 to 10 s	±(0.2% of FS)
12	1 to 2000 Hz		1 Hz	1 s	±(0.2% of FS)
13	0.01 to 20 kHz		10 Hz	100 ms	±(0.2% of FS)
14	0.1 to 200 kHz		100 Hz	100 ms	±(0.2% of FS)

	Input type	Input voltage level	Input Protection
15	Open collector	L: less than 1 V (5 V, 2.2 kΩ) pullup	30 V
	Logic	L: less than 1 V, HI: 2.5 to 15 V	15 V
	Magnet	0.3 to 30 V P-P	15 V

	Input type	Input voltage level	Input Protection
16	Voltage	50 to 500 V rms	500 V

• Strain gauge

	Power supply for sensor	Zero adjustment range	Span adjustment range	Maximum Resolution	Accuracy
17	5 V	–0.3 to +1 mV/V	1 to 3 mV/V	0.5 µV/digit	±(0.1% of FS) +2 digit
	10 V			1 µV/digit	

Sensor : 350 Ω
Power supply for sensor : 5 V±5% (less than 15 mA) 10 V±5% (less than 30 mA)

• Process

	Range	Measurement range	Display	Input Impedance	Input protection	Accuracy
18	1 V	1 to 5 V	offset ±9999	1 MΩ	±100 V	±(0.2% of FS)
	2 A	4 to 20 mA	full scale 0 to ±9999	10 Ω	±100 mA	±(0.2% of FS)

• Process with sensor power supply

	Range	Measurement range	Display	Input Impedance	Input protection	Accuracy
19	1 V	1 to 5 V	offset ±9999	1 MΩ	±100 V	±(0.2% of FS)
	2 A	4 to 20 mA	full scale 0 to ±9999	10 Ω	±100 mA	±(0.2% of FS)

Power supply for sensor : 12 V DC ±10% 50 mA 24 V DC ±10% 25 mA

Output Specification

• HI & LO setpoint output (A5XX1-XX)

Indication > High setpoint	HI
High setpoint ≧ Indication ≧ Lo setpoint	GO
Indication < Lo setpoint	LO

Setting range : –9999 to 9999
Hysteresis : 1 to 999 digit for each setpoints
Relay contact capacity : AC240V 8A resistive load DC30V 8A resistive load

• Analog output (A5XX2-XX)

Output	Resistive load	Accuracy
0 to 1 V	more than 10 kΩ	±(0.5% of FS)
0 to 10 V	more than 10 kΩ	
1 to 5 V	more than 10 kΩ	
4 to 20 mA	less than 550 Ω	

Output method : PWM method
Scaling : Digital scaling

• RS-232C (Conforming to EIA RS-232C) (A5XX3-XX)

Communication method : Full duplex
Transmission speed : 2400/4800/9600/19200/38400 bps
Start bit : 1 bit
Data length : 7 bit/8 bit
Parity : Even parity/odd parity
Stop bit : 1 bit/2 bit
Character code : ASCII code
Transmission control process : Ignored process

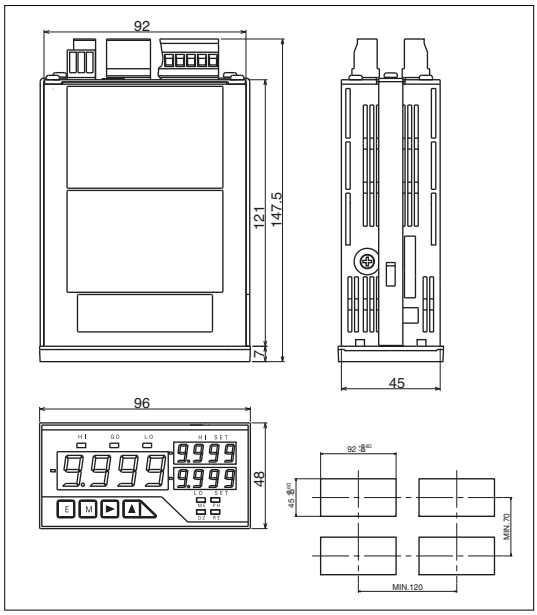
• RS-485 (Conforming to EIA RS-485) (A5XX4-XX)

Communication method : Full duplex
Transmission speed : 2400/4800/9600/19200/38400 bps
Start bit : 1 bit
Data length : 7 bit/8 bit
Parity : Even parity/odd parity
Error detection : BCC
Stop bit : 1 bit/2 bit
Character code : ASCII code
Transmission control process : Ignored process
Signal name : + non reversal output
– reversal output
Maximum No. of meter connected: 31
Line length : Up to 500 m in total

Common Specification

Display	:	Main display Red LED 14.2 mm height Sub display Green LED 8 mm height	
Conversion rate	:	12.5 times/sec.	
Maximum display	:	9999	
Overrange indication	:	When input exceeds the maximum display, display OL or –OL	
Zero display	:	Leading zero suppression	
Decimal point	:	Settable to any digit position	
External control	:	Start/Hold, Peak Hold, Digital Zero	
Operating temp.	:	0 to 50°C 35 to 85% RH	
Storage temp.	:	–10 to 70°C less than 60% RH	
Power supply	:	AC 100 to 240V±10% (AC main unit) DC 9 to 60 V (DC main unit)	
Power consumption	:	approx 4 VA (at 100 V)	
Dimensions	:	96 mm (W) X 48 mm (H) X 147.5 mm (D) DIN size	
Weight	:	approx. 450 g	
Dielectric strength (AC)	:	Power supply/input terminal/output terminal	AC2000 V/1 min.
		Input terminal/output terminal	DC500 V/1 min.
		Case/power supply/input terminal output terminal	AC2000 V/1 min.
Dielectric strength (DC)	:	Power supply/input terminal/output terminal	DC500 V/1 min.
		Input terminal/output terminal	DC500 V/1 min.
		Case/power supply/input terminal output terminal	AC2000 V/1 min.
Insulation resistance	:	DC500 V more than 100 MΩ at the above terminals	

Dimensions



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Input
01. DC voltage (±99.99 mV)
02. DC voltage (±999.9 mV to ±600V)
03. DC current (±9.999 mA to ±999.9 mA)
04. AC voltage AVG (99.99 mV to 9.999 V)
05. AC voltage AVG (99.99 V to 600 V)
06. AC voltage RMS (99.99 mV to 9.999 V)
07. AC voltage RMS (99.99 V to 600 V)
08. AC current AVG (9.999 mA to 999.9 mA)
09. AC current AVG (5 A)
10. AC current RMS (9.999 mA to 999.9 mA)
11. AC current RMS (5 A)
12. Resistance (99.99 Ω to 99.99 kΩ)
13. Temperature (Thermocouple)
14. Temperature (RTD)
15. Frequency (Open collector, Logic, Magnet)
16. Frequency (50 to 500 Vrms)
17. Strain gauge
18. 1 to 5 V, 4 to 20 mA
19. 1 to 5 V, 4 to 20 mA with sensor power supply

∗ Impossible to use only No.19 input for DC power supply

Output
0. None
1. HI & LO setpoint
2. Analog output
3. RS-232C
4. RS-485
5. HI & LO setpoint + analog output
6. HI & LO setpoint + analog output + RS-232C
7. HI & LO setpoint + analog output + RS-485

Display board
1. Single
2. Multiple

Main board
1. AC100 - 240 V (±10%)
2. DC9 - 60 V

We reserve the right to change specifications without notice.

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Universal Type Digital Panel Meter

A6000 SERIES

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www.watanabe-electric.co.jp

Input Specifications

■ DC voltage,current

• A6XX1-XX

Range	Measurement Range	Display	Input Protection	Accuracy (23˚C ± 5˚C, 35 ~ 85% RH)
11	±99.99 mV	offset ±9999 full scale ±9999	±50 V	±(0.03% of rdg + 1digit)
12	±999.9 mV		±50 V	
13	±9.999 V		±250 V	
14	±99.99 V		±250 V	
15	±700 V		±700 V	±(0.1% of rdg + 2digit)

• A6XX2-XX

Range	Measurement Range	Display	Input Protection	Accuracy (23˚C ± 5˚C, 35 ~ 85% RH)
21	±99.99 uA	offset ±9999 full scale ±9999	±10 mA	±(0.1% of rdg + 2 digit)
22	±999.9 uA		±10 mA	
23	±9.999 mA		±50 mA	
24	±99.99 mA		±500 mA	

• A6XX3-XX

Range	Measurement Range	Display	Input Protection	Accuracy (23˚C ± 5˚C, 35 ~ 85% RH)
25	±999.9 mA	offset ± 9999 full scale ±9999	±3 A	±(0.1% of rdg + 2 digit)
26	±2.000 A			

■ AC voltage, current (TRUE-RMS)

• A6XX4-XX

Range	Measurement Range	Display	Input Protection	Accuracy (23˚C ± 5˚C, 35 ~ 85% RH)
11	99.99 mV	offset ±9999 full scale ±9999	50 V	±(0.2% of rdg + 20 digit)
12	999.9 mV		50 V	
13	9.999 V		250 V	
14	99.99 V		250 V	
15	700.0 V		700 V	±(0.3% of rdg + 20 digit)

Minimum display 50 digits

• A6XX5-XX

Range	Measurement Range	Display	Input Protection	Accuracy (23˚C ±5˚C, 35 ~ 85% RH)
21	99.99 uA	offset ±9999 full scale ±9999	10 mA	±(0.5% of rdg + 20 digit)
22	999.9 uA		10 mA	
23	9.999 mA		50 mA	
24	99.99 mA		500 mA	

Minimum display 50 digits

• A6XX6-XX

Range	Measurement Range	Display	Input Protection	Accuracy (23˚C ±5˚C, 35 ~ 85% RH)
25	999.9 mA	offset ±9999 full scale ±9999	3 A	±(0.7% of rdg + 20 digit)
26	5 A		8 A	

Minimum display 50 digits

■ Resistance

• A6XX7-XX

Range	Measurement Range	Display	Current	Accuracy (23˚C ±5˚C, 35 ~ 85% RH)
11	99.99 Ω	offset ±9999 full scale ±9999	5 mA	±(0.1% of rdg + 4digit)
12	999.9 Ω		0.5 mA	
13	9.999 KΩ		50 uA	
14	99.99 kΩ		5 uA	

Measurement method: Two or Four wire (internal socket changable)

■ Thermocouple • RTD

• A6XX8-XX

Range	Sensor type	Measurement Range	Maximum Resolution	Accuracy (23˚C ±5˚C, 35 ~ 85% RH)
KA	K	-50.0 to 199.9˚C	0.1˚C	±(0.5% of FS)
KB	K	-50 to 1200˚C	1˚C	±(0.2% of FS)
J	J	-50 to 1000˚C	1˚C	±(0.2% of FS)
T	T	-50 to 400˚C	1˚C	±(0.6% of FS)
S	S	0 to 1700˚C	1˚C	±(0.4% of FS)
R	R	-10 to 1700˚C	1˚C	±(0.4% of FS)
B	B	100 to 1800˚C	1˚C	±(0.4% of FS)
PA	PT100 Ω	-100.0 to 199.9˚C	0.1˚C	±(0.15% of FS)
PB	PT100 Ω	-100 to 600˚C	1˚C	±(0.3% of FS)

available Fahrenheit display
Cold junction compensator accuracy : ±2˚C (10 to 40˚C)
Sensor lead resistance : less than 50 Ω
Linearzing method : Digital linearizing
Burn out alarm : - - - - -
Conversion time : 2.5/sec

■ Frequency

• A6XX9-XX

Range	Measurement Range	Accuracy (23˚C ±5, 35 ~ 85% RH)
11	0.1 to 999.9 Hz	±(0.2% of FS)
12	1 to 9.999 kHz	
13	10 to 99.99 kHz	

• A6XX9-XX

Input type	Input voltage level	Input Protection
Open collector	L: less than 1.5 V (5V, pullup)	30 V
Logic	L: less than 1 V, HI: 2.5 to 15 V	15 V
Magnet	0.3 to 30 V P-P	30 V
Voltage	30 V rms to 500 V rms	500 V

Prescale : 0.01 ~ 10.00
PPR : 1~100
Power supply for sensor : 12 VDC ±10%

■ Strain gauge

• A6XXA-XX

sensor	Zero adjustment range	Span adjustment range	Measurement range	Accuracy
5 V 10 V	-1 to + 1 mV/V	1 to 3mV/V	-4 ~ + 4 mV/V	±(0.1% of FS) + 2 digit

Sesnor : 350 Ω
Power supply for sensor : 5 V ± 5% (less than 15 mA)
10 V ± 5% (less than 30 mA)
Conversion speed : 1000/sec

