

INSTRUCTION MANUAL

PLUG-IN TRANSDUCER
FINE SERIES

ALARM SETTER

FSDEL

Thank you for purchase DAIICHI ELECTRONICS product.
Please this instruction manual carefully before use.

Safety concerns

■ Usage environment and product conditions

Please be sure to use this product in a place that meets the following conditions.

In places that do not meet this condition, it may cause malfunction or failure and product life decline.

- Within the range of ambient temperature -10 to 55 °C, humidity 5 to 95% RH.
- Place free of dust, corrosive gas, salt and oily smoke. (Corrosive gas : SO₂ / H₂S, etc.)
- Location that is not affected by vibration and shock.
- Location that is not affected by external noise.
- Altitude 1000m or less.

■ Outdoor use conditions

- These products are not a dustproof, waterproof, and splash proof construction.


Please avoid the place with much dust. Please do not install in the place directly exposed to the rain and water droplets.

- Please do not install in the place directly exposed to the sun even through the glass.

Discoloration and degradation of a name plate, and deformation of the box by the surface temperature rise may cause.

■ Mounting and wiring

Please refer to this instruction manual for mounting and the wiring.

| | |
|--|--|
|  CAUTION | <ul style="list-style-type: none"> ● Please refer to connection diagram for the wiring. ● Hot line work is prohibited. ● Please use an electrical wire size suitable with the rated current. ● Please check the tightening of the screw. |
|--|--|

■ Preparation

This product must be set before use. Please read this manual and make the setting correctly.

■ Maintenance and inspection

- Inspection during energization is dangerous.
- No replacement in periodic inspection.
- In case you check an output unavoidably by the hot line condition, please warn to be unable to touch output wiring and a human body to an input and an auxiliary power terminal.
- Please make sure that the power LED (POWER) is lit properly.
- Please regularly to see if wiring and mounting screws and fixing screws are not loose.
- Please wipe off lightly with the dry soft cloth. Please do not use the organic solvent, chemicals, cleaners, etc., such as an alcohol, for cleaning.

■ Storage

Please be storage in a place that meets the following conditions.

- The ambient temperature is within -25 to 70 °C (storage temperature).
- Daily average temperature 40 °C or less.
- Location corresponding to the usage environment and use conditions.
- Location that is not affected by vibration and shock.
- Aluminum electrolytic capacitors are used for products. Please energize the power supply within one year after purchase.

■ Countermeasures against troubles.

If this product breaks down within the warranty period, it will be repairs by DAIICHI ELECTRONICS.

■ Disposal

Please dispose of this product as industrial waste (noncombustible).

Mercury parts and a nickel-cadmium battery are not used for this product.

■ Warranty period.

The warranty period of the product is one year after the date of delivery.

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1. Outline on the product

This product is an alarm setter of a small plug-in structure.

This product compares the DC voltage or DC current signal input with a preset operating point and outputs excess or deficiency as a contact signal.

The full scale of the input can be arbitrarily set on the actual scale according to the process amount, and each setting value (operation value, contact delay, etc.) can be freely set and changed.

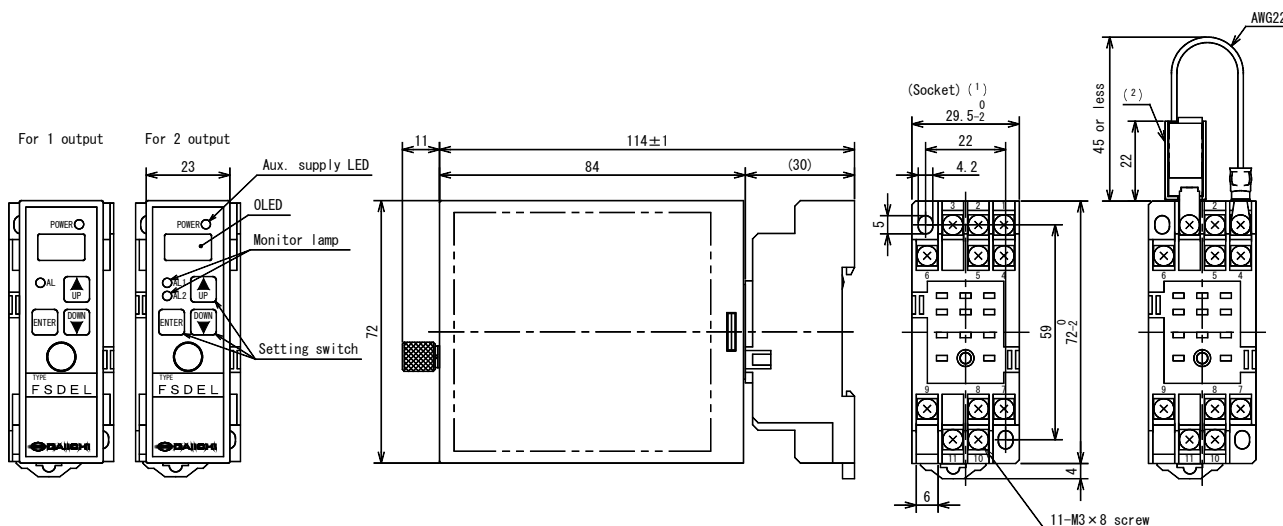
1.1 Features

- Compact size.
Miniaturized our company's alarm setter (SDLC-105A).
FSDEL is the same size as our small plug-in transducer (Fine series).
- Two mounting methods.
Socket installation or mounting base (FWBA) installation.
- Bright and easy to see display.
Adopted high contrast organic light emitting display (OLED) panel for display of setting and measurement.
- Display output operation status.
The output operation status is displayed on the monitor lamp (red) on the front.
- Test function.
Alarm output operation can be confirmed without applying input.
- Wide variety of setting functions.
There are setting functions such as output mode (upper limit and lower limit, excitation and non-excitation), dead band, starting delay, contact delay and so on.

2. Installation

2.1 Outline dimensions (Unit : mm)

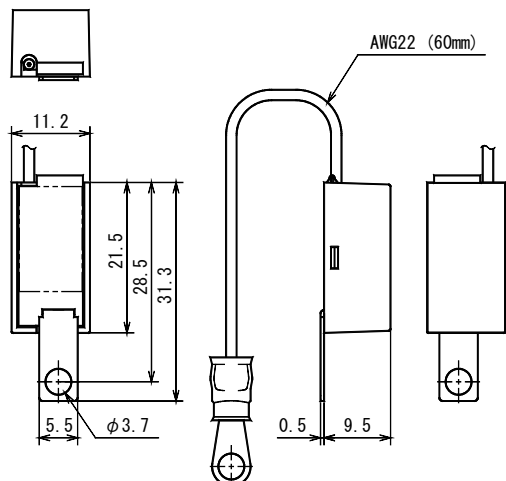
(1) FSDEL and socket



Note⁽¹⁾ Socket is standard attachment (FW11). When socket is unnecessary and mounting base (model name : FWBA) is used, please specify "socket unnecessary". The terminal screw of the socket is M3 screw (with square washer). If you would like a M3 screw with spring washer and plain washer, please specify socket as "FW11-W".

Note⁽²⁾ UR-2, precision resistance unit (option)

(2) Precision Resistance Unit, Type : UR-2 (option)



UR-2 combines an alarm setter of voltage input, and please use it. When open measures are necessary when they change an alarm setter with hot line condition in current input, they connect UR-2 to socket, and please use it by voltage signal.

(UR-2, Specify resistance value)

Resistance value of UR-2 in input signal

| Current signal Resistance | DC0 to 1mA | DC0 to 10mA | DC0 to 16mA | DC0 to 20mA | DC4 to 20mA |
|------------------------------|--------------|--------------|--------------|--------------|-------------|
| 10 Ω | — | DC0 to 100mV | DC0 to 160mV | DC0 to 200mV | — |
| 50 Ω | — | — | — | DC0 to 1V | — |
| 62.5 Ω | — | — | DC0 to 1V | — | — |
| 100 Ω | DC0 to 100mV | DC0 to 1V | — | — | — |
| 250 Ω | — | — | — | DC0 to 5V | DC1 to 5V |
| 500 Ω | — | DC0 to 5V | — | DC0 to 10V | — |
| 1k Ω | DC0 to 1V | DC0 to 10V | — | — | — |

2.2 Cautions on mounting

The environmental conditions of installation space. Please select indoors without low mechanical vibration, dust, and corrosive gas. There is no limit of a mounting position.

