FC400-DAC

OPERATION MANUAL

17AUG2021REV.118

UNIPULSE

Operation overview for FC400

Basic operation procedures

Please read "Setting/operation" on page **6**.

Calibration

Please read "Calibration procedures" on page **7**.

Weighing to fit the purpose

Please read "Settings related to final discharge control" on page **16**.

Contents

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).
- 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.
  - Do not wipe with a wet cloth, benzine, thinner, alcohol, etc. This may lead to discoloration and/or warping of the FC400. When dirty, clean using a well squeezed cloth soaked in diluted neutral detergent. Afterwards wipe with a soft, dry cloth.

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

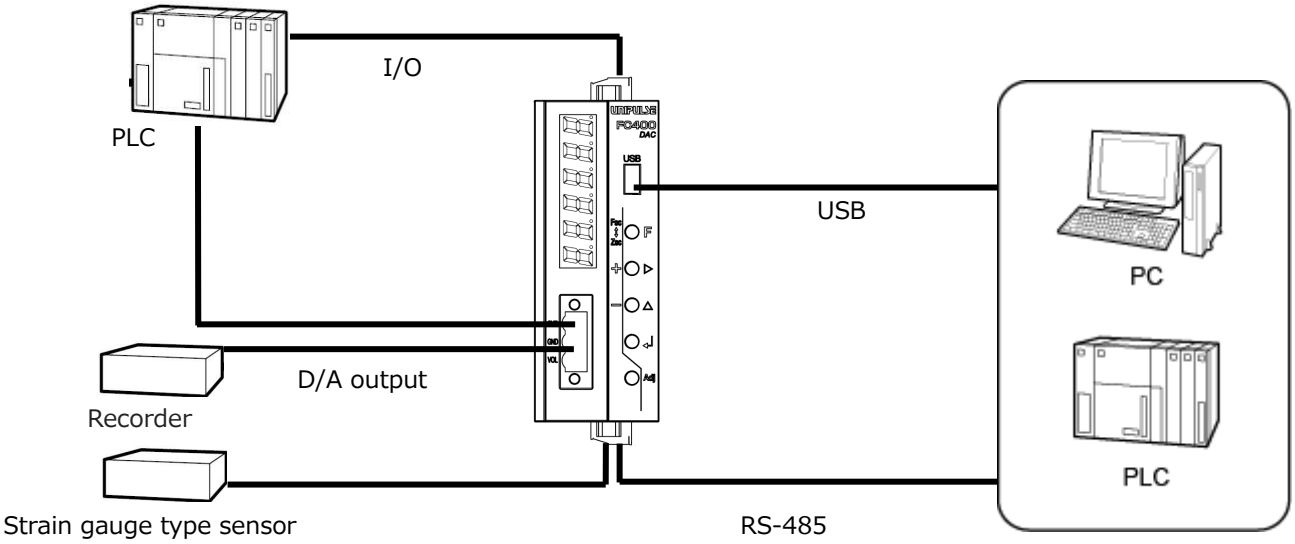
The parts and accessories used in this device (including the operation manual, package box and so on) correspond to the RoHS2 Directive which regulates the use of toxic substances that may have adverse effects on the environment as well as the human body.

1-2. Package contents

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

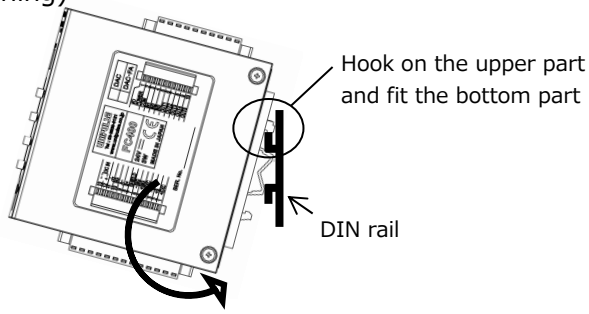
- FC400 main unit --- One unit
- Terminal block (10 pin) --- One piece
- Terminal block (13 pin) --- One piece
- D/A output connector (3pin) --- One piece
- Small screwdriver for connection of terminal block --- One piece
- Jumper wire --- Two pieces
- FC400 quick reference --- Two copies

1-3. Connection with other devices

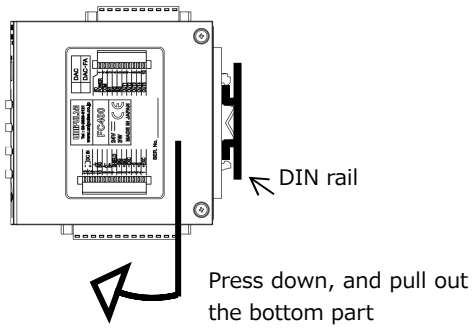


1-4. Attaching/detaching the DIN rail

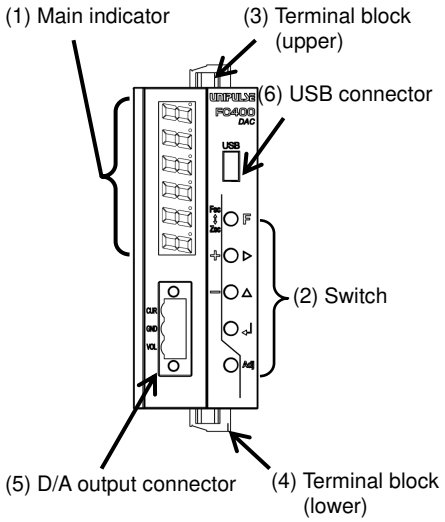
(Attaching)



(Detaching)



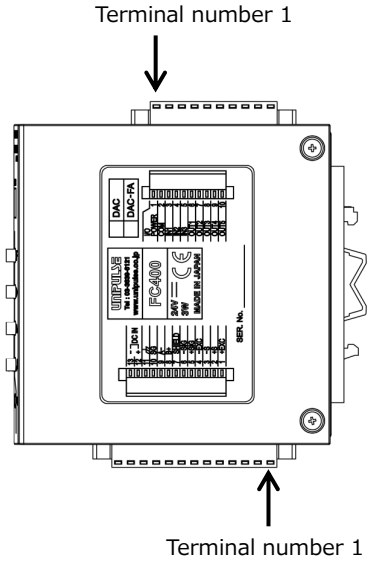
1-5. Front panel/terminal block



Name	Description		
(1) Main indicator	1) Weight value display		Displays weight values (gross weight/net weight)
	2) Over scale/error display		Displays over scale/other errors
	3) Setting value display		Displays various setting values
(2) Switch	F	FNC	Switches to the setting mode
	▷	TARE	One-touch tare subtraction/setting operations
	△	ZERO	Digital zero/setting operations
	↵	ENT(G/N)	Gross weight ⇔ net weight/ setting operations
	Adj	Adjustment	Go into the D/A output adjustment mode.
(3) Terminal block (upper)	Connects with external I/O.		
(4) Terminal block (lower)	Connects with the power supply/sensors/RS-485.		
(5) D/A output connector	Connects with a D/A output cable.		
(6) USB connector	Connects with a USB cable.		

