



FC400-DAC-FA

OPERATION MANUAL

04FEB2025REV.1.13E

UNIPULSE

Operation overview for FC400



Basic operation procedures

Please read "Setting/operation" on page **5**.

Calibration

Please read "Calibration procedures" on page **6**.

Measurement to fit the purpose

Please read "Setting and Operation Related to Comparison " on page **12**.

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1 Before getting started

Be sure to read for safety.

Make sure that installation, maintenance, and inspection of the FC400 are performed by personnel with electrical knowledge. In this manual, precautions for safe use of the FC400 are described separately as and in the following text. The precautions described in this text are important content regarding safety. Use this product having understood the content accurately.

WARNING

Events that may cause death or severe injury to persons in cases of misuse.

Design warning

- Prepare a safety circuit outside the FC400 so that the entire system functions safely.
- Be sure to contact our sales representative before use if the FC400 will be used in the following situations:
 - If the product is used in an environment not described in the operation manual;
 - If the product is used in a way that may have a substantial effect on human life and/or property, such as in medical devices, transportation equipment, entertainment devices, safety devices, etc..

Mounting precautions

- Do not disassemble, repair or alter the FC400.
- Do not install the product in the following environments:
 - Locations with corrosive gases or combustible gases;
 - Locations over which water, oil, or chemicals splash.

Wiring warning

- Do not connect commercial power supply directly to the signal I/O terminal.
- Be sure to perform class D grounding when installing the product.
- Be sure to check that the power is off before the following actions:
 - Wiring and connection of cables to a terminal block;
 - Connection to functional grounding terminals.
- Be sure to check signal names and pin assignment numbers before connecting to the signal I/O terminal in order to wire cables properly.
- No connection is necessary for unused terminals.
- Be sure to check the wiring and so on carefully before turning the power on.

Startup/maintenance warning

- Use power supply voltage and load within the specified range and rating.
- Do not touch the terminal while power is on. This may cause electric shock and malfunction.
- Do not open the main unit cover. Contact us for inspection and/or repair of internal parts.
- Turn power off immediately if smoke, abnormal smell, or abnormal noise is detected.

CAUTION

Events that may cause injury to persons or material damage in cases of misuse.

Mounting precautions

- The FC400 must be incorporated into the control panel and so forth.
- Do not install the product in the following environments:
 - Locations where temperature or humidity exceeds specifications;
 - Locations subject to drastic temperature fluctuations or icing and condensation;
 - Outdoors or locations above 2,000m;
 - Locations exposed to direct sunlight;
 - Locations subject to dust accumulation;
 - Locations with poor ventilation;
 - Locations with a lot of salt and metal powder;
 - Locations where the main unit is subject to direct vibration and/or shock.
- Perform adequate shielding if the product is used in the following locations:
 - Near power lines;
 - Locations subject to strong electric and/or magnetic field;
 - Locations subject to noise such as static electricity and relays.
- Install the product as far away as possible from equipment generating high frequency, high voltage, large current, surge, etc. Moreover, perform wiring of cables separately from these power lines. Do not perform parallel wiring and identical wiring.
- Do not use the product if it is damaged.

Wiring precautions

- Use shielded cables for cables (load cell, external I/O, RS-485, D/A).
- Be sure to ground the frame ground terminal.
- Tighten terminal screws to the specified torque.
Tightening torque: 0.31 to 0.37 N·m

Startup/maintenance precautions

- Be sure to allow an interval of five seconds or longer between turning power ON and OFF.
- Use after warming up for 30 minutes or longer following the startup of power supply.
- Protective performance of the FC400 may be lost if it is not used as specified.
- Cleaning
 - Unplug the power supply when cleaning.
 - Please use a dry cloth. When dirty, clean using a well squeezed cloth soaked in diluted neutral detergent. Afterwards wipe with a soft, dry cloth. Do not wipe with benzine, thinner, alcohol, etc. This may lead to discoloration and/or warping of the FC400.

Transportation precautions

- When sending the FC400 to us for repair and so on, pack it with sufficiently shock-absorbing materials.

Disposal precautions

- Handle this product as industrial waste when disposing.

1-1. Product supporting RoHS2 Directive

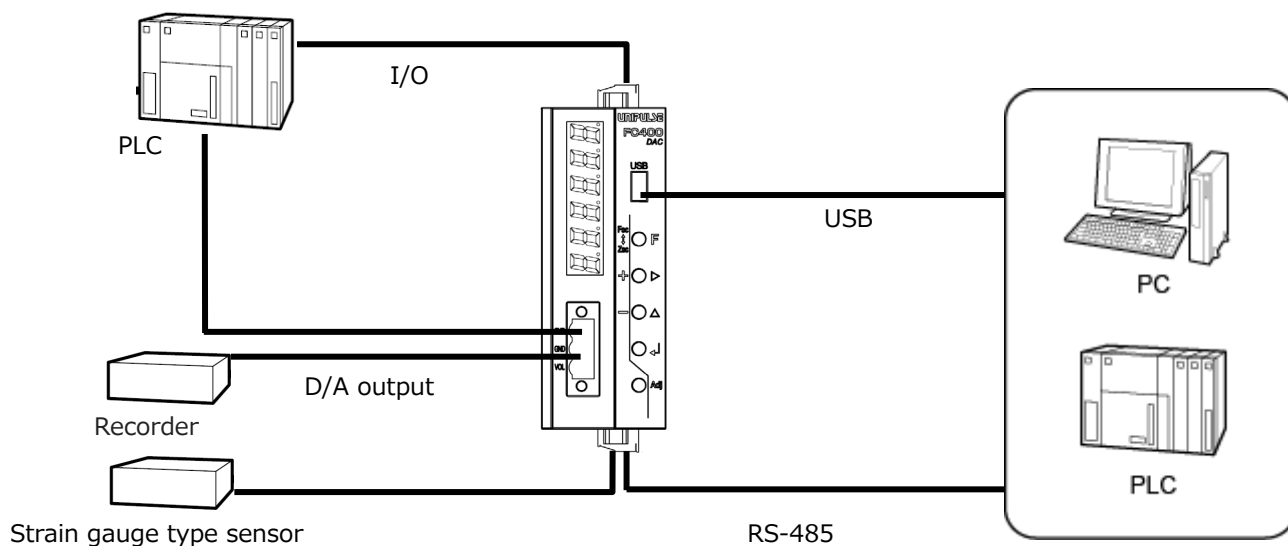
The parts and accessories used in this device (including the operation manual, package box and so on) correspond to the RoHS2 Directive which regulates the use of toxic substances that may have adverse effects on the environment as well as the human body.

1-2. Package contents

The following items are included in the package box. Be sure to check the contents before use.

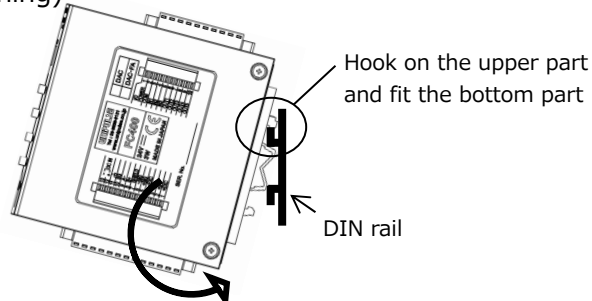
- | | | |
|--|-----|------------|
| - FC400 main unit | --- | One unit |
| - Terminal block (10 pin) [Model: CN87] | --- | One piece |
| - Terminal block (13 pin) [Model: CN85] | --- | One piece |
| - D/A output connector (3pin) [Model: CN86] | --- | One piece |
| - Small screwdriver for connection of terminal block | --- | One piece |
| - Jumper wire | --- | Two pieces |
| - FC400 quick reference | --- | Two copies |

1-3. Connection with other devices

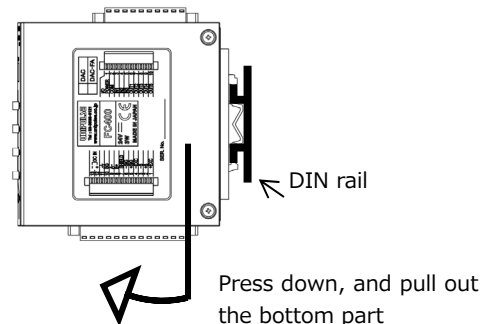


1-4. Attaching/detaching the DIN rail

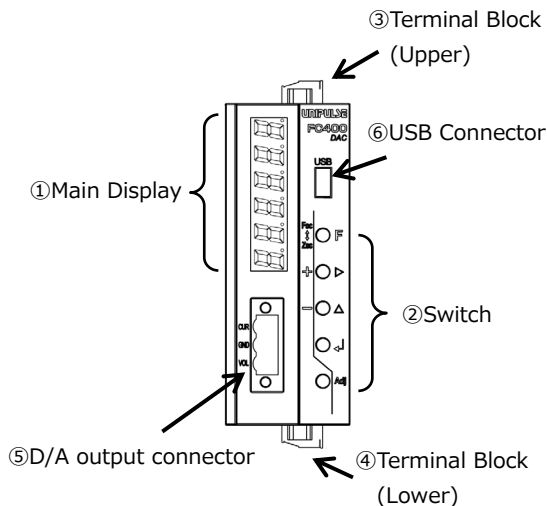
(Attaching)



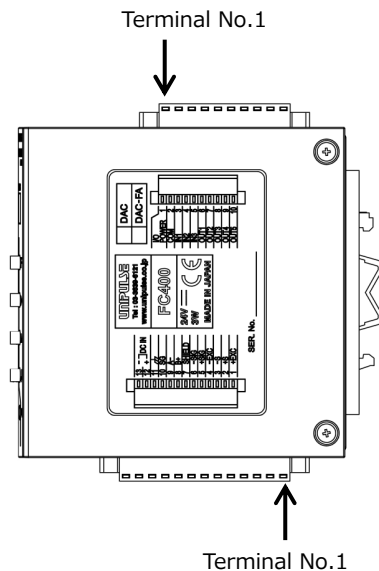
(Detaching)



1-5. Front panel / Terminal block



Name	Details	
①Main Display	1)Indicated value display	Display indicated value
	2)Over scale / error display	Over scale and other errors are displayed
	3)Setting value display	Each setting value is displayed
②Switch	F FNC	Go into setting mode
	▶ HOLD	Hold operation/Setting operation
	△ ZERO	Digital Zero/Setting operation
	↺ ENT(P/B)	Peak⇔bottom switching/setting operation
	Adj Adjustment	Go into the D/A output adjustment mode.
③Terminal Block (Upper)	Connects with external I/O.	
④Terminal Block (Lower)	Connects with the power supply/sensors/RS-485.	
⑤D/A output connector	Connects with a D/A output cable.	
⑥USB Connector	Connects with a USB cable.	



Terminal Block(Upper)

Uses	Terminal No.	Terminal Name	Details
Power supply for I/O signals	1	I/O POWER	Connects with the DC24V power supply for I/O
	2	COM	Common terminal of I/O signals.
Input terminal	3	IN1	Terminals for input signals. (Functions selected through settings.)
	4	IN2	
	5	IN3	
Output terminal	6	OUT1	Terminals for output signals. (Functions selected through settings.)
	7	OUT2	
	8	OUT3	
	9	OUT4	
	10	OUT5	

Terminal Block(Lower)

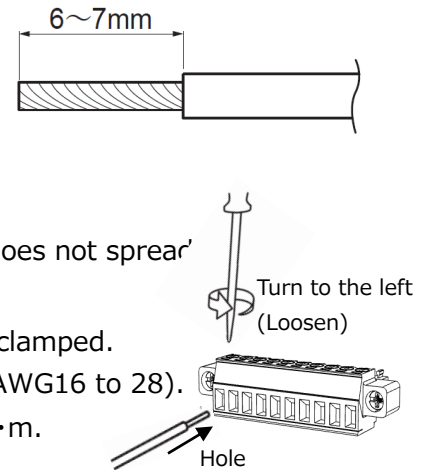
Uses	Terminal No.	Terminal Name	Details
Load input	1	+EXC	Terminals for connecting strain gauge type sensors. ※In the case of Four-line type, please connect +s with +EXC and -S with -EXC respectively by using the jumper wire of accessories.
	2	+S	
	3	-S	
	4	-EXC	
	5	+SIG	
	6	-SIG	
	7	SHIELD	
RS-485	8	B+	Terminals for connecting with the RS-485
	9	A-	
	10	SG	
Power supply input	11	h	Connects with the FC400 power supply (DC24V).
	12	DC IN+	
	13	DC IN-	

1-6. Connection to the terminal blocks

1. Peel off 6 to 7 mm of coating of the electric wire to be connected, and twist the tip enough so it does not spread.
2. Loosen the screw with a screwdriver and open the hole. A flathead screwdriver with a shaft diameter of 2.0mm is recommended. (Precision screwdrivers etc.)
3. Insert the electric wire into the hole, making sure that the tip does not spread.
4. Tighten the screw with a screwdriver.
5. Pull the electric wire slightly to check that it has been securely clamped.

* Electric wires between 0.08 to 1.31mm² can be connected (AWG16 to 28).

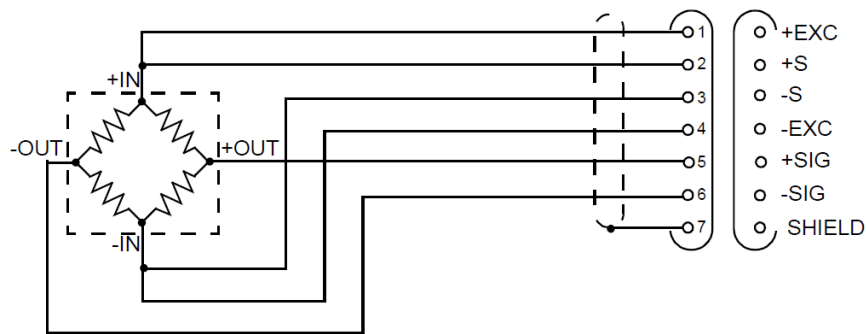
The recommended tightening torque value is 0.31 to 0.37 N·m.



1-7. Strain gauge type sensor connection

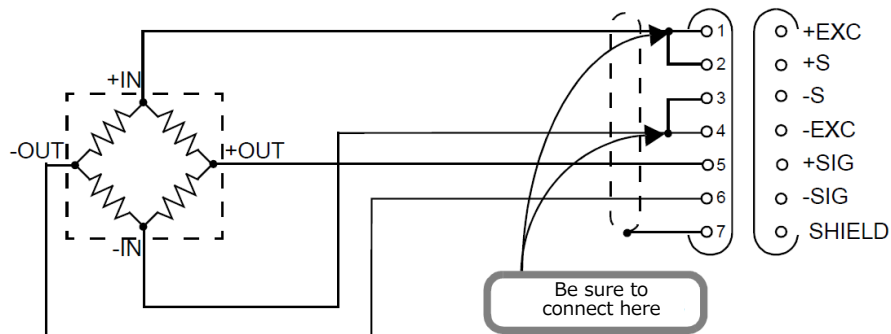
■ Six-line type connection

The load input terminal block for this device is of six-line type. Be sure to use a six-core shielded wire for connection with the Strain gauge type sensor and perform separate wiring for lines with a lot of noise (wiring for electrical power equipment, digital equipment etc.) and AC lines.



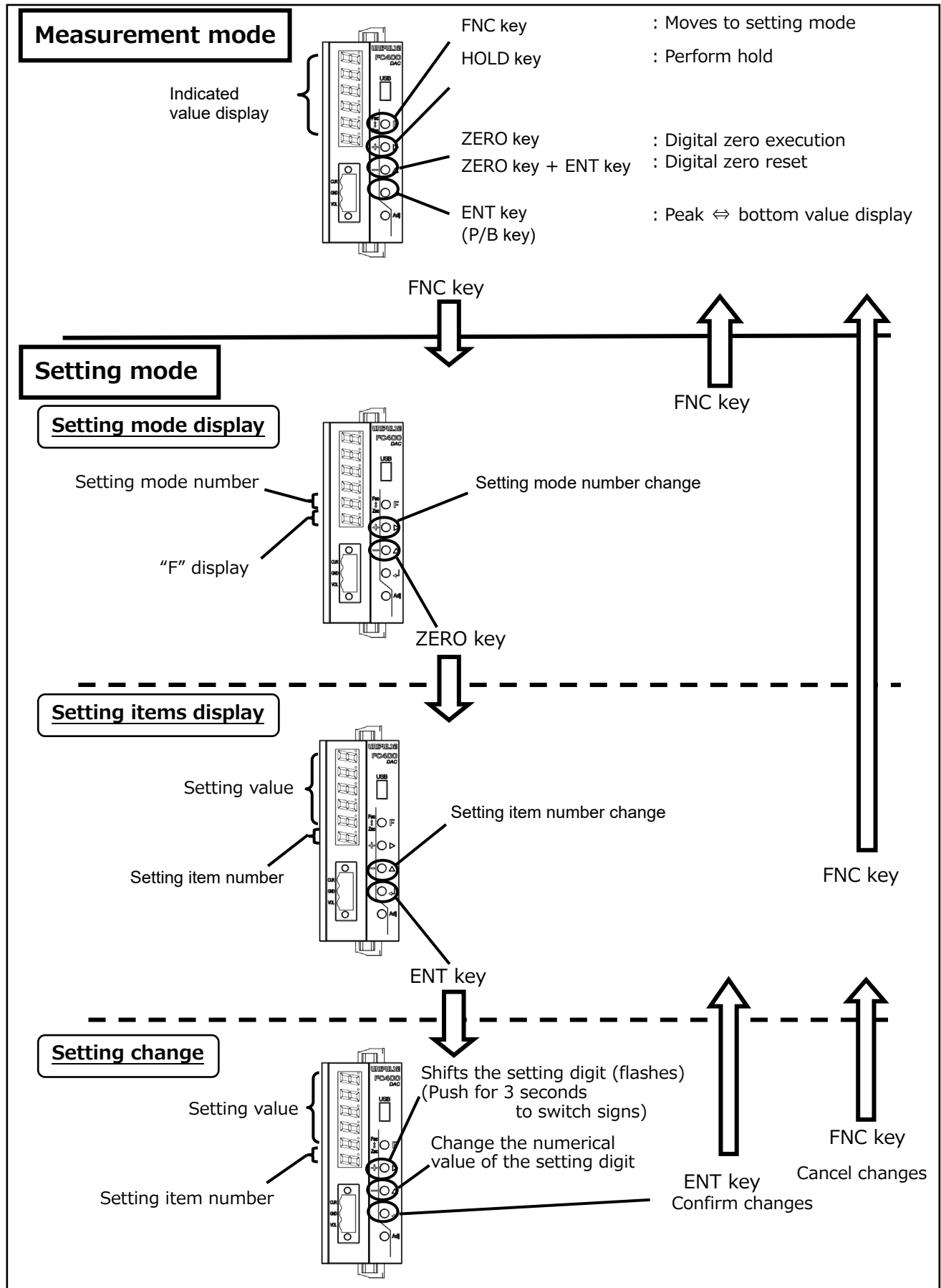
■ Four-line type connection

As outlined below, connect 1 with 2, and 3 with 4 respectively at the terminal block.