The installation can select 35mm width DIN rail mounting and screw mounting. In screw mounting, please install with M3 screw or M4 screw. (However, the screw is not attached. The tightening torque of a screw, M3 : 0.45 to 0.60N·m, M4 : 1.00 to 1.30N·m)

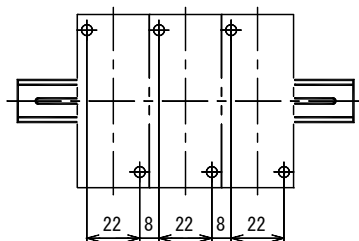
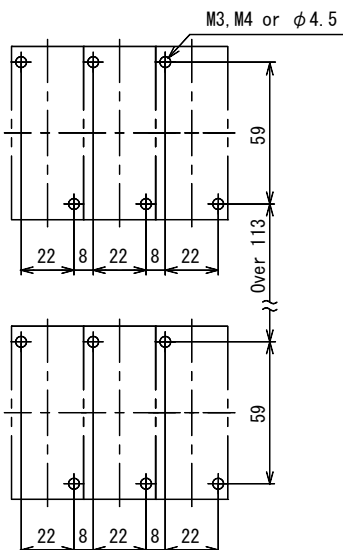
Please consider radiation and wiring space and separate more than 100mm of the space above and below.

(Reference of 2.3 section) Please secure the space distance of a terminal and a metal panel 10mm or more.

2.3 Example of combination mounting (Unit : mm)

Screw installation

Rail installation



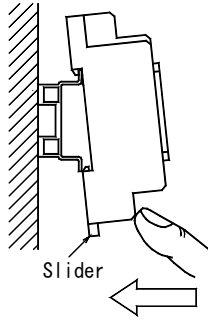
Please use rail of IEC, DIN technical standard 35mm width rail (strong type).
 «Recommendation product» Fuji electric Co.,Ltd. TH35-15AL

2.4 The mount to DIN rail, and the method of detachment.

<Cautions> If it insert and remove the body section from a socket, please carry out after shutting down a power supply and an input signal.

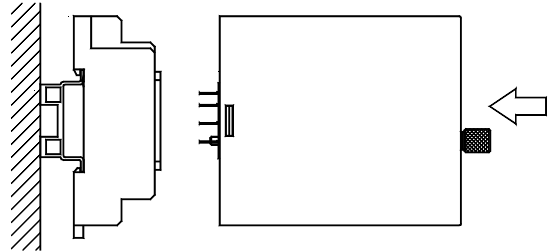
(1) How to fix a socket.

Set the base socket so that its slider is at the bottom. Position the upper hook at the rear side of base socket on the DIN rail and push in the lower.



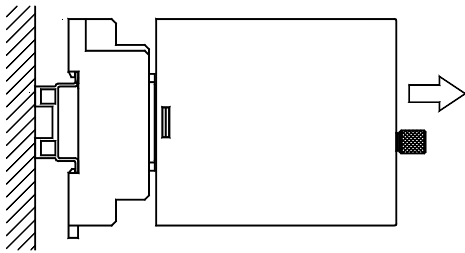
(2) How to fix a body to a socket.

Do in the direction which can read a label character correctly, and insert a body straightly. Press with the screw of a body. (Please do not tighten a screw too much.)



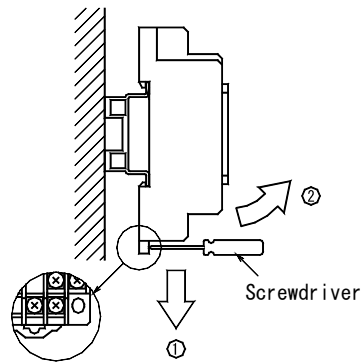
(3) How to remove a body from a socket.

Loosens the screw of a body. Please pull a body to straight near side.



(4) How to remove a socket.

Push down the slider utilizing a minus screwdriver and pull.

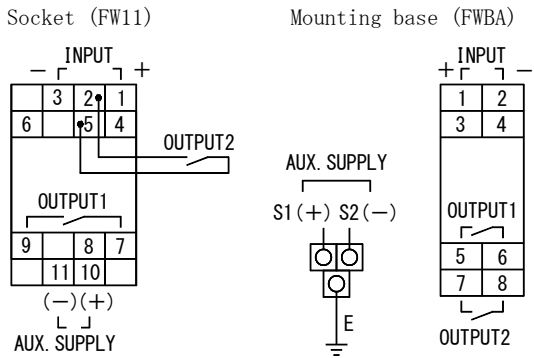


< Cautions >

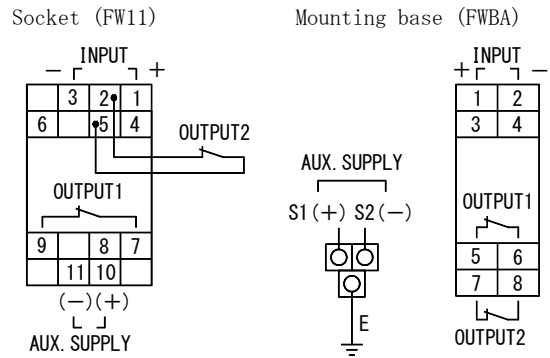
If a transducer body is taken out and inserted aslant, the terminal of a body will bend and a loose connection etc. will occur.

2.5 Connection diagram

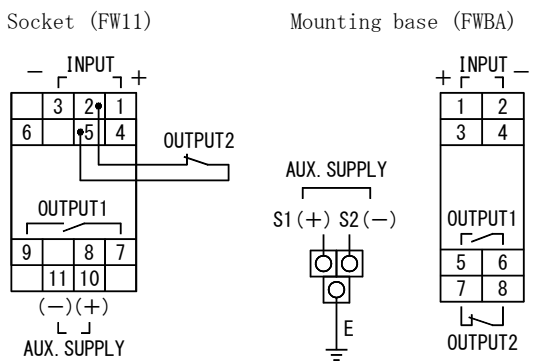
OUTPUT 1, 2 : Make contact (N.O.)



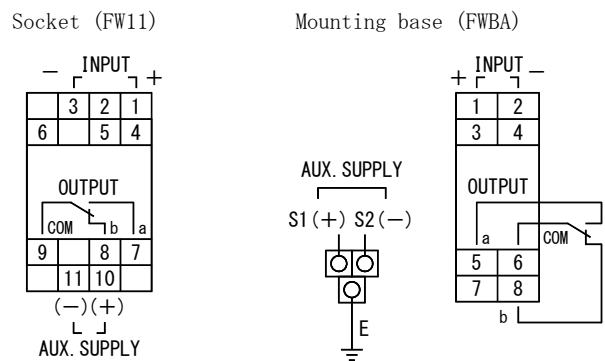
OUTPUT 1, 2 : Break contact (N.C.)



OUTPUT 1 : Make contact (N.O.) ,
OUTPUT 2 : Break contact (N.C.)



OUTPUT : Change-over break before make contact
(N.O. /N.C.)

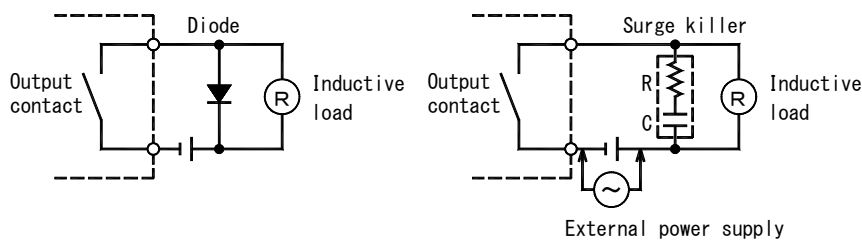


Terminals 5 and 8 are internally connected when using a socket.

<Caution>

- Please shut off the auxiliary power supply and input before starting work.
Touching terminals etc. while wet hands may cause electric shock.
Because burnout accident may be caused by wiring differences, please be careful of wiring.
Also, it is dangerous to inspect it in places with inflammables and flammable chemicals and gases.
- When inductive loads (electromagnetic relay, etc.) are connected to output contact, it recommends attaching diode or surge killer etc. near the load.

《Spark elimination circuit example》



2.6 About of auxiliary supply

By applying auxiliary power to the power supply (AUX. SUPPLY) terminal of mounting base, power is supplied to each unit.

When mounting base has unit individual power switch.

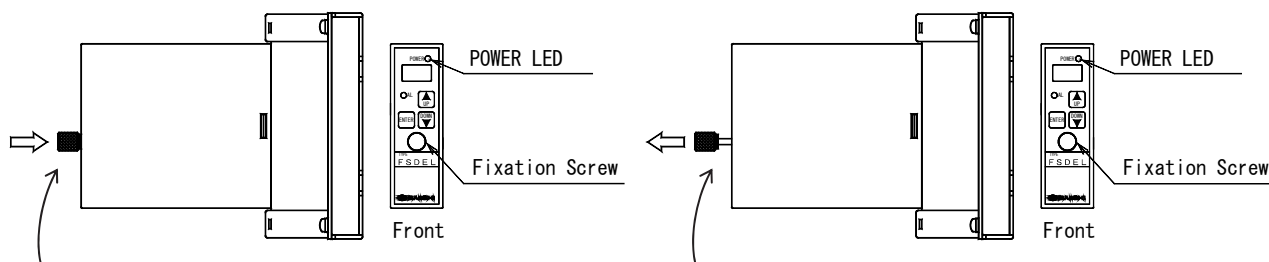
Please insert this product into the mounting base and tighten the screw to fix the main body. An auxiliary power is supplied.