Terminal block (upper)

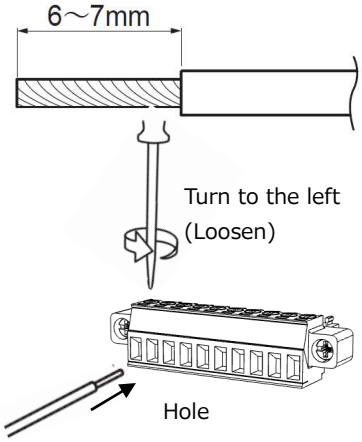
Use	Terminal number	Terminal name	Description
Power supply for I/O	1	I/O POWER	Connects with the DC24V power supply for I/O.
	2	COM	A common terminal for I/O signals.
Input terminal	3	IN1	Terminals for input signals. (Functions selected through settings.)
	4	IN2	
	5	IN3	
Output terminal	6	OUT1	Terminals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



Terminal block (lower)

Use	Terminal number	Terminal name	Description
LOADCELL	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	⏚	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.

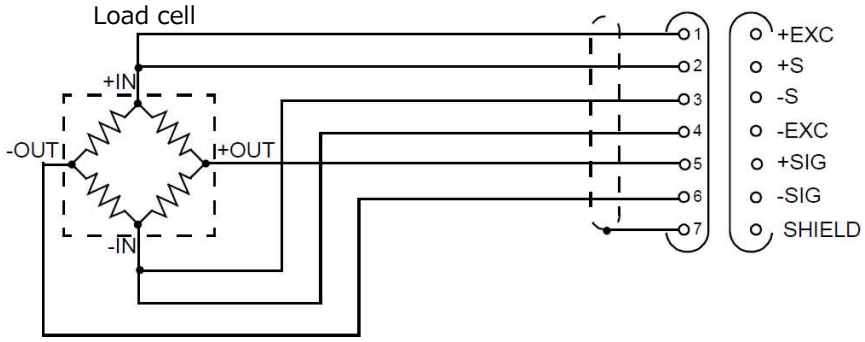
4. Tighten the screw with a screwdriver.

5. Pull the electric wire slightly to check that it has been securely clamped.
* Electric wires between 0.08 to 1.31mm^2 can be connected (AWG16 to 28).
The recommended tightening torque value is 0.31 to 0.37 N·m.

1-7. Load cell connection

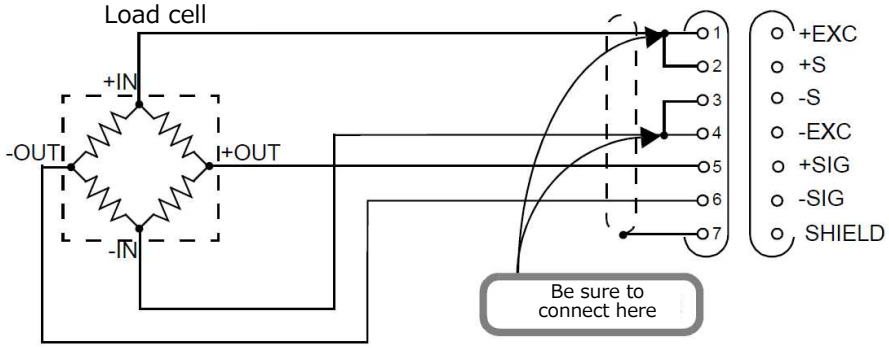
■ Six-line type connection

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



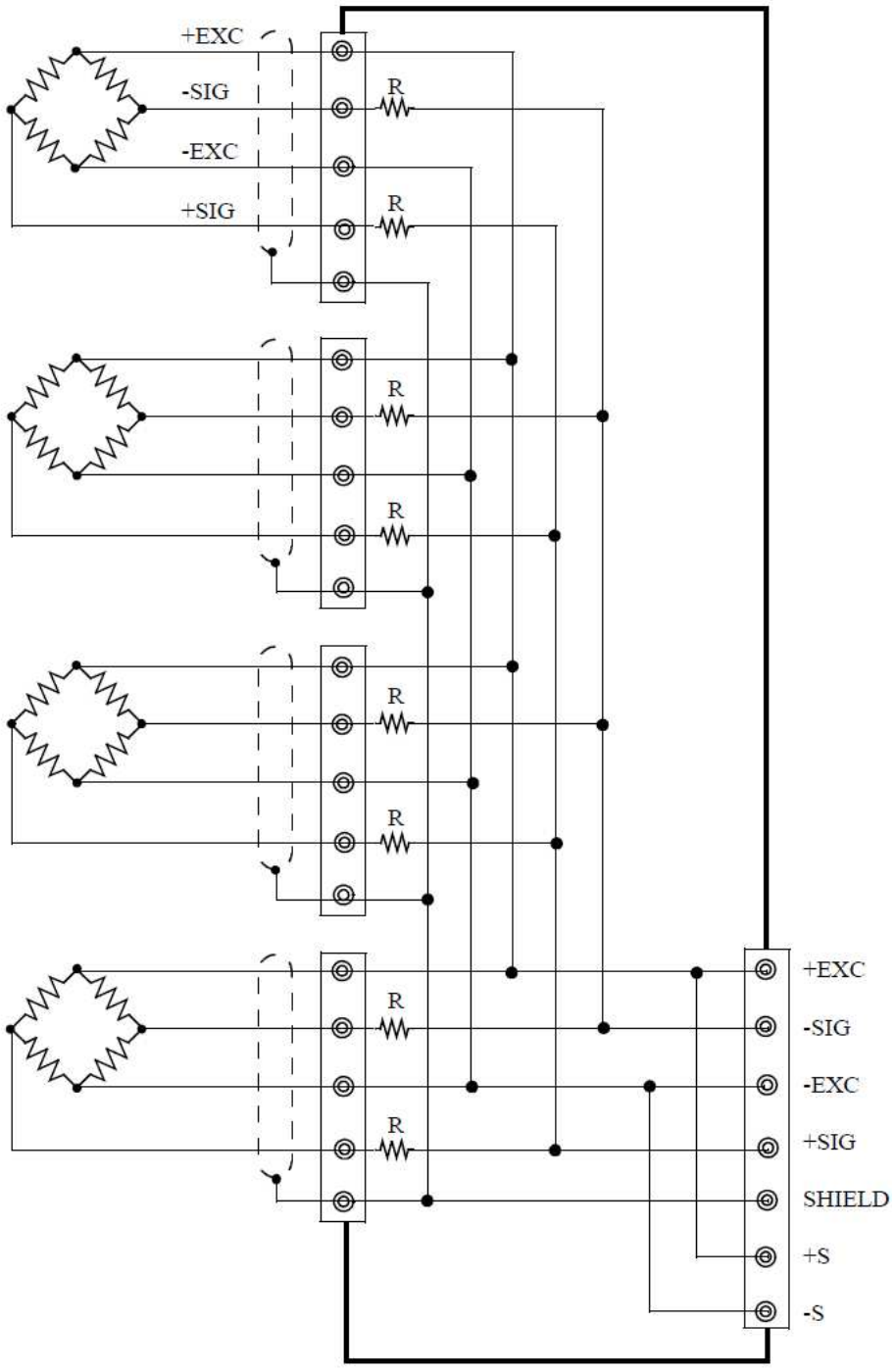
■ Four-line type connection

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



■ Load cell parallel connection

Hopper scale and truck scale configuration is possible for parallel connection of multiple load cells when using an industrial weighing device. The connection procedure is outlined in the diagram below. Simple parallel connection is possible using an optional B410 (junction box for four-point multi load cells).