2 Settings/operations

Refer to the following and change the setting items for the required setting modes. (Refer to the "List of Setting Items" at the end of this document for setting mode configurations.)



3 Calibration procedures

3-1. Calibration

"Calibration" means matching the FC400 with the strain gauge type sensor. There are two methods of calibration, the "actual load calibration" and "equivalent input calibration".

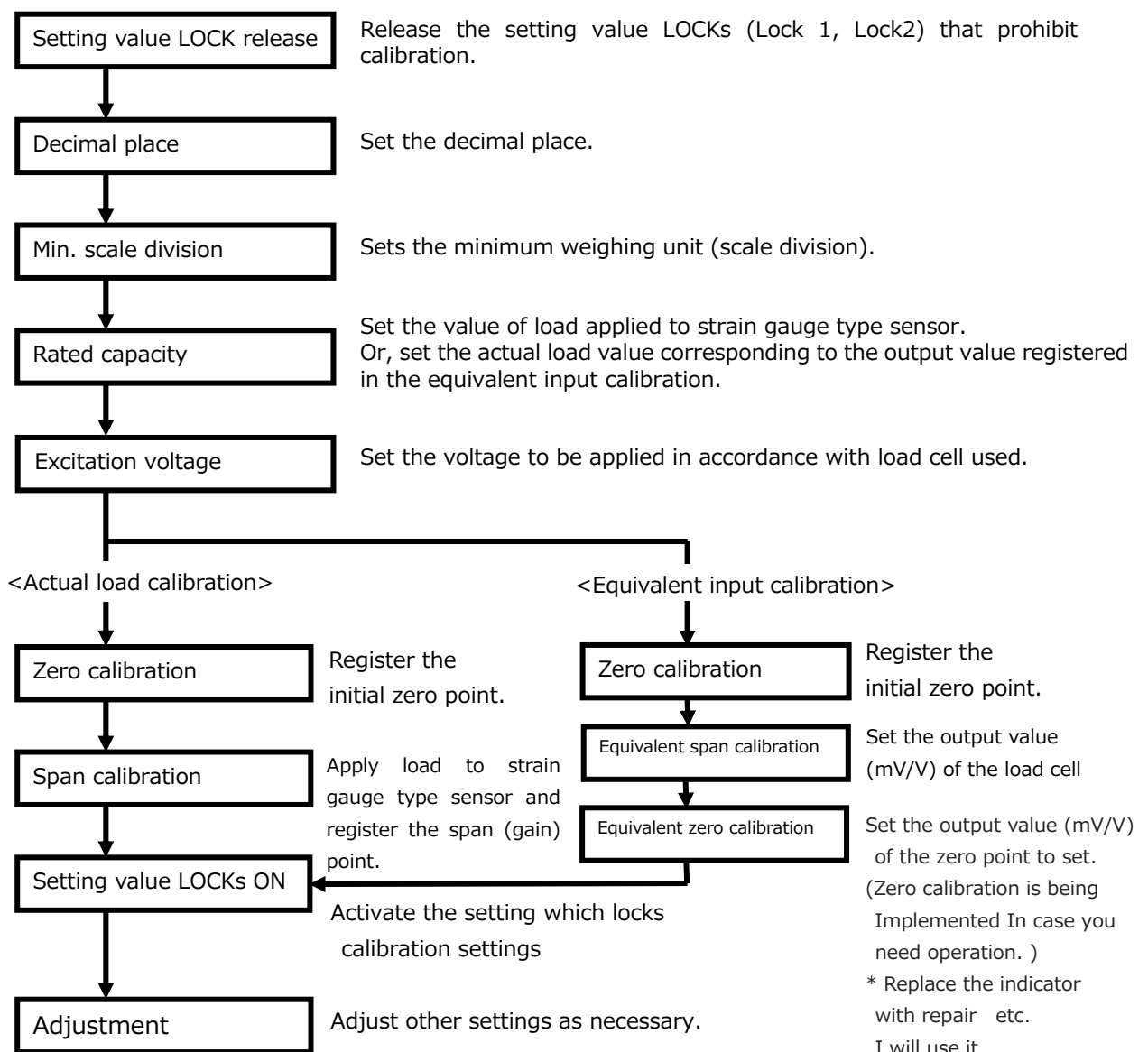
<Actual load calibration> ...

A method of calibration involving applying actual load or pressure to the sensor

< Equivalent input calibration > ...

A method of calibration involving directly inputting electrical signals equivalent to the electrical signal changes generated when actual load or pressure is applied to the sensor.

3-2. Calibration procedures



3-3. Settings/operations related to calibration

■ Setting value LOCK

LOCKS can be enabled to prevent calibration and setting values from being changed due to operational errors.

[Setting value LOCK]	(Setting item 3-1)
<div><div></div><div></div><div></div><div></div></div>	
	0: Lock1 OFF, Lock2 OFF 1: Lock1 ON, Lock2 OFF 2: Lock1 OFF, Lock2 ON 3: Lock1 ON, Lock2 ON

■ Decimal place

Set the common decimal place for displays, setting items etc. related to load.

[Decimal place]	(Setting item 5-4)
<div><div></div><div></div><div></div><div></div></div>	
	0:None 1:0.0 2:0.00 3:0.000 4:0.0000

■ Min. scale division

Set the minimum weighing unit (scale interval).
The input range is from 1 to 50.

[Min. scale division]	(Setting item 5-2)
<div><div></div><div></div><div></div></div>	(Input range: 1 to 50)

■ Rated capacity

Set the load applied to strain gauge type sensor during span calibration.
The input range is from 1 to 99999.

[Rated capacity]	(Setting item 5-1)
<div><div></div><div></div><div></div><div></div><div></div></div>	(Input range: 1 to 99999)

■ Excitation voltage selection

Set the voltage value applied to strain gauge type sensor.

[Excitation voltage selection]	(Setting item 5-5)
<div><div></div></div>	(0 : 5V, 1 : 2.5V)

* Please check the specifications of the strain gauge type sensor that you would like to use before changing the settings.

■ Zero calibration


Register the default zero point.

- (1) Select setting item 9-1
- (2) Make sure that unwanted load does not apply to the strain gauge type sensor.
- (3) Press the ENT key to start zero calibration
- (4) "CAL-ZE" is displayed while calibration is in progress
- (5) Returns to indicated value display, and zero calibration is complete

[Zero calibration]	(Setting item 9-1)
<div><div></div><div></div><div></div><div></div><div>0</div></div>	No setting value input ("0" is displayed)

■ Span calibration <Actual load calibration>


Apply load to strain gauge type sensor and register the span (gain) point.

[Span calibration] (Setting item 9-2)
 (Input range: 1 to 99999)

- (1) Select setting item 9-2
- (2) Enter the actual load value.
- (3) Hit ENT key to start the Actual load calibration.
- (4) "CAL-SP" is displayed while calibration is in progress
- (5) Returns to indicated value display, and span calibration is complete

■ Equivalent input span calibration <equivalent input calibration>

Perform calibration by inputting output of the sensor.


[Equivalent input span calibration] (Setting item 9-4)
 (Input range: 0.0100 to 3.8000)

- (1) Select setting item 9-4
- (2) Input the output value of the sensor
- (3) Execute equivalent input calibration by confirming the input value
- (4) Returns to indicated value display, and equivalent input calibration is complete

■ Equivalent input zero calibration <Equivalent input calibration>

Input the sensor output value and register the default zero point.

* Used when replacing indicators for repair and so on.

[Equivalent input zero calibration] (Setting item 9-3)
 (Input range: -3.0000 to 3.0000)

4 Settings/operations related to the fluctuation and stability of values


Here, the functions that have been built in for ease of use when actually weighing etc. after completing calibration are described.

Select the most appropriate value in accordance with the type of weighing and the setting environment.

■ Display update rate

Set the rate at which the indicated value is updated per second.
Reduce the display update rate if the indicated value flickers.

[Display update rate] (Setting item 5-4)




0: Once/sec
1: 3 times/sec
2: 6 times/sec
3: 13 times/sec
4: 25 times/sec

■ Sampling rate

This function changes a rate of referring to the sampled data.

[Sampling rate] (Setting item 2-3)



1: 2400 times/sec


■ Auto adjustment filter

This function recognizes fluctuation in the indicated value due to noise and vibration, and automatically sets the digital low-pass filter and moving average filter.

"CAL-FL" and indicated value are displayed alternately during adjustment.

Adjustment is complete once "CAL-FL" is no longer displayed.

[Auto adjustment filter] (Setting item 4-3)




0: Cancel
1: Execute

■ Digital low-pass filter

This low-pass filter is used to screen the A/D converted data and cancel unnecessary noise content.

The cut-off frequency is set like the low-pass filter of an analog circuit.

[Digital low-pass filter] (Setting item 4-1)


 (Input range: 0.1 to 600.0)

Cut-off frequency	0.1	⇔	600.0
Response speed	Slow	⇔	Fast
Stability of indicated value	Stable	⇔	Unstable

■ Moving average filter

This function takes the moving averages of the A/D converted data and reduces fluctuation in the indicated values.

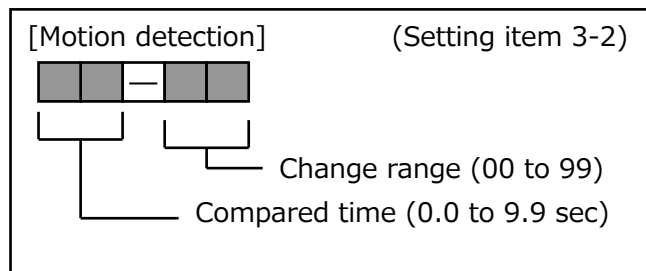
[Moving average filter] (Setting item 4-2)

 (Input range: 1 to 999)

Average rate	1	⇔	999
Response speed	Fast	⇔	Slow
Stability of indicated value	Unstable	⇔	Stable

■ Motion detection

Set the parameters to detect indicated value stability. If the indicated value change range is lower than the set range and this condition continues longer than the set time, indicated value is considered to be stable and the stable signal turns ON.



■ Zero tracking (Period)

■ Zero tracking (Range)

This function sets the indicated value to 0 (zero) automatically when the condition that the travel of the zero point is within the set tracking range continues for the set period of time or longer. The tracking range is set in increments of 1/4 of the indicated indicated value.

(E.g.: Setting value 0004 → Equivalent to 1 count on the display)

When the period is set to 0.0 sec and the range is set to 00, zero tracking does not work.

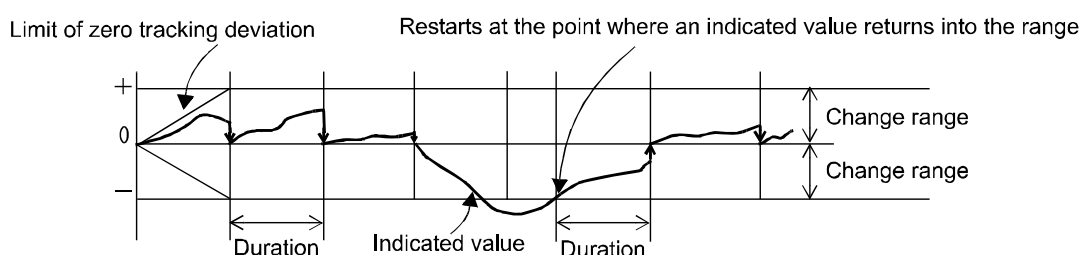
[Zero tracking (Period)] (Setting item 3-3)

(Input range: 0.0 to 9.9)

[Zero tracking (Range)] (Setting item 3-4)

(Input range: 0000 to 9999)

- Operation image



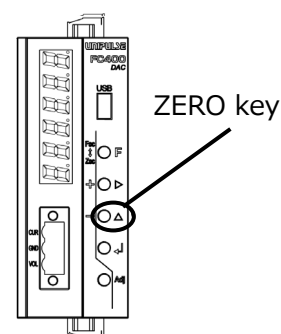
■ Digital zero (Designated key)

The indicated value is forcibly reset to zero when the ZERO key is pressed and digital zero is executed.

- If digital zero is executed with an indicated value exceeding the DZ regulation value, the DZ regulation value will be subtracted from the indicated value, and "ZE-AL" and display value displayed alternately.

Perform the following measures if this occurs.

- Change the setting value of DZ regulation value, and perform digital zero operation again.
(However, as this procedure is only meant as a temporary measure, perform zero calibration as soon as possible)
- Remove weighing residue attached to the tank and so forth.
- Check that there is no mechanical contact around the sensor.



■ DZ regulation value

Set the zero point correction (deviation from zero calibration point) range using digital zero or zero tracking.

[DZ regulation value] (Setting item 5-3)

(Input range: 00000 to 99999)

■ Peak ⇔ bottom value display (dedicated key)

If hold mode is set to "3:Peak & bottom", display of peak & bottom value can be switched alternately by pressing the ENT key (PEAK/BOTTOM key).

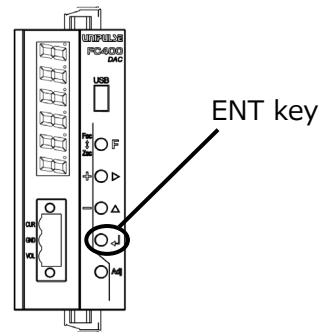
Switch to peak value display :

Peak value is displayed after indication of "P.HOLD".

Switch to bottom value display :

Bottom value is displayed after indication of "B.HOLD".

For hold mode other than "3: Peak & bottom", alternate switching is not possible.



■ Digital offset

This is a function to subtract a setting value from an indicated value. The value obtained by subtracting a setting value from an indicated value is displayed when digital offset is set.

This function is convenient when zero cannot be obtained with no load for some reason or when offset is implemented.

[Digital offset]

(Setting item 0-5)



(Input range: -99999 to 99999)

■ 6 digit display

Set the number of 7-segment display digits.

* If it is set to 6 digit display, Min. scale division setting of setting item 5-2 will not be reflected.

Also, this setting will not be reflected to the comparison and the hold.