Also, when removing, by loosening the screw, supply of auxiliary power supply is cut off.

(When the auxiliary power is supplied, the power LED of this product lights up, and it turns off when it is shut off.)

Without individual unit power supply switch.

Regardless of the tightening of the fixing screw on the main unit, auxiliary power is supplied.



Tighten the fixing screw to supply auxiliary power supply. (Power LED will light up)

Loosening the fixing screw will shut off the auxiliary power supply. (Power LED turns off)

CAUTION

In the case of Unit with individual power switch, you should be sure to tighten the fixing screws, no auxiliary power is supplied to this product. Please be sure to tighten the fixing screw securely.

2.7 Cautions on installation

● Wiring state

Please separate wiring of input and output and perform consideration to noise. And, please separate from a line with the power line used as the source of a noise and steep voltage, and current as much as possible. Please use shielding wire for the bottom of the remarkable environment of a noise.

● Environmental condition

(1) Ambient temperature and humidity range

The ambient temperature and humidity during the operation of each equipment should be in the following range.

Temperature: -10 to 55 °C, humidity: 5 to 95% RH (Non condensing)

(2) Ambient atmosphere

Please be careful when using in dusty environments.

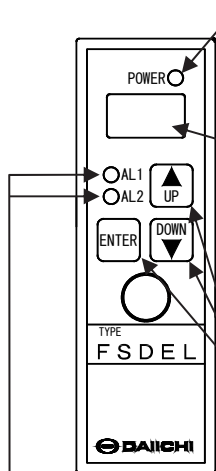
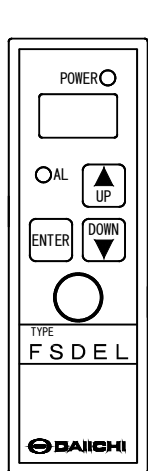
Also, please consult us when using under corrosive gas [hydrogen sulfide (H₂S), chlorine (Cl), etc.] environment.

3. Method of operation

3.1 Name and function of each part

For 1 output

For 2 output



POWER LED

The LED lights when the auxiliary power is supplied, and goes out when it is shut off.

OLED

Displays the measured value (actual scale) and various setting values.

Lights up when the switch is operated.

When the switch operation is completed, the display disappears after the automatic turn-off time has elapsed.

Setting switch

Make the changes of migration and settings for each mode.

Monitor lamp

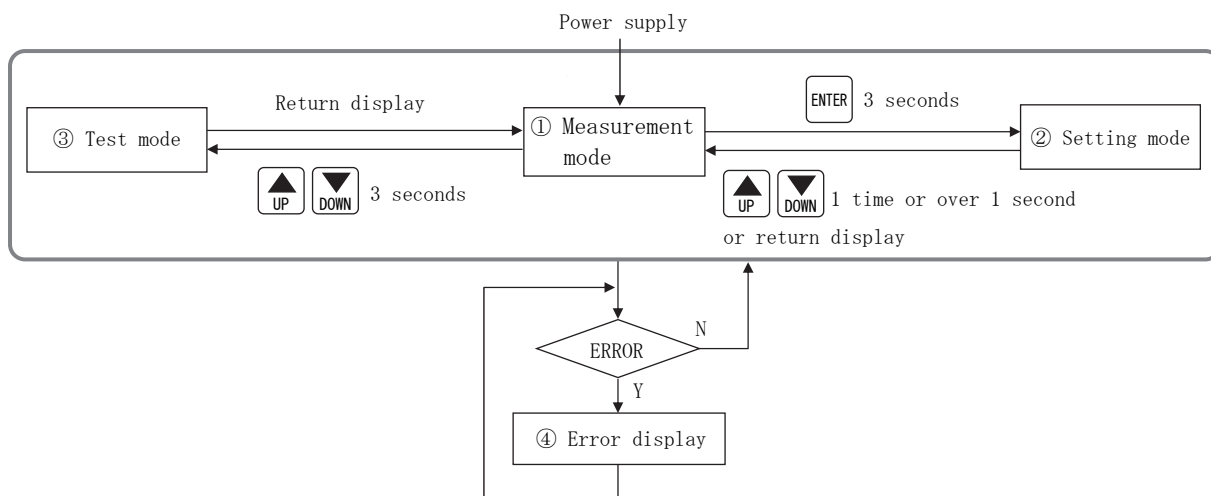
Lights up when relays of AL1 and AL2 are excited.

When pre-alarm is set, it blinks from the detection of the operation value until the end of the delay time.

3.2 Display mode and operation

Switching of each mode

There are three display modes, and it switches to each mode by the following switch operation.



① Measurement mode

Input value, maximum value, minimum value, alarm output 1 display (ON / OFF display ↔ setting value display), alarm output 2 display (ON / OFF display ↔ setting value display)

② Setting mode

Select the Setup item, and change the setting value.

③ Test mode

Alarm output can be turned ON/OFF without adding input.

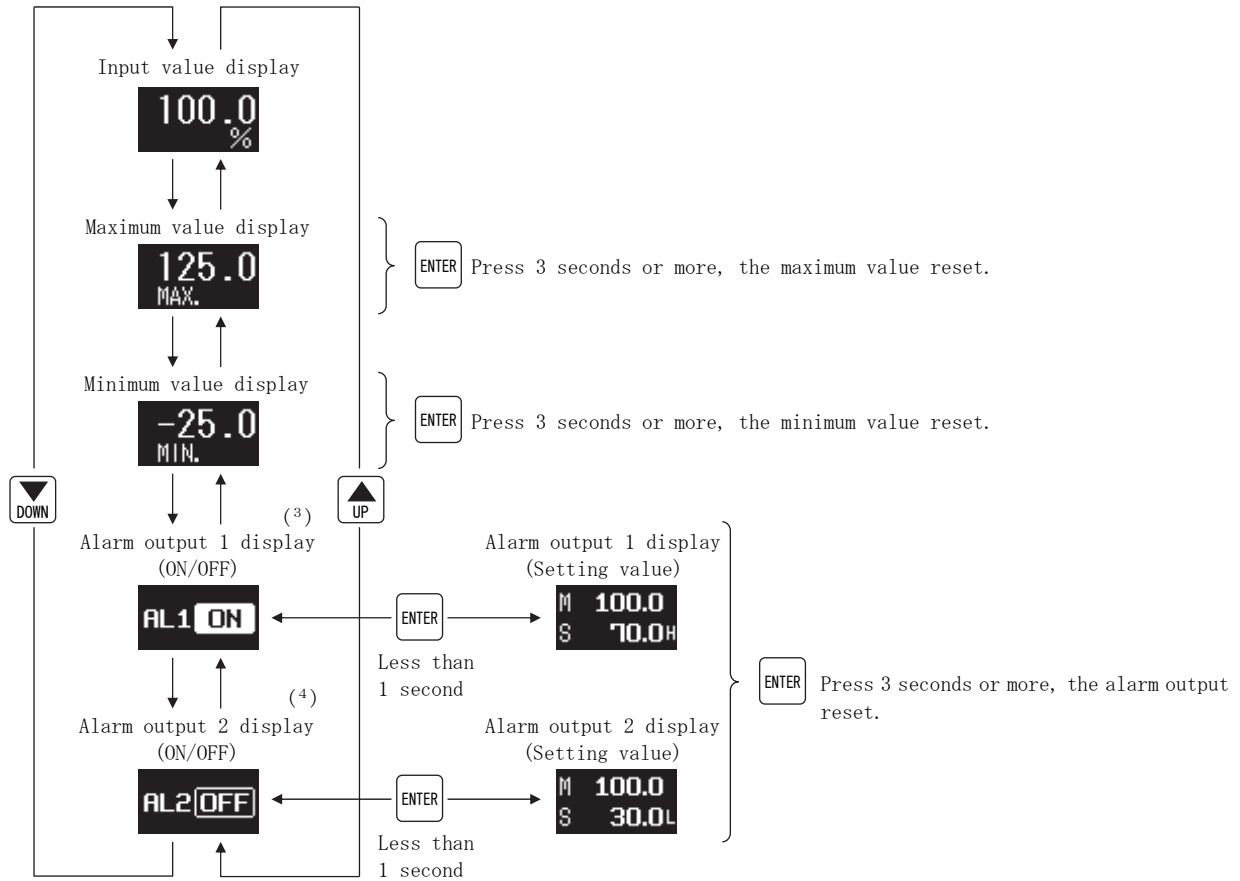
④ Error display

The error contents are displayed when an error occurs.