■ Process

• A6XXB-XX

sensor	Measurement Range	Display	Accuracy
1 V	1 to 5 V	offset: ±9999 full scale 0 to ±9999	±(0.03% of rdg + 2digit) ±(0.1% of rdg + 3digit)
2 V	±5 V		
2 A	4 to 20 mA		
3 A	±20 mA		

Excitation power supply : 12 VDC ±5%
24 VDC ±5% 25 mA

Output Specification

• HI & LO setpoints output (A6XXX-1X Relay output)
(A6XXX-2X Photocoupler)

Comparative condition:

Indication > High setpoint	HI
HIgh setpoint ≧ Indication ≧ Lo setpoint	GO
Indication < Lo setpoint	LO

Setting range : -9999 to 9999
Hysteresis : 1 to 999 digit for each setpoints
Relay contact capacity : AC250 V 2 A resistive load
DC30 V 2 A resistive load
Photocoupler capacity : DC30 V 20 mA

Option

• External control (A6XXX-X1)

Start/Hold : Shorted between COM terminal and start/hold terminal or same level → hold
Open COM terminal and start/hold terminal or 5 V → start
D. ZERO : Shorted between COM terminal and D.ZERO terminal → ON
P.HOLD : Shorted between COM terminal and P. HOLD terminal → ON
R.RE (relay reset) : Shorted between COM terminal and R.RE terminal → ON
P.SEL1 to 3 : as below

	pattern 1	pattern 2	pattern 3	pattern 4	pattern 5	pattern 6	pattern 7	pattern 8
P.SEL1	OFF	ON	OFF	ON	OFF	ON	OFF	ON
P.SEL2	OFF	OFF	ON	ON	OFF	OFF	ON	ON
P.SEL3	OFF	OFF	OFF	OFF	ON	ON	ON	ON

ON : Shorted between COM terminal and P.SEL terminal or same level
OFF : Open between COM terminal and P.SEL terminal or 5 V

• BCD output (A6XXX-X2 TTL)
(A6XXX-X3 Open collector)

Type of output : Open collector or TTL
Logic : Changeable
Output rate : DC30 V 10 mA (open collector)
Funout 2 (TTL)

• Analog output (A6XXX-X4)

output	Load resistance	Accuracy	Ripple
0 to 1 V 0 to 10 V 1 to 5 V	more than 10 kΩ	±(0.5% of F.S)	50 mV p-p
4 to 20 mA	less than 550 Ω		25 mV p-p

Output method : PWM method
Scaling : Digital scaling
Resolution : 13 bit
Reponse time : approx 0.5 sec

• RS232C (Conforming to EIA RS-232C)(A6XXX-X5)

Communication method : Full duplex
Transmission speed : 4800/9600/19200/38400 bps
Start bit : 1 bit
Data length : 7 bit/8 bit
Parity : Even parity/ odd parity/ none
Stop bit : 1 bit/2 bit
Character code : ASCII code
Transmission control process : Ignord process

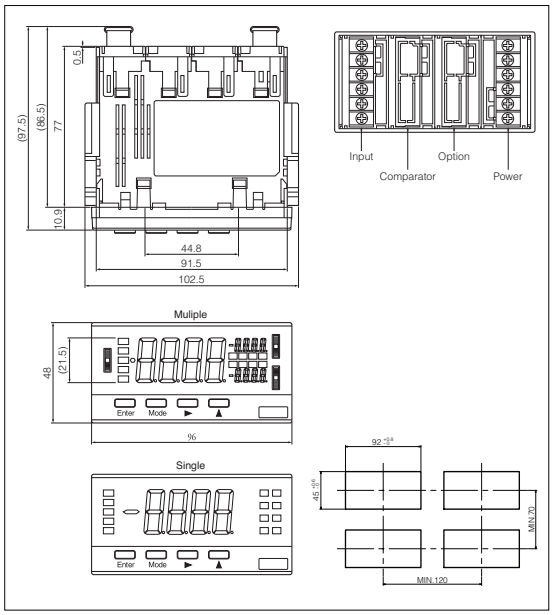
• RS-485 (conforming to EIA RS-485)(A6XXX-X6)

Communication method : Full duplex
Transmission speed : 4800/9600/19200/38400 bps
Start bit : 1 bit
Data length : 7 bit/ 8 bit
Parity : Even parity/ odd marity/ none
Error detection : BCC
Stop bit : 1 bit/2 bit
Character code : ASCII code
Transmssion control process : Ignord process
Signal name : +non reversal output
-reversal output
Maximum no of meter connected : 31
Line length : up to 500m in total

Common Specification

Display	:	Main display Red or Green LED 20 mm Sub display Red LED 6 mm	
Conversion rate	:	1000 times/sec.	
Maximum display	:	9999	
Overrange indication	:	When input exceed the maximum display display OVER or –OVER	
Zero display	:	Leading zero suppression	
Decimal point	:	Settable to any digit position	
Operating temp.	:	0 to 50°C 35 to 85% RH	
Storage temp.	:	–10 to 70°C less than 60% RH	
Power supply	:	AC 100 to 240 V ±10% DC 12 to 48 V ±10%	
Power consumption	:	8 VA (max. load)	
Dimensions	:	96 mm (W) X 48 mm (H) X 97.5 mm (D) DIN size	
Weight	:	approx. 450 g	
Dielectric strength (AC):		Power supply/input terminal/output terminal	AC1500 V/min.
(DC) :		Power supply/input terminal/output terminal	DC500 V/min.
(Common) :		Case/each terminal	AC1500 V/min.
Insulation resistance	:	DC500 V more than 100 MΩ at the above terminals	

Dimensions



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Option	0. none 1. External control 2. BCD output (TTL) 3. BCD output (open collector) 4. Analog output 5. RS-232C 6. RS-485 7. RS-232C, analog output 8. RS-485, analog output
Comparator output	0. none 1. Relay 2. Photocoupler
Input	1. DC voltage 2. DC current 3. DC current 4. AC voltage 5. AC current 6. AC current 7. Resistance 8. Temperature (T/C, RTD) 9. Frequency A. Strain gauge B. Process
Displayb board	1. Multiple 2. Single
Power supply	1. AC 100 to 240 V 2. DC12 to 48 V

We reserve the right to change specifications without notice.

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Printed in Japan, September 2010 (TA)

Universal Type Digital Panel Meter

A7000 SERIES

watanabe

www.watanabe-electric.co.jp

Input Specifications

■ DC voltage,current

• A7X11-X

Range	Measurement Range	Display	Input Protection	Accuracy (23˚C ± 5˚C, 35 ~ 85% RH)
11	±99.99 mV	offset ±9999 full scale ±9999	±50 V	±(0.03% of rdg + 1digit)
12	±999.9 mV		±50 V	
13	±9.999 V		±250 V	
14	±99.99 V		±250 V	
15	±700 V		±700 V	±(0.1% of rdg + 2digit)

Conversion rate: 1000times/sec

• A7X12-X

Range	Measurement Range	Display	Input Protection	Accuracy (23˚C ± 5˚C, 35 ~ 85% RH)
21	±99.99 uA	offset ±9999 full scale ±9999	±10 mA	±(0.1% of rdg + 2 digit)
22	±999.9 uA		±50 mA	
23	±9.999 mA		±50 mA	
24	±99.99 mA		±700 mA	

Conversion rate: 1000times/sec

• A7X13-X

Range	Measurement Range	Display	Input Protection	Accuracy (23˚C ± 5˚C, 35 ~ 85% RH)
25	±999.9 mA	offset ± 9999 full scale ±9999	±3 A	±(0.1% of rdg + 2 digit)
26	±2.000 A			

Conversion rate: 1000times/sec

■ AC voltage, current (TRUE-RMS)

• A7X14-X

Range	Measurement Range	Display	Input Protection	Accuracy (23˚C ± 5˚C, 35 ~ 85% RH)
11	99.99 mV	offset ±9999 full scale ±9999	50 V	±(0.2% of rdg + 20 digit)
12	999.9 mV		50 V	
13	9.999 V		250 V	
14	99.99 V		250 V	
15	700.0 V		700 V	±(0.3% of rdg + 20 digit)

Minimum display 50 digits
Frequency range: 40Hz to 1kHz
Response time: Approx 1 sec(10% to 90%)
Conversion rate: 1000times/sec

• A7X15-X

Range	Measurement Range	Display	Input Protection	Accuracy (23˚C ±5˚C, 35 ~ 85% RH)
21	99.99 uA	offset ±9999 full scale ±9999	10 mA	±(0.5% of rdg + 20 digit)
22	999.9 uA		10 mA	
23	9.999 mA		50 mA	
24	99.99 mA		500 mA	

Minimum display 50 digits
Frequency range: 40Hz to 1kHz
Response time: Approx 1 sec(10% to 90%)
Conversion rate: 1000times/sec

• A7X16-X

Range	Measurement Range	Display	Input Protection	Accuracy (23˚C ±5˚C, 35 ~ 85% RH)
25	999.9 mA	offset ±9999 full scale ±9999	3 A	±(0.7% of rdg + 20 digit)
26	5 A		8 A	

Minimum display 50 digits
Frequency range: 40Hz to 1kHz
Response time: Approx 1 sec(10% to 90%)
Conversion rate: 1000times/sec

■ Resistance

• A7X17-X

Range	Measurement Range	Display	Current	Accuracy (23˚C ±5˚C, 35 ~ 85% RH)
11	99.99 Ω	offset ±9999 full scale ±9999	5 mA	±(0.1% of rdg + 4digit)
12	999.9 Ω		0.5 mA	
13	9.999 KΩ		50 uA	
14	99.99 kΩ		5 uA	

Conversion rate: 100times/sec
Measurement method: Two or Four wire (internal socket changable)

■ Thermocouple • RTD

• A7X18-X

Range	Sensor type	Measurement Range	Maximum Resolution	Accuracy (23˚C ±5˚C, 35 ~ 85% RH)
KA	K	-50.0 to 199.9˚C	0.1˚C	±(0.5% of FS)
KB	K	-50 to 1200˚C	1˚C	±(0.2% of FS)
J	J	-50 to 1000˚C	1˚C	±(0.2% of FS)
T	T	-50 to 400˚C	1˚C	±(0.6% of FS)
S	S	0 to 1700˚C	1˚C	±(0.4% of FS)
R	R	-10 to 1700˚C	1˚C	±(0.4% of FS)
B	B	100 to 1800˚C	1˚C	±(0.4% of FS)
PA	PT100 Ω	-100.0 to 199.9˚C	0.1˚C	±(0.15% of FS)
PB	PT100 Ω	-100 to 600˚C	1˚C	±(0.3% of FS)

available Fahrenheit display
Cold junction compensator accuracy : ±2˚C (10 to 40˚C)
Sensor lead resistance : less than 50 Ω
Linearzing method : Digital linearizing
Burn out alarm : - - - - -
Conversion time : 2.5times/sec

■ Frequency

• A7X19-X

Range	Measurement Range	Accuracy (23°C ±5, 35 ~ 85% RH)
11	0.1 to 999.9 Hz	±(0.2% of FS)
12	1 to 9.999 kHz	
13	10 to 99.99 kHz	

Input type	Input voltage level	Input Protection
Open collector	L: less than 1.5 V (5V, pullup)	30 V
Logic	L: less than 1 V, HI: 2.5 to 15 V	15 V
Magnet	0.3 to 30 V P-P	30 V
Voltage	30 V rms to 500 V rms	500 V

Prescale : 0.01 ~ 10.00
PPR : 1~100
Power supply for sensor : 12 VDC ±10%

■ Strain gauge

• A7X1A-X

sensor	Zero adjustment range	Span adjustment range	Measurement range	Accuracy
5 V	-1 to + 1 mV/V	1 to 3mV/V	-4 ~ + 4 mV/V	±(0.1% of FS) + 2 digit
10 V				

Sesnor : 350 Ω
Power supply for sensor : 5 V ± 5% (less than 15 mA)
10 V ± 5% (less than 30 mA)
Conversion speed : 1000/sec

■ Process

• A7X1B-X

sensor	Measurement Range	Display	Accuracy
1 V	1 to 5 V	offset: ±9999 full scale 0 to ±9999	±(0.03% of rdg + 2digit) ±(0.1% of rdg + 3digit)
2 V	±5 V		
2 A	4 to 20 mA		
3 A	±20 mA		

Conversion rate : 1000times/sec
Excitation power supply : 12 VDC ±5%
24 VDC ±5% 25 mA

Output Specification

• HH, HI & LO, LLsetpoints output

Comparative condition:

Indication > High High setpoint	HH
High High setpoint ≧ Indication > High setpoint	HI
High setpoint ≧ Indication ≧ Lo setpoint	GO
Low setpoint > Indication ≧ Low Low setpoint	LO
Low Low setpoint > Indication	LL

