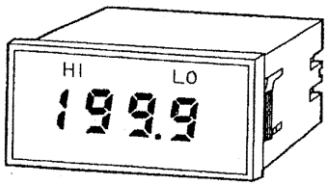
# DIGITAL METER RELAY
# MODEL AM-212 SERIES
# INSTRUCTION MANUAL




■Meaning of warning mark

| | |
|---|---|
| ⚠ WARNING | This mark indicates that if the meter is operated incorrectly, death or serious injury may result. |

■Caution marks

**⚠ CAUTION**

| | |
|---|---|
| ⚠ | The mark on the label indicates the measuring range in Item 2. Specifications. |
| | Do not disassemble the meter or touch the components and parts inside the meter with the power turned on or input connected. |

## ⚠ Precautions

(1) The application of voltage or current exceeding its maximum allowable value to the input terminals may result in instrument damage.
(2) The supply of power out of its allowable range may cause fire, electric shock or instrument failure.
(3) The content of this manual may subject to change without prior notice for product improvement.
(4) This manual is carefully prepared. However, if any question arises, or any mistake, omission or suggestion is found in the content of this manual, contact your nearest our sales agent.
(5) Make this manual available easily anytime.

Caution required when the AM-212 is used on equipment conforming to EN/IEC Standards!
For the AM-212 with an input signal of more than 70VDC, connect its HOLD and ANALOG out terminals to the equipments whose foundation is isolated.

## 1. Outline

The AP-212 digital meter relay is a scaling meter with the 2-step setting analog comparator function. It is provided with the output of 2-stage relays and analog signal as the standard specification. It has case dimensions of 48mm×24mm conforming to DIN Standard and is driven by a power supply voltage of 24V DC.

Its display uses 7-segment LEDs with a character height of 8mm with a maximum display of 1999.

## 2. Specifications

■Instrumentation signal input

(DC voltage measurement)

| Model/Range code | Measuring range | Display | Input impedance | Max. allowable input voltage |
|---|---|---|---|---|
| AM-212-1V | 1 to 5V | Offset ±1000<br>Fullscale<br>100 to 1999 | Approx. 1MΩ | ±250V |

Accuracy : ±(0.1% of rdg +2digit)(23℃±5℃、35 to 85%RH)

■Instrumentation signal input

(DC current measurement)

| Model/Range code | Measuring range | Display | Input resistance | Max. allowable input current |
|---|---|---|---|---|
| AM-212-2A | 4 to 20mA | Offset ±1000<br>Fullscale<br>100 to 1999 | 51Ω | ±70mA |

Accuracy : ±(0.1% of rdg +2digit)(23℃±5℃、35 to 85%RH)

■DC voltage measurement

| Model/Range code | Measuring range | Display | Input impedance | Max. allowable input voltage |
|---|---|---|---|---|
| AM-212-11 | ±199.9mV | Offset ±1000<br>Fullscale<br>±100 to 1999 | 100MΩ | ±100V |
| AM-212-12 | ±1.999V | | 10MΩ | ±250V |
| AM-212-13 | ±19.99V | | 10MΩ | ±250V |
| AM-212-14 | ±199.9V | | 10MΩ | ±500V |

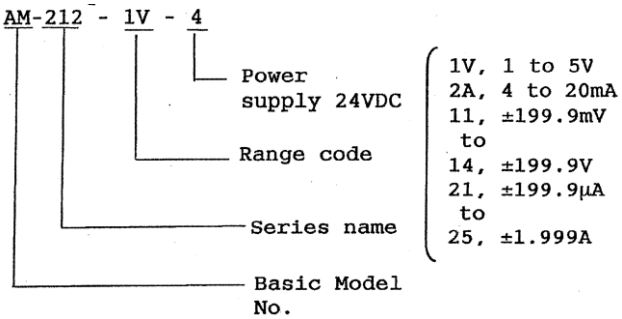
Accuracy : ±(0.1% of rdg +2digit)(23℃±5℃、35 to 85%RH)

■DC current measurement

| Model/Range code | Measuring range | Display | Input resistance | Max. allowable input current |
|---|---|---|---|---|
| AM-212-21 | ±199.9μA | Offset ±1000<br>Fullscale<br>±100 to 1999 | 1kΩ | ±10mA |
| AM-212-22 | ±1.999mA | | 100Ω | ±50mA |
| AM-212-23 | ±19.99mA | | 10Ω | ±150mA |
| AM-212-24 | ±199.9mA | | ※1Ω | ±500mA |
| AM-212-25 | ±1.999A | | ※0.1Ω | ±3A |

Accuracy : ±(0.2% of rdg +2digit)(23℃±5℃、35 to 85%RH)
However, only for the AM-212-25: ±(0.3% of rdg +1digit)
*In the internal resistance column: Externally mounted.