3.3 Measurement mode

After turning on the auxiliary power supply, the measurement mode is entered and each measurement can be confirmed. [Input value display, Maximum value display, Minimum value display, Alarm output 1 display (ON/OFF ⇔ Setting value), Alarm output 2 display (ON/OFF ⇔ Setting value)]

Press **UP** or **DOWN** to switch display.



Note⁽³⁾ 1 output is AL.

Note⁽⁴⁾ 2 output only.

About of alarm output display (Setting value display)

M 100.0
S 70.0H

The input value is displayed in the upper row.

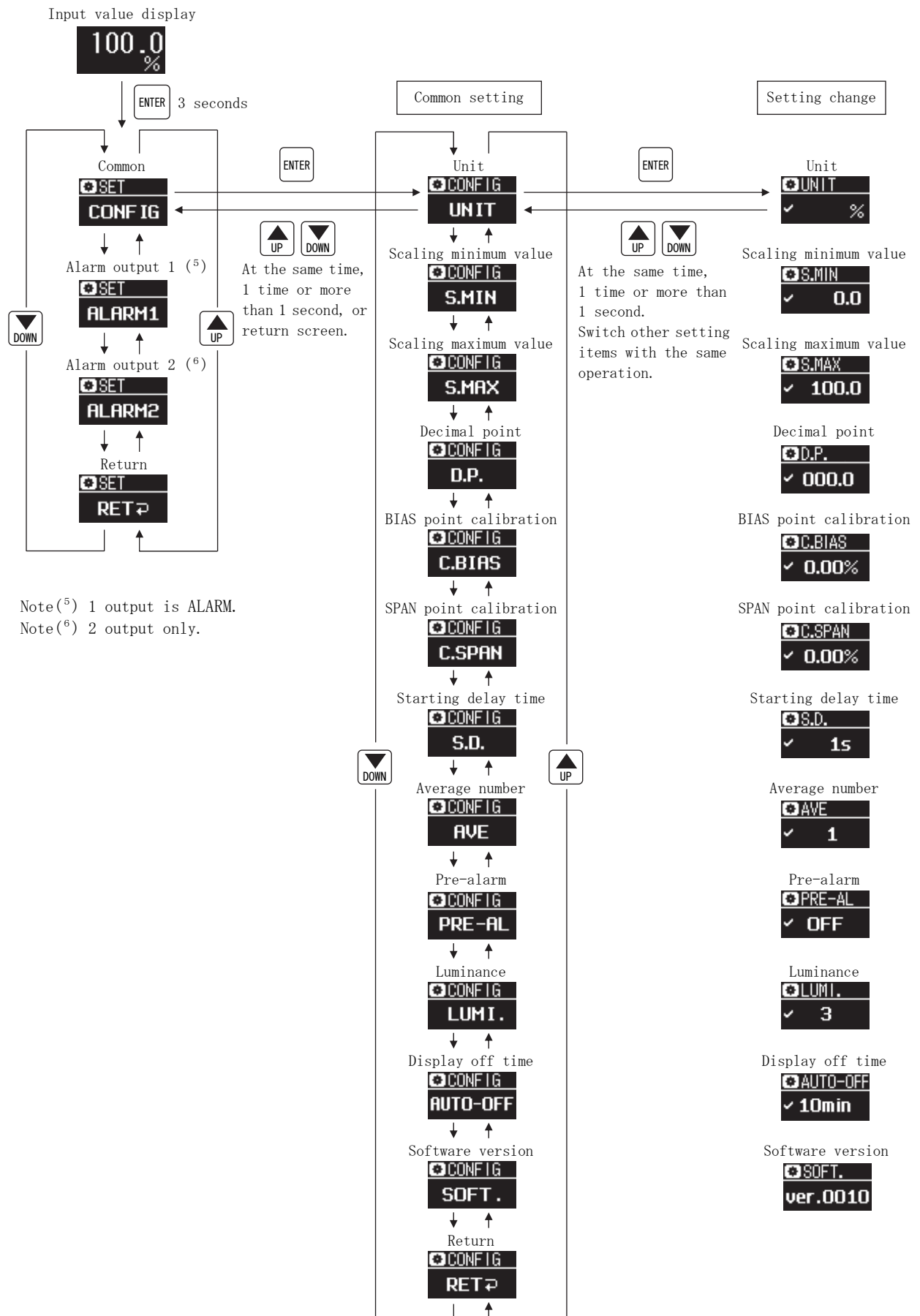
The operation value of the alarm output is displayed in the lower row.

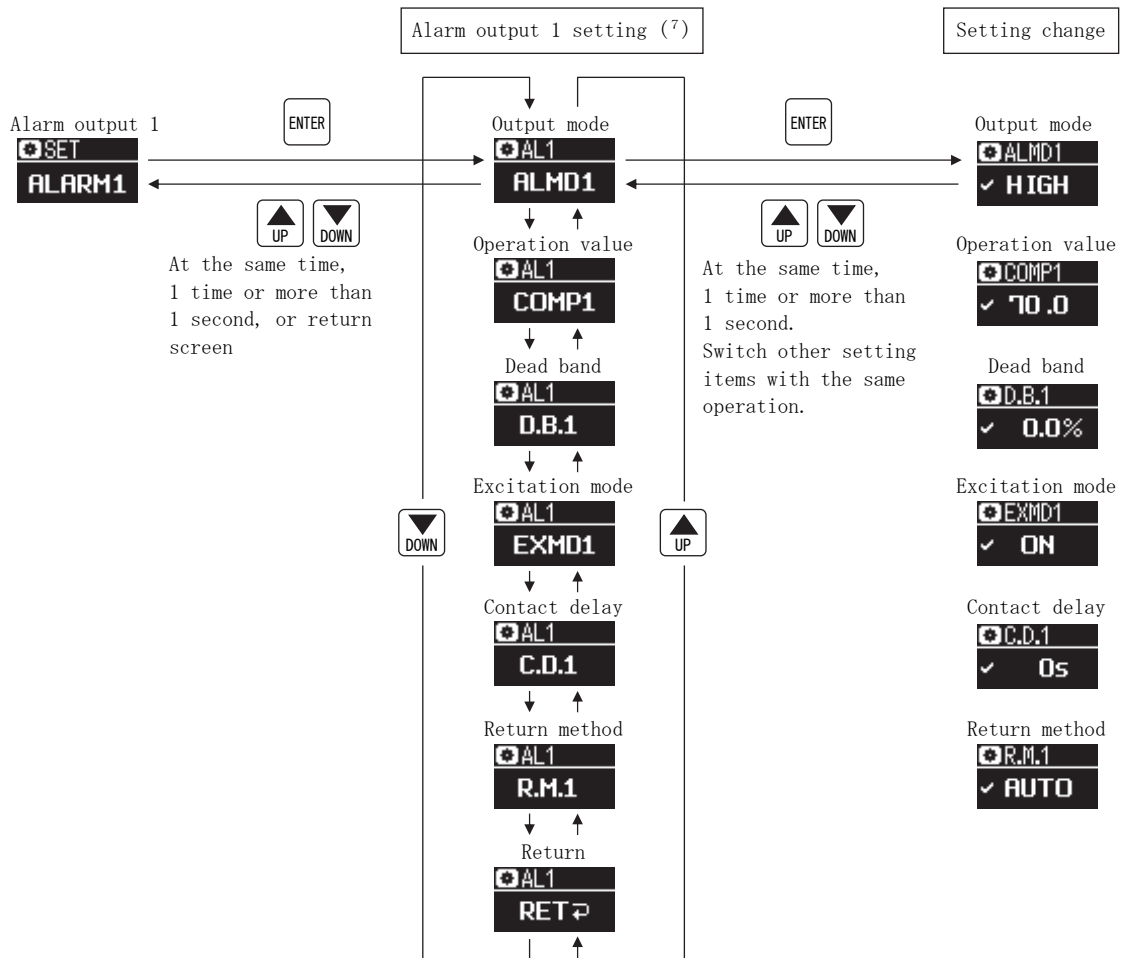
H: Upper limit detection

L: Lower limit detection

3.4 Setting mode (Each set value can be changed.)

Pressing **ENTER** for 3 seconds or longer with input value display switches to setting mode.