Setting range : -9999 to 9999
Hysteresis : 1 to 999 digit for each setpoints
Relay contact capacity : AC125 V 0.3 A resistive load
DC30 V 1 A resistive load
Photocoupler capacity : DC30 V 50 mA

• BCD output

Type of output : Open collector or TTL
Logic : Changeable
Output rate : DC30 V 10 mA (open collector)
Funout 2 (TTL)

• Analog output (PWM)

output	Load resistance	Accuracy	Ripple
0 to 1 V	more than 10 kΩ	±(0.5% of F.S)	±50 mV p-p
0 to 10 V			
1 to 5 V			
4 to 20 mA	less than 550 Ω		±25 mV p-p

Output method : PWM method
Scaling : Digital scaling
Resolution : 13 bit
Reponse time : approx 0.5 sec

• RS232C (Conforming to EIA RS-232C)

Communication method : Full duplex
Transmission speed : 4800/9600/19200/38400 bps
Start bit : 1 bit
Data length : 7 bit/8 bit
Parity : Even parity/ odd parity
Stop bit : 1 bit/2 bit
Character code : ASCII code
Transmission control process : Ignord process

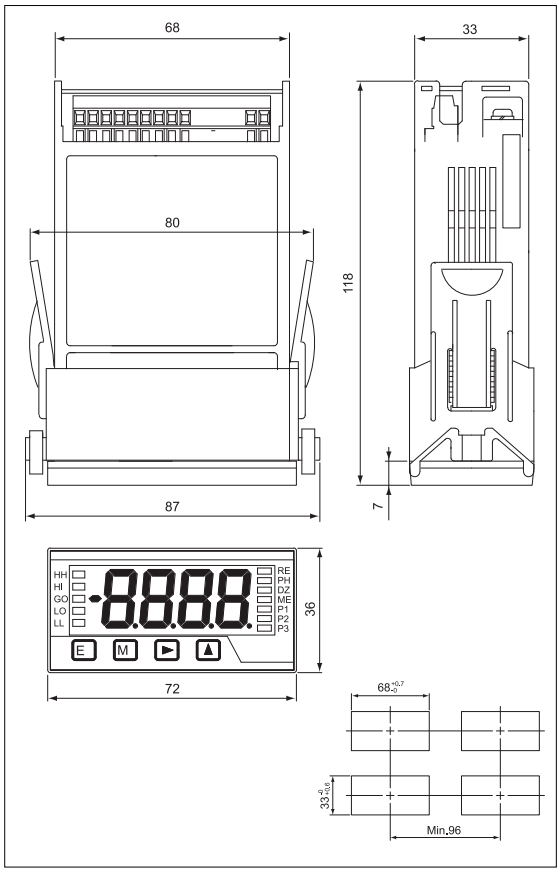
• RS-485 (conforming to EIA RS-485)

Communication method : Full duplex
Transmission speed : 4800/9600/19200/38400 bps
Start bit : 1 bit
Data length : 7 bit/ 8 bit
Parity : Even parity/ odd marity
Error detection : BCC
Stop bit : 1 bit/2 bit
Character code : ASCII code
Transmssion control process : Ignord process
Signal name : +non reversal output
-reversal output
Maximum no of meter connected : 31
Line length : up to 500m in total

Common Specification

Maximum display	:	9999	
Overrange indication	:	When input exceed the maximum display display OVER or -OVER	
Zero display	:	Leading zero suppression	
Decimal point	:	Settable to any digit position	
Operating temp	:	0 to 50°C (35 to 85% RH)	
Storage temp.	:	-10 to 70°C less than 60%RH	
Power supply	:	100 to 240VAC ± 10% 12 to 48VDC	
Power consumption	:	8VA (At AC) 7W(At DC)	
Dimensions	:	72mm (W) × 36mm (H) × 118mm (D)	
Weight:approx	:	160g	
Dielectric strength (AC):		Power supply/input terminal/output terminal	AC1500 V/min
(DC)	:	Power supply/input terminal/output terminal	DC500 V/min
	:	Input terminal/output terminal	DC500V/min
Insulation resistance	:	DC500V more than 100M at the abo ve terminals	

Dimensions



Ordering Code

A 7 □ 1 □ – □

Output
0. none
1. Relay output
2. Photocoupler output
3. BCD output (TTL)
4. BCD output (Open collector)
5. BCD output (TTL), Photocoupler output
6. BCD output (Open collector), Photocoupler output
7. Analog output
8. Analog output, Photocoupler output
9. RS-232C
A. RS-485
B. RS-232C, Photocoupler output
C. RS-485, Photocoupler output

Input
1. DC voltage
2. DC current
3. DC current
4. AC Voltage
5. AC current
6. AC current
7. Resistance
8. Temperature (T/C, RTD)
9. Frequency
A. Strain gauge
B. Process

Power supply
1. AC100 to 240V
2. DC12 to 48V

We reserve the right to change specifications without notice.

watanabe

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UNIVERSAL TYPE DIGITAL PANEL METER

A8000

■Featuers

- **Power Supply : 5V to 12VDC, 12V to 24VDC**
- **BCD Output (option)**
- **4 1/2 digit**

Input Specifications

■DC voltage , current

●A83□1-0□ (DC voltage)

range	Measurement Range	Display	Input Protection	Accuracy (23°C ± 5°C, 35 to 85%RH)
11	± 199.99mV	offset ± 19999 full scale ± 19999	± 50V	± (0.1% of rdg + 2 digit)
12	± 1.9999V		± 50V	
13	± 19.999V		± 250V	
14	± 199.99V		± 250V	

●A83□2-0□ (DC current)

range	Measurement Range	Display	Input Protection	Accuracy (23°C ± 5°C, 35 to 85%RH)
22	± 1.9999mA	offset ± 19999 full scale ± 19999	± 50mA	± (0.2% of rdg + 2 digit)
23	± 19.999mA		± 50mA	
24	± 199.99mA		± 3A	
25	± 1999.9mA		± 3A	

■AC voltage, current (TRUE-RMS)

●A83□4-0□ (AC voltage)

range	Measurement Range	Display	Input Protection	Accuracy (23°C ± 5°C, 35 to 85%RH)
11	199.99mV	offset ± 19999 full scale ± 19999	50V	± (0.2% of rdg + 20 digit)
12	1.9999V		50V	
13	19.999V		250V	
14	199.99V		250V	

Frequency range : 40Hz to 1kHz
Response time : Approx 1 sec (10% to 90%)
Dead band : 100 digit

●A83□5-0□ (AC current)

range	Measurement Range	Display	Input Protection	Accuracy (23°C ± 5°C, 35 to 85%RH)
23	19.999mA	offset ± 19999 full scale ± 19999	50mA	± (0.5%of rdg + 20 digit)
24	199.99mA		3A	
25	1999.9mA		3A	

Frequency range : 40Hz to 1kHz
Response time : Approx 1 sec (10% to 90%)
Dead band : 100 digit

■Process

●A83□B-0□

range	Measurement Range	Display	Input Protection	Accuracy (23°C ± 5°C, 35 to 85%RH)
1V	1 to 5V	Offset : ± 19999 Fullscale ± 9999	± 50V	± (0.1% of rdg + 3digit)
2V	4 to 20mA		± 50mA	± (0.2% of rdg + 3digit)

Excitation power supply : 24VDC ± 10% 30mA

■Thermocouple • RTD

●A83□C-0□ (Thermocouple)

range	Sensor type	Measurement Range	Maximum Resolution	Accuracy (23°C ± 5°C, 35 to 85%RH)
KA	K	-50.0 to 199.9°C	0.1°C	± (0.5% of FS)
KB	K	-50 to 1200°C	1°C	± (0.2% of FS)
J	J	-50 to 1000°C	1°C	± (0.2% of FS)
T	T	-50 to 400°C	1°C	± (0.6% of FS)
S	S	0 to 1700°C	1°C	± (0.4% of FS)
R	R	-10 to 1700°C	1°C	± (0.4% of FS)
B	B	100 to 1800°C	1°C	± (0.4% of FS) applied over 500°C

Cold junction compensator accuracy : ± 2°C (10 to 40°C)
Sensor lead resistance : less than 50
Linearzing method : Digital linearizing
Burn out alarm : - - - - -

●A83□D-0□ (RTD)

range	Sensor type	Measurement Range	Maximum Resolution	Accuracy (23°C ± 5°C, 35 to 85%RH)
PA	PT100	-100.0 to + 199.9°C	0.1°C	± (0.15% of FS)
PB	PT100	-100 to + 600°C	1°C	± (0.3% of FS)

available Fahrenheit display

Output Specification

●BCD output

Type of output: Open collector or TTL
Logic: Changeable
Output rate: DC30V 10mA (open collector)
Funout 2 (TTL)

●External Control

Hold: Shorted HOLD terminal and COM terminal or equipotential, Hold ON
Digital Zero: Shorted DZ terminal and COM terminal or equipotential, Digital zero ON
Peak Hold: Shorted PH terminal and COM terminal or equipotential, Peak hold ON

■Common Specification

Display: Red LED 10mm height
Maximum display: -19999 to 19999
Conversion rate: 20times/sec
Overrange indication: When input exceed the maximum display display OL or -OL
Zero display: Leading zero suppression
Decimal point: Settable to any digit position
Operating temp: 0 to 50° C (35 to 85% RH)
Storage temp: -10 to 70° Cless than 60%RH
Power supply: 5V to 12VDC, 12V to 24VDC
Power consumption: Appro x 1.5W
Dimensions: 48mm (W) x 24mm (H) x 96mm (D)
DIN size
Weight (unit only) : Appro x 100g
Dielectric strength: Power supply/input terminal/output terminal/external control DC500V/min
Input terminal/output terminal/external control DC500V/min
Case/each terminal AC1500V/min
Insulation resistance: DC500V more than 100M Ω at the above terminals

UNIVERSAL TYPE DIGITAL PANEL METER

A8000

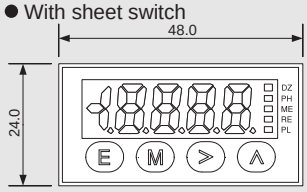
■Ordering Code

A8 □ □ □ – 0 □

Option	1. none 2. BCD (TTL), external control 3. BCD (Open collector), external control
Input	1. DC voltage 2. DC current 4. AC voltage 5. AC current B. Process C. Thermocouple D. RTD
Front sheet	1. with sheet switch 2. without print sheet swtich
Power supply	3. 5V to 12VDC 4. 12V to 24VDC

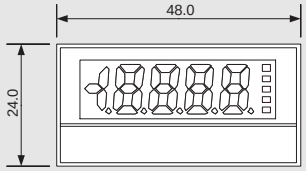
■Dimensions

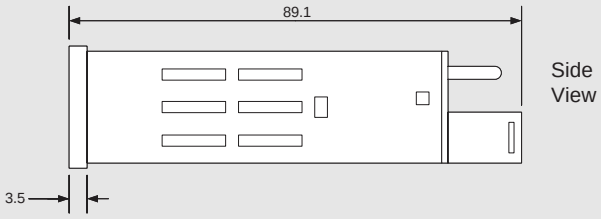
● With sheet switch



Front View

● Without sheet switch





Side View

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NEW!