■Model No. configuration
Example:



## 3.General specifications

■Measurement block

| | |
|---|---|
| Measurement function | : Specify one Model from among DC voltage and current measurement Model Nos. |
| Operation type | : Double integral |
| Input circuit | : Single-ended |
| Input bias current | : 2nA(TYP) |
| Sampling speed | : 2.5 times/sec |
| Noise rejection ratio | : NMR40dB TYP (50/60Hz) |
| Temperature characteristics | : Offset displayed-value: Within ±0.3digit/℃ Fullscale displayed-value Within ±0.3digit/℃ |
| Overrange warning | : ”1999” flashes for input signal exceeding the maximum display. |
| Fullscale variable range | : 100 to 1999 |
| Offset variable range | : ±1000 |
| Span | : 2000 counts |
| Display | : LEDs(Light Emitting Diodes, Numeric elements) Character height;8mm(red) |
| Polarity display | : ”－” is automatically displayed when the measurement result is minus. |
| External control | : ・Scaling function : Set by the multi-rotating variable resistor on the front surface. ・External hold : 0V signal or contact signal (shorting) ・External start : Positive pulse of +5V for more than 1ms from 0V or contact signal (open) ・Decimal point : The position of the decimal point can be freely set by the stud pin on the front surface. |
| Analog output | : 0 to ±2V Load resistance; More than 1kΩ |

■Comparison block specifications

| | |
|---|---|
| Control method | : Analog comparator |
| Comparison setting range | : 100 to +1999(for both high and low limits) However for offset display, the offset value becomes the minimum value of the setpoint. |
| Comparison setting accuracy | : Setpoint ±2digit(23℃±5℃)(TYP) |
| Setting | : Set by selector switch. Set by the multi-rotating variable resistors for both HI and LO. |
| Comparison output relays | : Relay output for HI and LO; 250V AC, 0.1A Max. Resistive load 120V AC 0.5A MAX. Resistive load 28V DC 1A MAX. Resistive load Mechanical service life; More than 5 million times Electrical service life; More than 100,000 times (at rated load) |
| Comparison operation indication | : For both HI and LO; Red LEDs on the front surface light. |
| Comparison conditions | : For HI; High-limit setpoint≦Displayed value For LO; Low-limit setpoint> Displayed value |
| Hysteresis | : None |
| Response | : 5ms(TYP) |

■Common specifications

| | |
|---|---|
| Dielectric strength | : Between power supply terminal (0V) and input terminal (LO); For 1 min. at 500V DC Between input terminal (LO) and case; For 1 min. at 1500V AC |
| Insulation resistance | : Between each terminal described above; More than 100MΩ at 500V DC |
| Operating temperature/ humidity range | : 0 to 50℃/ 35 to 85%RH (No-condensing) |
| Power supply voltage | : 24V DC |
| Allowable voltage variation range | : 24V DC±20% |
| Consuming current | : 35mA(TYP)(At 24V DC) |
| Dimensions | : 48(W)×24(H)×87(D)DIN size |
| Weight | : Approx. 55g(Only for the mainframe) |
| Accessories | : Instruction manual 1 copy Connectors 2 pcs. Scaling label 1 sheet |
| Others | : If you need to display engineering units, please contact us. |
| Compliance standard | : EN61326-1/2006 EMI:Class A EMS:Industrial locations ※Cable length: 30m or less ※In the case of DC drive DC power Supply port: DC connections between parts of equipment EN61010-1:2001 |
| Mounting environment | : Mounting category Ⅱ Pollution level 2 (IEC1010-1) |
| Mounting altitude | : Lower than 2000m |
| Fuse | : MC3/10. 125V, 0.3A Quick blow type |

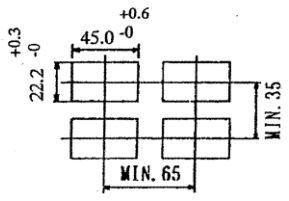
## 4. Mounting

4-1 Mounting

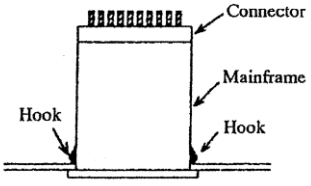
1)Mounting the meter on mounting panel

Drill the hole as shown in Fig.1 through the mounting panel, then insert the meter into the mounting panel through the hole from the front.

Recommended panel thickness: 0.8 to 3.5mm




[Fig. 1]




[Fig. 2]

4-2 Connector connection

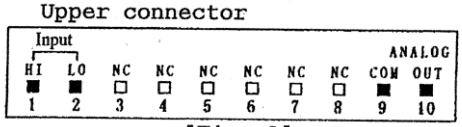
1)Power supply connection

Connect the power supply between the zno.9 (0V) and No.10 (+24V) terminals on the lower connector. Use the meter at a power supply voltage of 24V DC+20%. (As this meter is not provided with a power supply switch, the meter is ready to operate just when the power is turned on.)

2)Connect the input signal between the HI (No.1) and LO (No.2) terminals on the upper connector.