[6 digit display]

(Setting item 5-4)




0: 5 digit display
1: 6 digit display

5 Setting and Operation Related to Comparison

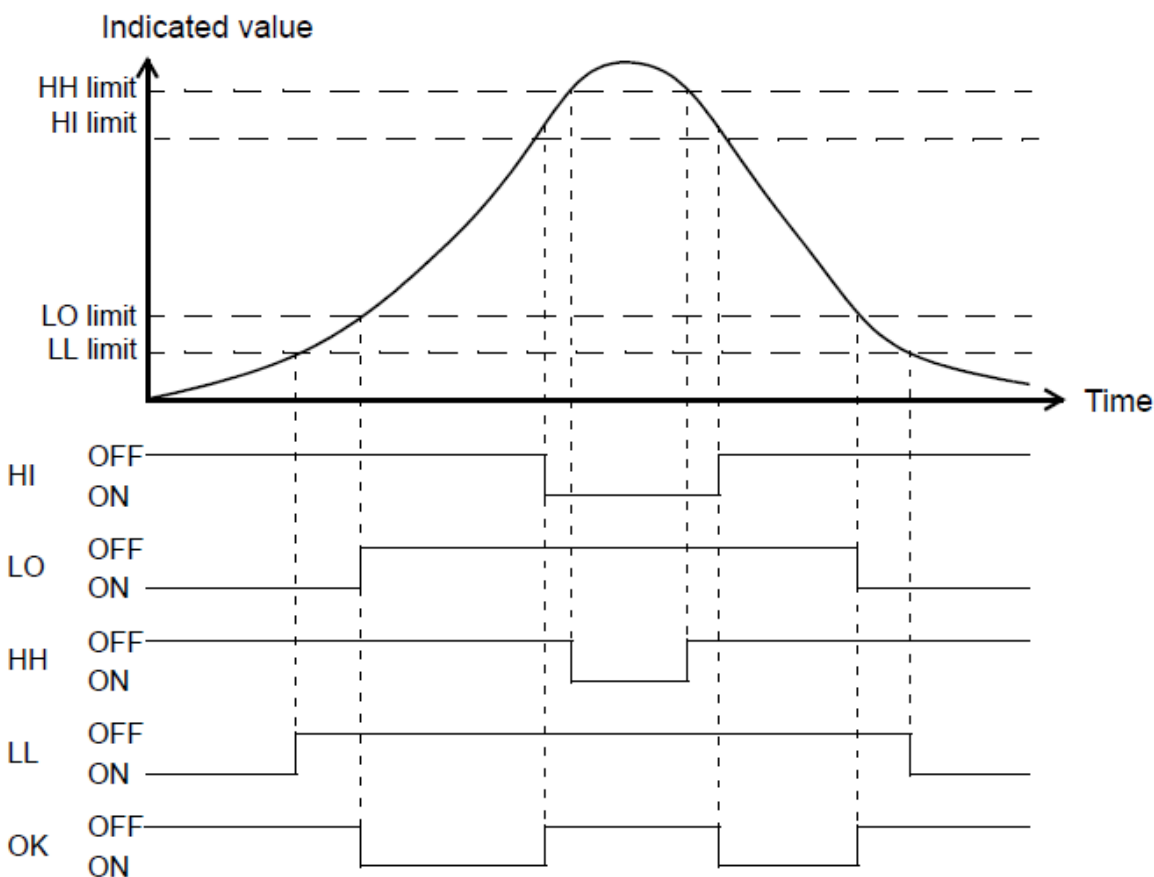
■ HI limit, LO limit, HH limit, LL limit

This function sets the HI limit and LO limit, turns the HI output ON when an indicated value exceeds the HI limit value, and turns LO output ON when an indicated value falls below the LO limit value. HH limit and

LL limit can also be set outside of these HI/LO limit comparisons. HH output is turned ON when an indicated value exceeds the HH limit value, and LL output is turned ON when the indicated value falls below the LL limit value. When HI, HH output, LO, and LL output are all OFF, OK output is turned ON.


[HI limit]	(Setting item 0-1)
[LO limit]	(Setting item 0-2)
[HH limit]	(Setting item 0-6)
[LL limit]	(Setting item 0-7)
	(Input range: -99999 to 99999)

● Output operations




■ HI/LO limit comparison mode

This function specifies the comparison timing.

[HI/LO limit comparison mode]	(Setting item 1-2)
	0: ALL
	1: MD
	2: NZ
	3: MD+NZ
	4: Hold

■ Hysteresis

This function provides off timing range of HI/LO limit comparison. This function is effective for chattering prevention when signals fluctuate (vibrate) subtly.

[Hysteresis]	(Setting item 0-4)
	(Input range: 0000 to 9999)

<Comparison conditions>

- HI limit

ON condition: Indicated value > HI limit setting value

OFF condition: Indicated value \leq (HI limit setting value - Hysteresis setting value)

- LO limit

ON condition: Indicated value < LO limit setting value

OFF condition: Indicated value \geq (LO limit setting value + Hysteresis setting value)

- HH limit

ON condition: Indicated value > HH limit setting value

OFF condition: Indicated value \leq (HH limit setting value - Hysteresis setting value)


- LL limit

ON condition: Indicated value < LL limit setting value

OFF condition: Indicated value \geq (LL limit setting value + Hysteresis setting value)

■ Alarm HI limit, Alarm LO limit

A sensor input value is always compared with the alarm HI limit and alarm LO limit. If the value exceeds alarm HI limit or falls below alarm LO limit, an OVERLOAD error will occur and the OVERLOAD output turns ON.

[Alarm HI limit]	(Setting item 2-1)
[Alarm LO limit]	(Setting item 2-2)
	(Input range: -99999 to 99999)

However, in the case when hold mode is set to "3:Peak & bottom", hold value comparison will be:

Peak value > Alarm HI limit

Bottom value < Alarm LO limit

■ Near zero

This function detects that an indicated value is a value near zero.

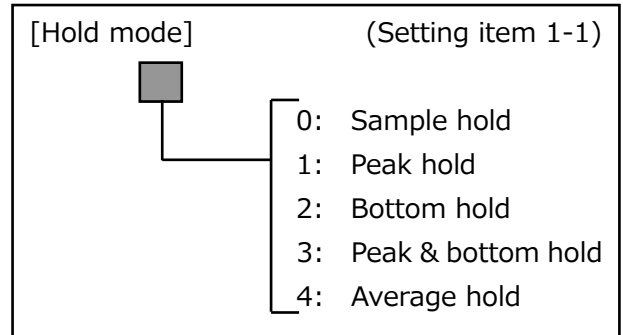
[Near zero]	(Setting item 0-3)
	(Input range: 00000 to 99999)

6 Settings and Operations Related to Hold

6-1. Setting of hold

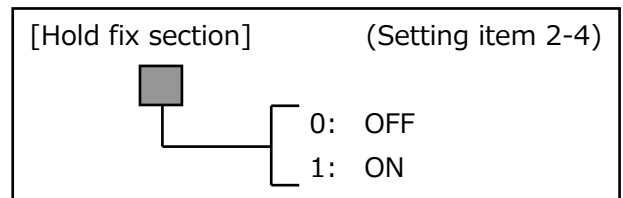
■ Hold mode

FC400 has a peak hold function that maintains and displays a peak value (maximum value) of input signals, a bottom hold function that maintains and displays a bottom value (minimum value) of input signals and a sample hold function that maintains and displays an arbitrary point. When hold fix section is set as 1: ON, detection section and fix section can be distinguished.



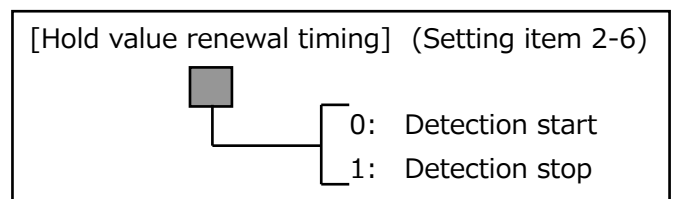
■ Hold fix section

Whether or not a fix section is inserted into hold motion can be selected.



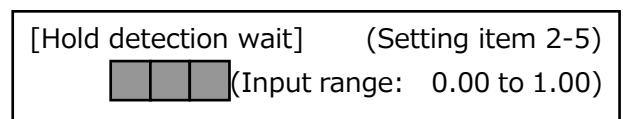
■ Hold value renewal timing

Renewal timing of hold value display can be changed. Normally, it is 0: detection start, but if only hold values are to be displayed or indicated values are to be held at high-speed measurement, 1: detection stop is set.



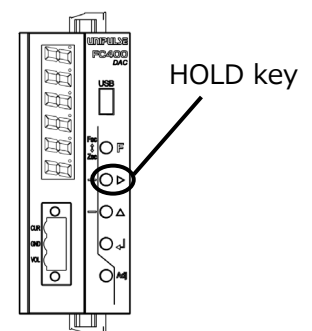
■ Hold detection wait

Detection wait of hold input is set. Changes of hold input will not be recognized within the time set as detection wait after capturing the changes.



■ Hold control (dedicated key)

This key is used for hold function operation. Operations change depending on setting values of hold fix section.



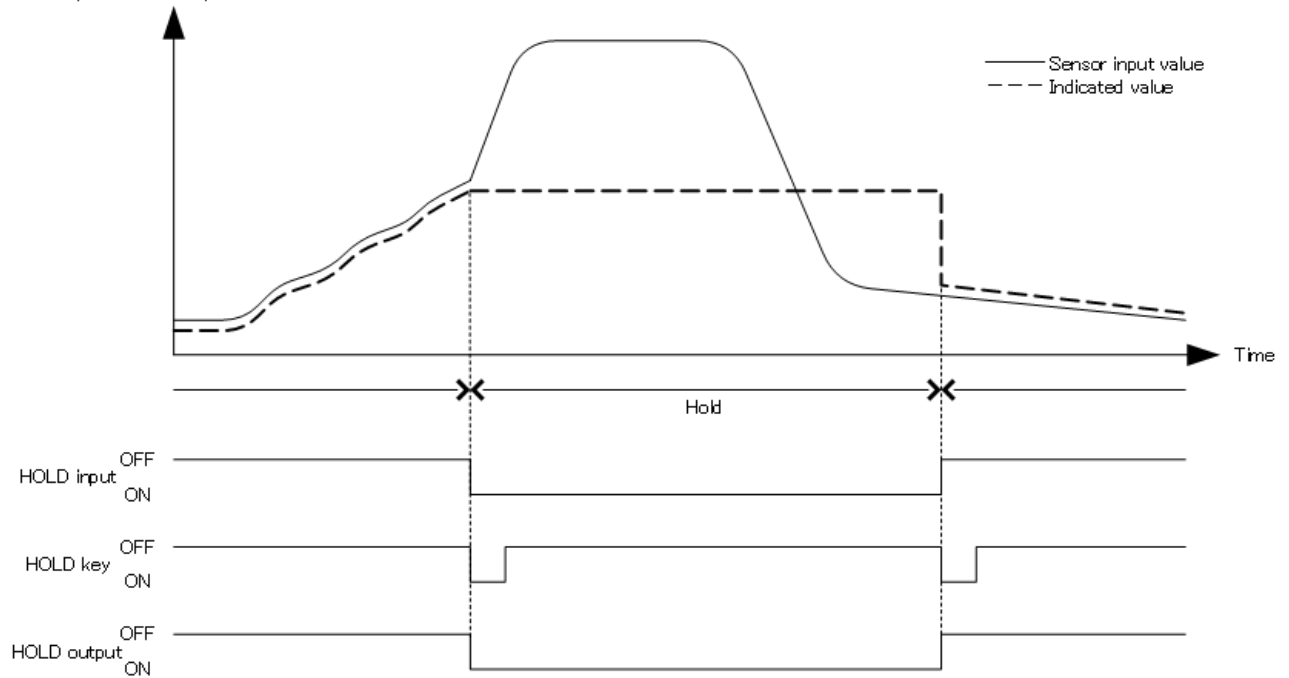
Key point

- When hold is turned ON with external signals, turn it OFF with external signals.
- When hold is turned ON with key inputs, turn it OFF with key inputs.

6-2. Sample hold (maintaining arbitrary points)