■ **Features**

* DIN size (48X96mm)
* BCD output (option)

■ **Input specifications**

●DV voltage measurement

Range	Measurement Range	Display	Accuracy	input impedance	Maximum allowable input
11	±199.99mV	Offset ±19999 Fullscale ±19999	±(0.1% of rdg+2 digit)	100MΩ	±50V
12	±1.9999V				
13	±19.99V			Approx.1MΩ	±250V
14	±199.99V				

●DC voltage measurement 15 range

Range	Measurement Range	Display	Accuracy	input impedance	Maximum allowable input
15	±700.0V	Offset ±19999 Fullscale ±19999	±(0.1% of rdg+3 digit)	100MΩ	±700V

●DC current measurement

Range	Measurement Range	Display	Accuracy	input impedance	Maximum allowable input
22	±1.9999mA	Offset ±19999 Fullscale ±19999	±(0.2% of rdg+2 digit)	Approx.10Ω	±50mA
23	±19.999mA				
24	±199.99mA			Approx0.1Ω	±3A
25	±1999.9mA				

●Process signal measurement

Range	Measurement Range	Display	Accuracy	input impedance	Maximum allowable input
2A	4～20mA	Offset ±19999 Fullscale ±19999	±(0.2% of rdg+3digit)	Approx.10Ω	±50mA
1V	1～5V		±(0.1% of rdg+3digit)	Approx.1MΩ	±50V
3V	0～±10V		±(0.1% of rdg+3digit)	Approx1MΩ	±50V

●**Common specification**

Operating Type	: Δ Σ conversion type
Input Circuit	: Single Ended Type
Sampling speed	: Maximum 25 times per second
Over range alarm	: Display O.L.or -O.L. applying to maximum display for the input
Display	: red 7 segment LED (character height 14.2mm)
Display range	: -19999～19999
Maximum display	: 19999
Zero display	: Leading zero suppress
Built-in EEPROM	
Number of rewriting	: 1,000,000 times(min)
Operating temperature and humidity range	: 0～50℃35～85%RH
Storage temperature and humidity range	: -10～70℃ not less than 60% RH
Dimensions	: 96mm(H) × 48mm(W) × 75mm(D)
Weight	: 160g(TYP)(AC power supply)/ 150g(TYP)(DC power supply)
Dielectric voltage	: power supply signal input/BCD output / Betweens of external control input AC 1500V per minute(AC power supply) power supply signal input/ BCD output/ Betweens of external control input DC500V per minute(DC power supply) Signal input BCD output/betweens of external control DC500V per minute(common) Case betweens of each terminal AC 1500V per minute (common)
Insulated resistance	: In the above interterminal DC 500V 100MΩ
Attention	: Built-in rewriting EEPROM, in the case of digital zero "OFF" to "ON", setup "ON", digital zero "OFF" to "ON". Please be sure that number of rewriting not surpassing the above number of cases

●AC current (A9111-0□,A9112-0□)

Power supply voltage range: AC100～240V±10%

Consuming VA: 4.5VA

●DC power supply (A9311-0□,A9312-0□)

Power supply voltage range: DC5-5%～12V+10%

Electric power consumption: 1.5W

●DC power supply(A9411-0□,A9412-0□)

Power supply voltage range: DC12～24V±10%

Electric power consumption: 1.5W

■External control

Hold	"Hold terminal or COM terminal" short, or hold "ON" with the "0" level
Digital zero	"DZ terminal or COM terminal" short or digital zero "ON" with the "0" level
Peak hold	"PH terminal or COM terminal" short or peak hold function "ON" with the "0" level
Pattern select	By the combination of P.SEL0 terminal, P.SEL1 terminal open/short(or "1" level/"0" level),select the scaling pattern
Attention)	"0" level :0～1.5V apply to COM, "1" level : 3.5～5V apply to COM

■Option specification

●BCD output

◎At TTL(A9□11-02,A9□1-02)

Measurement data	Tri-state parallel BCD
Porality signal	"1" level at minus display
"OVER" signal	"1" level at OVER display
Printing command signal	A positive pulse of approx.1ms at every measurement
Output logic	Available for switching (except the printing commnad signal)
Output signal	TTL level, funout 2 CMOS 5V

◎At open collector

Measurement data	Negative logic transistor "ON" at logic 1
Polarity signal	Transistor "ON" at minus input
"OVER" signal	Transistor "ON" at overflow input
Printing command signal	Transistor "ON" durina a period of approx.20ms At every measurement completion
Transistor output capacity	Applied voltage 30V max Current 10mA max Saturated output voltage,less than 1.2V at 10mA

●ENABLE

Function	Shorted Enable and COM terminals, Transistor OFF. (High impedance status at TTL) "0" level :applying to COM 0～1.5V "1" level :applying to COM 3～5V

■Ordering Code

A9□1□-0□

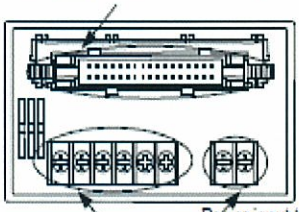
Output: 1 None (only for display)
2 BCD TTL
3 BCD open collector

Input: 1 DC voltage measurement
E DC voltage measurement (15 range)
2 DC current measurement
B Process signal measurement

Power supply:
1 AC power supply AC 100～240V
3 DC power supply DC 5-12 V
4 DC power supply DC 12-24V

■ Connection diagram

BCD output / External control input connector



Suitable solder less terminal
5.8mm or less 5.8mm or less

●DC voltage/current measurement

① Input terminal HI (11,12range,22,23range + side input) terminal)
② Input terminal HI (13,14range,24,25range + side input) terminal)
③ Input terminal LO (-side input terminal)
④⑤⑥ NC terminal

●DC voltage measurement 15 range

① Input terminal HI (15 range + side terminal)
③ Input terminal LO(15 range - side input terminal)
②④⑤⑥ :NC terminal

●Process signal measurement

① Input terminal HI (2A range +seide input terminal)
② Input terminal HI(1V range + seide input terminal)
③ Input terminal HI(3V range + seide input terminal)
④ Input terminal LO(minus side input terminal)
⑤⑥ NC terminal

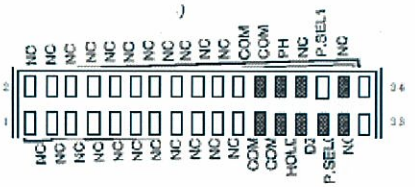
●Power supply

Please do not connect to the NC
⑦ Power supply terminal(In the case of DC power supply 0V)
⑧ Power supply terminal(In the case of DC power supply +V)

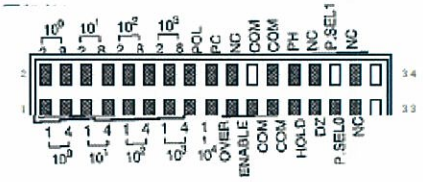
This panel meter has no power supply switch so that if connecting to power supply directly to operating condition.

●BCD output ・external control

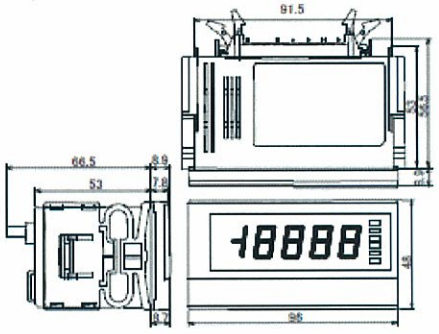
Upper terminals (without BCD outputs)



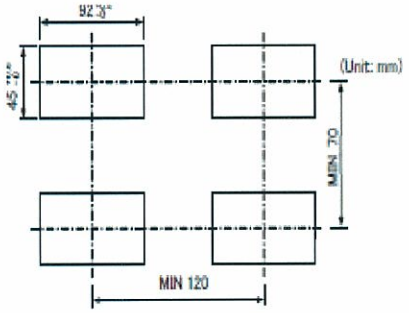
Upper terminals (with BCD outputs)



■Dimensions



■Panel cut diagram



※Recommended panel thickness 0.8 to 5 mm

DIGITAL PANEL METER

A1000

■Features

- Low cost
- Bright LED 14.2mm (red)
- AC power and DC power available

Input Specifications

■DC Voltage, current

· DC voltage measurement (Range 11 to 14)

Range	Measurement Range	Input Impedance	Input Protection	Accuracy (23°C±5°C, 35 to 85%)
11	±199.9mV	100M	±100V	± (0.3% of F.S)
12	±1.999V			
13	±19.99V	1M	±250V	
14	±199.9V		±150V	

· DC current measurement (Range 23 to 25)

Range	Measurement Range	Input Resistance	Input Protection	Accuracy (23°C±5°C, 35 to 85%)
23	±19.99mA	10	±150mA	± 0.5% of F.S
24	±199.9mA	1	±500mA	
25	±1.999A	0.1	±3A	

■AC Voltage, current

· AC voltage measurement (Range 12 to 14 Average)

Range	Measurement Range	Input Impedance	Input Protection	Accuracy (23°C±5°C, 35 to 85%)
12	1.999V	1M	50V	± 0.5% of F.S
13	19.99V		50V	
14	199.9V		500V	

Input Frequency: 40 Hz to 100Hz
Rectifier Circuit : Represents effective value of sine wave by demodulation of mean value
Response time: approx 1 sec (10 to 90%)

· AC current measurement (Range 23 to 26 Average)

Range	Measurement Range	Input Resistance	Input Protection	Accuracy (23°C±5°C, 35 to 85%)
23	19.99mA	10	150mA	± 1.0% of F.S
24	199.9mA	1	500mA	
25	1.999A	0.1	3A	
26	5A	1	8A	

Input Frequency: 40 Hz to 100Hz
Rectifier Circuit : Represents effective value of sine wave by demodulation of mean value
Response time: approx 1 sec (10 to 90%)

■Thermocouple (Range KC, JC)

Range	Sensor Type	Measurement Range	Max Resolution	Accuracy (23°C±5°C, 35 to 85%)
KC	K	0 to +1000°C	1°C	± 0.8% of F.S
JC	J	0 to +400°C	1°C	

Sensor lead Resistance: less than 50
Burn out: Flash -1999
Over input voltage: ±5VDC
Cold Junction Compensator Accuracy:±2° C

■RTD (Pt100) (Range PA, PJ)

Range	Sensor Type	Measurement Range	Max Resolution	Accuracy (23°C±5°C, 35 to 85%)
PA	Pt100	-100.0 to +199.9°C	0.1°C	± 0.2% of F.S
PJ	Pt100	-200 to +600°C	1°C	± 0.4% of F.S

Current for resistance : 1mA (TYP)
External lead resistance: less than 1 ohm per lead

■Process (Range 1V, 2A)

Range	Measurement Range	Display	Input Impedance	Input Protection	Accuracy (23°C±5°C, 35 to 85%)
1V	1 to 5V	offset ±1000	1M	±100V	± 0.3% of F.S
2A	4 to 20mA	fullscale ±100 to 1999	51	50mA	± 0.4% of F.S

■Common Specification

Input bias current: 50 pA (TYP)
Sampling speed: 2.5/sec
Over range indication: When input exceeds the maximum display flash 1999
Max. display: 1999
Display: Red LED 14.2mm height
Dimensions: 96mm (H) X 48mm (W) X 75mm (D) DIN size
Power supply: 90 to 132 VAC
180 to 264 VAC
5 to 24 VDC
Power Consumption: 1.5 VA at AC power
100mA at DC power
Operating Temp.: 0 to 50° C, 35 to 85%RH
Storage Temp.: -10 to 70° C less than 60% RH
Dielectric Strength: Power supply and input, 1500 VAC/1min at AC power
Power supply and input, 500 VDC/1min at DC power
Insulattion Resistance : 500 VDC 100M at above terminals

DIGITAL PANEL METER

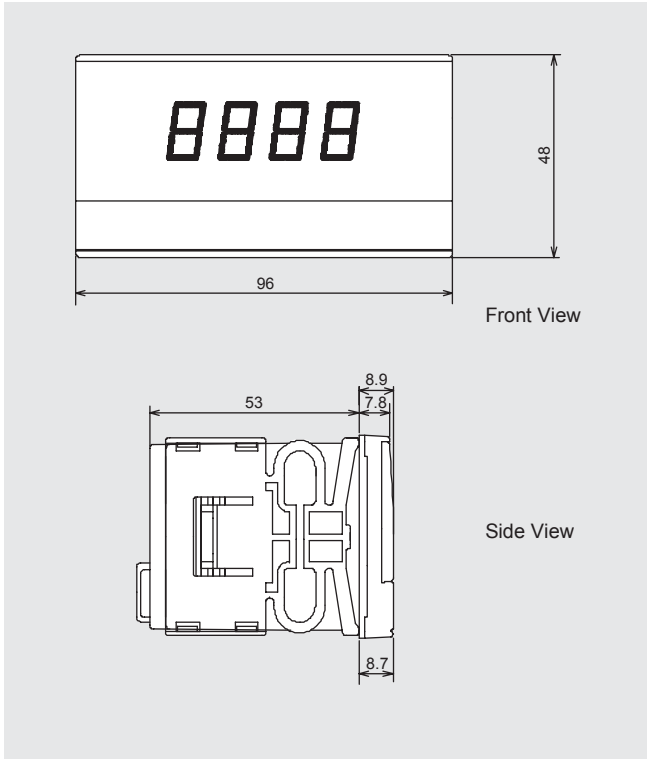
A1000

■Model Code

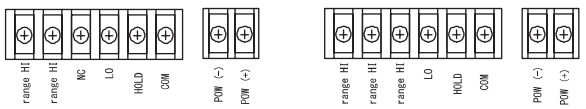
A1□1□-□□

- Range
- Input: 1. DC voltage
  2. DC current
  4. AC voltage
  5. AC current
  6. AC current 5A
  B. Process
  C. Thermocouple
  D. RTD
- Power Supply 1. 90 to 132 VAC
  2. 180 to 264 VAC
  3. 5 to 24 VDC±10%

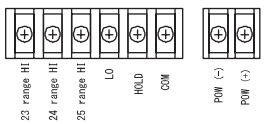
■Dimensions



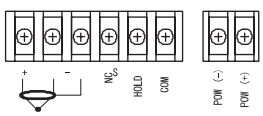
■Connection Diagram



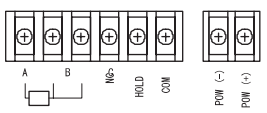
DC voltage (11 to 14 range)
AC voltage (12 to 14 range)