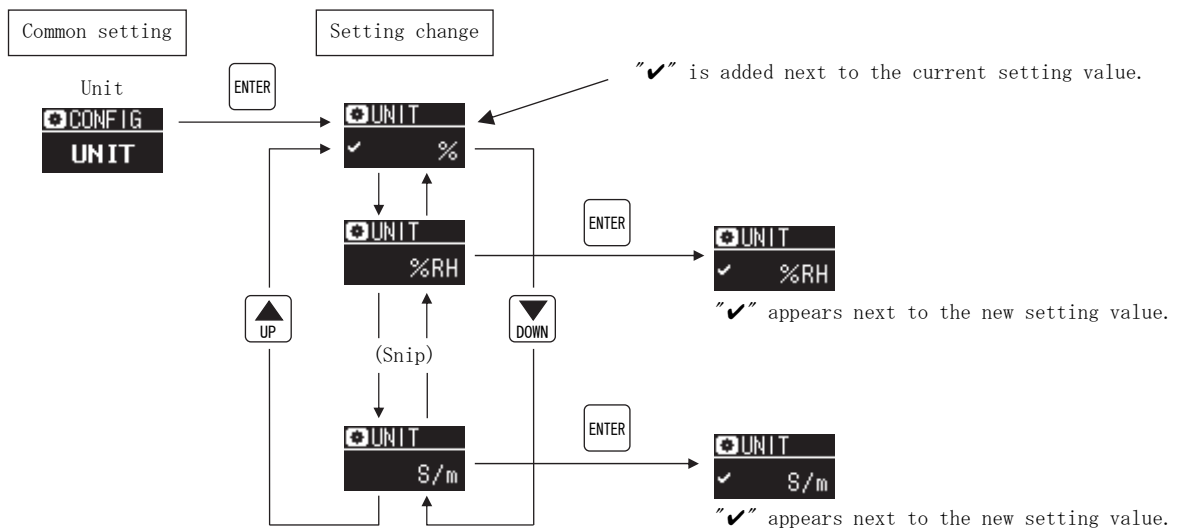




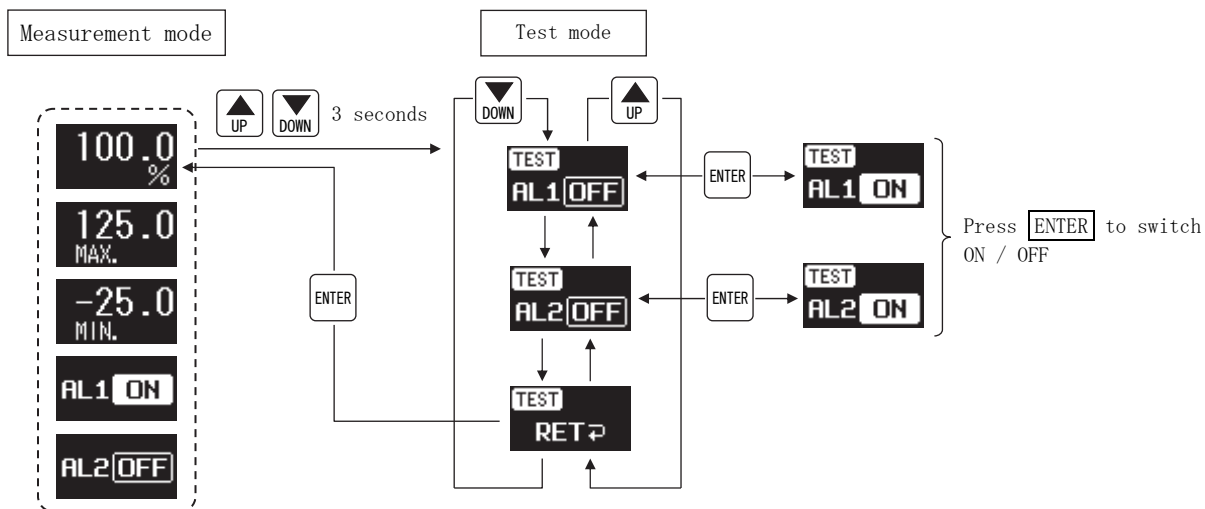
Note(7) When 1 output is selected, the display of each setting item is different.
 (Example) 2 output: ALMD 1, 1 output: ALMD etc.

* Alarm output 2 is the same setting item as alarm output 1.

● When setting units



- Test mode
Pressing **UP** and **DOWN** for more than 3 seconds in the measurement mode switches to the test mode.
Normal detection operation is not performed during the test mode.



- Error display
When an error occurs, it switches to the error display.

RAM ERR
FRAM ERR
AD ERR

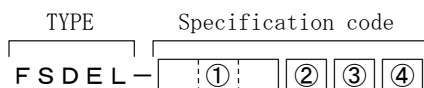
| Error display | Error contents |
|---------------|--|
| RAM ERR | RAM lead / right error |
| FRAM ERR | Save data error of the non-volatile memory |
| AD ERR | A/D converter error |

3.5 Calibration

Because output adjustment of this product is done, there is no necessity for calibration. However, if an operating point of alarm output shifts in the use over many years, please adjust in the next way.

- (1) After applying auxiliary power supply, pre-energize (warm up) for 15 minutes.
- (2) Set the setting value C.BIAS so that the minimum display is obtained when the input corresponding to the minimum display is applied.
Next, set the setting value C.SPAN so that the maximum display is obtained when the input corresponding to the maximum display is applied.
Confirm the above again, calibration is completed if the display matches.
For setting of the set values C.BIAS and C.SPAN, see Section 3.4 "Setting mode".
- (3) Confirm the operation value, return value, dead band.

4. Model name and specification code



| ① Input (Input resistance) | | ② Alarm output | | |
|----------------------------|--------------------------|----------------|---|----------------------|
| | | | Output 1 | Output 2 |
| 0A8 | DC1 to 5V (About 1MΩ) | 1 | Change-over break before make contact (N.O./N.C.) | — |
| 0C7 | DC4 to 20mA (About 100Ω) | 2 | Make contact (N.O.) | Make contact (N.O.) |
| ZZZ | Other | 3 | Break contact (N.C.) | Break contact (N.C.) |
| | | 4 | Make contact (N.O.) | Break contact (N.C.) |

| ③ Auxiliary supply | | ④ Fuse for auxiliary supply | |
|--------------------|--|-----------------------------|--------------|
| F | AC80 to 264V DC80 to 264V [Rated voltage AC100/110V 50/60Hz AC200/220V 50/60Hz DC100/110V] | 1 | Without fuse |
| | | 2 | With fuse |
| 5 | DC19 to 30V [Rated voltage DC24V] | | |

5. Specification

5.1 Rating

| Item | | Specifications | | | |
|------------------|---|---|---------------------------------|--------------------------|-----------------|
| Input | Quantity | 1 circuit | | | |
| | DC voltage input | DC60mV to less than 1V DC±60mV to less than ±1V DC1V to 60V DC±1V to ±60V | | | |
| | DC current input | DC1mA to 50mA DC±1mA to ±50mA | | | |
| Alarm output | Contact composition and output points | 1 point : Change-over break before make contact (N.O./N.C.) | Omron Corporation, G6S-2F DC12V | | |
| | | 2 points : Both make contact (N.O.) Both break contact (N.C.) Individual make contact (N.O.) / break contact (N.C.) | | | |
| | Contact capacity | Maximum switching load | | AC125V 0.5A | Resistance load |
| | | | | DC110V 0.5A | Resistance load |
| | | | AC125V 0.1A | Inductive load cos φ=0.4 | |
| | | | DC110V 0.1A | Inductive load L/R=7ms | |
| | | DC30V 0.5A | Inductive load L/R=7ms | | |
| | Minimum switching load | DC10mV 10 μA | | | |
| Mechanical life | Over 100 million times (Switching frequency 36,000 times / h) | | | | |
| Electrical life | Over AC 100,000(Switching frequency 1800 times / h) | | | | |
| | Over DC 100,000 or more, (Switching frequency 1200 times / h) | | | | |
| Auxiliary supply | Auxiliary supply range, | AC80 to 264V (AC100/110V 4.0VA , AC200/220V 5.5VA) DC80 to 264V (DC100/110V 2.5W) | | | |
| | Power consumption | DC19 to 30V (DC24V 2.0W) | | | |
| | Inrush current (Time constant) | AC110V below 1.6A (below 1.3ms), AC220V below 3.2A (below 1.3ms) DC110V below 1.1A (below 1.3ms) DC24V below 1.9A (below 3.3ms) | | | |