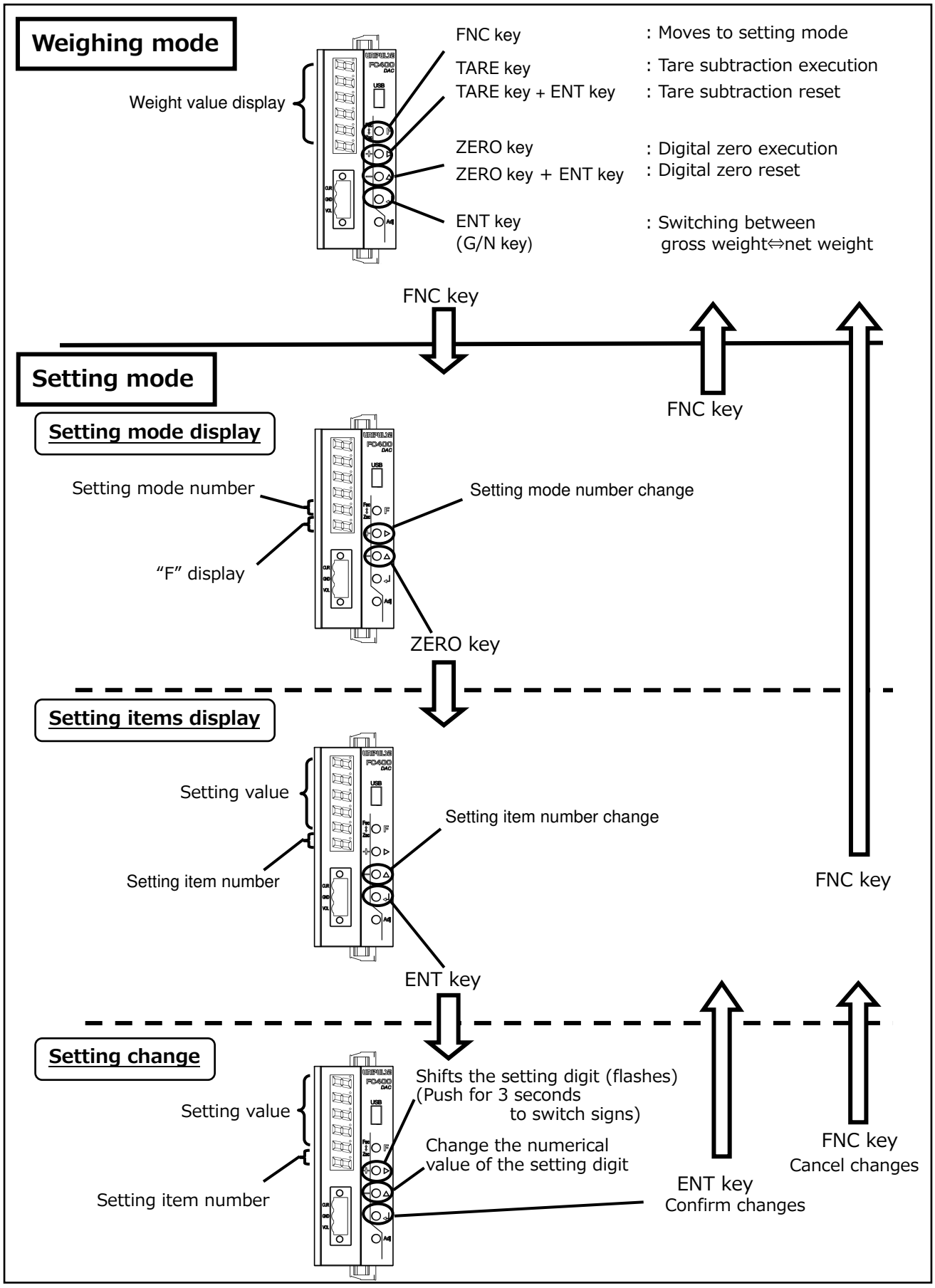


■ Sensor cable

Cable colors of sensors differ from one manufacturer to another. (They may also differ from one model to another for some products.) Refer to the sensor manual (or data sheet) and check signal names and colors in order to connect the cables correctly.

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 load cells. There are two methods of calibration, the "actual load calibration" and "equivalent input calibration".

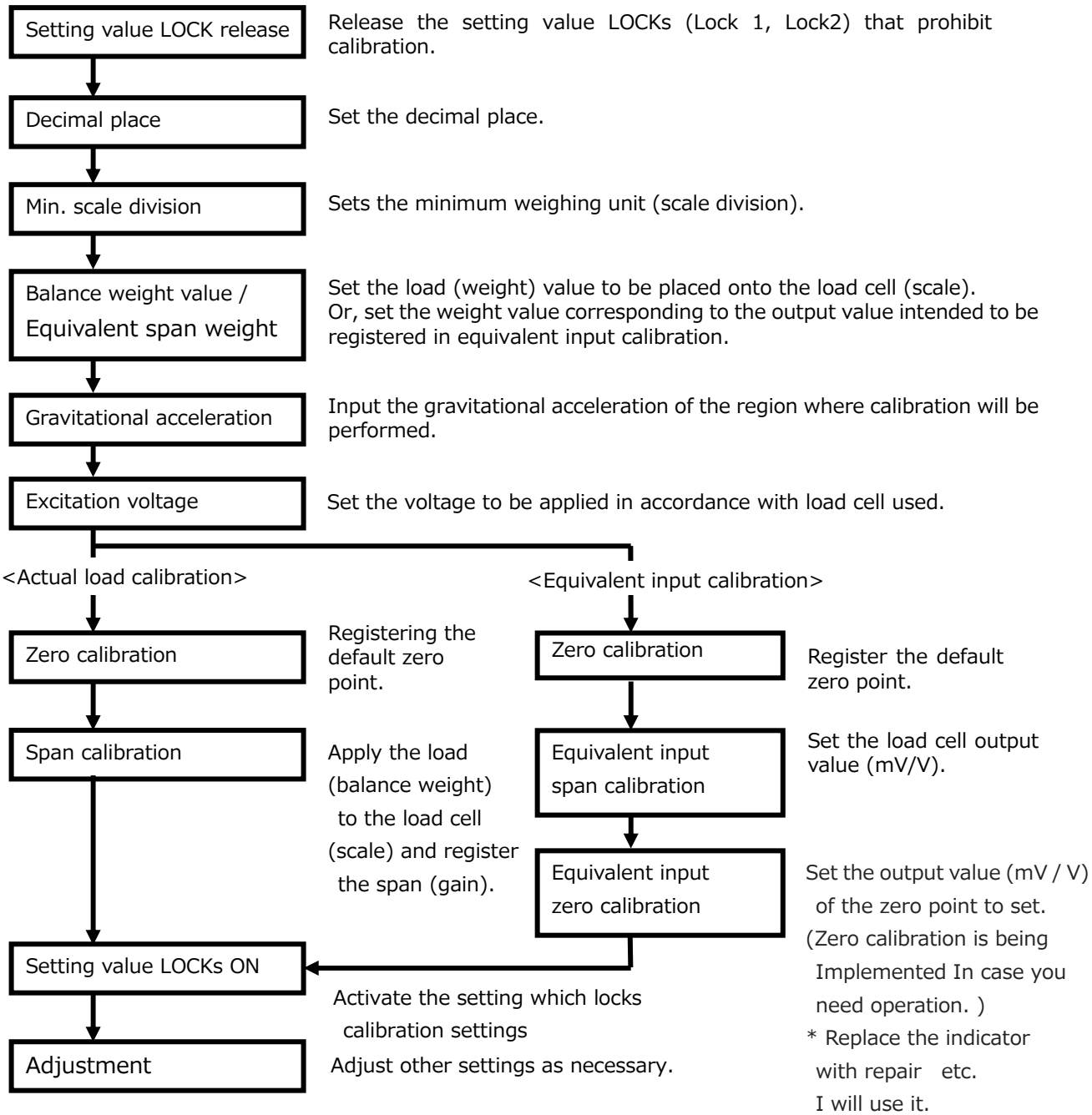
<Actual load calibration> ...