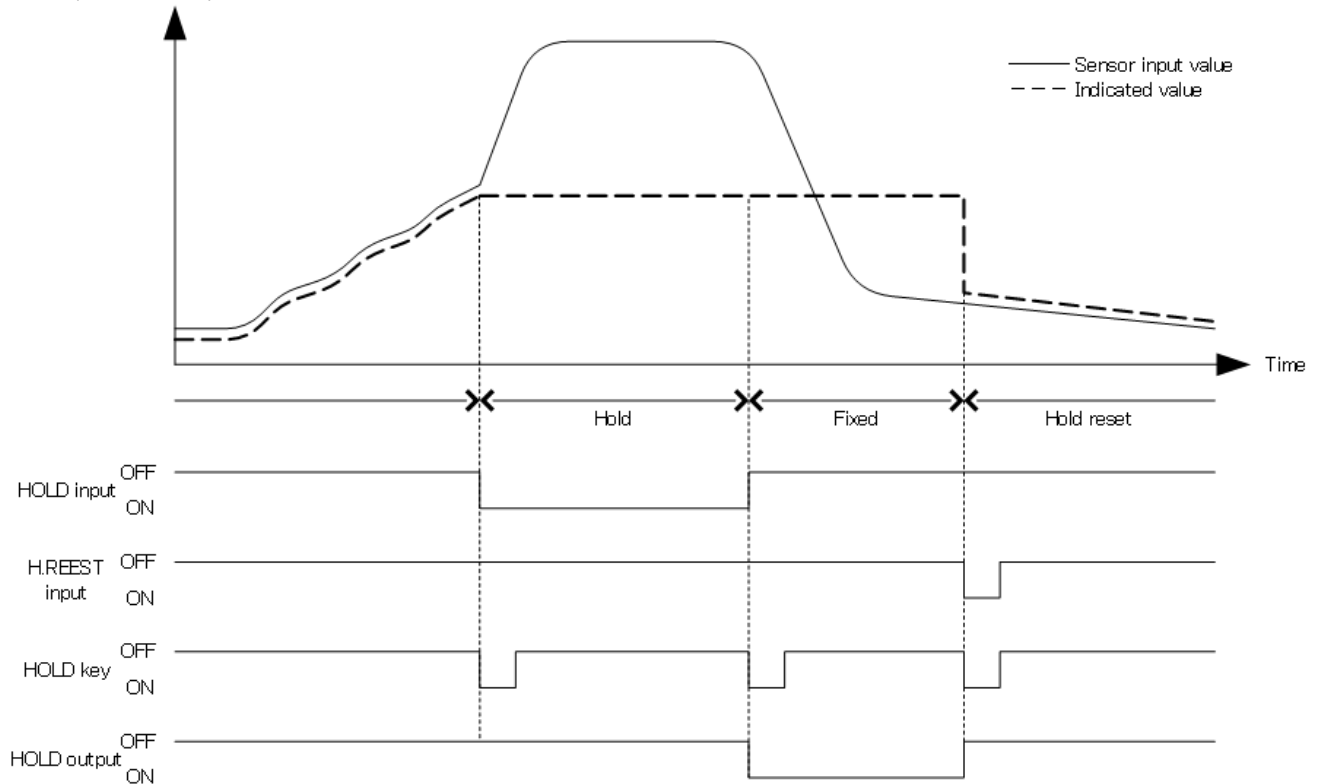
When hold fix section is 0: OFF

● Operation of sample hold



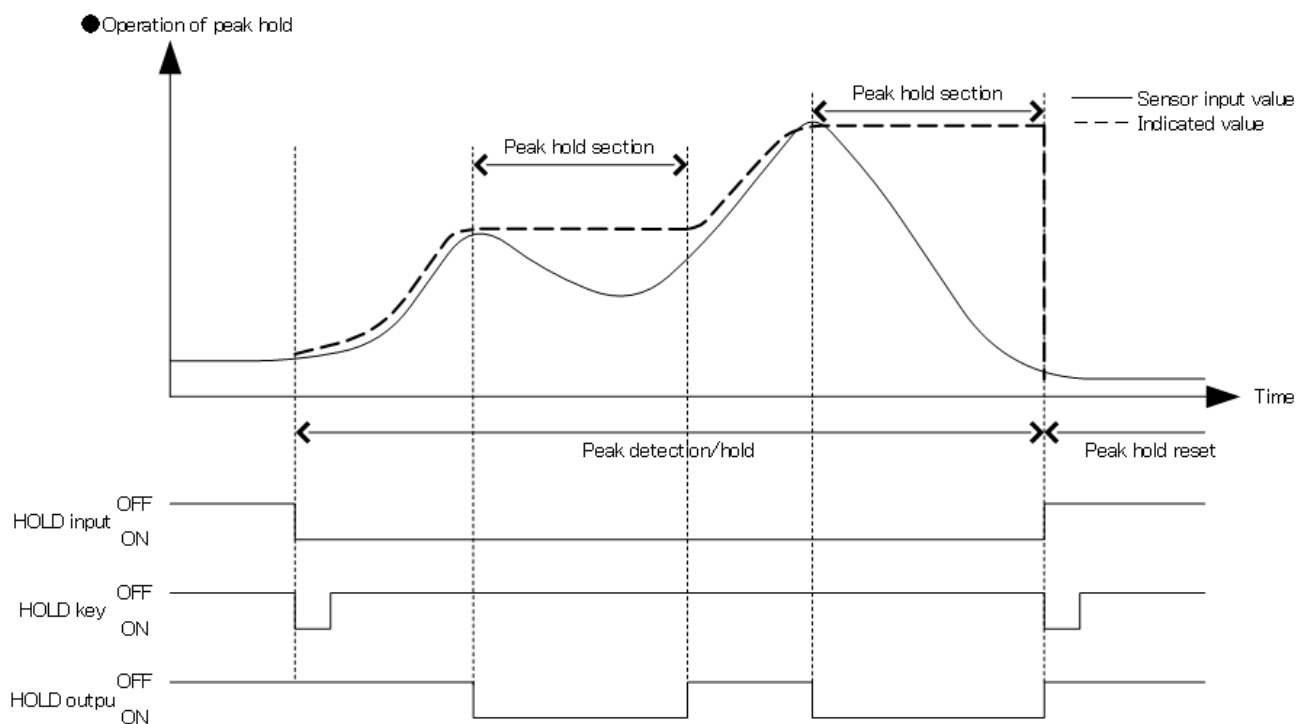
When hold fix section is 1: ON

● Operation of sample hold

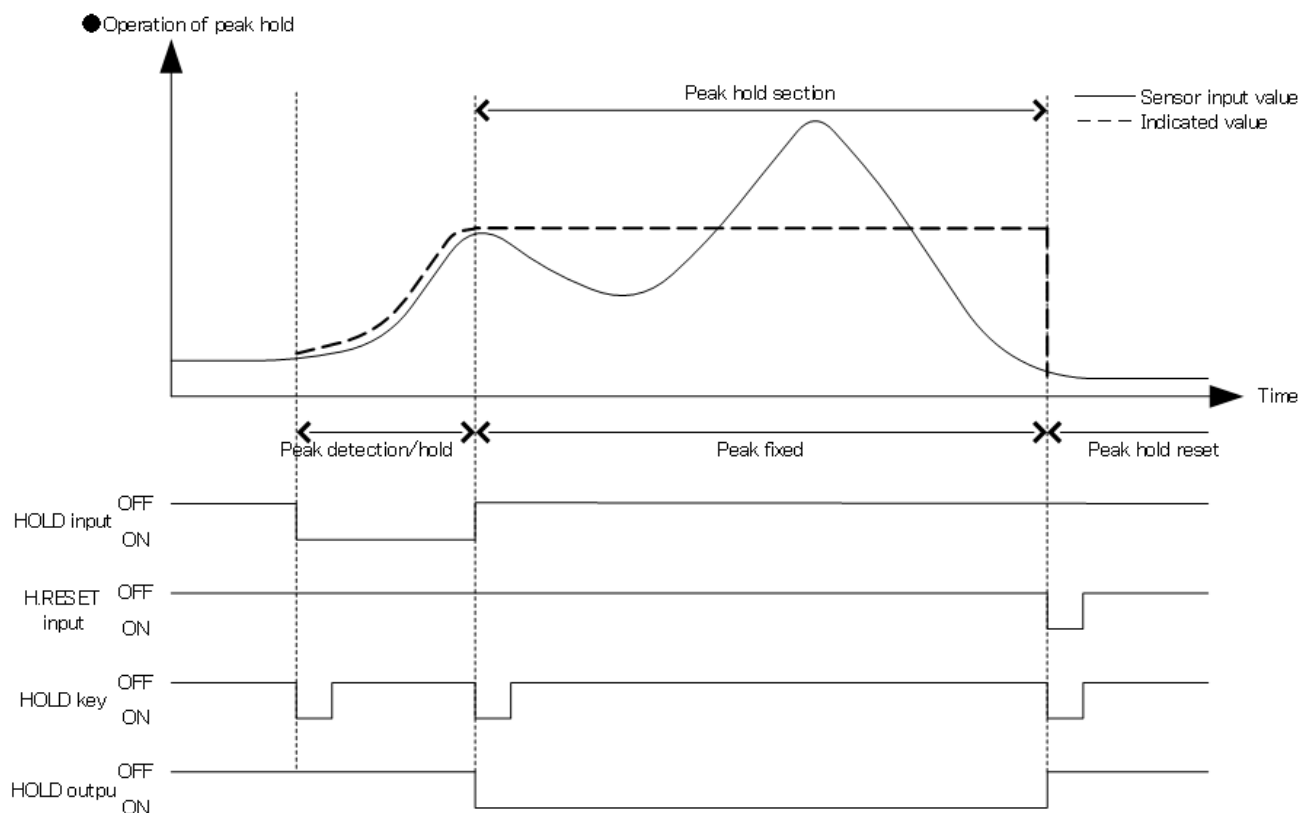


6-3. Peak hold (maintaining a maximum point)

When hold fix section is 0: OFF

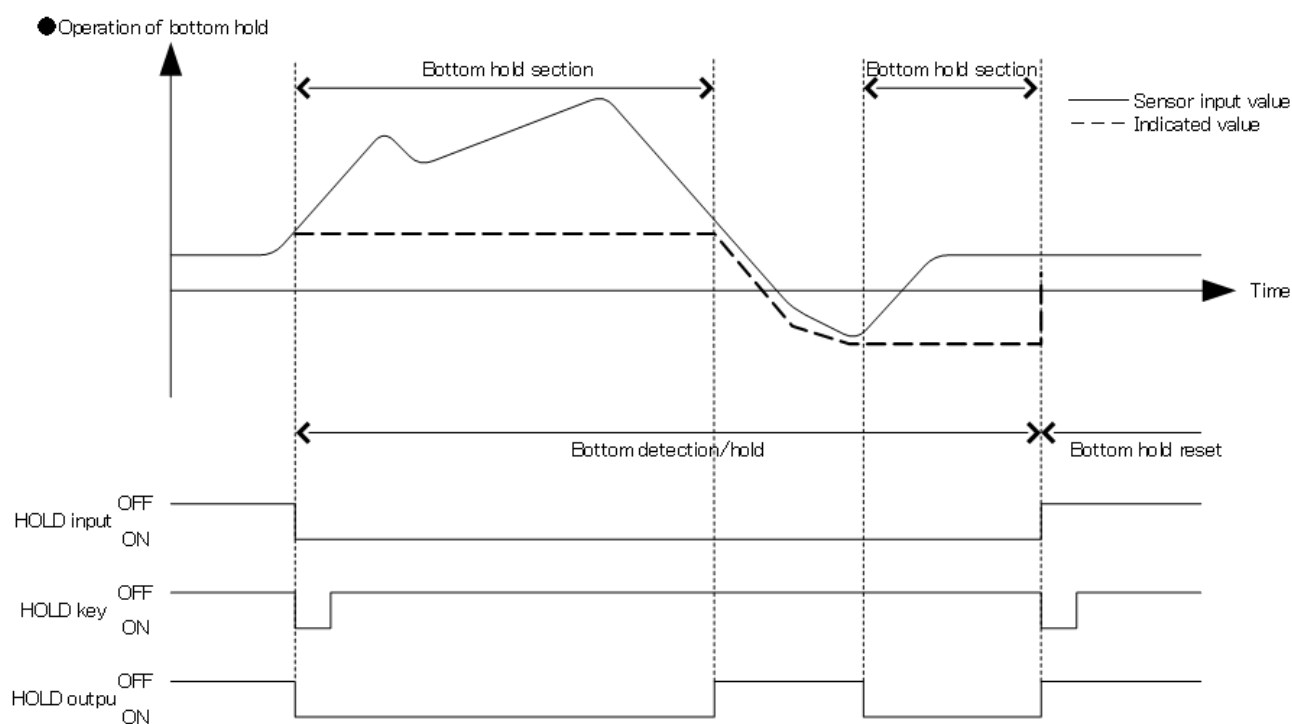


When hold fix section is 1: ON

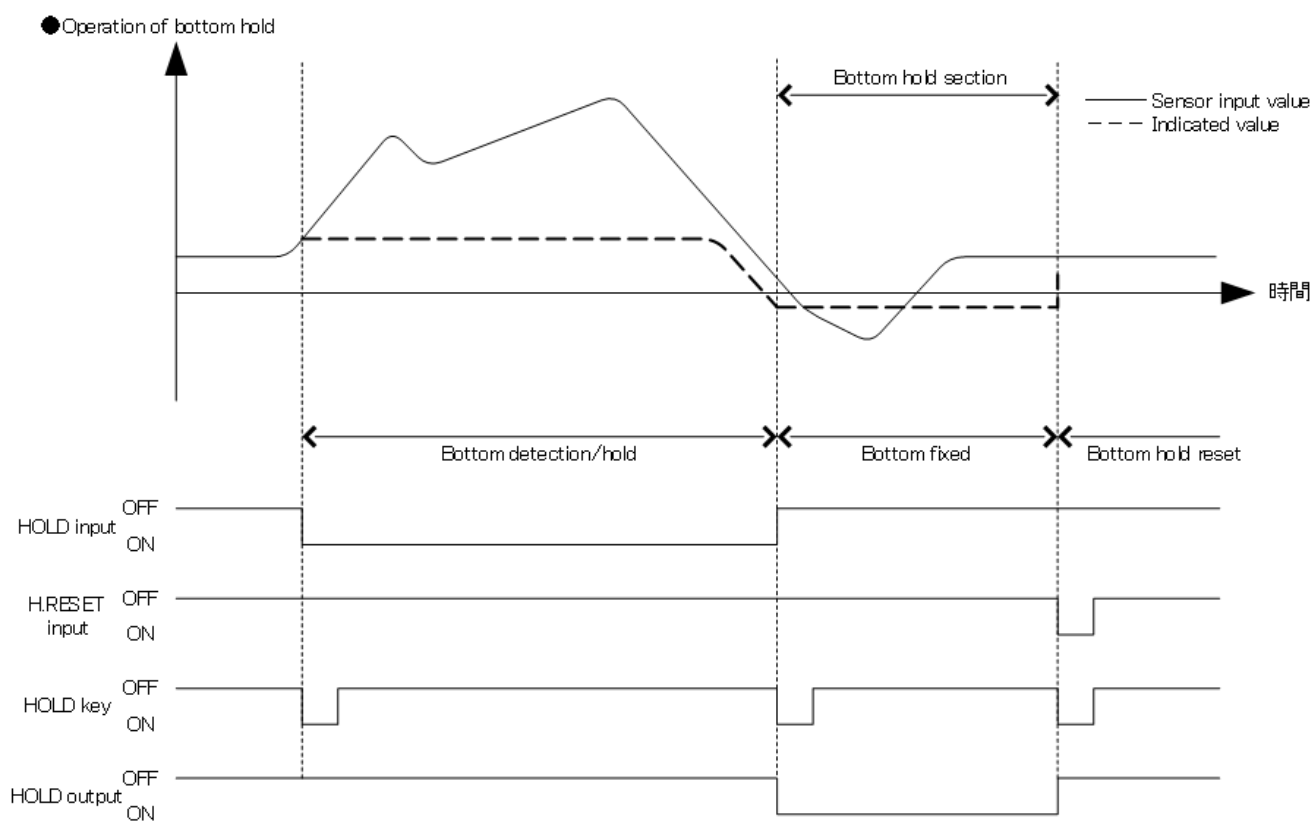


6-4. Bottom hold (maintaining a minimum point)

When hold fix section is 0: OFF

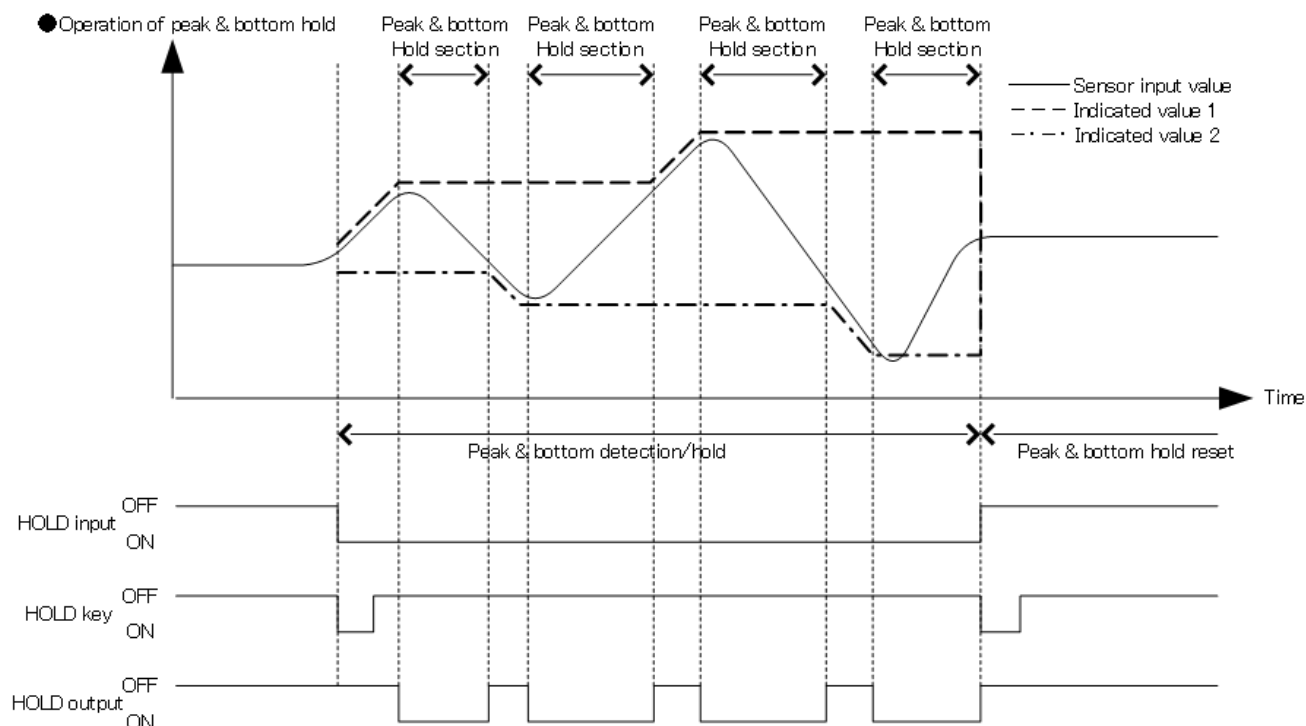


When hold fix section is 1: ON

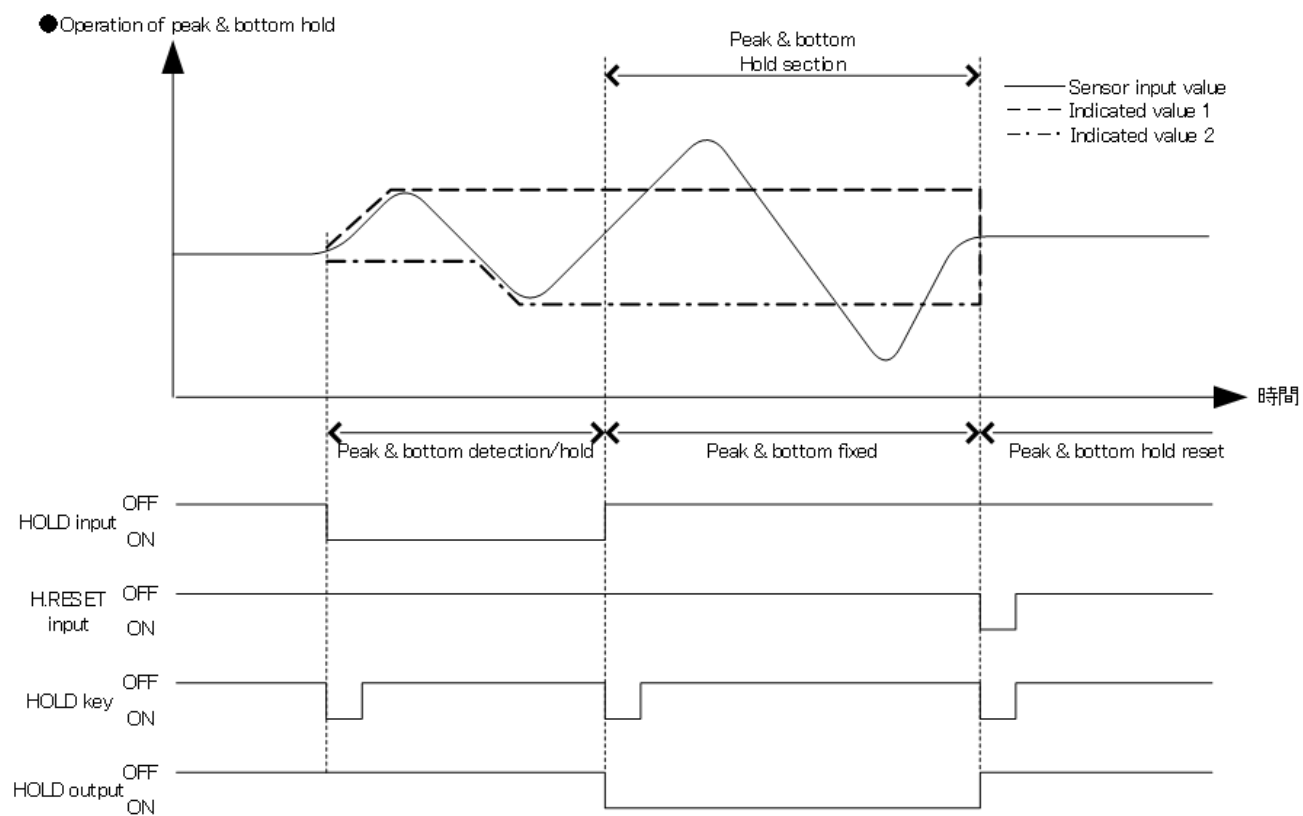


6-5. Peak & bottom hold (maintaining a maximum point and a minimum point)

When hold fix section is 0: OFF



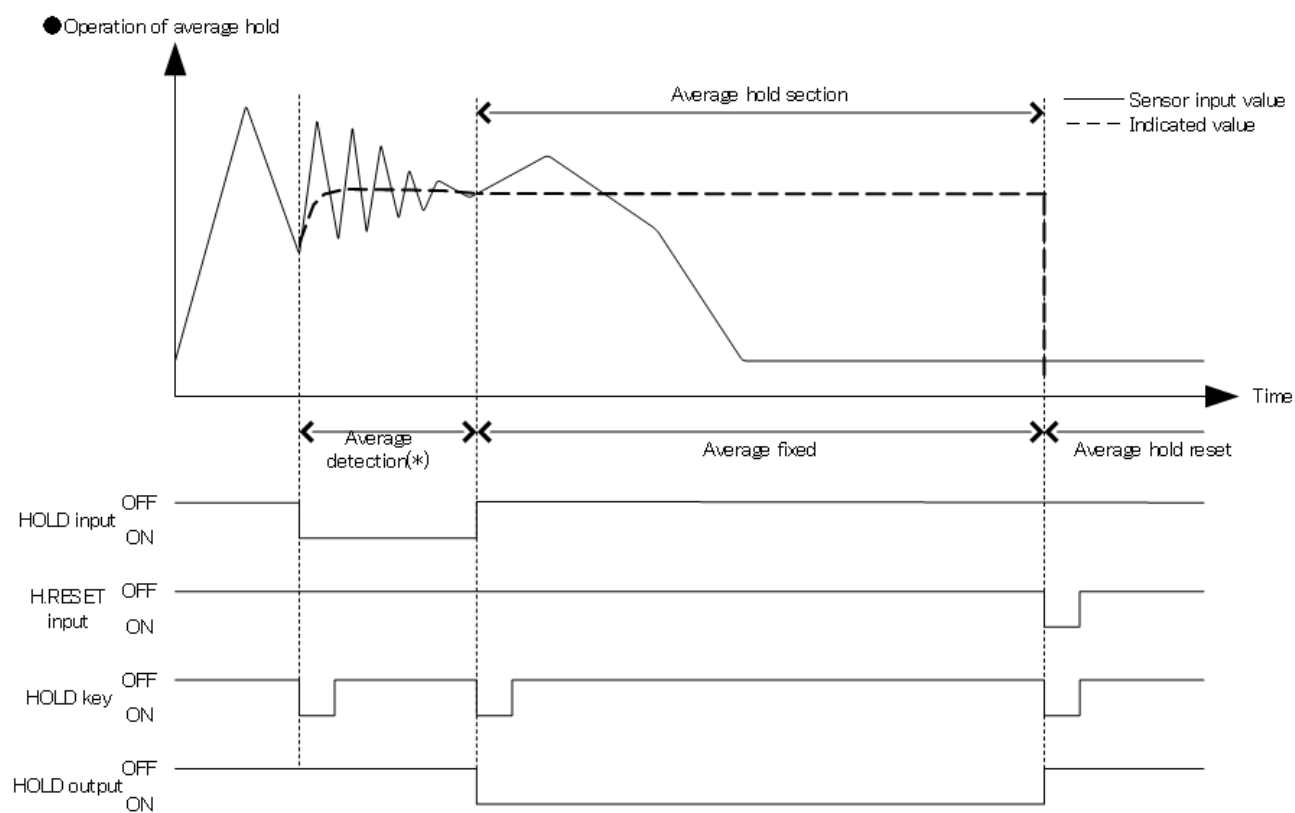
When hold fix section is 1: ON



6-6.Average hold (maintaining an average point)

Average hold only works if hold fix section is ON.