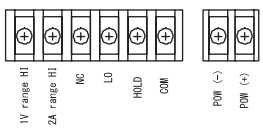
DC current (23 to 25 range)
AC current (23 to 25 range)



Thermocouple (KC, JC)



RTD (PA, PJ)



Process

DIGITAL PANEL METER

A2100

■ Features

- LED hight 10mm
- Power supply 5VDC or 5 to 24VDC
- 3 1/2 digit

■ DC Voltage Measurement

Range	Measurement Range	Input Impedance	Input Protection	Accuracy
11	±199.9mV	100M	±50V	± (0.1% of F.S)
12	±1.999V			
13	±19.99V	1M	±250V	
14	±199.9V			

■ DC Current Measurement

Range	Measurement Range	Input Impedance	Input Protection	Accuracy
22	±1.999mA	100	±50mA	± (0.2% of F.S)
23	±19.99mA	10	±150mA	
24	±199.9mA	1	±500mA	
25	±1.999A	0.1	±3A	

■ Power supply

●Non-isolation type
Voltage: 5VDC±5%
Consumption: 60mA

●Isolation type
Voltage: 5 to 24VDC
Consumption: 100mA

■Specification

Input configuration:	Single Ended
Conversion rate:	2.5/sec
Max display:	1999
Overrange indication :	When input exceeds the maximum display, 0000 or -0000 flashes
Display :	Red LED, 10mm
Polarity :	A "-" is displayed automatically
Decimal point :	Settable to any digit position by front SW
External control :	Hold
Operating Temp. :	0 to 50°C 35 to 85% RH
Dimensions :	48mm(W) ×24mm(H) ×39.7mm(D) DIN size
Weight :	40g
Dielectric strength :	Power supply and input terminal at 500VDC/1min Case and each terminals at 1500VAC/1min
Insulation resistance :	500VDC 100MΩ at the above terminals

* Replacement for AP-200, AP-201A, AP-202A(no option)

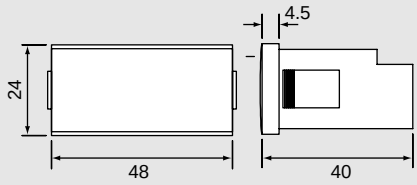
■ Ordering Code

A21□0-□□

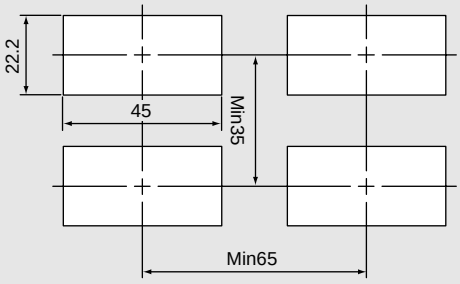
Range
- 11. ±199.9mV
- 12. ±1.999V
- 13. ±19.99V
- 14. ±199.9V
- 22. ±1.999mA
- 23. ±19.99mA
- 24. ±199.9mA
- 25. ±1.999A

Power Supply
1. non-isolation type (5VDC)
2. isolation type (5 to 24VDC)

■ Dimensions



■ Panel Cutout



DIGITAL PANEL METER

A2200

■ Features

- LED hight 10mm
- Power supply 5 to 24VDC (Isolation)
- 4 1/2 digit

■ DC Voltage Measurement

Range	Measurement Range	Input Impedance	Input Protection	Accuracy
12	±1.999V	100M	±50V	± (0.1% of F.S)
13	±19.99V	1M	±250V	
14	±199.9V			

■ Ordering Code

A2220-□□

Range
- 12. ±1.9999V
- 13. ±19.999V
- 14. ±199.99V

■ Power supply

●Isolation type

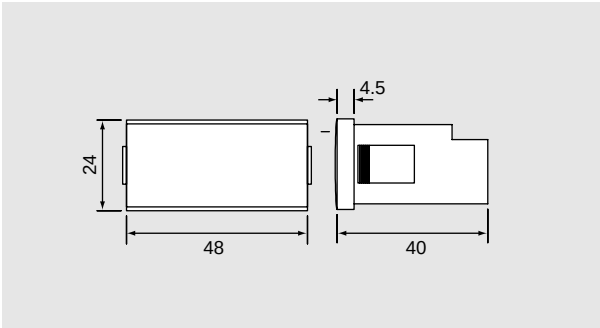
Voltage: 5 to 24VDC
Consumption: 100mA

■ Specification

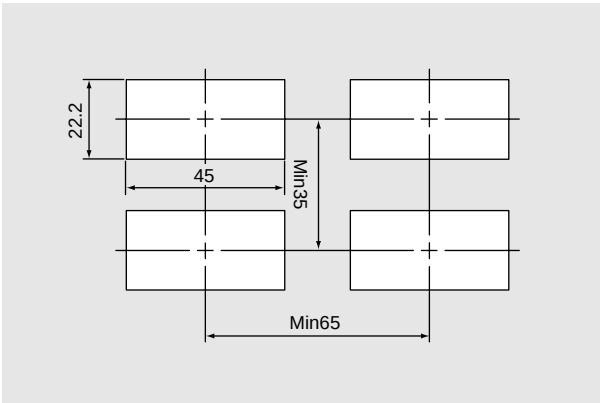
Input configuration:	Single Ended
Conversion rate:	2.5/sec
Max display:	19999
Overrange indication :	When input exceeds the maximum display, 0000 or -0000 flashes
Display :	Red LED, 10mm
Polarity :	A "-" is displayed automatically
Decimal point :	Settable to any digit position by front SW
External control :	Hold
Operating Temp. :	0 to 50°C 35 to 85% RH
Dimensions :	48mm(W) ×24mm(H) ×39.7mm(D) DIN size
Weight :	40g
Dielectric strength :	Power supply and input terminal at 500VDC/1min Case and each terminals at 1500VAC/1min
Insulation resistance :	500VDC 100M Ω at the above terminals

* Replacement for AP-241A, AP-242A, AP-244A(no option)

■ Dimensions



■ Panel Cutout



Remote Monitor

AI-406

Features

★ BCD Parallel input
★ With latch
★ Leading zero suppression
★ Bright LED, 14.2mm (Red)

Ordering code

AI - 406 - □ □

Code	Power supply
1	5Vdc
2	12Vdc

Code	Pull-up resistance
1	4.7kΩ
2	100kΩ

BCD parallel input

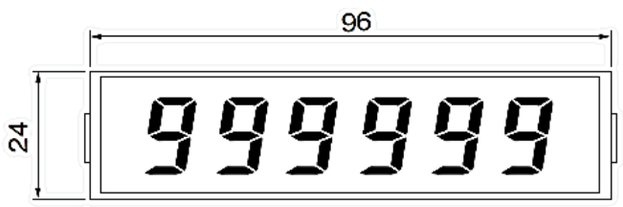
Model & code	Input level	Input pull-up resistance	Power supply
AI-406-11	TTL	4.7kΩ	5Vdc
AI-406-12	CMOS	100kΩ	5Vdc
AI-406-22	0 ≤ L ≤ 2 10 ≤ H ≤ 12	100kΩ	12Vdc

Specifications

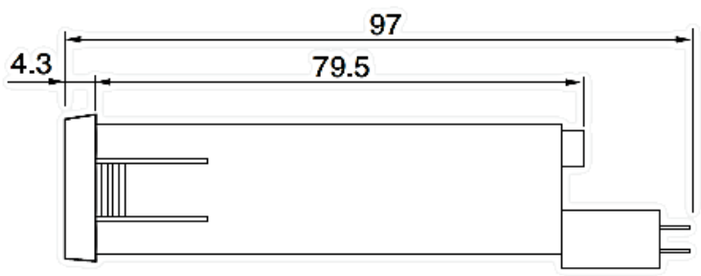
Input	Parallel BCD Input 5Vdc (CMOS / TTL level) 12Vdc (0 ≤ L ≤ 2, 10 ≤ H ≤ 12)
Zero display	Leading zero suppression (option)
Display	999999 (6 digits) LED (red) 14.2mm
External control	Data Latch : Latch terminal and 0V terminal(short) BCD Data Latch Display
Decimal point	Able to set to any digit
Power supply	5Vdc ±10%, 12Vdc ±10%
Operating temperature	0 to 50°C
Operating relative humidity	35 to 85% (non-condensing)
Power consumption	Approx. 35mA / digit
Dimensions	96mm(W) x 24mm(H) x 97mm(D) DIN size
Weight	Approx. 90g

Dimensions

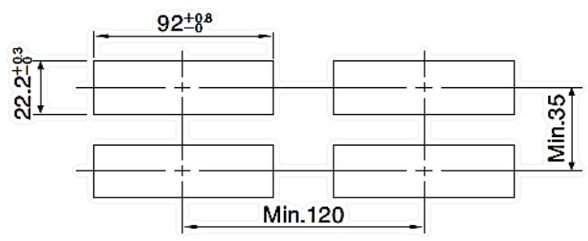
◆Front view



◆Side view



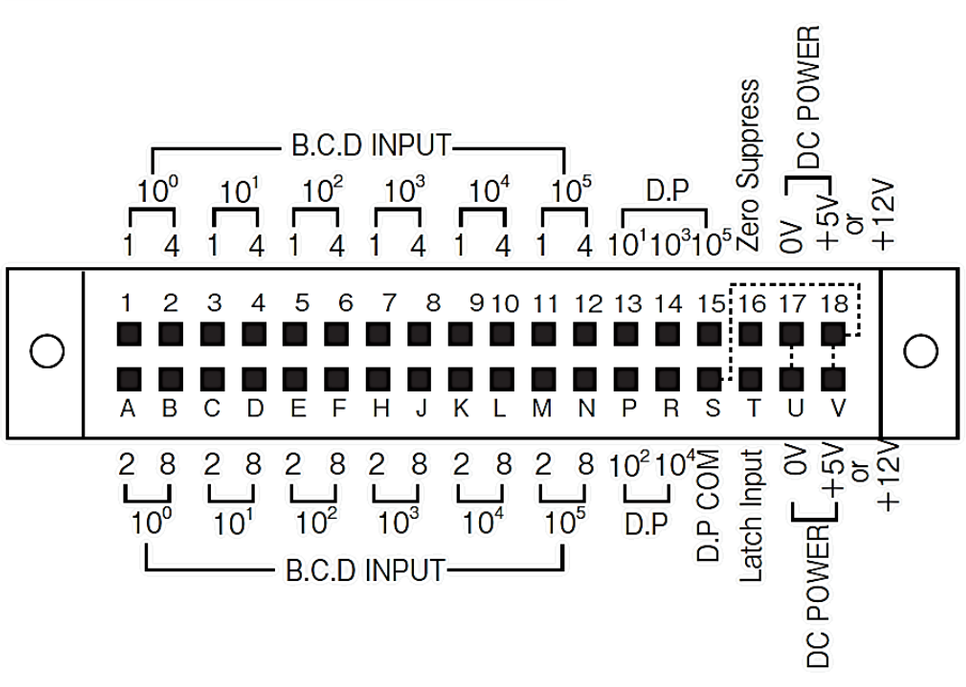
◆Panel cutout



Panel thichness 0.8 to 4.0mm

(Unit : mm)

Terminal Connections



∗ **Specification is subject to change without notice**

Remote Monitor

AI-416

Features

★ BCD Parallel input
★ With latch
★ Leading zero suppression
★ Bright LED, 14.2mm (Red)
★ Power supply, 24Vdc

Ordering code

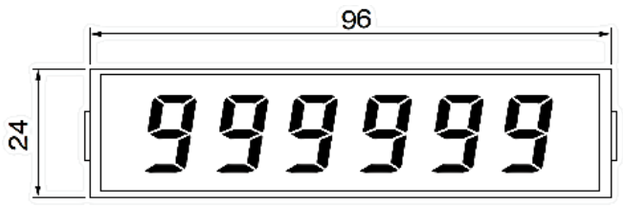
AI - 416

Specifications

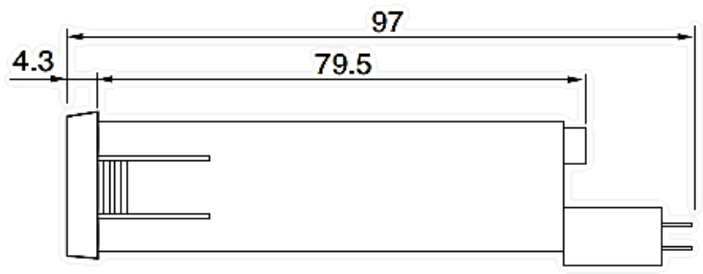
Input	Parallel BCD Input 24Vdc (0 ≤ L ≤ 2, 20 ≤ H ≤ 24)
Zero display	Leading zero suppression (option)
Display	999999 (6 digits) LED (red) 14.2mm
Decimal point	Able to set to any digit
External control	Latch Positive logic : Latched BCD input is displayed with the latch and 24V terminals shorted or at 24V. Negative logic : Latched BCD input is displayed with the latch and 0V terminals shorted or at 0V.
Power supply	24Vdc ±10%
Operating temperature	0 to 50°C
Operating relative humidity	35 to 85% (non-condensing)
Power consumption	Approx. 90mA
Dimensions	96mm(W) x 24mm(H) x 97mm(D) DIN size
Weight	Approx. 130g