A method of calibration involving applying actual weight 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 weight or pressure is applied to the sensor.

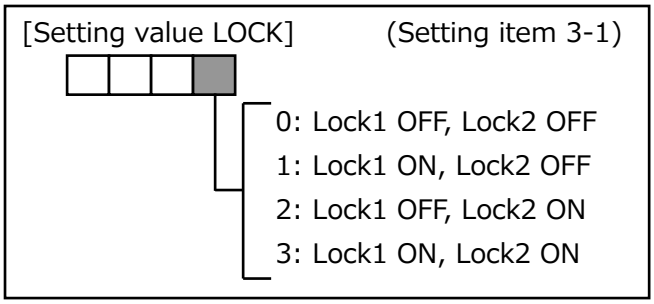
3-2. Calibration procedures



3-3. Settings/operations related to calibration

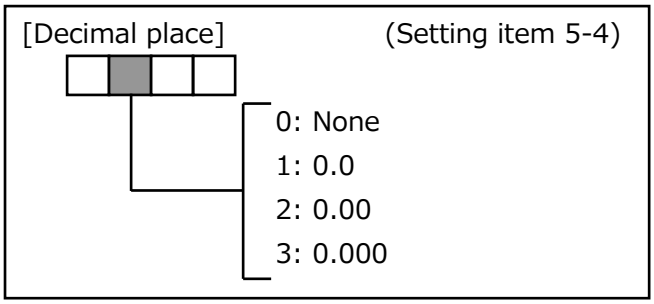
■ Setting value LOCK

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



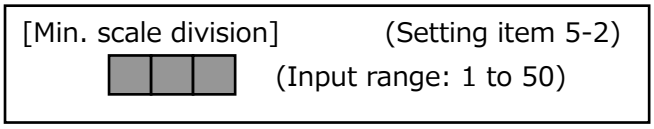
■ Decimal place

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



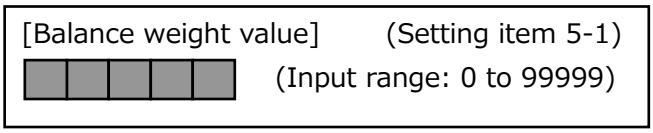
■ Min. scale division

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



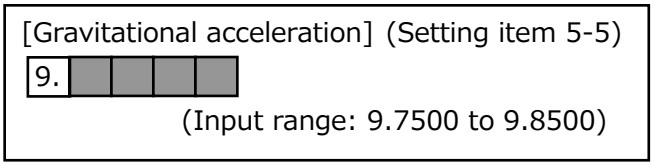
■ Balance weight value / Equivalent span weight

Preset the weight value placed on the load cell (scale) during span calibration.
The input range is from 0 to 99999.



■ Gravitational acceleration

This function corrects weight discrepancies when the scale calibration location and installation location differ based on the different gravitational accelerations of each region.
When the scale calibration location and installation location differ, correct the gravitational acceleration using the following procedures.



(1)Input the gravitational acceleration at the location of actual load calibration
(2)Perform actual load calibration
(3)Input the gravitational acceleration at the installation location
* Setting is not required when the calibration and installation locations are in the same region.

■ Excitation voltage selection

Set the voltage value applied to strain gauge type sensor.

[Excitation voltage selection](Setting item 6-7)
■ (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.

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

(1) Select setting item 9-1
(2) Confirm that there is no unnecessary load applied to the load cell (scale).
(3) Press the ENT key to start zero calibration
(4) "CAL-ZE" is displayed while calibration is in progress
(5) Returns to weight value display, and zero calibration is complete

■ Span calibration <Actual load calibration>

Place weight onto the load cell (scale) and register the span (gain).

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

(1) Select setting item 9-2
(2) Input the weight of the weight to be used
(3) Place the weight onto the load cell
(4) Press the ENT key to start actual load calibration
(5) "CAL-SP" is displayed while calibration is in progress
(6) Returns to weight value display, and span calibration is complete

■ Equivalent input span calibration <equivalent input calibration>

Input the load cell output value (mV/V) and register the span.

[Equivalent input span calibration] (Setting item 9-4)
■■■■■ (Input range: 0.0100 to 3.0000)

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

■ Equivalent input zero calibration <Equivalent input calibration>

Input the load cell output value (mV/V) and register the default zero point.

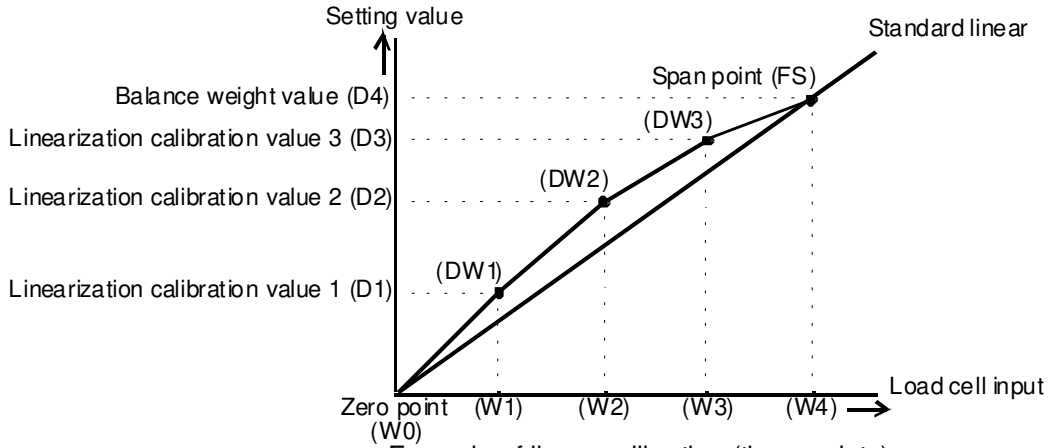
[Equivalent input zero calibration] (Setting item 9-3)
■■■■■ (Input range: -0.5000 to 2.0000)

*
* Used when replacing indicators for repair and so on.

3-4. Linearization calibration

When zero calibration and span calibration are performed and linearity cannot be achieved, improvements can be made by performing linearization calibration (three points maximum).

* Linearization calibration may not always be necessary.