When hold fix section is 1: ON

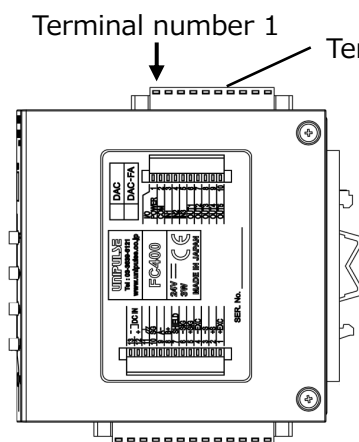


Key points

*Maximum detection section is 5 sec (fixed).
Detection more than 5 sec can not be made.

7 External I/O signals

7-1. Terminal block pin assignment



Use	Terminal number	Terminal name	Description
Power supply for I/O	1	I/O POWER	Connects with the DC24V power supply for I/O.
	2	COM	A common terminal for I/O signals.
Input terminal	3	IN1	Terminals for input signals. (Functions selected through settings.)
	4	IN2	
	5	IN3	
Output terminal	6	OUT1	Terminals for output signals. (Functions selected through settings.)
	7	OUT2	
	8	OUT3	
	9	OUT4	
	10	OUT5	

- An external DC24V (power supply for the external I/O signal circuit) must be prepared separately.
- I/O circuits and internal circuits are electrically insulated by a photo-coupler.

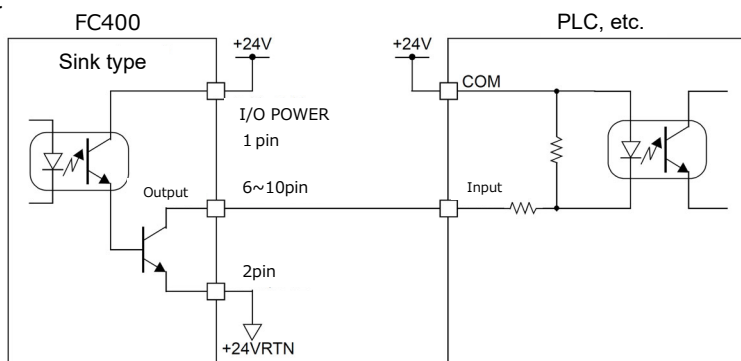
7-2. Connecting an external control device

Input terminals ... Switches, relays, transistors, photo-couplers etc. can be connected.

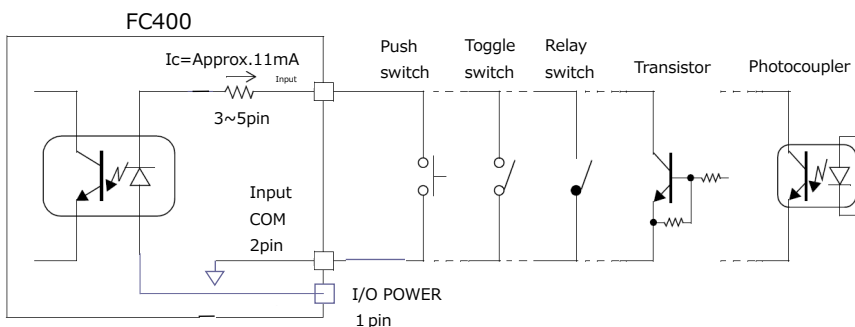
Connect a sink type unit for connecting transistors, photo-couplers etc.

Output terminals ... Open collector output for transistors.

- Output



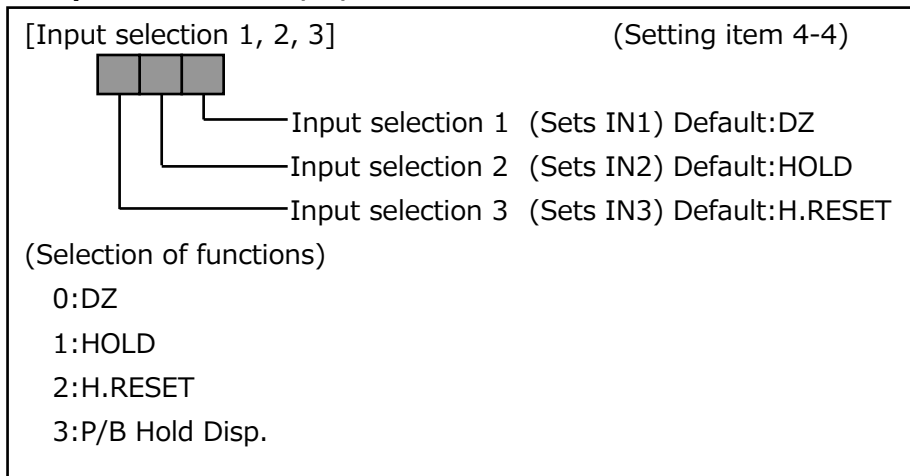
- Input



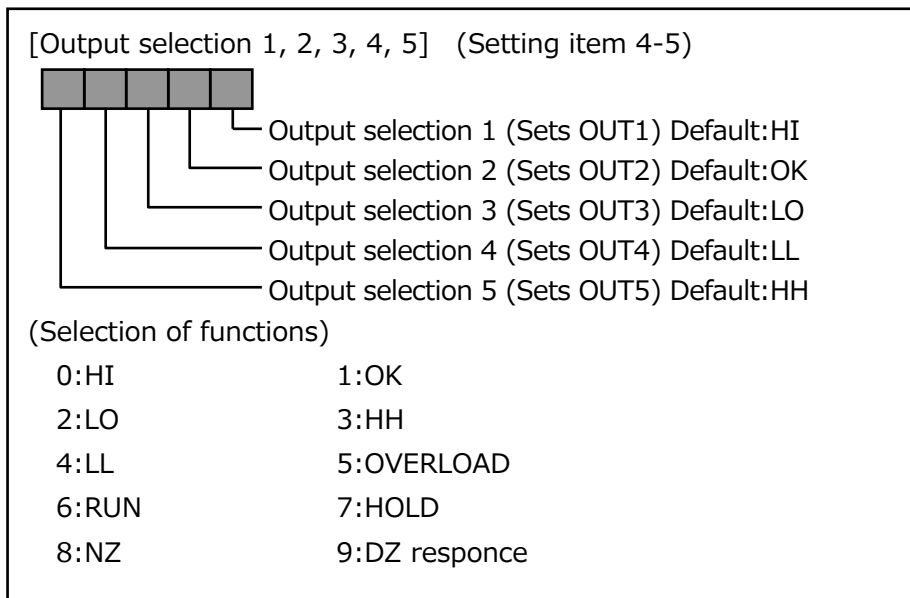
7-3. Selection of external I/O signal functions

Functions can be selected for each I/O terminal.

■ Input selection 1, 2, 3



■ Output selection 1, 2, 3, 4, 5



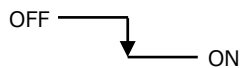
7-4. Description of external I/O signal functions

(Input signals)

Function	Input method	Description
DZ	Edge input	Digital zero is implemented at ON edge.
HOLD	Edge input	Hold control is performed. If hold fix section is set to 0:OFF, holding value is detected and fixed at the ON edge, and holding value is released at the OFF edge.
H.RESET	Edge input	Hold is released at ON edge. If hold fix section is set to 0:OFF, HOLD signals is also hold release at the same time.
P/B Hold Disp.	Edge input	If hold mode is set to 3: Peak & Bottom, the indication value display becomes bottom hold value at the ON edge, and becomes peak hold value at the OFF edge.

<Edge input>

- ON edge (OFF → ON)



- OFF edge (ON → OFF)



* Pulse range of 50 msec or more

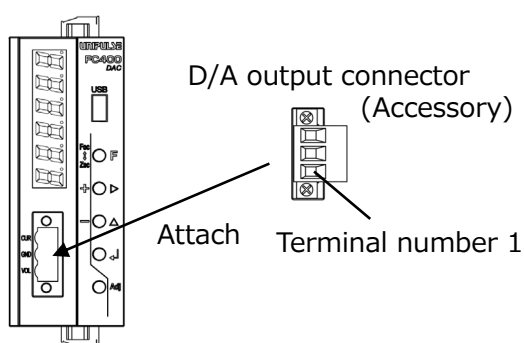
(Output signals)

Function	Description
HI	Output turns ON when HI limit < indicated value.
OK	Output turns ON when LO limit < indicated value < HI limit.
LO	Output turns ON when HI limit < indicated value.
HH	Output turns ON when HH limit < indicated value.
LL	Output turns ON when LL limit < indicated value.
HOLD	Use this function to obtain synchronization of hold and decision.
NZ	Output turns ON when indicated value ≤ near zero setting value.
OVERLOAD	This function outputs results of comparisons of Alarm HI limit and Alarm LO limit against indicated values.
DZ response	Use this function to check if digital zero is recognized.
RUN	The signal will switch between ON and OFF roughly once every 0.5 seconds.

8. D/A Converter Interface

D/A converter is an interface to output the weight value as an electrical signal. The converter can output a voltage and current proportional to the weight value.

8-1. Names of components



Terminal number	Terminal name	Description
3	CUR	Current output terminal
2	GND	Ground for voltage and current output (Common)
1	VOL	Voltage output terminal

8-2. Settings related to D/A

■ Voltage zero scale setting

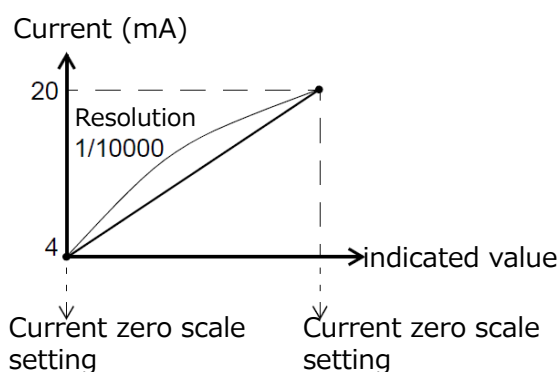
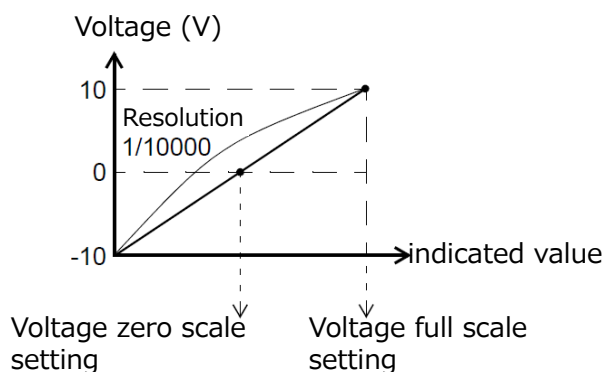
■ Voltage full scale setting

■ Current zero scale setting

■ Current full scale setting

Set the indicated values for when zero scale (0V/4mA) and full scale (+10V/20mA) are output.

[Voltage zero scale setting]	(Setting item 8-1)
[Voltage full scale setting]	(Setting item 8-2)
[Current zero scale setting]	(Setting item 8-3)
[Current full scale setting]	(Setting item 8-4)
<input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/>	(Input range: -99999 to 99999)



■ D/A output link setting

Set the weight value to be linked.

[D/A output link setting]	(Setting item 8-5)
<input type="checkbox"/>	0: Linked with indicated value
<input type="checkbox"/>	1: Not linked indicated value

8-3. D/A output fine adjustment

- Voltage zero scale adjustment
- Voltage full scale adjustment
- Current zero scale adjustment
- Current full scale adjustment

Fine adjustments can be made to the current and voltage zero scale output (0V/4mV) and full scale output (+10V/20mA).

(The adjustable range is about $\pm 10\%$ of the full scale)

* Unlike the setting operations in other modes, press the Adj key to switch to adjustment mode.

(Setting operation)

[Voltage zero scale adjustment]

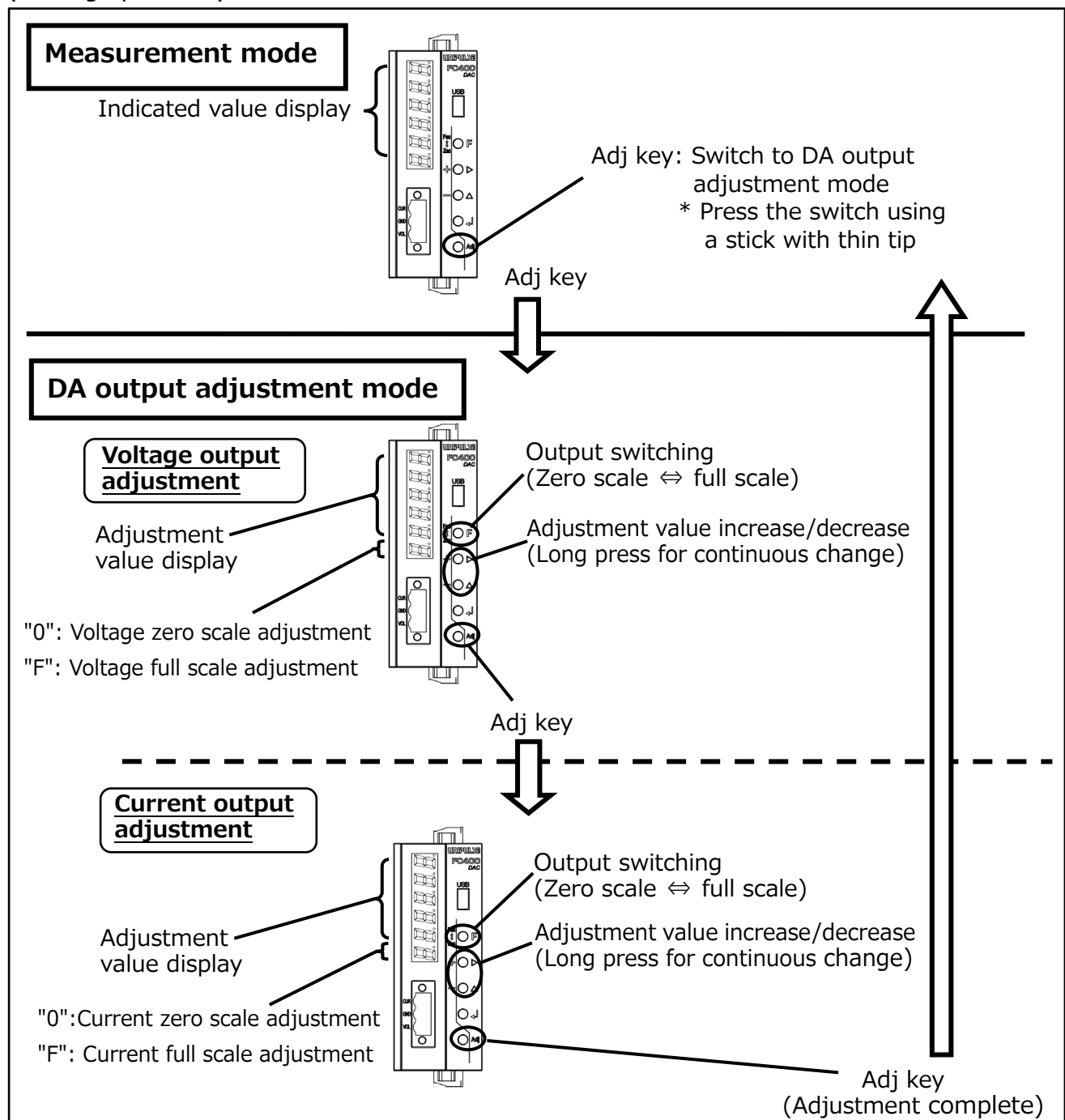
[Voltage full scale adjustment]

(Input range: -5461 to 5461)

[Current zero scale adjustment]

[Current full scale adjustment]

(Input range: -4194 to 4194)



9 RS-485 Interface

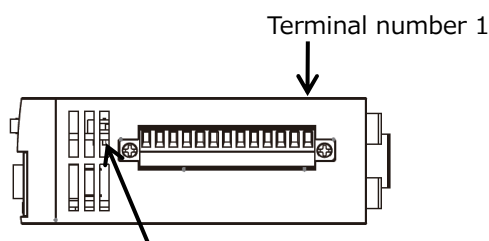
RS-485 is an interface to read the indicated values and status of the FC400 and read and write setting values.