5.2 Alarm output

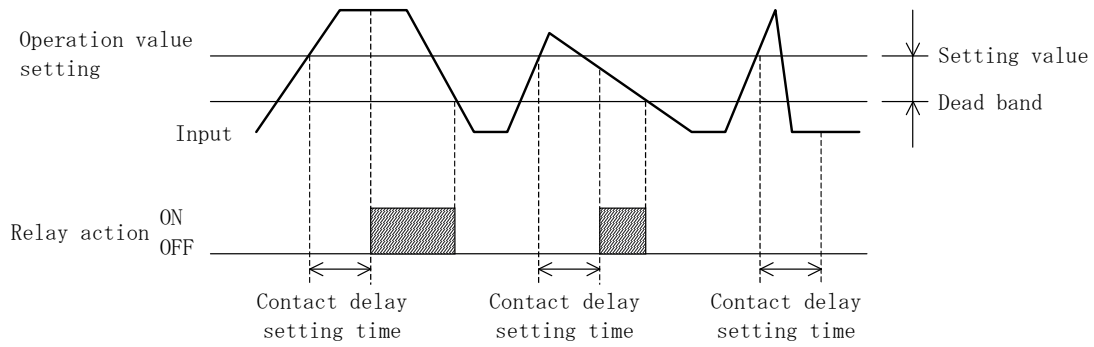
| Item | | Function | |
|--|---|--|---|
| Output mode | Output mode setting | Setting in five kinds of modes as follows is possible for operation of detection. ① High limit detection (H), Alarm output, relay excitation ② High limit detection (H), Alarm output, Relay non-excitation ③ Low limit detection (L), Alarm output, relay excitation ④ Low limit detection (L), Alarm output, Relay non-excitation ⑤ OFF, Always relay non-excitation. | |
| Relay excitation status display | | At each of the contacts, the monitor lamp lights up when the relay is excited. The monitor lamp blinks during the delay time when the pre-alarm setting is ON. | |
| Relay and monitor lamp operation | Auxiliary supply OFF, or relay non-excitation. | Relay break contact (N.C.) "ON", Monitor lamp "OFF". | |
| | Relay excitation | Relay make contact (N.O.) "ON", Monitor lamp "ON". | |
| | Output mode | ▽ Operation value setting Input upper limit → | |
| | Excitation | H | <p>● : Monitor lamp ON ○ : Monitor lamp OFF</p> |
| | | L | |
| | Non-excitation | H | |
| L | | | |
| OFF (Excitation · Non-excitation) | Monitor lamp | ○ ○ | |
| Relay | Relay | Non-excitation Non-excitation | |
| Relay contact status | Output, Contact composition | 1 alarm output Change-over break before make contact (N.O./N.C.) | |
| | Auxiliary supply OFF or relay non-excitation | <p>Terminal No. 7 8 9</p> | |
| | Relay excitation | <p>Terminal No. 7 8 9</p> | |
| | Output, Contact composition | 2 alarm output Both make contact (N.O.) 2 alarm output Both break contact (N.C.) | |
| | Auxiliary supply OFF or relay non-excitation | <p>Terminal No. 7 9 2 5</p> | |
| | Relay excitation | <p>Terminal No. 7 9 2 5</p> | |
| | Auxiliary supply OFF or relay non-excitation | <p>Terminal No. 7 9 2 5</p> | |
| | Relay excitation | <p>Terminal No. 7 9 2 5</p> | |
| Output, Contact composition | 2 contact outputs (AL1) Make contact (N.O.) / (AL2) break contact (N.C.) | | |
| Auxiliary supply OFF or relay non-excitation | <p>Terminal No. 7 9 2 5</p> | | |
| Relay excitation | <p>Terminal No. 7 9 2 5</p> | | |

* The terminal number is the number when mounting the socket (FW11 or FW-11W).

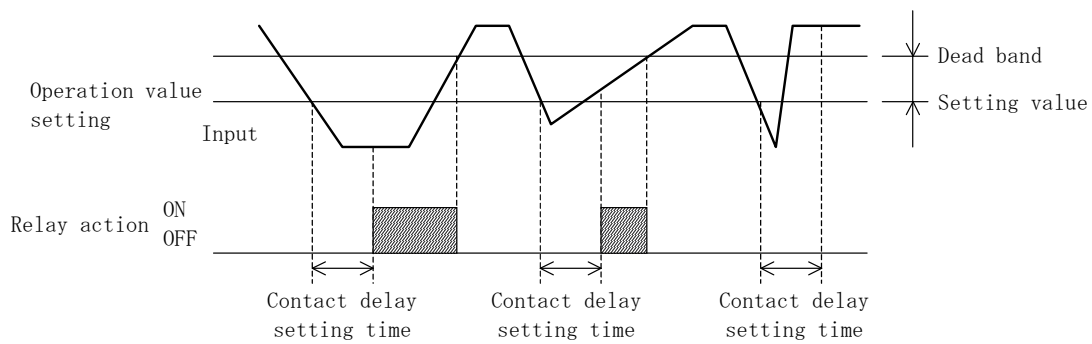
5.3 Relay operation

■ Contact delay function

Relay operation in over-input detection. (Output mode : Excitation, H ⁽⁸⁾)

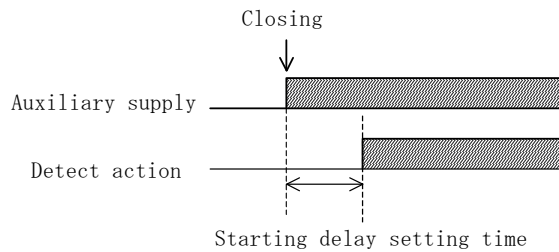


Relay operation in shortage-input detection. (Output mode : Excitation, L ⁽⁸⁾)



Note⁽⁸⁾ In case of non-excitation for relay excitation operation setting, action of relay becomes reverse.

■ Starting delay function



After an auxiliary supply apply, detection action is performed after a starting delay time.

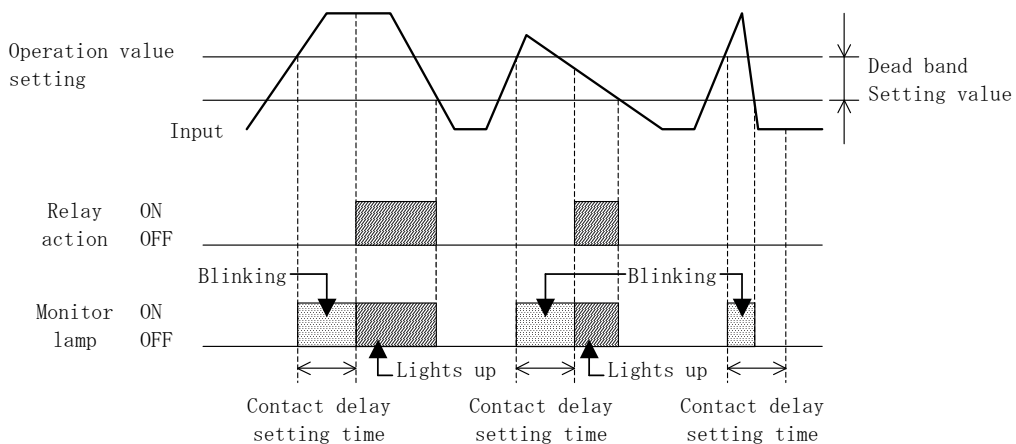
5.4 Pre-alarm function

A monitor lamp is blinked among contact delay time until excitation of a relay after operation value detection. Blinking of a monitor lamp will be gradually fast, and when the point of contact delay time passes, a monitor lamp is lights up.

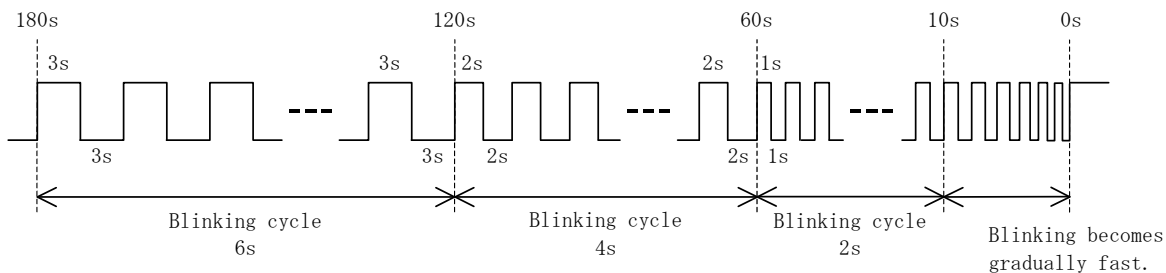
If contact delay time setting is made into 0 second, a pre-alarm function constitutes OFF.

- Relay action and pre-alarm in over-input detection.