Dimensions

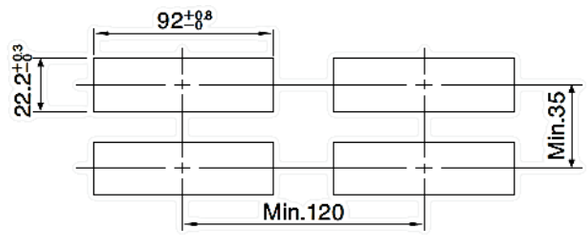
◆Front view



◆Side view



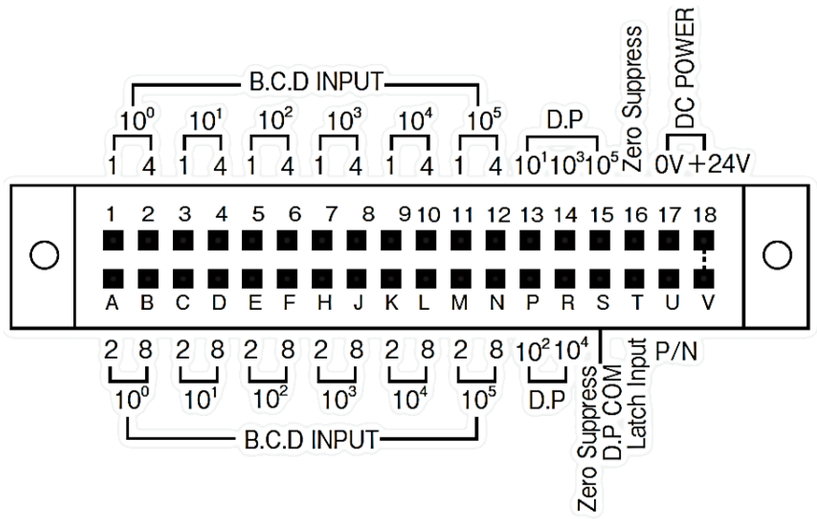
◆Panel cutout



Panel thichness 0.8 to 4.0mm

(Unit : mm)

Terminal Connections



∗ **Specification is subject to change without notice**

AI-105A

*Polarity Display

■ Features

- BCD Parallel input (Positive or Negative logic)
- With Polarity display
- Leading Zero suppression
- Bright LED, 14.2mm (Red)

■ BCD Parallel Input

Model & Code	Input Level	Input pull up Resistance	Power Supply
AI-105A-11	TTL	4.7kΩ	DC5V
AI-105A-12	CMOS	100kΩ	DC5V
AI-105A-22	10 ≦ H ≦ 12 0 ≦ L ≦ 2	100kΩ	DC12V

■ Ordering Code

AI-105A- □□

- Pull-up Resistors { 1. 4.7kΩ, 2. 100kΩ
- Power Supply { 1. DC5V, 2. DC12V

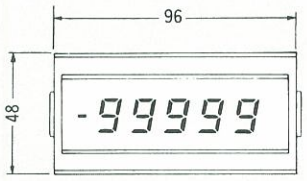
Note: Not available AI-105A-21

■ Specifications

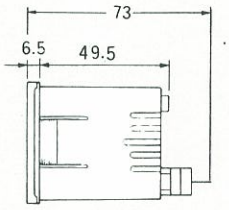
Data Input:	Parallel BCD input (Selectable positive or negative logic) 5VDC (CMOS/TTL level) 12VDC (0≦L≦2, 10≦H≦12)
Max. Display:	-99999
Display:	LED, 14.2mm 5 digits
Polarity:	Display "-", when terminal 14 open or logic "1" at positive logic Display "-", when terminal 14 and 17, U shorted or logic "0" at negative logic
External Control:	Data latch, when terminal R open or logic "1" at positive logic Data latch, when terminal r and 17, U shorted at negative logic
Decimal Point:	Settable to any digit position
Segment Chec:	Terminal 13 and COM shorted
Power Supply:	5VDC±10% 12VDC±10%
Power Consumption:	Max. 30mA per digit (Display "8")
Dimensions:	48(H) X 96(W) X 73(D) mm DIN size
Weight:	95 g (Unit only)
Accessories:	Connector, Instruction manual

■ Dimensions

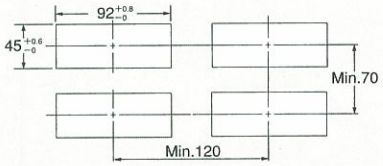
Front



Side

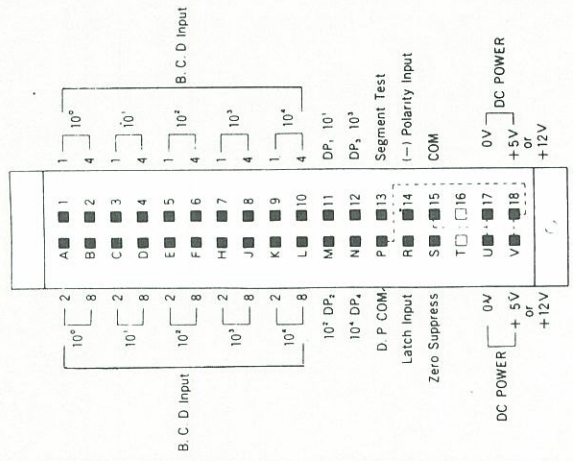


Panel Cutout



Panel thickness 0.8~5.0mm

■ Connection Diagram



1/8 DIN Totalizing Counter

AC-116B

Features

★ Standard DIN size.
★ Leading zero suppression
★ Latch function
★ 12Vdc, 50 mA built in excitation. (Sensor power supply)

Ordering code

AC - 116B - □ 2

Code	Power supply
1	90 to 132Vac
2	180 to 264Vac

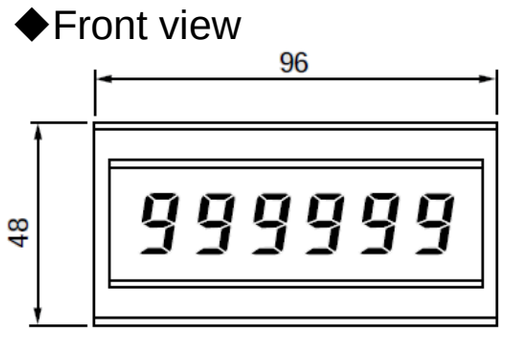
Code	Description
2	with Count backup function

Specifications

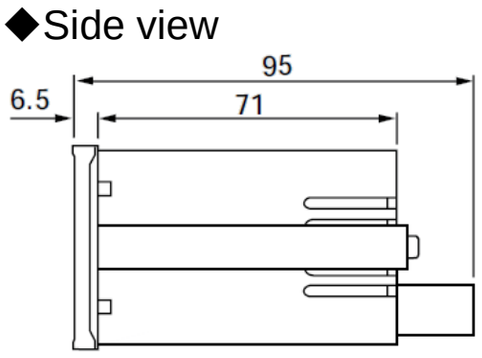
Count input	Contact : Counted when contact is closed (Use built in external power supply) Voltage : 'L' Counted at the rise to 'H' 'L' : 0 to 2Vdc, 'H' : 4.5 to 30Vdc
Maximum counting speed	10cps/5kcps (cycle per second) (By input terminal selection)
Minimum pulse width	10cps : 50ms, 5kcps : 0.1ms (cycle per second)
Input resistance	10cps : 6kΩ, 5kcps : 12kΩ (cycle per second)
Display	Max. 999999 counts (6 digits) LED (red) 14.2mm
Zero display	Leading zero suppression
Memory protection	EEPROM (non-volatile memory) Duration : 10 years (Number of rewrites : 100,000 times)
Decimal point	Able to set to any digit
External control	•Reset (When coltage is applied to reset terminals) Contact : Reset at rise to 'H' Voltage : 'L' Reset at rise to 'H', 'L' : 0 to 2Vdc, 'H' : 4.5 to 30Vdc Minimum pulse width, 0.1ms or more input resistance 6kΩ Response time ON/OFF : 0.1ms or less Automatically reset when power is turned ON (Not reset for battery built in type) •Latch (Latched when voltage is applied to latch terminals) If latch input is applied during input rise is displayed without any modifications. However, Since counting continues, the present counted value is displayed when latch input is released. Contact : Latched when contact is closed (Used built in excitation power supply) Voltage : 'L' Latched rise to 'H', 'L' : 0 to 2Vdc, 'H' : 4.5 to 30Vdc Response time : 0.1ms or less Input resistance 6kΩ
Built in excitation	External power supply for sensor +12Vdc, 50mA (at 100/200 Vac) Ripple : 5% or less
Operating temperature	0 to 50°C
Operating relative humidity	35 to 85% (non-condensing)
Power supply	90 to 132Vac, 180 to 264Vac
Power consumption	Approx. 3.5VA at (100Vac/200V, when 50mA excitation power supply)
Dimensions	96mm(W) x 48mm(H) x 95mm(D) DIN size
Dielectric strength	1500VAC per 1 min. : Power supply terminal - Earth(E), Ground(GND)
Insulation resistance	500Vdc, 100MΩ or more on the above terminals
Weight	Approx. 350g

Dimensions

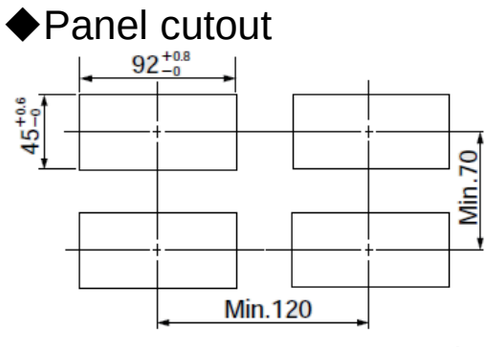
◆Front view



◆Side view

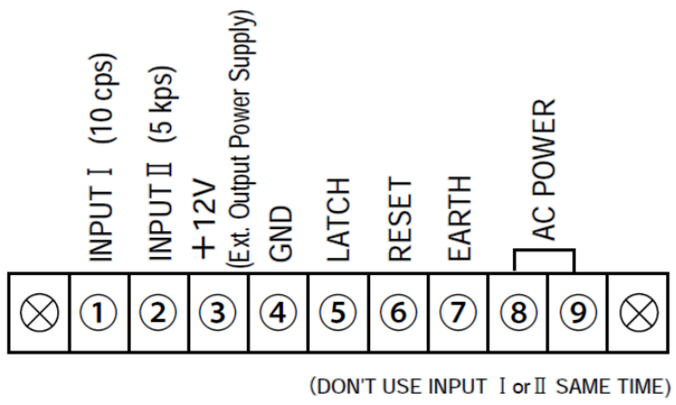


◆Panel cutout



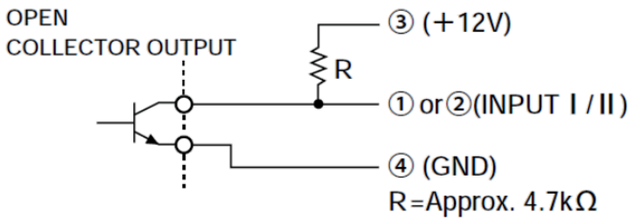
(Unit : mm)

Terminal Connections



(DON'T USE INPUT Ⅰ or Ⅱ SAME TIME)

＊IF YOU USE OPEN COLLEECTOR,
PLEASE CONNECT RESISTOR AS FOLLOWS.