This interface is convenient for processing such as controls, totals, and records by connecting the FC400 to a PLC, programmable display unit and so forth.

9-1. Communication specifications

Message format	Modbus-RTU/UNI-Format	
Signal level	RS-485 compliant, 2-wire	
Transmitting distance	Approx. 1km	
Transmitting method	Asynchronous, half duplex	
Transmitting speed	9600/19200/38400/57600/115.2kbps	
Number of connectible units	Maximum 32 (including 1 master unit)	
Bit configuration	Start bit	1bit
	Character length	Select from 7 or 8bit (8bit for Modbus-RTU)
	Stop bit	Selectable from 1 or 2bit
	Parity bit	Select from none, odd or even
	Terminator	Select from CR, CR+LF
Communication mode	Hand shake/Modbus-RTU	
Selection code	Binary (Modbus-RTU)/ASCII (UNI-Format)	

9-2. RS-485 connection



Terminal number	Terminal name	Description
8	B+	Signal wire B+ side
9	A-	Signal wire A- side
10	SG	Signal ground

Slide switch for switching terminators (inside the case)

A terminator is mounted on the right side in the diagram above, and there is no terminator mounted on the left side.

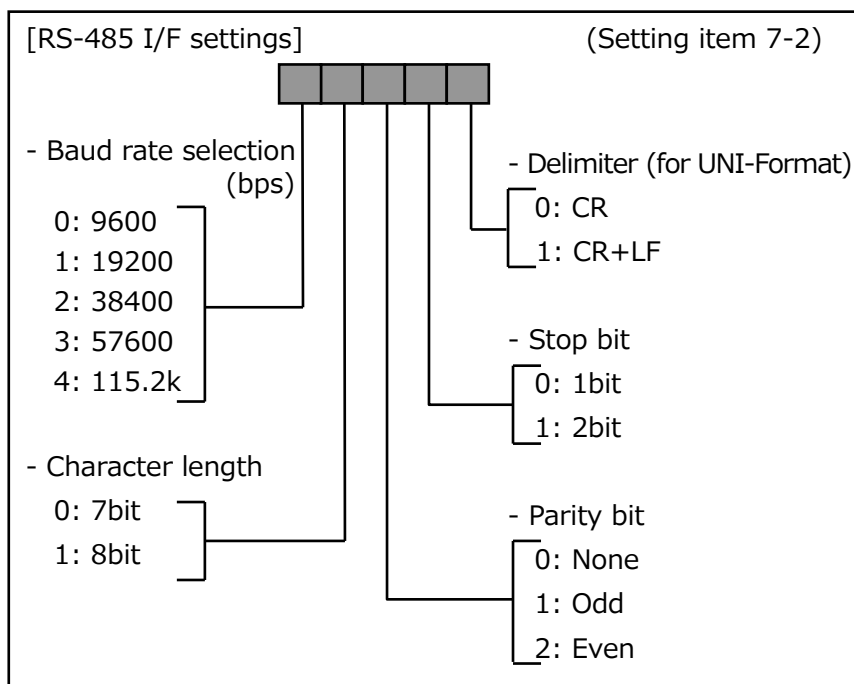
- Use twisted pair wires for connection cables. (Noise margin increases.) However, two-core parallel cables are sufficient for short-distance connection.
- SG terminal is a ground terminal (which protects circuits) used on the circuit. SG terminal does not normally need to be used if the main unit of the FC400 and connection counterpart device are class D grounded. However, if connection is necessary based on the on-site conditions, check the specifications of the counterpart device before connecting.
- Attach terminators on both the host and the FC400 sides. (For the FC400, switch using the slide switch in the above diagram.)
When connecting multiple FC400 units, **mount a terminator only to the terminal device.**
- Depending on the master device (PLC etc.), A and B may be indicated in reverse. If communication is not possible, switch A and B.

9-3. Settings related to RS-485

■ RS-485 I/F settings

These settings are for RS-485 communication.

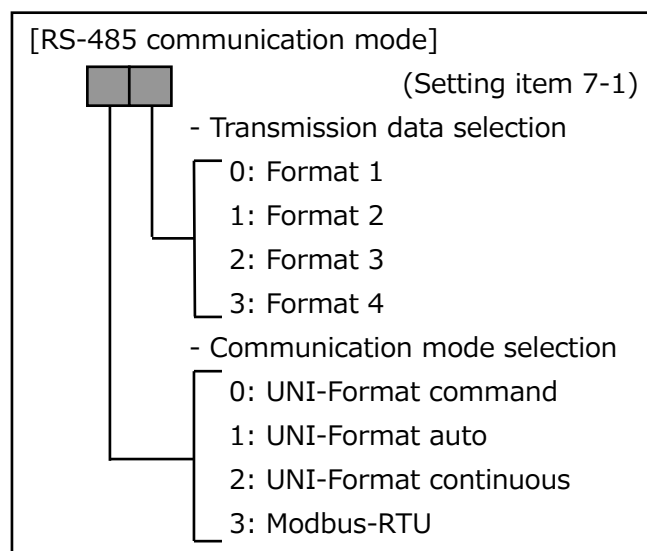
Use the same settings as the connecting device.



■ RS-485 communication modes

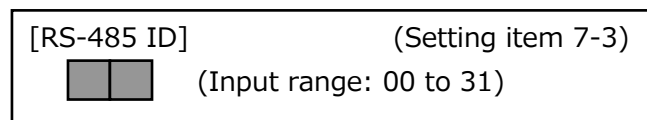
Select communication mode from Modbus-RTU or UNI-Format.

Also, select the transmission data for UNI-Format auto/continuous.



■ RS-485 ID

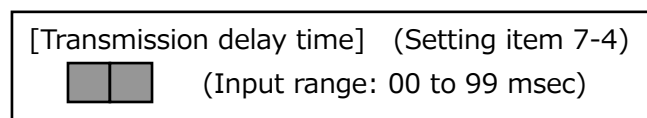
Set the ID for RS-485.



■ Transmission delay time

Adjust the time from when the FC400 receives a message from the master device to when it responds. (For Modbus-RTU mode only)

Set the delay time when the master device cannot process a response.



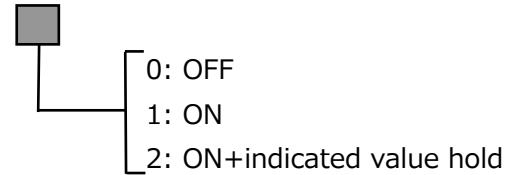
■ Automatic printing command

FC400-DAC automatically outputs indicated values via RS-485 interface as soon as STABLE Status turns ON.

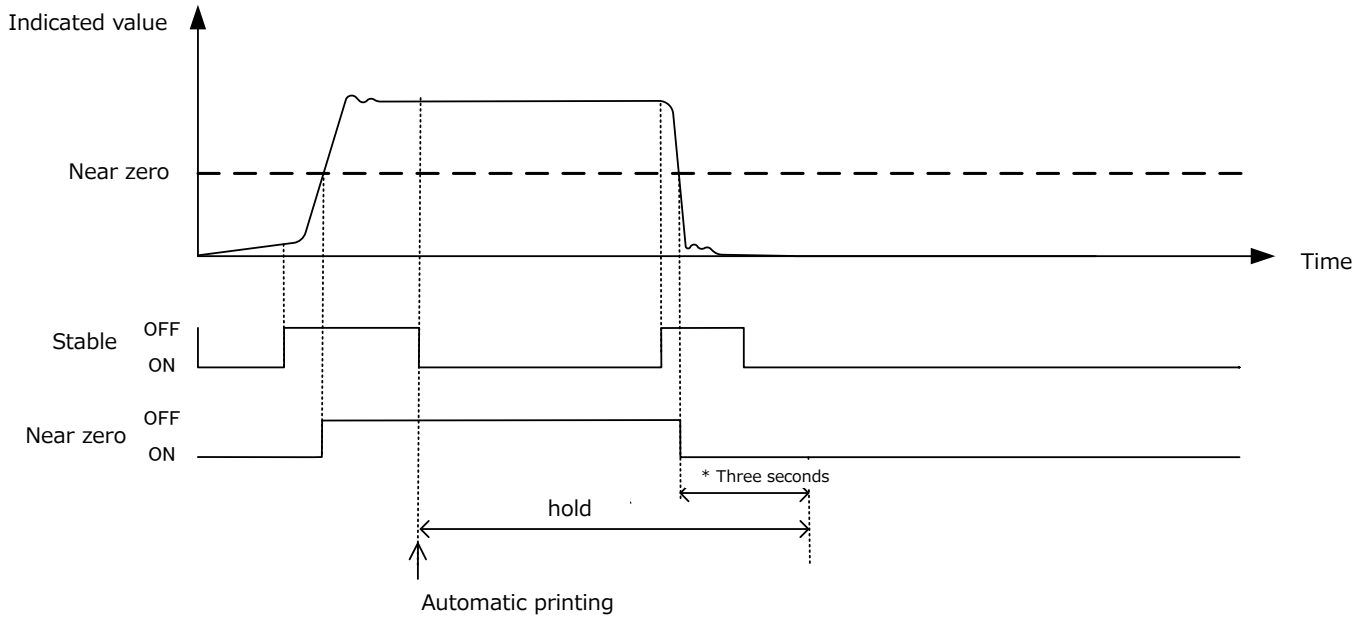
(STABLE Status works depending on Motion Detect Setting.)

In addition, the reading can be held for 3sec if required. (HOLD function)

[Automatic printing] (Setting item 7-5)



● Indicated value hold function operations



■ Hold value printing

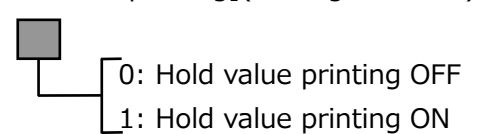
FC400-DAC automatically outputs the hold values via RS-485 interface as soon as HOLD is released.

*When "Hold Fix Section" is ON, the hold values are outputted as soon as hold value is fixed.

Also Automatic Printing does not work when "Hold value printing" is set to ON.

"Indicated value hold" by "Automatic Printing" does not work as well.

[Hold value printing](Setting item 7-6)



9-4. UNI-Format

There are the following three communication modes for the UNI-Format.

- UNI-Format command ... Responds or operates in accordance with the command from the master device.
The commands can be broadly divided into the following four types.
 - Reading commands Read indicated values and status
 - Setting value reading/writing commands Read/write setting values
 - Calibration commands Execute calibration processes
 - Execution commands Execute other processes (tare subtraction etc.)
- UNI-Format auto ... Transmits a message in the UNI-Format upon completion.
- UNI-Format continuous ... Continuously transmits a message in the UNI-Format (Transmission intervals are as follows).
 - 9600bps ... 25 times
 - 19200bps ... 50 times
 - 38400bps ... 100 times
 - 57600bps ... 150 times
 - 115.2kbps ... 300 times

9-5. UNI-Format message formats

Reading command

- Reading weight values

N	O			R	(1)	CR
---	---	--	--	---	-----	----

ID No.

I	D			R	(1)	±	1	0	0	.	0	0	Delimiter
---	---	--	--	---	-----	---	---	---	---	---	---	---	-----------

ID No.

Sign, 5 or 6 digits, decimal point

(1) Weight value

A: Linked indicated value (only 5 digits)

B: Not linked indicated value (5 or 6 digits)

C: Linked indicated value(Hold mode: peak&bottom,bottom indicated) (only 5 digits)

- Reading status 1 **RD**

N	O			R	D	CR
---	---	--	--	---	---	----

ID No.

I	D			R	D	(1)	(2)	(3)	(4)	(5)	(6)	(7)	Delimiter
---	---	--	--	---	---	-----	-----	-----	-----	-----	-----	-----	-----------

ID No.

(1)when ±LOAD,OFL1,2,oLoad,ZALM (2)Zero tracking

(3)HH (4)LL (5)LOCK1 (6)LOCK2 0:OFF 1:ON

(7)Calibratin error No. 2, 3, 6 to 8, (0: no error)

- Reading status 2 **RE**

N	O			R	E	CR
---	---	--	--	---	---	----

ID No.

I	D			R	E	(1)	(2)	(3)	(4)	(5)	(6)	0	Delimiter
---	---	--	--	---	---	-----	-----	-----	-----	-----	-----	---	-----------

ID No.

(1) Hold (2) Stable (3) Near zero (4) HI (5) OK (6) LO

0: OFF

1: ON

- Reading status 3 **RF**

N	O			R	F	CR
---	---	--	--	---	---	----

ID No.

I	D			R	F	(1)	0	0	0	0	0	0	0	Delimiter
---	---	--	--	---	---	-----	---	---	---	---	---	---	---	-----------

ID No.

(1) DZ response

0: OFF

1: ON

Setting value reading/writing commands

- Writing setting values

N	O			W	(1)	(2)	(3)					CR
---	---	--	--	---	-----	-----	-----	--	--	--	--	----

ID No.

5 digits

* Higher digits are filled with 0 when the setting value is under 5 digits.

(1) Setting mode number, (2) Setting item number

* Refer to the list of setting values

(3) Sign

No sign: 0

Sign: + or -

- Reading setting values

N	O			W	(1)	(2)	CR
---	---	--	--	---	-----	-----	----

ID No.

I	D			W	(1)	(2)	(3)							Delimiter
---	---	--	--	---	-----	-----	-----	--	--	--	--	--	--	-----------

(1) Setting mode number, (2) Setting item number

* Refer to the list of setting values

The same as the setting value writing format

(3) Sign

No sign: 0

Sign: + or -

Calibration commands

- Zero calibration/span calibration

- Equivalent zero calibration/equivalent span calibration

N	O			C	(1)	CR
---	---	--	--	---	-----	----

ID No.

I	D			N	(1)	(2)	Delimiter
---	---	--	--	---	-----	-----	-----------

Calibrating

(1) Calibration mode

A: Zero calibration

B: Span calibration

U: Equivalent input zero calibration

V: Equivalent input span calibration

(2) Calibration error

2, 3, 6 to 8, (0: no error)

Execution command

N	O			C	(1)	CR
---	---	--	--	---	-----	----

ID No.

(1) Command

C: Peak value display, D: Bottom value display, E: Hold ON F: Hold OFF

G: Digital zero H: Digital zero reset J: Hold Reset O: Auto adjustment filter

UNI-Format auto/continuous

- Format 1

G	S	,	(1)	,	(2)	,	(3)	,	(4)	,	(5)	,	±					CR
---	---	---	-----	---	-----	---	-----	---	-----	---	-----	---	---	--	--	--	--	----

GS: Linked with indicated value

Sign, 5 digits, decimal point

- Format 2

N	T	,	(1)	,	(2)	,	(3)	,	(4)	,	(5)	,	±					CR
---	---	---	-----	---	-----	---	-----	---	-----	---	-----	---	---	--	--	--	--	----

NT: Not linked with indicated value

Sign, 5 or 6 digits, decimal point

- Format 3

For BCC calculation																			
SOH	W	T	STX	(1)	(2)	(3)	(4)	(5)	(6)	±					±			ETX	BCC

WT: Linked with indicated value

Sign, 5 digits

Sign, 5 digits

& Not linked with indicated value

(1) O: LOAD/OFL1,2/OVERLOAD

(4) N: Near zero OFF

S: Stable M: Unstable H: Hold

Z: Near zero ON

(2) A: ZT OFF T: ZT ON

(5) H: HH ON L: LL ON G: HH and LL OFF

(3) H: HI ON L: LO ON G: HI and LO OFF

N: HH and LL ON F: Comparison OFF

N: HI and LO ON F: Comparison OFF

(6) Decimal place

0: None, 1: 0.0, 2: 0.00, 3: 0.000, 4:0.0000

- Format 4

For BCC calculation																			
SOH	W	P	STX	±					±					±				ETX	BCC

WP: Peak indicated value

& Bottom indicated value

& Real-time value

Each ASCII code of SOH,STX and ETX

BCC:Block check character

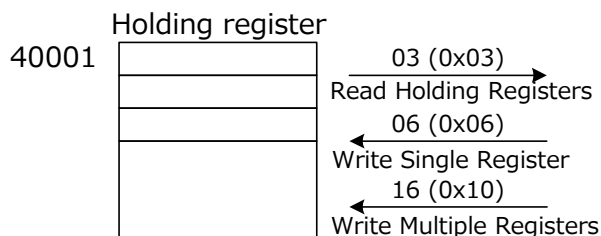
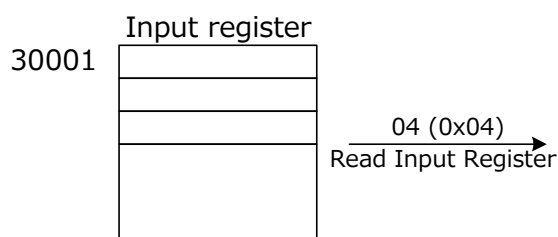
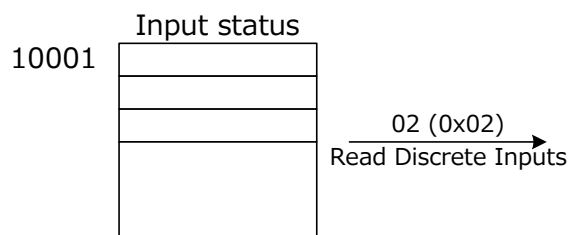
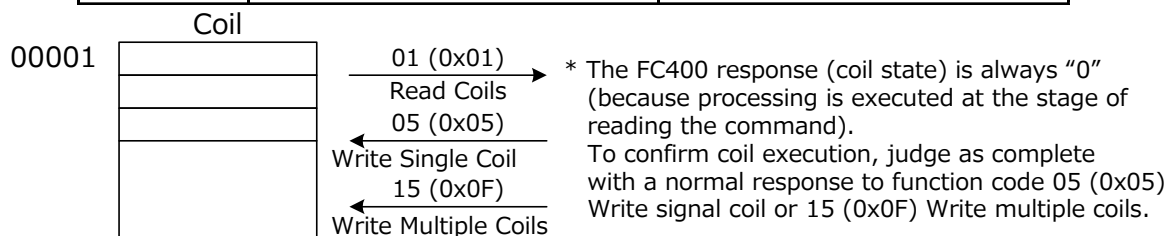
It is calculated as the XOR of the transmitted character(Hexadecimal)

9-6. Modbus-RTU

Introduction into a system with the same Modbus-RTU configuration can be easily performed by selecting Modbus-RTU for the communication mode. (Refer to the specifications for the Modbus protocol, which are open to the public.)