Example of linear calibration (three points)

3-5. Linearization calibration procedures

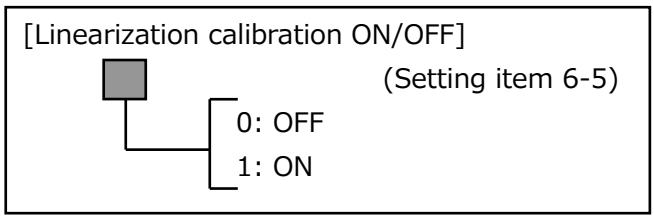
Perform actual load calibration

Linearization calibration ON/OFF	Set linearization calibration to ON.
Linearization calibration 1	Place a weight of approx. 1/4 of the weight value onto the scale, and register that weight value as linearization calibration value 1.
Linearization calibration 2	Place a weight of approx. 1/2 of the weight value onto the scale, and register that weight value as linearization calibration value 2.
Linearization calibration 3	Place a weight of approx. 3/4 of the weight value onto the scale, and register that weight value as linearization calibration value 3.
Calibration point confirmation	Confirm that each calibration point has become valid.
Span correction	Make fine adjustments to the span. (Carry out as appropriate.)

3-6. Settings/operations related to linearization calibration

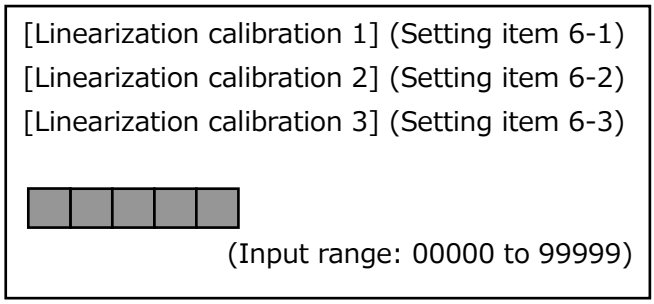
■ Linearization calibration ON/OFF

Set the ON/OFF for linearization calibration. Set to ON when performing linearization calibration 1 to 3.
(Calibration not possible when OFF.)



■ Linearization calibration 1
■ Linearization calibration 2
■ Linearization calibration 3

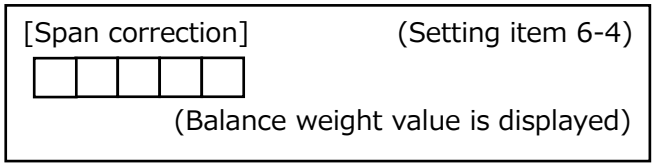
Register linearization calibration value 1 to 3.



(1) Place weight onto the scale
(2) Select setting item 6-1 (2, 3)
(3) Input the weight value of the weight
(4) Press the ENT key to execute linearization calibration
(5) "CAL-SP" is displayed while calibration is in progress
(6) Returns to setting item display, and linearization calibration is complete

■ Span correction

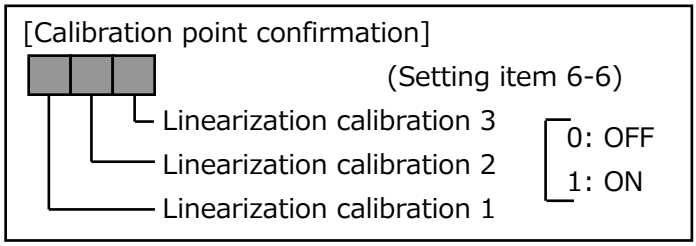
Fine adjustment of the span can be performed after linearization calibration.
Span adjustment while maintaining a gradient ratio that considers the linearization calibration value is possible using span correction.
A calibration error occurs if there is more than a ±2% deviation from standard linear.



(1) Place the weight of the balance weight value onto the scale
(2) Select setting item 6-4
(3) Press the ENT key and the display will flash
(4) Press the ENT key to execute span correction
(5) "CAL-AJ" is displayed while calibration is in progress
(6) Returns to weight value display, and span correction is complete

■ Calibration point confirmation

Turns ON when each linearization calibration is executed correctly.
Turns OFF when span calibration is executed.



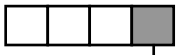
4 Settings/operations related to the fluctuation and stability of values

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

■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 weight 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 300.0)

Cut-off frequency	0.1	⇔	300.0
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)

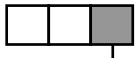
(Input range: 1:OFF、2 to 512)

Average rate	1	⇔	512
Response speed	Fast	⇔	Slow
Stability of indicated value	Unstable	⇔	Stable

■Filter in stable condition

This function automatically inserts a digital filter to reduce fluctuation when the indicated value is stable.
The conditions for stability are set in motion detection (MD).

[Filter in stable condition] (Setting item 3-7)

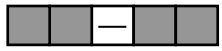


0: Insert (512 times)
1: Do not insert

■ Motion detection

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

[Motion detection] (Setting item 3-3)



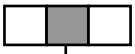
Change range (00 to 99)

Compared time (0.0 to 9.9 sec)

■ Motion detection mode

Motion detection has two modes: stable mode and checker mode.

[Motion detection mode] (Setting item 3-7)



0: Stable mode

1: Checker mode

[Stable mode]

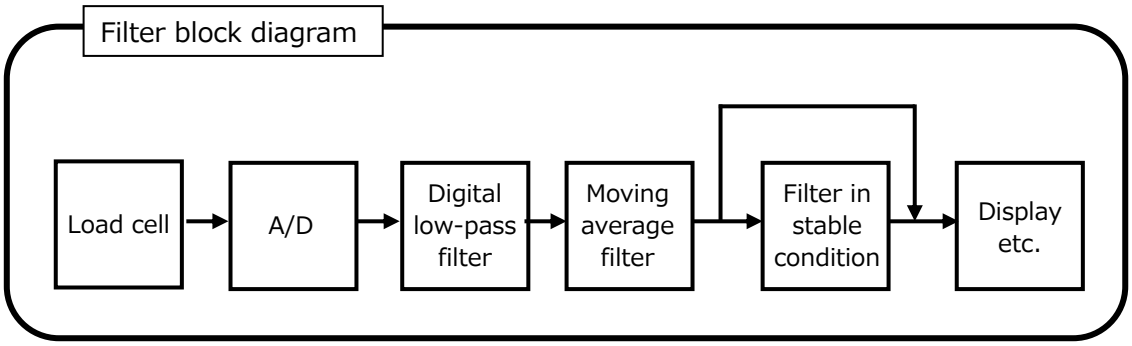
This mode is recommended for weighing for which stability is important.

Stable mode:1sec + MD (Comparison time)

[Checker mode]

This mode enables fast response of stability detection, and is recommended as a simple checker.

Checker mode :0.09sec + MD (Comparison time)



■ Zero tracking (Period)

■ Zero tracking (Range)

This function sets the gross weight 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 weight 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.

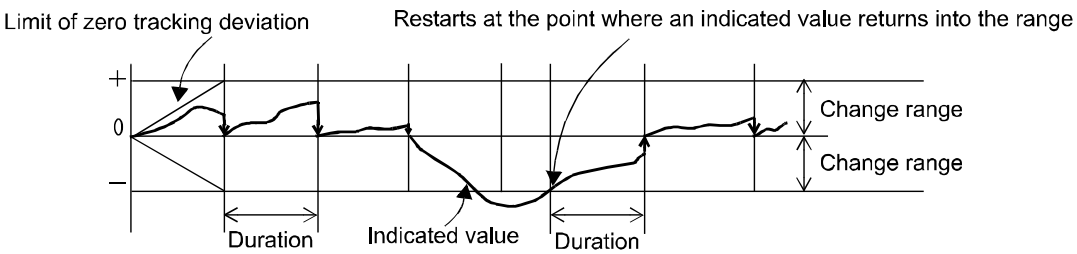
[Zero tracking (Period)] (Setting item 3-4)

(Input range: 0.0 to 9.9)

[Zero tracking (Range)] (Setting item 3-5)

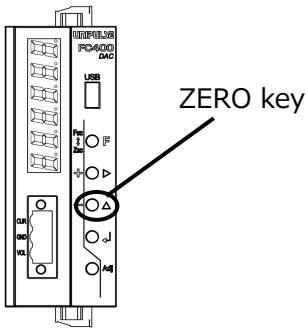
(Input range:0000 to 9999)

- Operation image



■ Digital zero (Designated key)

The gross weight (GROSS) is forcibly reset to zero when the ZERO key is pressed and digital zero is executed.