ONE COUNT WHEN TRASISTOR ON → OFF

＊ Specification is subject to change without notice

SETPOINT COMPARATOR

AM-215A

■Featuers

- AL1 and AL2 set-point
- Bright LED 8mm (Red)
- 1 to 5V, 4 to 20mA Measurement
- Power Supply DC24V ±20% (isolated)
- Offset +/-9999 adjustable
- Fullscale +/-9999 adjustable

■DC Voltage Measurement

Model	Range	Display Adjustable	Input Impedance	Max. Allowed Input
AM-215A-11	±99.99mV	Offset ±9999 Full scale ±9999	100MΩ or more	±50V
AM-215A-12	±999.9mV			
AM-215A-13	±9.999V		Approx. 1MΩ	
AM-215A-1V	1 to 5V			

Accuracy : ±(0.03% of rdg. +2 digit) (23℃ ±5℃)

■DC Current Measurement

Model	Range	Display Adjustable	Input Impedance	Max. Allowed Input
AM-215A-2A	4-20mA	Offset ±9999 Full scale ±9999	Approx. 50Ω	±50mA

Accuracy : ±(0.1% of rdg. +2 digit) (23℃ ±5℃)

* This accuracy is for (FSC - OFS) / $\frac{(FIN - OIN)}{*1} \leqq 1$

*1 : 1V [(FIN - OIN) × 2], 2A : [(FIN – OIN) × 5]

■Specifications

Measurement function :	Select either DC voltage or DC current (single range)
Input circuit :	Single ended
Operation type :	Sigma -Delta conversion
Sampling speed :	Max. 25 per second
Display :	Red 7-segment LED display (character height : approx. 8mm)
Polarity display :	A minus sign is displayed if the operation result is negative.
Out-of-range warning :	"oL" or "-oL" is displayed with respect to the input signal when the value is outside the display range.
Max. display :	±9999 (full 4 digits)
Decimal point :	Can be set at any position using the front-panel flat switches.
Zero display :	Leading zero suppress
Backup :	Settings are held in EEPROM (guaranteed for 100,000 writes)
Operating temperature and humidity ranges :	0 to 50℃, 35 to 85% RH (no condensation)
Storage temperature and humidity ranges :	-20 to 70℃, 60% or less RH (no condensation)
Supply voltage :	DC 24V ±20%
Consumed power :	Approx. 2.2W
External dimensions :	48(W) × 24(H) × 87.8(D)
Weight :	Approx. 100g
Withstand voltage :	DC 500V for 1 minute across power terminals/input terminals and each output terminal. DC 500V for 1 minute across input terminals/each output terminal. AC 1500V for 1 minute across case/power terminals, input terminals, and each output terminal.
Insulating resistance :	100MΩ or more with DC 500V across the terminals listed above.
Standard accessories :	Operation manual, unit seal
Conformity standard :	EN61326+A1, +A2 E247481

●External control unit

Digital zero : Digital zero is turned ON when the DZ terminal and COM terminal are shorted or at the same potential.

●External power supply unit

Rating : DC 24V ±5%

Max. load : 25mA

●Comparator unit

Control method : Microcomputer computation

Setting range : -9999 to +9999

Comparator operation : Depends on sampling speed

Comparator conditions :

HI / GO / LO mode

Comparator condition	Check result display		Output		
	AL1	AL2	OUT1	OUT2	OUT3
Measurement value＞HI limit value	OFF	ON	OFF	OFF	ON
LO limit value≦Measurement value≦HI limit value	OFF	OFF	OFF	ON	OFF
LO limit value＞Measurement value	ON	OFF	ON	OFF	OFF

HH / HI / GO mode

Comparator condition	Check result display		Output		
	AL1	AL2	OUT1	OUT2	OUT3
Measurement value＞HH limit value	ON	ON	OFF	ON	ON
Measurement value＞HI limit value	ON	OFF	OFF	ON	OFF
HI limit value≧Measurement value	OFF	OFF	ON	OFF	OFF

GO / LO / LL mode

Comparator condition	Check result display		Output		
	AL1	AL2	OUT1	OUT2	OUT3
Measurement value≧LO limit value	OFF	OFF	OFF	OFF	ON
LO limit value＞Measurement value	OFF	ON	OFF	ON	OFF
LL limit value＞Measurement value	ON	ON	ON	ON	OFF

Setting condition : HI / GO / LO mode HI limit value＞LO limit value
HH / HI / GO mode HH limit value＞HI limit value
GO / LO / LL mode LO limit value＞LL limit value

Hysterisis : For each comparator all limit value can be set as 1 to 999 digits.

●Relay output unit

Output ratings : DC 24V, 1A (resistance load)

●Photocoupler output unit

Output ratings : MAX. 30V 50mA

Output saturation voltage : 1.2V max. at 50mA

●Optional unit
Analog output unit (can not be installed together with RS-485)

Output function: 4 to 20mA (AM-215A-XX-6X) or 0 to 10V (AM-215A-XX-7X)

Output specifications:

Mode	Load Resistance	Accuracy	Ripple
4 to 20mA	0 to 250Ω	±(0.5% of FS)	25mVp-p max.
0 to 10V	10kΩ min.		50mVp-p max.

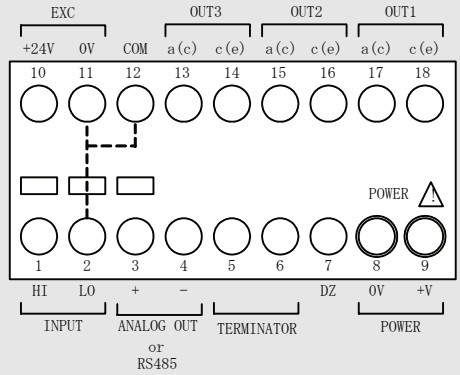
SETPOINT COMPARATOR

AM-215A

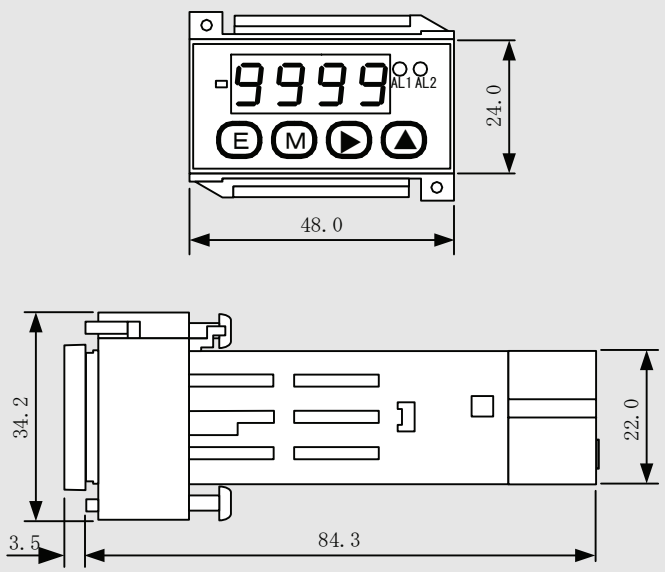
●RS-485 unit

Synchronization method :	Start-stop synchronization
Communication method :	2-wire half-duplex (poling selecting)
Transfer rates :	38400 / 19200 / 9600 / 4800 / 2400
Start bit :	1 bit
Data length :	7 bits / 8 bits
Parity bit :	Even / Odd / None
Error check :	Block check character (BCC) checksum
Stop bit :	1 bit / 2 bits
Character code :	ASC Ⅱ code
Delimiter :	CR+LF / CR
Transmission control protocol :	None
Used signal name :	Non-inverted (+), inverted (-)
Max. connected units :	Max. 31 meters
Max. line length :	500 meters (total)

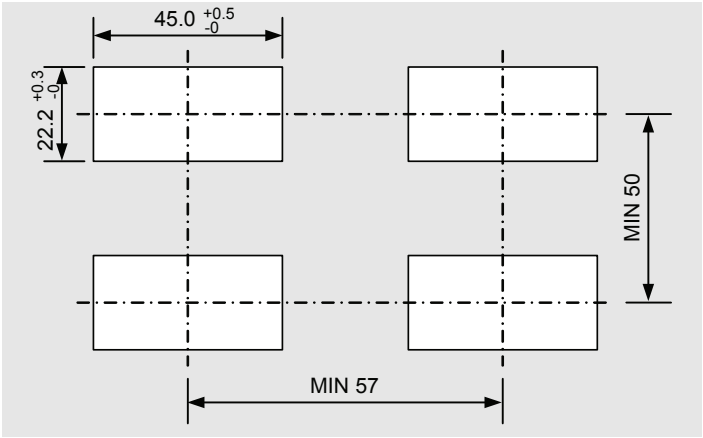
■Connection Diagram



■Dimensions



■Panel Cut Out



■Ordering Code

AM-215A- □□ - □□

- Comparator output □
  - 1 : Ralay
  - 2 : Photo coupler
- Option output □
  - 1 : None
  - 4 : RS-485 interface
  - 6 : Analog output (4-20mA)
  - 7 : Analog output (0-10V)
- Input range □
  - 11 : 11 range (±99.99mV)
  - 12 : 12 range (±999.9mV)
  - 13 : 13 range (±9.999V)
  - 1V : 1V range (1-5V)
  - 2A : 2A range (4-20mA)

DC VOLTMETER & AMMETER

AP-101

✻Standard 3 1/ 2 Digit

■ Features

- Low Cost
- Bright LED 14.2mm (Red)
- AC180~264V, 90~132V, DC5V, DC24V
- 200mV~200V, 200μA~2A Measurement
- ±800V Measurement (option)

■ DC Voltage Measurement

Model	Range	Maximum Resolution	Input Impedance	Input Protection
AP-101-11	±199.9mV	100∝V	100M	±250V
AP-101-12	±1.999 V	1mV	100M	±250V
AP-101-13	±19.99 V	10mV	10M	±250V
AP-101-14	±199.9 V	100mV	10M	±500V

Accuracy: ±0.1% rdg. ±1 digit (23° C±5° C)

■ DC Current Measurement

Model	Range	Maximum Resolution	Internal Resistance	Input Protection
AP-101-21	±199.9∝A	100nA	1k	±10mA
AP-101-22	±1.999mA	1∝A	100	±50mA
AP-101-23	±19.99mA	10∝A	10	±150mA
AP-101-24	±199.9mA	100∝A	1	±500mA
AP-101-25	±1.999A	1mA	0.1	±3A

Accuracy: ±0.2% rdg. ±1 digit (23° C±5° C)
±0.3% rdg. ±1 digit only for AP-101-25

■ Specifications

Input Configuration:	Single Ended
Input Bias Current:	50PA (Typ.)
Conversion Rate:	2.5/sec
Normal Mode Rejection:	TYP.40dB (50/60Hz)
Zero Stability:	Automatic Zero Adjustment
Display:	LED. 14.2mm 3 1/2-digit
Polarity:	A "-" is displayed automatically
Decimal Point:	Settable to any digit position
Overrange Indication:	When input exceeds the maximum display, 1999 flashes.
Power Supply:	AC90~132V AC180~264V DC5V±5%, 100mA (Max.) DC24V±20%, 30mA (Max.)
Operating Temperature:	0~50° C, 35 to 85% RH
Power Consumption:	1.5VA
Dimensions:	48(H) · 96(W) · 73(D)mm DIN Size
Weight:	Approx. 150g (For AC), 85g (For DC)
Dielectric Strength:	AC type: Between input (Lo) terminal and earth, DC500V Between power supply terminal and input terminal, earth, common, case, AC1500V/1 min. DC type: Between input (Lo) and power supply (0V), DC±500V
Insulation Resistance:	DC500V 100M at above terminals

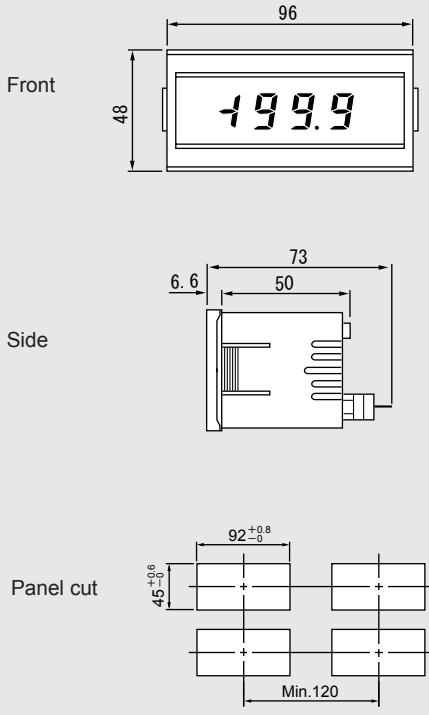
■ Ordering Code

AP-101-□□-□

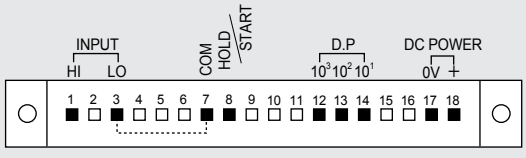
Power Supply
1. AC90~132V
2. AC180~264V
3. DC5V (Isolated)
4. DC24V (Isolated)

Range
11 21
〃 〃
14 25
15 ±800V (Option)

■ Dimensions



■ Connection Diagram



DC VOLTMETER & AMMETER

AP-301

✻Compact Size, 14.2mm LED

■ Features

- Compact Size, 36(H) · 72(W) · 29(D)mm
- Bright LED, 14.2mm (Red)
- DC5V(Non-Isolated)
- 200mV~200V Measurement
- Isolated DC24V Available (Option A or D)