The FC400 operates as a slave to enable the following operations from the master side.

Code	Function name	Command
01 (0x01)	Read Coils	Read coils
02 (0x02)	Read Discrete Inputs	Read discrete inputs
03 (0x03)	Read Holding Registers	Read holding registers
04 (0x04)	Read Input Register	Read input register
05 (0x05)	Write Single Coil	Write to single coil
06 (0x06)	Write Single Register	Write to single holding register
15 (0x0F)	Write Multiple Coils	Write to multiple coils
16 (0x10)	Write Multiple Registers	Write to multiple holding registers
08 (0x08)	Diagnostics	Diagnostic mode
11 (0x0B)	Get Comm Event Counter	Read event counter
12 (0x0C)	Get Comm Event Log	Read communication events
17 (0x11)	Report Slave ID	Read slave ID information



The address number used on a message is a relative address.

The relative address is calculated by the following equation.

$$\text{Relative address} = \text{Last 4 digits of address No.} - 1$$

For example, it is 0010(0x0A) when input register 30011 is designated.

9-7. Modbus-RTU address map

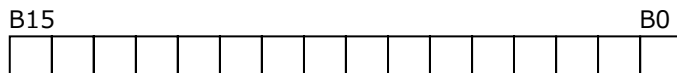
Data type	Address	Data name	Data format	LOCK	
				1	2
Coil 0XXXX	00001	Hold ON	B1		
	00002	Hold OFF			
	00003	Digital zero			
	00004	Digital zero reset			
	00005	Hold Reset			
	00006	Survival verification request ON			
	00007	Survival verification request OFF			
	00008	Auto adjustment filter			
	00009				
	00010				
	00011				
	00012				
	00013	Zero calibration			
	00014	Span calibration			
	00015	Equivalent input zero calibration			
	00016	Equivalent input span calibration			
	00017 to 09999	Reserved area (cannot be used)			
Input status 1XXXX	10001	Hold	B1		
	10002	Stable			
	10003	Near zero			
	10004	Overload			
	10005	Zero tracking			
	10006	HH			
	10007	HI			
	10008	OK			
	10009	LO			
	10010	LL			
	10011	Undefined			
	10012				
	10013	LOCK1	B1		
	10014	LOCK2			
	10015	Undefined			
	10016	Survival verification request	B1		
	10017 to 19999	Reserved area (cannot be used)			

Data type	Address	Data name	Data format	LOCK	
				1	2
Input register 3XXXX	30001	Status 1 *1	I16		
	30002	Status 2 *2			
	30003	Status 3 *3			
	30004	Undefined			
	30005	Linked indicated value (HI) *4	I32		
	30006	Linked indicated value (LO)*4			
	30007	Linked indicated value (HI) *4 *5			
	30008	Linked indicated value (LO) *4 *5			
	30009	Not linked indicated value (HI)*4			
	30010	Not linked indicated value (LO)*4			
	30011	Undefined			
	30012	Undefined			
	30017 to 39999	Reserved area (cannot be used)			
Holding register 4XXXX	40001	HI limit (HI)	I32	⊙	
	40002	HI limit (LO)		⊙	
	40003	LO limit (HI)		⊙	
	40004	LO limit (LO)		⊙	
	40005	Near zero (HI)		⊙	
	40006	Near zero (LO)		⊙	
	40007	Digital offset (HI)		⊙	
	40008	Digital offset (LO)		⊙	
	40009	HH limit (HI)		⊙	
	40010	HH limit (LO)		⊙	
	40011	LL limit (HI)		⊙	
	40012	LL limit (LO)		⊙	
	40013	Alarm HI limit (HI)		⊙	
	40014	Alarm HI limit (LO)		⊙	
	40015	Alarm LO limit (HI)		⊙	
	40016	Alarm LO limit (LO)		⊙	
	40017	Output selection (HI)			⊙
	40018	Output selection (LO)			⊙
	40019	Rated capacity (HI)		⊙	⊙
	40020	Rated capacity (LO)		⊙	⊙
	40021	DZ limitation value (HI)			⊙
	40022	DZ limitation value (LO)			⊙
	40023	Voltage zero scale setting (HI)		⊙	⊙
	40024	Voltage zero scale setting (LO)		⊙	⊙
	40025	Voltage full scale setting (HI)		⊙	⊙
	40026	Voltage full scale setting (LO)		⊙	⊙
	40027	Current zero scale setting (HI)		⊙	⊙
	40028	Current zero scale setting (LO)		⊙	⊙
	40029	Current full scale setting (HI)		⊙	⊙
	40030	Current full scale setting (LO)		⊙	⊙

Data type	Address	Data name	Data format	LOCK	
				1	2
Holding register 4XXXX	40031	Equivalent input zero calibration (HI)	I32	⊙	⊙
	40032	Equivalent input zero calibration (LO)		⊙	⊙
	40033	Equivalent input span calibration (HI)		⊙	⊙
	40034	Equivalent input span calibration (LO)		⊙	⊙
	40035 to 40038	Reserved area (cannot be used)			
	40039	Hysteresis	I16	⊙	
	40040	Hold mode			⊙
	40041	HI/LO limit comparison mode			⊙
	40042	Hold fix section			⊙
	40043	Hold detection wait			⊙
	40044	Hold value renewal timing			⊙
	40045	Key invalid · LOCK			
	40046	Motion detection (Period-Range)			⊙
	40047	Zero tracking (Period)			⊙
	40048	Zero tracking (Range)			⊙
	40049	Extended function selection			⊙
	40050	Digital low pass filter			⊙
	40051	Moving average filter			⊙
	40052	Auto adjustment filter			⊙
	40053	Input selection			⊙
	40054	Minimum scale division		⊙	⊙
	40055	Display selection		⊙	⊙
	40056	Excitation voltage selection		⊙	⊙
	40057	Automatic printing			⊙
	40058	Hold value printing			⊙
	40059	D/A output link setting			⊙
	40060	Voltage zero scale adjustment		⊙	⊙
	40061	Voltage full scale adjustment		⊙	⊙
	40062	Current zero scale adjustment		⊙	⊙
	40063	Current fullscale adjustment		⊙	⊙
	40064 to 49999	Reserved area (cannot be used)			

B1: 1bit, I16: 16bit integer, I32: 32bit integer

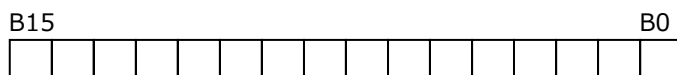
*1: Status 1



B15: when \pm LOAD,OFL1,2,oLoad,ZALM, B14: overload, B13: OFL2, B12: OFL1
 B11: -LOAD, B10: +LOAD, B9: ZALM, B8: Calibrating
 B7 to B4: Undefined , B3 to B0: Calibration error No.

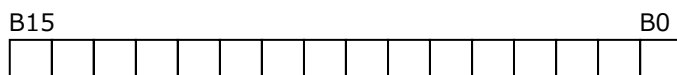
Calibration error No.	bit No.			
	B3	B2	B1	B0
2	0	0	1	0
3	0	0	1	1
6	0	1	1	0
7	0	1	1	1
8	1	0	0	0

*2: Status 2



B15 to B12: Undefined, B11: Hold, B10: stable, B9: Near zero, B8:Zero traking
 B7 to B5: Undefined, B4: LL, B3: LO, B2: OK, B1: HI, B0: HH

*3: Status 3



B15 : Suvival verification request, B14: Undefined, B13: LOCK2, B12: LOCK1
 B11 to B3: Undefined, B2 to B0: Decimal place

*4 Negative numbers of the Indicated value are represented in two's complement.

*5 The bottom value is shown on the indicator when Peak & Bottom Hold works.

Key points

- When writing an I32 (32bit integer) setting value, write the HI words and LO words in one go using "write multiple registers".
- An error response is returned when the start address specifies LO words, or the end of the start address + number of registers specifies HI words.

10 USB interface

The USB interface is used to read the indicated values of the FC400 and to write setting values into the FC400. Reading/writing setting values, recording, and graph display are possible using a dedicated PC application for the FC400.

10-1. USB interface

Communication specifications

Communication standard USB Ver.2.0 compliant, full speed (12Mbps)

Connector mini-B TYPE

10-2. PC preparation

For a PC that is being used for the first time, the USB driver and the dedicated PC application must be installed.

PC operating environment

OS	Windows 7/10 Home Premium/Professional/Ultimate 32/64bit Japanese edition, English edition, Chinese (Simplified) edition
Display	800 × 640 pixel or above
USB port	One free port (USB 2.0 or above)
USB driver	Virtual COM Port (VCP) Drivers (manufactured by FTDI Limited)
Memory	2GB or above
Hard disk	15GB free space or more

USB driver installation

A driver will be installed automatically when a USB is connected in a network environment.

Connect the PC to the network.

Automatic download/installation will start when the device is connected to the PC with the optional USB cable.

If automatic installation fails or the dedicated application does not start up, delete the drive and reconnect.

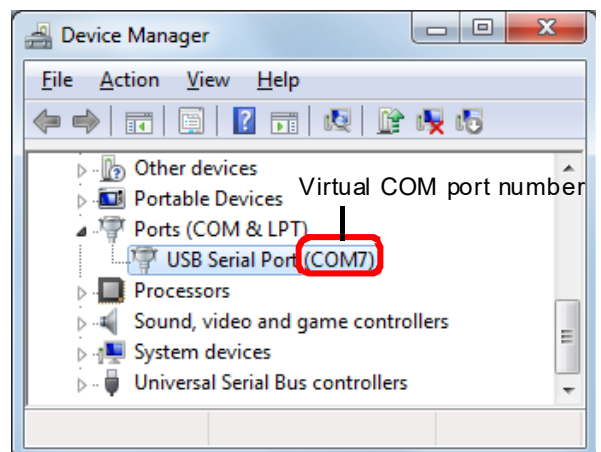
See the FTDI website if automatic installation does not work.

Guide (English) <http://www.ftdichip.com/Support/Documents/InstallGuides.htm>

Driver (English) <http://www.ftdichip.com/Drivers/VCP.htm>

Virtual COM port check

Check the virtual COM port number to which the device is connected from the PC device manager or when installing the driver.



Key point

If the COM port number of the FC400 cannot be identified due to multiple USB serial ports and so on, unplug the USB cable and confirm that one COM port is removed from the list of ports (COM and LPT). When the USB cable is reconnected to the previous connector, the number of COM ports displayed in the list will increase. This number represents the COM port number of the FC400.

Installation of the dedicated PC application

The dedicated application is used for setting the device, and is useful for managing and analyzing data.

Download and install the application from the UNIPULSE website. To download the application, user registration (free) is required.

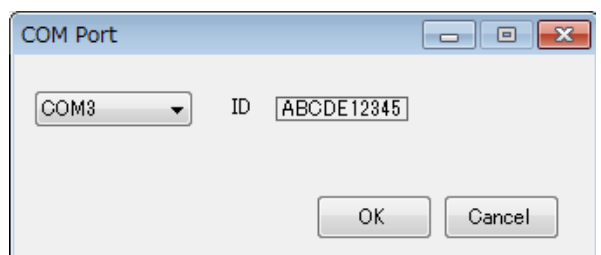
PC application startup

Double-click the FC400 shortcut on the desktop or click "UNIPULSE" → "FC400" → FC400 from the start menu.

Specifying the COM port

The COM port selection screen will appear when the PC application is activated for the first time after installation.

Once the COM port is selected and the "OK" button is clicked, it connects to the FC400 and the screen will appear.



11 Other functions

■ Operation when a zero error occurs

Select the display operation for when digital zero is performed in a state where the DZ regulation value has been exceeded.

[Operation when a zero error occurs]

(Setting item 3-5)



- 0: Execution (Indicated value - DZ regulation value)
- 1: Non-execution

■ Digital zero condition

Set the operating condition for digital zero.

[Digital zero condition]

(Setting item 3-5)



- 0: Accept regularly
- 1: Only at stable time

■ Key invalid

Makes key operations for digital zero, hold subtraction and peak/bottom value switch invalid/valid.

[Key invalid]

(Setting item 3-1)



- P/B switching key
 - ZERO key
 - HOLD key
- 0: Invalid
 - 1: Valid

■ Input conversion value display

Displays output values from the connected strain gauge type sensor in real time.

* Used when replacing indicators for repair and so on, or for confirming initial load etc.

[Input conversion value display]

(Setting item 9-5)



(Display range: -3.9000 to 3.9000)

■ Setting value restoration

The current setting parameters including calibration value can be saved.

In case the setting parameters are accidentally changed, you can load the saved setting parameters by just inputting the password.

Save setting parameters : 5059

Restore setting parameters : 6059

* Do not perform the Restoration if the setting parameters are not saved on FC400.



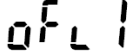
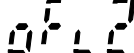
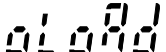
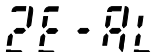
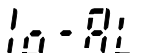
[password]

(Setting item 9-9)



12 Troubleshooting

12-1. Over scale display

Display	Error name	Error content/countermeasures
	A/D converter input over	Signals that exceed the FC400 signal input range are input. Confirm that the sensor output does not exceed the span calibration range and that the cable connecting the FC400 to the sensor is not disconnected. This may also appear if nothing is connected to the load input on the terminal block.
	A/D converter minus over	Signals lower than the signal input range of the FC400 are input. Confirm that the sensor output is not below the span calibration range and that the cable connecting the FC400 to the sensor is not disconnected. This may also appear if nothing is connected to the load input on the terminal block.
	Display over	The indicated value is exceeding -99999. In order to return to normal display from this over scale display, increase the input signal of sensor until the over scale display disappears.
	Display over	The indicated value is exceeding 99999. In order to return to normal display from this over scale display, decrease the input signal of sensor until the over scale display disappears.
	OVERLOAD error	Sensor input is exceeding alarm HI limit or dropping below alarm LO limit. In order to return to normal display from this over scale display, change input signal of sensor closer to 0 until the over scale display disappears, or edit the settings of alarm HI limit or alarm LO limit.
	Digital zero over	Digital zero is executed with an indicated value exceeding the DZ regulation value. Change the DZ regulation value, and restart the digital zero operation.
	External output error	External output is overloaded.(Over current) Please check if the wires are properly connected.

12-2. Calibration error display

Display	Error name	Error content/countermeasures
c Err2	Calibration error 2	Zero calibration or span calibration cannot be performed because the electronic signal input on the positive side exceeds the input voltage range. Check for cable disconnection and mis-wiring.
c Err3	Calibration error 3	Zero calibration or span calibration cannot be performed because the electronic signal input on the negative side exceeds the input voltage range. Check for cable disconnection and mis-wiring.
c Err6	Calibration error 6	Load cell output value has not reached the span adjustment range of the FC400. Confirm that the load is applied to the load cell correctly and that the load cell output is capable of reaching the span adjustment range, and then re-perform span calibration.
c Err7	Calibration error 7	The load cell output is on the minus (negative) side. Confirm that load is applied to the load cell in the correct direction and that the wiring for load cell +SIG and -SIG are not reversed, and then re-perform span calibration.
c Err8	Calibration error 8	Load cell output exceeds the span adjustment range of the FC400. Confirm that the load is applied to the load cell correctly and that the rated output value of the load cell is within the span adjustment range, and then re-perform span calibration.