* If digital zero is executed with a gross weight exceeding the DZ regulation value, the DZ regulation value will be subtracted from the gross weight, 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 load cell (scale).

■ DZ regulation value

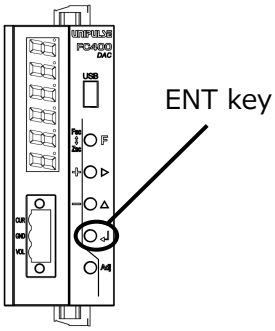
Set the zero point correction (deviation from zero calibration point) range using digital zero or zero tracking.

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

(Input range: 0000 to 9999)

■ Gross weight display/net weight display switch (Designated key)

Gross weight and net weight are displayed alternately every time the ENT key (GROSS/NET key) is pressed.



When switched to gross weight display:

Gross weight is displayed after "GROSS"

When switched to net weight display:

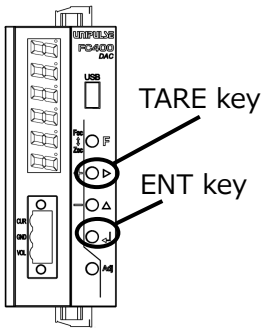
Net weight is displayed after "NET"

Displayed as net weight = gross weight - tare weight.
Tare weight is determined by one-touch tare subtraction and preset tare subtraction.

■ One-touch tare subtraction (Dedicated key)

■ One-touch tare subtraction reset

One-touch tare subtraction is executed when the TARE key is pressed.
One-touch tare subtraction is a function that equalizes gross weight and tare weight, and resets the net weight to zero.
The one-touch tare subtraction is reset by simultaneously pressing the TARE key and ENT key.



■ One-touch tare subtraction condition

Set the operating condition for one-touch tare subtraction.

[One-touch tare subtraction condition]

(Setting item 3-6)

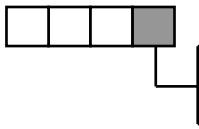
0: Accept regularly

1: Only at stable time

■ Preset tare subtraction

Preset tare subtraction is a function that subtracts a given setting value from the net weight.

[Preset tare subtraction] (Setting item 1-9)

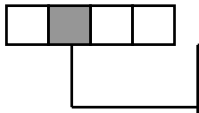


0: OFF
1: ON

■ Preset tare subtraction limit

Limit the setting operations for preset tare subtraction and preset tare weight when one-touch tare subtraction is operating.

[Preset tare subtraction limit] (Setting item 3-6)



0: Setting enabled during one-touch tare subtraction
1: Setting disabled during one-touch tare subtraction

■ Preset tare weight

Preset tare subtraction is executed by setting the preset tare weight and turning preset tare subtraction ON.
One-touch tare subtraction and preset tare subtraction operate independently.
Even when preset tare weight is ON, one-touch tare subtraction is performed immediately after the TARE key is pressed, and the net weight value is reset to zero.

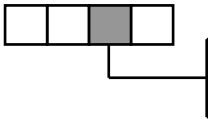
[Preset tare weight] (Setting item 3-2)

(Input range: 00000 to 99999)

■ 1/4 scale division

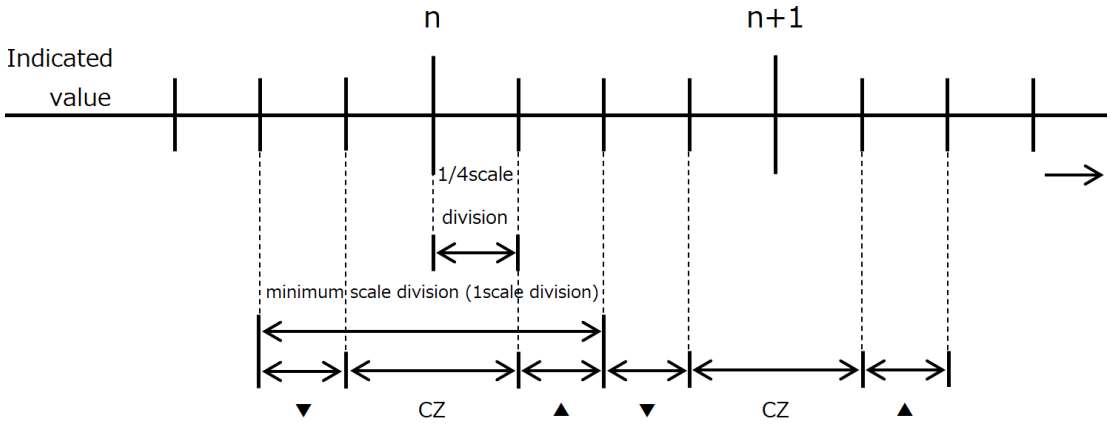
This function detects the center point of the scale interval of the indicated value.
Communication status "CZ" turns ON if the indicated value is at the center point of the minimum scale division after it is further divided into 4.

[1/4 scale division] (Setting item 5-4)



0: OFF
1: ON

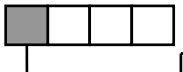
The range in which each communication status (▼, CZ, ▲) is turned ON is as shown in the figure below.



■ 6 digit display

Set the number of displayed digits.

[6 digit display] (Setting item 5-4)



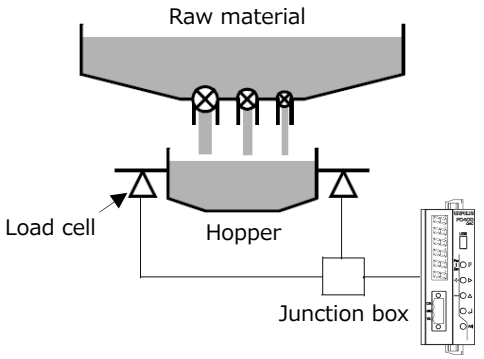
0: 5 digit display
1: 6 digit display

5 Settings related to final discharge control

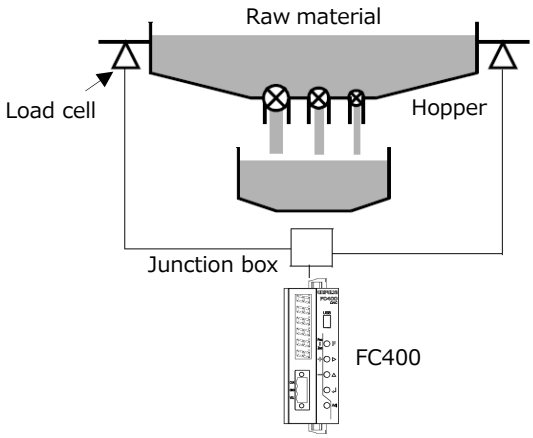
5-1. Final discharge control

최종 배출 제어는 호퍼와 같은 탱크에서 각 최종에 대한 원료의 배출을 제어하는 절차입니다. 최종/설정점 2/설정점 1/보상, 과다/미달/진행의 판정 설정, 비교 금지, 판정 등과 같은 타이머 설정을 적절히 조합하여 하나의 최종을 정확하게 배출할 수 있습니다.
계량 절차에는 공급 계량 및 배출 계량이 있으며 제어 절차에는 단순 비교 제어 및 시퀀스 제어가 있습니다.