■ DC Voltage Measurement

Model	Range	Maximum Resolution	Input Impedance	Input Protection
AP-301-11	±199.9mV	100 ∝V	100M	±100V
AP-301-12	±1.999V	1mV	100M	±100V
AP-301-13	±19.99V	10mV	10M	±250V
AP-301-14	±199.9V	100mV	10M	±500V

Accuracy: ±0.1% rdg. ±1 digit (23° C ±5° C)

■ Ordering Code

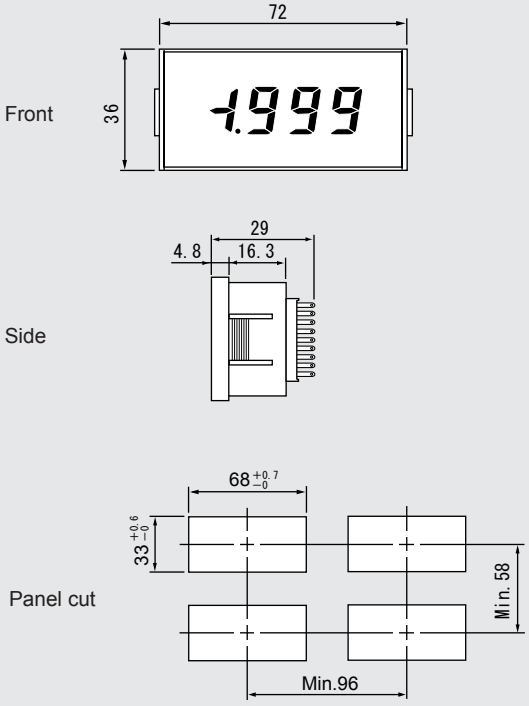
AP-301-□□-□

- Option
  - A. Screw Terminal, 4-20 mA (Range code 11)
  - B. Screw Terminal, Scaling (Range code 11-14)
  - C. Screw Terminal, Range Select (Range code 12-14)
  - D. Screw Terminal, DC-DC Isolated power supply(5V DC)
  - BLANK-None
- Range
  - 11 1V
  - ~
  - 14

■ Specifications

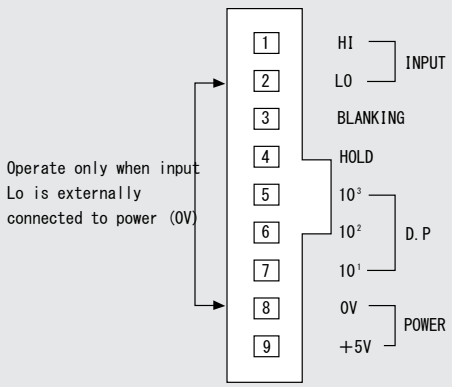
Input Configuration:	Single Ended
Input Bias Current:	50PA (Typ.)
Conversion Rate:	2.5/sec
Normal Mode Rejection:	40dB (Typ.) (50/60Hz)
Zero Stability:	Automatic Zero Adjustment
Display:	LED, 14.2mm 3 1/2-digit
Polarity:	A "-" is displayed automatically
Decimal Point:	Settable to any digit position
Overrange Indication:	When input exceeds the maximum display, 1999 flashes
Power Supply:	DC5V ±5%, 80mA (Max.)
Operating Temperature:	0~50° C, 35 to 85%RH
Power Consumption:	400mW
Dimensions:	36(H) · 72(W) · 29(D)mm DIN Size
Weight:	Approx. 35g
Dielectric Strength:	Between input (Lo) terminal and case, AC1500V/1 min. Between input (Lo) terminal and power supply (0V), DC500V
Insulation Resistance:	DC500V 100M at above terminals

■ Dimensions



Panel thickness 0.8 to 3.5mm

■ Connection Diagram



1/8 DIN DC Voltmeter

AP-501B

Prohibiting Use of
Hazardous Substances

Features

★ Standard DIN size.
★ Slim design (snap-in installation).
★ Short depth 34.5mm

Ordering code

AP - 501B - □□

Code	Input range
11	±199.9mV
12	±1.999V
13	±19.99V
14	±199.9V

Input Specifications

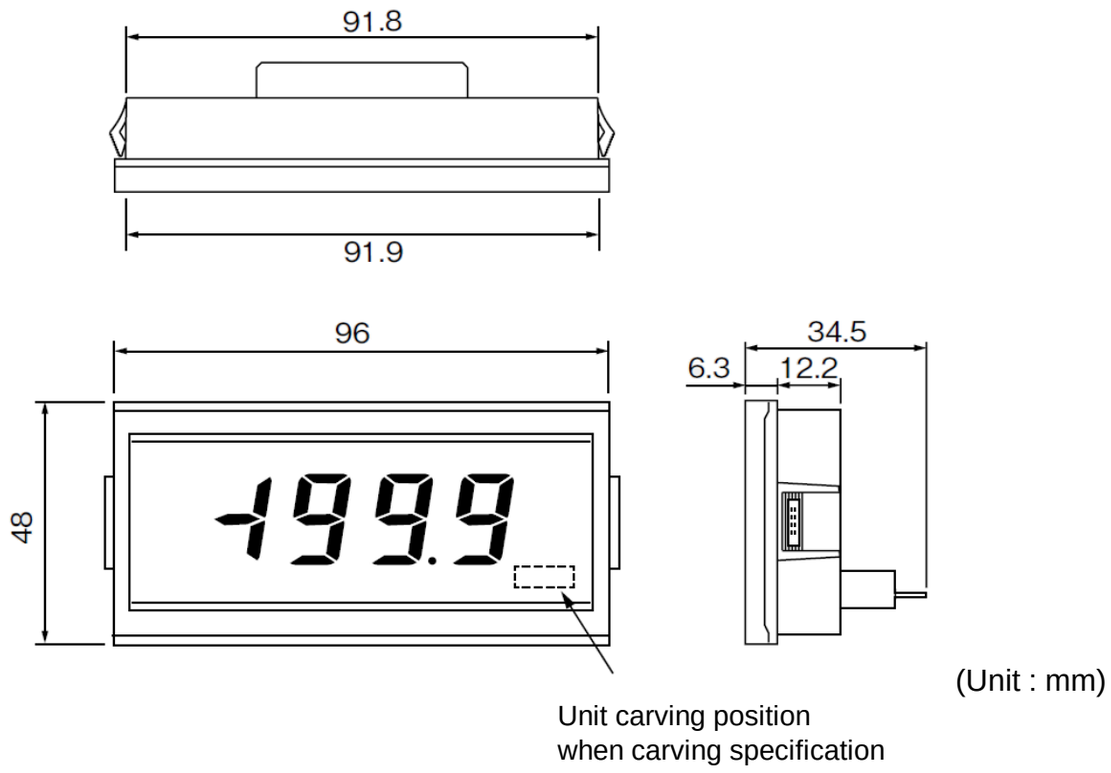
◆DC voltage

Model	Measurement range	Resolution	Impedance	Max. allowable input	Accuracy
AP-502A-11	±199.9mV	100μV	100MΩ	±100V	±(0.1% reading +1 digit)
AP-502A-12	±1.999V	1mV			
AP-502A-13	±19.99V	10mV	10MΩ	±250V	
AP-502A-14	±199.9V	100mV		±500V	

Specifications

Display	Red 7 segment LED (height 14.2mm)
Polarity	'-' is displayed at negative polarity
Display range	±1999 (3 1/2 digits)
Scaling function	None
Over range display	When input exceeds the max. display, 1999 or -1999 flashes
Decimal point	Able to set to any digit (Swiches by key switch)
Zero display	Leading zero suppression
Operating temperature	0 to 50°C
Operating relative humidity	35 to 85% (non-condensing)
Power supply	5Vdc ±5% (non-isolation)
Power consumption	100mA max.
Dimensions	96mm(W) x 48mm(H) x 34.5mm(D)
Weight	Approx. 50g
Dielectric strength	1500Vac per 1 min. : Between input terminal (LO) and mounted plate
Insulation resistance	500Vdc, 100MΩ or more on the above terminals
Sampling rate	Approx. 400ms (2.5 times per second)
Built in excitation (Sensor power supply)	None
Standard accessory	Connectter

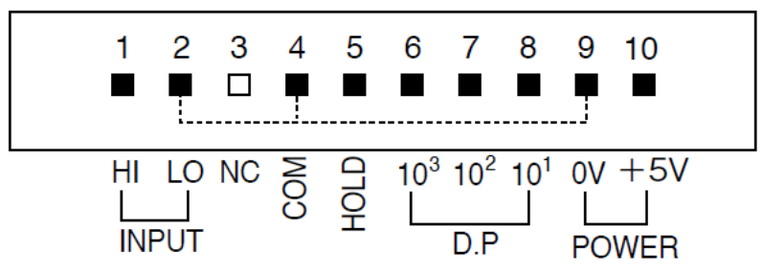
Dimensions



(Unit : mm)

Unit carving position
when carving specification

Terminal Connections



No.	Terminal name	Remarks
1	HI (+)	Input terminal (+)
2	HI (-)	Input terminal (-)
3	NC	No connection
4	COM	External control common terminal
5	HOLD	Hold
6	D.P 10^3	Decimal point 10^3
7	D.P 10^2	Decimal point 10^2
8	D.P 10^1	Decimal point 10^1
9	POWER (-)	Power supply terminal (-)
10	POWER (+)	Power supply terminal (+)

∗ **Specification is subject to change without notice**

DC VOLTMETER & AMMETER

AP-540

■ Features

- Bright LED, 14.2 mm (Red)
- Thin Case (Depth 34.5 mm)
- Power supply DC 5V (Non-isolated)
- 200 mV～200 V measurement

■ DC Voltage Measurement

Model	Range	Maximum Resolution	Input Impedance	Input Protection
AP-540-11	±199.99mV	10μV	100M	±100V
AP-540-12	±1.9999V	100μV	100M	±100V
AP-540-13	±19.999V	1mV	1M	±250V
AP-540-14	±199.99V	10mV	1M	±500V

Accuracy:±(0.03% of rdg +1 digit)°C@25°C 45~75%RH)

■ Specifications

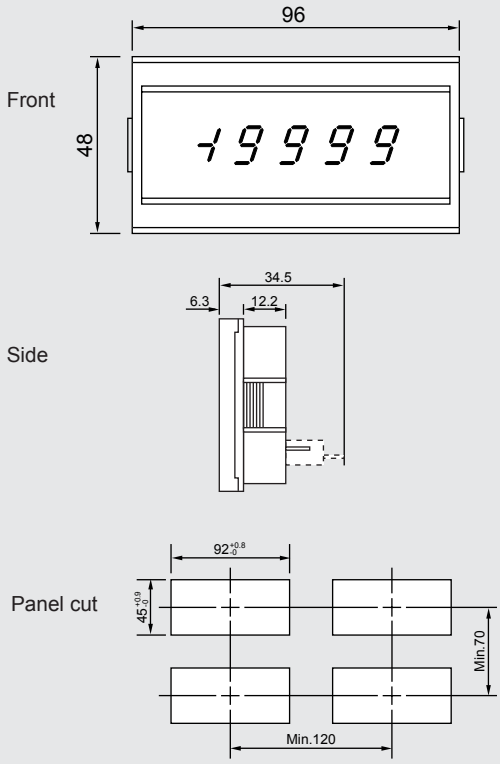
Input configuration:	Single ended
Input bias current:	100 pA (TYP.)
Conversion rate:	2.5/sec
Normal mode rejection:	More than NMR50dB (50/60 Hz)
Maximum display:	19999
Overrange indication:	When input exceeds the maximum display, 0000 flashes
Display:	LED, 14.2 mm (Red)
Polarity:	A "-" is displayed automatically
Hold:	START/HOLD terminal and 0 V shorted or level "0"
Start:	START/HOLD terminal and 0 V open or level "1"
Decimal point:	Settable to any digit position
Operating temperature:	0~50° C 35~85%RH
Power supply:	DC 5 V±5%
Power consumption:	75 mA (Max.)
Dimensions:	48(H) · 96(W) · 34.5(D)mm DIN size
Weight (unit):	Approx. 60 g
Dielectric strength:	Between LO and case, AC 1500 V/1 min.
Insulation resistance:	More than DC 500 V 100 MΩ at the above terminals
Accessory:	Connector, instruction manual

■ Ordering Code

AP-540-□□

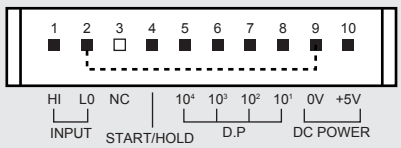
Range { 11, 12, 13, 14

■ Dimensions



Panel thickness 0.8 to 3.2mm

■ Connection Diagram



□ 영업 및 기술지원 네트워크

제품 및 견적문의 :sales@sunden.co.kr / 기술지원문의 : tech@sunden.co.kr

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