■Connector connection diagrams

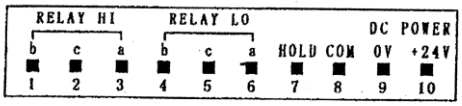
Upper connector




LO and COM are internally connected.

[Fig. 3]

Lower connector




[Fig. 4]

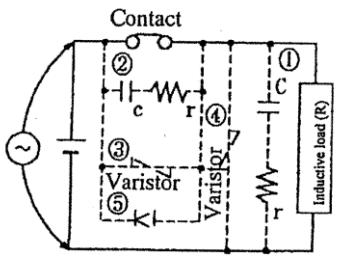
⚠ CAUTION

NC is a vacant terminal, but do not use it as a junction terminal.

⚠ CAUTION

When wiring is made, take such treatment to cover each wired terminal with an insulation tube.

If the relay output of this meter is used to close or open an inductive load (relay or solenoid), in order to prevent contact damage (welding, etc.) caused by electric arc, to heighten the reliability of contacts and also to extend a meter service life, it is recommended that a contact protection circuit be inserted in the output of the meter.



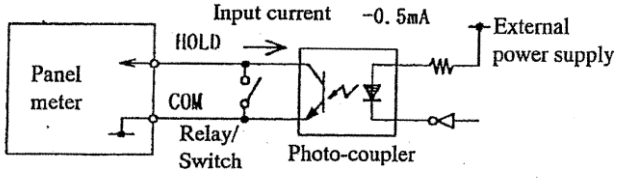

① For AC and DC
r ≃ R C = 0.1μF
② For DC
(r ≃ 20 to 30Ω or more are required.)
For AC
R ≦ r
(If the impedance of R is extremely smaller than the impedance of c and r.)
③④ For AC and DC
⑤ DC only

*The above values may not always be correct depending on the characteristic of the load used. Therefore, finally determine these values in the actual circuit.

## 5. System functions

5-1 Start/Hold

If the HOLD terminal (No.7 on the lower connector) is shorted with the COM terminal (No.8 on the lower connector), the displayed value just after their shorting is held. In addition, measurement will start by opening these terminals at the necessary timing. The minimum time required for one time of measurement is about 400ms. Perform control using mechanical contacts such as relays or switches. When performing control using TTL or transistors, add such a circuit as shown in Fig.5.




[Fig. 5]

5-2 Decimal point position setting

First, turn off the power supply and input; insert a screwdriver in the groove at the bottom of the front panel; and then lightly turn the screwdriver in the groove to remove the front panel from the case. The position of the decimal point can be set by the stud pin on the front surface. The decimal point is not set to any position prior to meter factory shipment. Therefore, set it to the desired position at the site. (See Fig.6.)

5-3 Offset adjustment

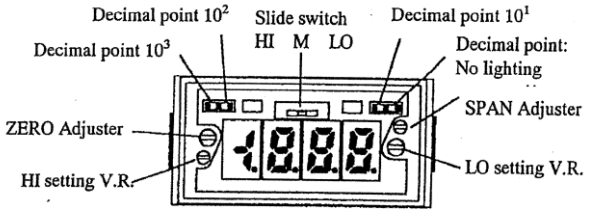
Apply the minimum measured-voltage (current) to the input terminals of the meter, then turn the ZERO adjuster from 0 to ± 1000 until the desired display is obtained. (See Fig.6.)

5-4 Fullscale adjustment

Apply the minimum measured-voltage (current) to the input terminals of the meter, then turn the SPAN adjuster from 100 to 2000 until the desired display is obtained. (See Fig.6.)

5-5 Comparison setting

Turn the slide switch at the front to the LO position, then set the desired value by turning the LO setting multi-rotating variable resistor. Next, turn the slide switch to the HI position, then set the desired value by turning the HI setting multi-rotating variable resistor. Always set the LO setpoint to any value smaller than the HI setpoint.




[Fig. 6]

⚠ CAUTION

Do not touch any parts other than those specified.

## 6. Analog output

| | |
|---|---|
| Output voltage | : 0 to ±2V |
| Accuracy | : ±0.5% of FS |
| Ripple | : Less than 15mVp-p |
| Response | : Within 3ms |
| Load resistance | : More than 1kΩ |

## 7. Maintenance

7-1 Cautions for maintenance

Store the meter at a storage temperature of -10℃ to +70℃ and a humidity of less than 60%RH. As the case and panel are made of plastics, do not use any volatile oil such as thinner for removing stains on them.

## 8.Warranty

This meter is warranted for a period of one year from date of delivery. Any defect which occurs in this period and is undoubtedly caused by Watanabe faults will be remedied free of charge. This warranty does not apply to the meter showing abuse or damage which has been altered or repaired by others except as authorized by Watanabe electric co.,Ltd.

## 9.After-sale service

This meter is delivered after being manufactured, tested and inspected under strict quality control. However, if any problem does occur, contact your nearest Watanabe sales agent or Watanabe directly giving as much information on problem as possible.

watanabe
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