<Feed weighing>
원료를 계량탱크(호퍼)에 투입할 때 중량값을 측정하는 절차입니다.



<Discharge weighing>
이는 계량탱크(호퍼)에 원료를 다시 채울 때와 탱크에서 원료를 배출할 때 중량값을 측정하는 절차입니다.



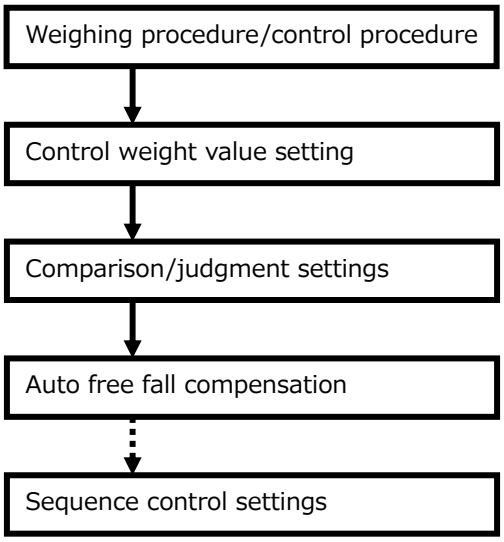
<Simple comparison control> ... 정기적으로 중량값과 설정값을 비교하여 출력을 ON, OFF 합니다.

<Sequence control> ... 출력은 시작 신호에 따라 ON되고, 계량이 진행됨에 따라 순차적으로 OFF됩니다. (자동 계량의 경우)

<단순비교제어와 시퀀스제어의 차이점>

Item	Simple comparison control	Sequence control
SP1	Compares regularly	Turns ON after the start signal is input and turns OFF after the condition is met
SP2	Turns ON when the condition is met	Turns ON after the start signal is input and turns OFF after the condition is met
SP3	Turns ON when the condition is met	Turns ON after the start signal is input and turns OFF after the condition is met
Under	Turns ON when the condition is met	Turns ON when the condition is met
Over	Turns ON when the condition is met	Turns ON when the condition is met
Go	Turns ON when the condition is met	Turns ON when the condition is met
Feeding control/discharging control	○	○
External judging function for over/under comparison	○	×
External judging function for upper/lower limit comparison	○	×
External hold input function	○	×
Compensation feeding function	×	○
Comparison inhibit input function	○	×
Condition for start of next weighing	From when the weight value falls below 25% after completion of the previous weighing	From when the start signal is input after completion of the previous weighing

5-2. Setting procedures



Select the weighing procedure/control mode.

Set the weight values for [Set point 1], [Final] etc.

Set the comparison target and judgment conditions.

Set to correct for fluctuation of compensation.

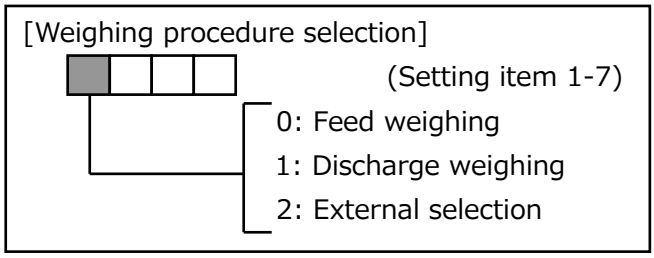
Set the settings if sequence control is selected for the control procedure.

5-3. Selecting a weighing procedure/control procedure

■ Weighing procedure

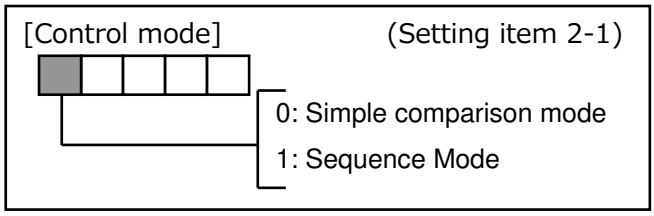
Select feed/discharge weighing.
"External selection" enables you to switch between feed/discharge with an external input signal.

OFF (HI) ... Feed weighing
ON (LO) ... Discharge weighing



■ Control mode

Select the control procedure for final discharge control.



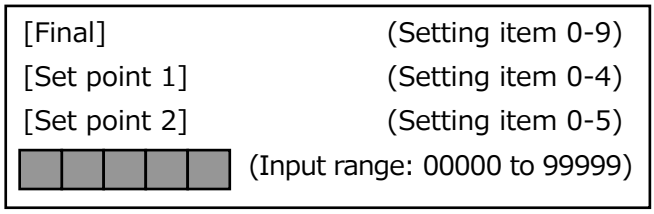
5-4. Control weight value

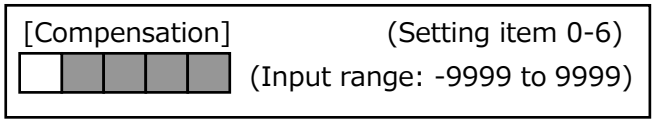
The setting value used to compare/judge the weight value being weighed. External output signals operate on the basis of this setting value.

■ Final, Set point 1, Set point 2, Compensation

The respective output turns ON when the following weights are reached.

- Final - Set point 1 ... SP1 ON
- Final - Set point 2 ... SP2 ON
- Final - Compensation ... SP3 ON





5-5. Settings related to comparison/judgment

Functions and settings to make final discharge control more convenient.

■ **Near zero**

■ **Near zero comparison mode**

This function detects when the weight value is a value near zero.

- Near zero ... Set threshold value
- Near zero comparison mode... Select comparison condition
- Near zero status turns ON when the condition is met

[Near zero] (Setting item 0-3)

(Input range: 00000 to 99999)

[Near zero comparison mode] (Setting item 1-7)

0: Near zero signal ON when gross weight ≦ near zero setting value
1: Near zero signal ON when net weight ≦ near zero setting value
2: Near zero signal ON when |gross weight| ≦ near zero setting value
3: Near zero signal ON when |net weight| ≦ near zero setting value
4: Comparison OFF

■ **Upper limit, lower limit**

■ **Upper/lower limit comparison weight**

■ **Upper/lower limit comparison mode**

This function detects whether the weight value exceeds the upper/lower limit.

- Upper limit/lower limit ... Set threshold value
- Upper/lower limit comparison weight... Select comparison target
- Upper/lower limit comparison mode ... Select comparison condition
- Upper limit/lower limit status turns ON when the condition is met

[Upper limit] (Setting item 0-1)

[Lower limit] (Setting item 0-2)

(Input range: 00000 to 99999)

[Upper/lower limit comparison weight] (Setting item 1-7)

0: GROSS
1: NET
2: Comparison OFF

[Upper/lower limit comparison mode] (Setting item 1-8)

0: Compare regularly
1: Compare when external judging input is ON

■ **Over, under**

■ **Final and over/under comparison weight**

■ **Over/under comparison mode**

This function detects whether the weight value is over or under.