(Output mode setting : Excitation H, Pre-alarm setting : ON)



- Action of the pre-alarm in contact delay time (blinking)



5.5 Setting value

| No. | Contents | | Mark | Initial value | | Setting range |
|-----|-----------------------------|--------------------|----------|---------------|-----------|---|
| | | | | 1 output | 2 outputs | |
| 1 | Unit display | | UNIT | % | | Select one point from 129 points (Please refer to the "5.6 Unit" for more information) |
| 2 | Scaling (⁹) | Minimum value | S. MIN | 0.0 | | -9999 to 9998 |
| 3 | | Maximum value | S. MAX | 100.0 | | -9998 to 9999 |
| 4 | | Decimal point | D. P. | 000.0 | | None decimal point to 3 decimal places |
| 5 | Calibration | BIAS | C. BIAS | 0.00% | | -9.99 to 9.99% (% of input span) |
| 6 | | SPAN | C. SPAN | 0.00% | | -9.99 to 9.99% (% of input span) |
| 7 | Starting delay time | | S. D. | 5s | | 1 to 180s |
| 8 | Average number | | AVE | 1 | | 1, 4, 8, 16, 32 |
| 9 | Pre-alarm | | PRE-AL | OFF | | ON : Pre-alarm ON, OFF : Pre-alarm OFF |
| 10 | Luminance | | LUMI. | 3 | | 1 to 5 |
| 11 | Display off time | | AUTO-OFF | 10min | | 1 minutes, 2 minutes, 5 minutes, 10 minutes, 15 minutes, 30 minutes |
| 12 | ALARM | Output mode | ALMD | HIGH | — | High : H operation, Low : L operation, OFF : Non-operation |
| 13 | | Operation value | COMP | 70.0 | — | With respect to the real scale, within the measurement display range (-25 to + 125%). |
| 14 | | Dead band | D. B. | 3.0% | — | 0.5 to 50.0% |
| 15 | | Excitation mode | EXMD | ON | — | ON : Excitation, OFF : Non-excitation |
| 16 | | Contact delay time | C. D. | 0s | — | 0 to 180s |
| 17 | | Reset method | R. M. | AUTO | — | AUTO, HOLD |
| 18 | ALARM1 | Output mode | ALMD1 | — | HIGH | High : H operation, Low : L operation, OFF : Non-operation |
| 19 | | Operation value | COMP1 | — | 70.0 | With respect to the real scale, within the measurement display range (-25 to + 125%). |
| 20 | | Dead band | D. B. 1 | — | 3.0% | 0.5 to 50.0% |
| 21 | | Excitation mode | EXMD1 | — | ON | ON : Excitation, OFF : Non-excitation |
| 22 | | Contact delay time | C. D. 1 | — | 0s | 0 to 180s |
| 23 | | Reset method | R. M. 1 | — | AUTO | AUTO, HOLD |
| 24 | ALARM2 | Output mode | ALMD2 | — | LOW | High : H operation, Low : L operation, OFF : Non-operation |
| 25 | | Operation value | COMP2 | — | 30.0 | With respect to the real scale, within the measurement display range (-25 to + 125%). |
| 26 | | Dead band | D. B. 2 | — | 3.0% | 0.5 to 50.0% |
| 27 | | Excitation mode | EXMD2 | — | ON | ON : Excitation, OFF : Non-excitation |
| 28 | | Contact delay time | C. D. 2 | — | 0s | 0 to 180s |
| 29 | | Reset method | R. M. 2 | — | AUTO | AUTO, HOLD |

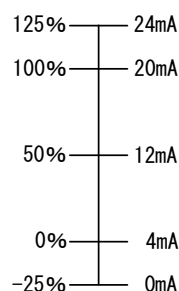
Note⁽⁹⁾ When changing the scaling, the alarm action value will also change according to the scaling.

< Notes of setting >

An operation value can be set up in -25 to +125% or -9999 to 9999 (decimal point depends on setting) of the measurement display range.

When changing the scaling, the operation values will also change according to the scaling.

(Example) Input : 4 to 20mA, Operation values : -25.0, Output mode : Low.



L is detected at input 0 mA and it can be used as disconnection detection.

5.6 Unit

| No. | Item | Setting unit | | | | | | | |
|-----|-----------------------|---------------------|-----------------------|-----------------------|-----------------------|------------------|--------------------|-----------------------|------------------|
| | | μ m | mm | cm | m | $\times 10$ mm | $\times 10$ cm | | |
| 1 | Length | μ m | mm | cm | m | $\times 10$ mm | $\times 10$ cm | | |
| 2 | Mass | mg | g | kg | t | $\times 10$ kg | | | |
| 3 | Time | s | min | | | | | | |
| 4 | Current | mA | A | kA | μ A | $\times 10$ A | | | |
| 5 | Temperature | K | $^{\circ}$ C | $\times 10^{\circ}$ C | | | | | |
| 6 | Angle | $^{\circ}$ | | | | | | | |
| 7 | Volume | m^3 | mL | L | kL | $\times 10$ L | $\times 100$ L | | |
| 8 | Speed | m/s | mm/min | m/min | mm/h | m/h | | | |
| 9 | Acceleration | m/s^2 | | | | | | | |
| 10 | Frequency | Hz | | | | | | | |
| 11 | Rotational speed | min^{-1} | s^{-1} | rpm | $\times 10$ rpm | | | | |
| 12 | Density | mg/L | g/L | | | | | | |
| 13 | Power | N | N \cdot m | kN | | | | | |
| 14 | Pressure | Pa | hPa | kPa | MPa | PaG | $\times 10$ kPa | | |
| 15 | Mass flow | kg/s | kg/min | t/min | mg/h | kg/h | t/h | $\times 10$ kg/min | $\times 10$ kg/h |
| 16 | Flow | m^3/s | m^3/min | m^3/h | m^3/d | L/s | mL/min | L/min | L/h |
| | | kL/h | $\times 10$ t/min | $\times 10$ t/h | $\times 10$ m^3/min | $\times 10$ kL/h | 10^{-1} m^3/s | $\times 10^2$ m^3/h | |
| 17 | Normal | m^3/s (normal) | m^3/min (normal) | m^3/h (normal) | m^3/d (normal) | L/s (normal) | mL/min (normal) | L/min (normal) | L/h (normal) |
| | | kL/h (normal) | | | | | | | |
| 18 | Quantity of heat | J | KJ | MJ | | | | | |
| 19 | Voltage | mV | V | kV | | | | | |
| 20 | Impedance | Ω | k Ω | M Ω | | | | | |
| 21 | Conductance | μ S | S | | | | | | |
| 22 | Active power | W | kW | MW | mW | $\times 10$ kW | $\times 10$ MW | | |
| 23 | Electric energy | W \cdot h | kWh | $\times 10$ kWh | | | | | |
| 24 | Reactive power | var | kvar | Mvar | $\times 10$ Mvar | | | | |
| 25 | Electric conductivity | μ S/cm | S/m | | | | | | |
| 26 | Concentration | % | %RH | ppb | ppm | pH | $\times 10$ ppb | $\times 10$ ppm | |
| 27 | Datum level | APm | OPm | SPm | TPm | YPm | DLm | ELm | $\times 10$ TPm |
| 28 | Other | $\cos \phi$ | $\cos \theta$ | LAG | LEAD | ϕ | | | |
| 29 | No unit | (NO UNIT) | | | | | | | |

<Note 1> Unit is not displayed when no-unit setting is set.

<Note 2> Normal flow rate units are displayed in one step.

5.7 Performance • Class

| Item | Specification | |
|--|--|---|
| Setting accuracy | Input range | Accuracy |
| | DC60mV to Less than 1V | ±0.2% (% of input span) |
| | DC±60mV to Less than ±1V | |
| | DC1 to 60V | ±0.1% (% of input span) |
| | DC±1 to ±60V | |
| | DC1 to 50mA | |
| DC±1 to ±50mA | | |
| Display accuracy | Input range | Accuracy |
| | DC60mV to Less than 1V | When the measurement display span is less than 10000 (5 digits except the decimal point), ±0.2% (% of input span) ±1digit |
| | DC±60mV to Less than ±1V | When the measurement display span is or 10000 or more (5 digits except the decimal point), ±0.2% (% of input span) ±2digit |
| | DC1 to 60V | When the measurement display span is less than 10000 (5 digits except the decimal point) ±0.1% (% of input span) ±1digit |
| | DC±1 to ±60V | |
| | DC1 to 50mA | When the measurement display span is 10000 or more (5 digits except the decimal point) ±0.1% (% of input span) ±2digit |
| DC±1 to ±50mA | | |
| Reproducibility of the operating point | ±0.1% (% of input span) | |
| Operating time | ±0.25 seconds of contact delay time set value (However, in case of set value = 0 second. 0.5±0.25 seconds) Average number, N=1 0.5s±0.25s Average number, N=4, 8, 16, 32 (1/2)N×0.1s+0.5s±0.25s | |
| Reset time | Less than 0.5 seconds Since the dead band is% to scaling, the standard values varies depending on the operation values. Average number, N=1 0.5 seconds or less Average number, N=4, 8, 16, 32 $\frac{(4 \text{ times} \times \text{Operating values} (\%) \div 10) \times \text{Dead band} + 1}{\text{Mean measurement data of 4 times} \times \text{Operating values} (\%) \div 10} \times N \times 0.1s + 0.2s \pm 0.25s$ Example) Operating values 70.0 , Dead band 0.5% $\frac{28 \times 0.5 + 1}{4 \times 7} N \times 0.1s + 0.2s \pm 0.25s$ | |
| Starting delay time accuracy | ±0.25 seconds of starting delay time set value | |
| Operation cycle | About 0.1 second | |
| Display update time | About 0.5 seconds | |
| Influence of temperature | 0.2% (% of input span) / 23±10°C | |
| Influence of auxiliary supply | 0.1% (% of input span) / Within the rated voltage range | |
| Response time | About 0.5 second In case 90 to 110% of step variation of operation value setting is given, in CD=0 second. If the average number is 1. | |