13 List of setting values

Setting mode 0

Setting item	Name	Initial value	Setting range	LOCK		Page
				1	2	
1	HI limit	000.00	-99999 to 99999	⊙		P12
2	LO limit	000.00	-99999 to 99999	⊙		P12
3	Near zero	000.00	00000 to 99999	⊙		P13
4	Hysteresis	00.00	0000 to 9999	⊙		P13
5	Digital offset	000.00	-99999 to 99999	⊙		P11
6	HH limit	999.99	-99999 to 99999	⊙		P12
7	LL limit	-999.99	-99999 to 99999	⊙		P12

Setting mode 1

Setting item	Name	Initial value	Setting range	LOCK		Page
				1	2	
1	Hold mode	0	0 : Sample hold 1 : Peak hold 2 : Bottom hold 3 : Peak & bottom hold 4 : Average hold		⊙	P14
2	HI/LO limit comparison mode	0	0 : ALL 1 : MD 2 : NZ 3 : MD+NZ 4 : Hold		⊙	P12

Setting mode 2

Setting item	Name	Initial value	Setting range	LOCK		Page
				1	2	
1	Alarm HI limit	999.99	-99999 to 99999	⊙		P13
2	Alarm LO limit	-999.99	-99999 to 99999	⊙		P13
3	Sampling rate	1	1 : 2400 times/sec		⊙	P9
4	Hold fix section	0	0 : OFF 1 : ON		⊙	P14
5	Hold detection wait	0.00	0.00~1.00 sec		⊙	P14
6	Hold value renewal timing	0	0 : Detection start 1 : Detection stop		⊙	P14

Setting mode 3

Setting item	Name	Initial value	Setting range	LOCK		Page
				1	2	
1	Key invalid/LOCK	1 1 1 0				
	Setting value LOCK		0: Lock1 OFF, Lock2 OFF 1: Lock1 ON, Lock2 OFF 2: Lock1 OFF, Lock2 ON 3: Lock1 ON, Lock2 ON			P7
	PEAK/BOTTOM key		0: Invalid 1: Valid			P38
	ZERO key		0: Invalid 1: Valid			
	HOLD key		0: Invalid 1: Valid			
2	Motion detection (period - range)	1.5-05	0.0 to 9.9 – 00 to 99		⊙	P10
3	Zero tracking (period)	0.0	0.0 to 9.9		⊙	P10
4	Zero tracking (range)	0000	0000 to 9999		⊙	P10
5	Extended function selection	0 0				
	Operation when a zero error occurs		0: Execution (indicated value - dz regulation value) 1: Non-execution			P38
	Digital zero condition		0: Accept regular 1: Only at stable time		⊙	P38

Setting mode 4

Setting item	Name	Initial value	Setting range	LOCK		Page
				1	2	
1	Digital low-pass filter	100.0	0.1 to 600.0		⊙	P9
2	Moving average filter	030	1:OFF, 2 to 999		⊙	P9
3	Auto adjustment filter	0			⊙	P9
4	Input selection	2 1 0				P21
	Input selection 1		0: DZ			
	Input selection 2 Input selection 3		1: HOLD 2: H.RESET 3: P/B Hold Disp.			
5	Output selection	4 3 2 1 0				P21
	Output selection 1		0: HI			
	Output selection 2		1: OK			
	Output selection 3		2: LO			
	Output selection 4		3: HH			
	Output selection 5		4: LL			
			5: OVERLOAD			
			6: RUN			
			7: HOLD			
			8: NZ			
			9: DZ response			

Setting mode 5

Setting item	Name	Initial value	Setting range	LOCK		Page
				1	2	
1	Rated capacity	100.00	00001 to 99999	⊙	⊙	P7
2	Min. scale division	0.01	01 to 50	⊙	⊙	P7
3	DZ regulation value	999.99	00000 to 99999		⊙	P10
4	Display selection	0204				
	Display update rate		0: Once/sec 1: 3 times/sec 2: 6 times/sec 3: 13 times/sec 4: 25 times/sec			P9
	Undefined		0: Fixed			
	Decimal place		0: None 1: 0.0 2: 0.00 3: 0.000 4: 0.0000	⊙	⊙	P7
	6 digit display		0: 5 digit display 1: 6 digit display			P11
5	Excitation voltage selection	1	0: 5V 1: 2.5V	⊙	⊙	P7

Setting mode 7

Setting item	Name	Initial value	Setting range	LOCK		Page
				1	2	
1	RS-485 communication mode	00				
	Transmission data selection (for auto, continuous)		0: Format1 1: Format2 2: Format3 3: Format4			P26
	Communication mode selection		0: Command 1: Auto 2: Continuous 3: Modbus-RTU	⊙		
2	RS-485 I/F settings	21000				
	Delimiter (for UNI-Format)		0: CR 1: CR+LF			
	Stop bit		0: 1bit 1: 2bit			
	Parity bit		0: None 1: Odd 2: Even	⊙		P26
	Character length		0: 7bit 1: 8bit			
	Baud rate		0: 9600bps 1: 19200bps 2: 38400bps 3: 57600bps 4: 115.2kbps			
3	RS-485 ID	01	00 to 31		⊙	P26
4	Transmission delay time	00	00 to 99		⊙	P26

Setting mode 7

Setting item	Name	Initial value	Setting range	LOCK		Page
				1	2	
5	Automatic printing	1	0: OFF 1: ON 2: ON + Indicated value Hold	⊙	⊙	P27
6	Hold value printing	0	0: Hold value printing OFF 1: Hold value printing ON	⊙	⊙	P27

Setting mode 8

Setting item	Name	Initial value	Setting range	LOCK		Page
				1	2	
1	Voltage zero scale weight value	000.00	-99999~99999	⊙	⊙	P23
2	Voltage full scale weight value	100.00	-99999~99999	⊙	⊙	P23
3	Current zero scale weight value	000.00	-99999~99999	⊙	⊙	P23
4	Current full scale weight value	100.00	-99999~99999	⊙	⊙	P23
5	D/A output link setting	0	0: Linked with indicated value 1: Not linked with indicated value		⊙	P23
6	Voltage zero scale adjustment(※)	0000	-5461~5461	⊙	⊙	P24
7	Voltage full scale adjustment(※)	0000	-5461~5461	⊙	⊙	P24
8	Current zero scale adjustment(※)	0000	-4194~4194	⊙	⊙	P24
9	Current full scale adjustment(※)	0000	-4194~4194	⊙	⊙	P24

(※) Adj key

Setting mode 9

Setting item	Name	Initial value	Setting range	LOCK		Page
				1	2	
1	Zero calibration	0		⊙	⊙	P7
2	Span calibration	100.00	00001 to 99999	⊙	⊙	P8
3	Equivalent input zero calibration	0.0000	-3.0000 to 3.0000	⊙	⊙	P8
4	Equivalent input span calibration	2.0000	0.0100 to 3.8000	⊙	⊙	P8
5	Input conversion value display	---	-3.9000 to 3.9000			P38
7	Version display	***				
8	Checksum display	****				
9	Password	0000				

14 Specifications

14-1. Analog section

Load cell power supply	DC5V or 2.5V±5% Output current: 90 mA or 45mA, ratiometric type (Up to six 350Ω series load cells can be connected in parallel)
Zero adjustment range	Automatically adjusted by digital computation -3.0 to 3.0 mV/V
Span adjustment range	Automatically adjusted by digital computation 0.01 to 3.8 mV/V
Minimum input sensitivity	0.15μV/count
Accuracy	Non-linearity 0.01%FS or less Zero drift 0.0002%FS/°C Typ Gain drift 1 ppm/°C Typ
Filter	Low-pass filter 0.1 to 600.0 Hz Moving average filter 1 to 999 times
A/D converter	Conversion rate 2400 times Conversion resolution 24bit (binary)
Minimum indicated resolution	1/10000

14-2. Display section

Display unit	Numbers are displayed by a 7-segment green LED with a character height of 8 mm (5 digit)
Display value	Max. 6 digits
Min. scale division	Can be set from 1 to 50
Decimal place	Selectable from 0, 0.0, 0.00, 0.000, and 0.0000 (zero blanking display based on decimal place)
Over scale display	A/D converter input over LOAD A/D converter input minus over -LOAD Display over OFL1 Display over OFL2 OVERLOAD OLOAD

14-3. Settings section

Setting procedure	Settings made using four tact switches Settings can also be made using an interface (D/A, USB, RS-485)
Saving of setting values	Initial setting values saved in NOVRAM (non-volatile memory) Other settings saved in F-RAM (non-volatile memory)
Setting value protection	Protection possible through locking software

14-4. External signal input/output

Compatible plug	CN87 (10 pin), CN85 (13 pin)
Input signal (3 points)	Each control input can be selected through settings Contact (relays, switches etc.) or non-contact (transistors, photo-couplers etc.) Considered ON when short-circuited with COM terminal * Prepare a DC24V external power supply
Output signal (5 points)	Each control output can be selected through settings Open collector output for transistors ($V_{ceo} = 30\text{ V}$, $I_c = 50\text{ mA}$)

14-5. Interface

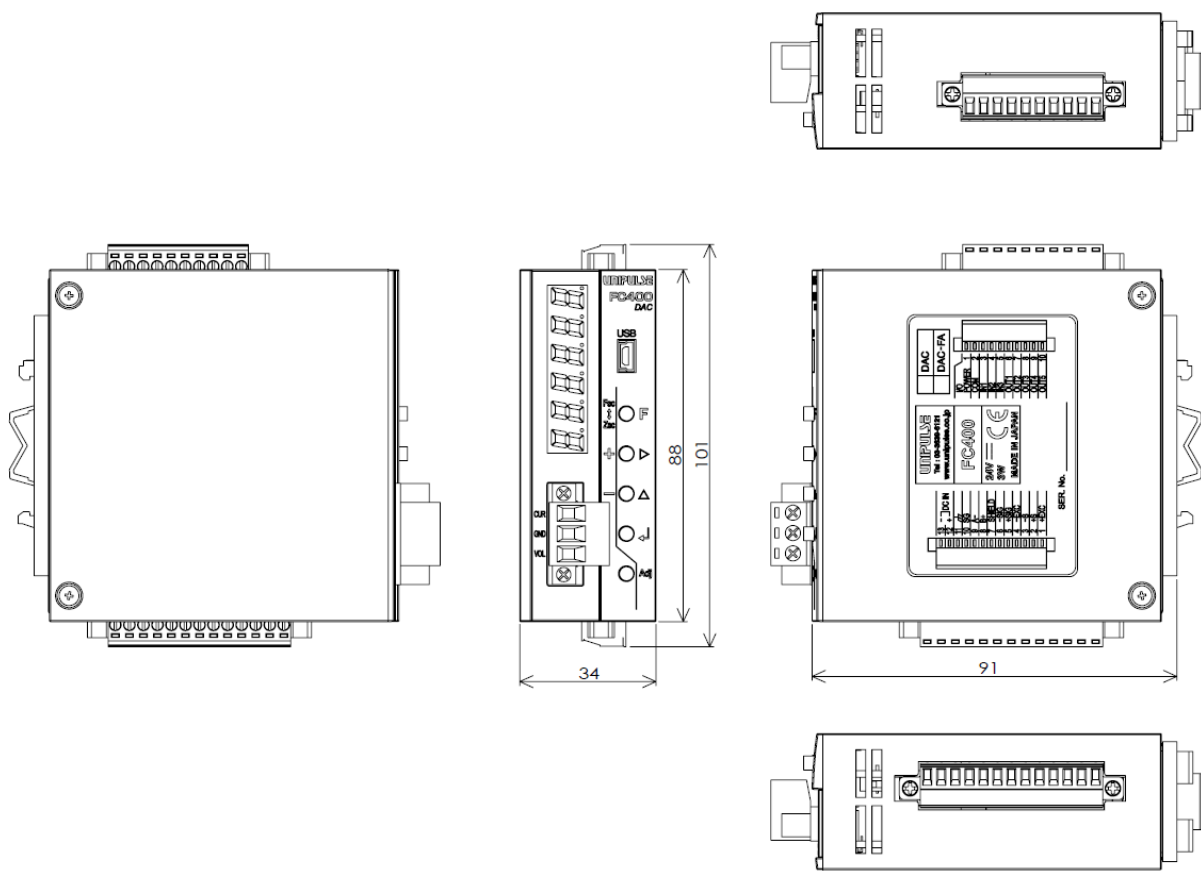
D/A converter interface		
	Voltage output	Current output
Output range	-10V to 10V (Load resistance of 2 k Ω or more)	4mA to 20mA (Load resistance of 500 Ω or less)
D/A conversion rate	2400 times	2400 times
Resolution	1/10000	1/10000
Over range	Approx. $\pm 10\%$ FS	Approx. $\pm 10\%$ FS
Zero adjustment range	Approx. $\pm 10\%$ FS	Approx. $\pm 10\%$ FS
Gain adjustment range	Approx. $\pm 10\%$ FS	Approx. $\pm 10\%$ FS
Zero drift	0.6 mV/ $^{\circ}\text{C}$ or less	0.5 $\mu\text{A}/^{\circ}\text{C}$ or less
Gain drift	50ppm/ $^{\circ}\text{C}$ or less	50ppm/ $^{\circ}\text{C}$ or less
Non-linearity	0.05%FS or less	0.05%FS or less
Compatible plug	CN86	

RS-485 communication interface		
Signal level	RS-485 compliant	
Transmitting distance	Approx. 1 km	
Transmitting method	Asynchronous, half duplex	
Transmitting speed	Selectable from 9600, 19200, 38400, 57600, 115.2k	
Bit configuration	Start bit	1bit
	Character length	Selectable from 7 or 8bit
	Stop bit	Selectable from 1 or 2bit
	Parity bit	Selectable from none, odd or even
Code	ASCII (for UNI-Format) Binary (for Modbus-RTU)	

14-6. General performance

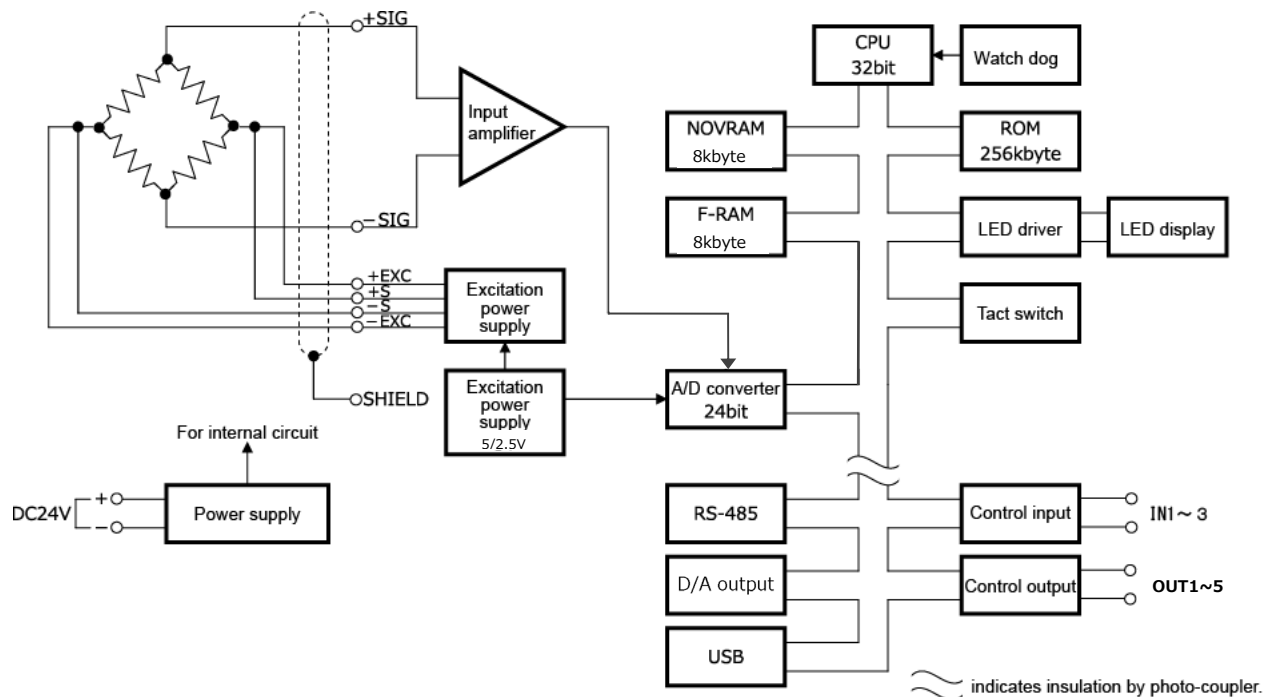
Power supply voltage	DC24V (±15%)
Power consumption	3 W
Operating conditions	Temperatures temperature range -10 to 50 °C Storage temperature range -20 to 85 °C Humidity 85%RH or below (no condensation)
External dimensions	34(W)×88(H)×91(D) mm (* not including protruding sections)
Weight	Approx. 210 g

14-7. External dimensions



Unit : mm

14-8. Block diagram



14-9. Compliance with EC directives

***The FC400 is CE-compliant. With using it, observe the following:**

The FC400 weighing indicator is compliant with EC Directives(based on Council of the European Union) and CE-marked.

-EMC Directive EN61326-1:2013
 EN55011:2009,A1:2010 Group1, ClassA
 EN61000-4-2:2009
 EN61000-4-3:2006, A1:2008, A2:2010
 EN61000-4-4:2012
 EN61000-4-5:2006
 EN61000-4-6:2009
 EN61000-4-8:2010

The following precautions should be taken for installation.

- 1.Since FC400 is defined as an open type(built-in device), it should be used to install and fix to a panel,etc.
- 2.Use shielded cable for connections other than power supply (load cell, external input/output, RS-485, D/A output and optional interface).
- 3.Be sure to ground the frame ground terminal(H).

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