5.8 Electrical strength and mechanical strength

| Item | | Specification | |
|---|------------------|---|--|
| Insulation resistance JIS C 1111 | 1 alarm output | Between electric circuit and case. | Above 50MΩ at DC500V. |
| | | Between input, output and auxiliary supply. | |
| | | Between input and output. | |
| | 2 alarm output | Between electric circuit and case. | |
| | | Between input, output and auxiliary supply. | |
| | | Between input and output. Between AL1 output and AL2 output. | |
| Power frequency withstand voltage JIS C 1111 | 1 alarm output | Between electric circuit and case. | AC2210V (50/60Hz) 5 seconds |
| | | Between input, output and auxiliary supply. | |
| | | Between input and output. | |
| | 2 alarm output | Between electric circuit and case. | |
| | | Between input, output and auxiliary supply. | |
| | | Between input and output. Between AL1 output and AL2 output. | |
| Impulse withstand voltage JIS C 1111 | | Between electric circuit and case. | 5kV 1.2/50 μs Both positive and negative polarity for each 3 times. |
| Vibration JIS C 60068-2-6 | | Vibration of vibration frequency 16.7Hz, Double amplitude 1mm. In the direction of X Y Z for 10 minutes each. | No malfunction |
| Shock JIS C 60068-2-27 | | Shock of 98m/s ² , X, Y, Z direction for each 3 times. | No malfunction |
| | | Shock of 294m/s ² , X, Y, Z direction for each 3 times. | No abnormality |
| Overload capacity | Voltage input | 2 times 10 seconds and 1.5 times continuation of rated voltage. | |
| | Current input | 10 times 5 seconds and 1.5 times continuation of rated current. | |
| | Auxiliary supply | 1.5 times 10 seconds of rated voltage. And upper limit of the variation range is continued. | |

5.9 Noise immunity

| Item | Specification | |
|---------------------------------------|---|--|
| Damped oscillatory wave immunity test | Peak voltage : 2.5kV, Frequency : 1MHz Repeat frequency 6 to 10 times / One cycle of commercial frequency, Continued application for 2 seconds. | |
| Square impulse immunity test | Pulse width 1 μs, 100ns width, Repeat cycle 20ms, Application time 5 minutes Auxiliary supply (Normal / Common) 1.0kV or more Output (Common) 1.0kV or more Input (Induction) 1.0kV or more | |
| Radio wave immunity test | Transceiver rated output 1W : 144MHz, 430MHz Radiation direction : X, Y, Z Irradiation distance : 1m | |
| Electrostatic discharge immunity test | Applied by air discharge. Energized : 8kV, Not energized : 10kV 10 times each for positive and negative polarities. | |

5.10 EMC Directive (CE Marking)

| Item | Specification | | | |
|--|--|--|---|--|
| Electrostatic discharge immunity test | Contact discharge ±4kV (Charge voltage) Air discharge ±8kV (Charge voltage) | Performance standard : B | After test : Normal operation | EN61000-6-2:2005 EN61000-4-2:2009 |
| Radiated, radio-frequency, electromagnetic field immunity test | Frequency : ① 80 to 1000MHz ② 1.4 to 2.0GHz ③ 2.0 to 2.7GHz Field strength : ① 10V/m ② 3V/m ③ 1V/m Amplitude modulation : 80%AM(1kHz) | Performance standard : A | During test : No malfunction After test : Normal operation | EN61000-6-2:2005 EN61000-4-3:2006 +A2:2010 |
| Electrical fast transient / burst immunity test | Power port : ±2.0kV Contact output : ±1.0kV | Performance standard : B | After test : Normal operation | EN61000-6-2:2005 EN61000-4-4:2012 |
| Surge immunity test | Power port : Line to earth ±0.5kV (DC) Line to line ±0.5kV Power port : Line to earth ±2.0kV (AC) Line to line ±1.0kV DC input : Line to earth ±1.0kV Contact output : Line to earth ±1.0kV | Performance standard : B | After test : Normal operation | EN61000-6-2:2005 EN61000-4-5:2014 |
| Immunity to conducted disturbances, induced by radio-frequency fields | Frequency : 150kHz to 80MHz Voltage level : 10V, 80%AM(1kHz) | Performance standard : A | During test : No malfunction After test : Normal operation | EN61000-6-2:2005 EN61000-4-6:2014 |
| Power frequency magnetic field immunity test | Frequency : 50/60Hz Field strength : 30A/m | Performance standard : A | During test : No malfunction After test : Normal operation | EN61000-6-2:2005 EN61000-4-8:2014 |
| Voltage dips , short interruptions and voltage variations immunity tests (AC power supply) | Residual voltage : 0%, 1 cycle (50/60Hz) | Performance standard : B | After test : Normal operation | EN61000-6-2:2005 EN61000-4-11:2004 |
| | Residual voltage : 40%, 10/12 cycle (50/60Hz) | Performance standard : C | | |
| | Residual voltage : 70%, 25/30 cycle (50/60Hz) | | | |
| | Residual voltage : 0%, 250/300 cycle (50/60Hz) | | | |
| Electromagnetic radiation disturbance | Frequency band 30 to 230MHz | 3m distance : 50dB(μV/m) or less, 10m distance : 40dB(μV/m) or less | | EN61000-6-4:2007 +A2:2011 |
| | Frequency band 230 to 1000MHz | 3m distance : 57dB(μV/m) or less, 10m distance : 47dB(μV/m) or less | | |
| Mains terminal disturbance voltage (AC power supply) | Frequency band 0.15 to 0.5MHz | Quasi-peak : 79dB(μV) or less, Average : 66dB(μV) or less | | EN55011:2016 classA, Group1 |
| | Frequency band 0.5 to 30MHz | Quasi-peak : 73dB(μV) or less, Average : 60dB(μV) or less | | |

Performance standard A : During and after the test the equipment shall be able to continue operation as specified.

Performance standard B : The equipment shall be able to continue operation as specified after the test.

However, performance degradation during testing is allowed.

Performance standard C : Temporary loss of function is allowed, but the function can be self-healing or can be recovered by operation of the control device.

5.11 Structure, Use / Storage environmental conditions, Others

| Item | Specification |
|---|--|
| Material | ABS resin |
| Appearance color | Munsell N1.5 (Black) |
| External dimensions | 29.5 mm × 76 mm × 125 mm (Width × height × depth) Including socket |
| Mass | FSDEL : Approx. 105g , Socket : Approx. 50g |
| Accessories | Socket : FW11 (OMRON Corporation) ×1 , When socket is unnecessary, please specify at arrangement. |
| CE marking | EMC Directive (2014/30/EU) Low Voltage Directive (2014/35/EU) EN61010-1 |
| Safety | IEC61010-1 CATIII Maximum use voltage : 264V Pollution degree 2 |
| Operating temperature and humidity limits | -10 to 55°C , 5 to 95% RH (Non condensing) |
| Storage temperature limits | -25 to 70°C |
| Power outage guarantee | Each set value is data-saved by non-volatilized memory. |

6. Trouble shooting

| Symptoms | Possible causes | Remedial measures |
|------------------------------|---|---|
| Power LED does not light up | Supplementary power supply is not applied to terminals 10 and 11. | Applying the auxiliary supply |
| Display disappears | By auto off function | Pressing the switch |
| Display error (Large error) | Auxiliary supply voltage is out of range | Check auxiliary supply voltage |
| | Input is abnormal | Check input value |
| | Scaling setting incorrect | Check setting of scaling |
| Display error (Small error) | Aging of input | Please calibrate the display (Refer to section 3.5 in the operation manual) |
| Alarm output is not out | Output wiring is incorrect | Check output wiring |
| | Operation mode setting is OFF | Check setting of operation mode |
| | The contact delay time is set | Check setting of starting delay time |
| Alarm output does not return | Reset method is set to hold | Check setting of reset method |
| | Dead band is big | Check setting of dead band |
| Error is displayed | RAM ERR | RAM READ/WRITE error |
| | FRAM ERR | Save data error of the non-volatile memory |
| | AD ERR | A/D conversion error |
| | | Replace the device |

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