- Over/under ... Set threshold value
- Final and over/under comparison weight ... Select comparison target
- Over/under comparison mode ... Select comparison condition
- Over/under status turns ON when the condition is met
- The go status turns ON when no over/under is detected

[Over] (Setting item 0-7)

[Under] (Setting item 0-8)

(Input range: 0000 to 9999)

[Final and over/under comparison weight] (Setting item 1-7)

0: GROSS
1: NET
2: Comparison OFF

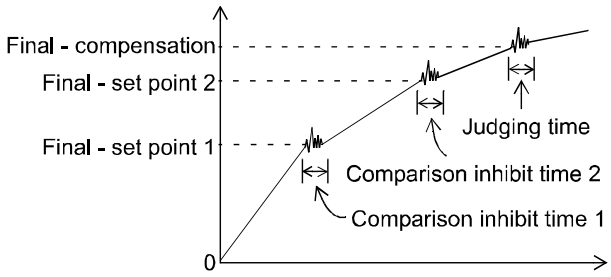
[Over/under comparison mode] (Setting item 1-8)

0: Compare regularly
1: Compare when external judging input is ON
2: Compare when complete output is ON
3: Compare and HOLD when complete output is ON

■ Comparison inhibit time 1/comparison inhibit time 2
■ Judging time

Comparison/judgment can be inhibited for a certain period of time to prevent inappropriate control operation due to mechanical vibration caused by valve opening/closing.
It operates when it reaches the control weight value, and the output turned ON will not turn OFF during the set period of time.

[Comparison inhibit time 1] (Setting item 1-1)
[Comparison inhibit time 2] (Setting item 1-2)
[Judging time] (Setting item 1-3)
■■■ (Input range: 0.00 to 9.99 s)

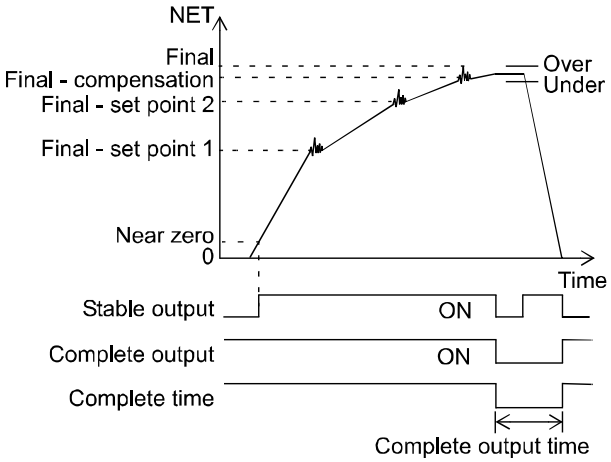


■ Complete output time
■ Complete signal output mode

Set the period and timing for the output of the complete signal when weighing has been completed.

[Complete output time](Setting item 1-4)
■■■ (Input range: 0.00 to 9.99 s)

[Complete signal output mode]
□□■ (Setting item 1-8)
- 0: On for the complete output time from when the judging timer has expired
- 1: On for the complete output time from when the weight value becomes stable after the judging timer has expired
- 2: On for the complete output time from when the judging timer has expired or from when the weight value becomes stable



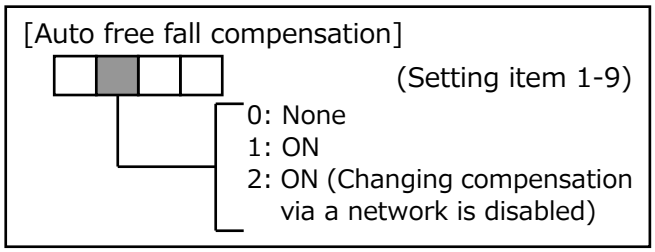
5-6. Settings related to auto free fall compensation

This function automatically corrects the fluctuation of compensation, which is a major factor in weighing errors. It samples the deviation from the final each time weighing is complete, and automatically adjusts the compensation setting value.

* Set "number of times for judging" to something other than "00" when using the auto free fall compensation.

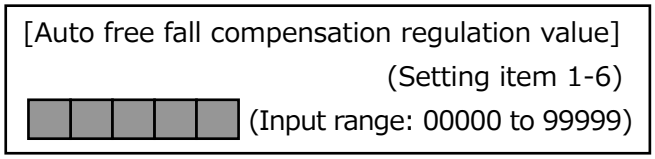
■ Auto free fall compensation

Select ON/OFF for the auto free fall compensation function.



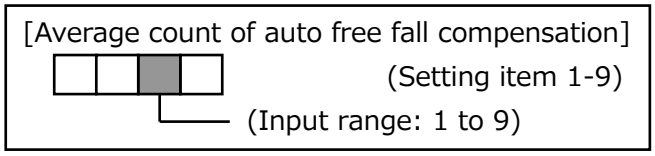
■ Auto free fall compensation regulation value

Limit the range over which compensation is automatically adjusted.



■ Average count of auto free fall compensation

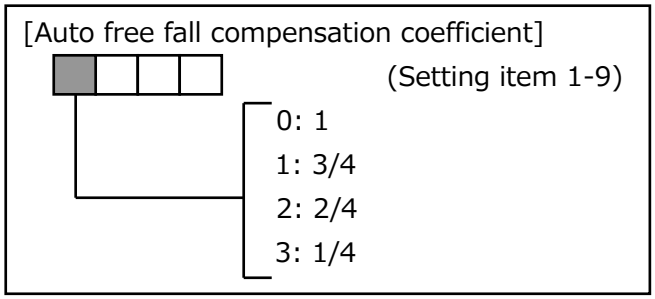
Set the number of sampling counts for automatic adjustment.
Compensation will be adjusted automatically for each sampling count.



■ Auto free fall compensation coefficient

Adjust the settings if the compensation value fluctuates.

Every weighing value
About the same ⇔ Fluctuates
Auto free fall compensation coefficient
1 ⇔ 1/4

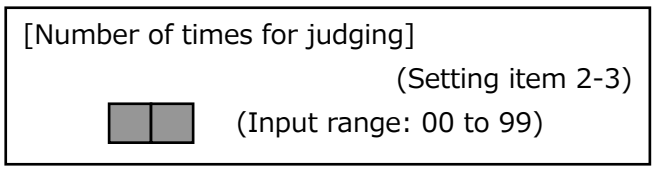


5-7. Settings related to sequence control

Set various parameters for performing a series of operations from weighing start to weighing complete.

■ Number of times for judging

This function is used to select whether to perform judging on over, under, or go when a complete signal is output after weighing has been completed.



00: Judging is OFF
01: Judging is performed every time
99: Judging is performed once every 99 weighings

■ Number of times for AZ

This function is used to select whether to set the weighing value to zero when starting weighing. Digital zero is performed if the weighing value is the gross weight, and tare subtraction is performed if the value is the net weight.
The execution timing is at ON edge of the start signal input.

[Number of times for AZ] (Setting item 2-2)

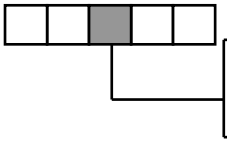
(Input range: 00 to 99)

00: Auto-zero OFF
01: Auto-zero is performed every time
99: Auto-zero is performed once every 99 weighings

■ At start NZ confirmation

This setting is used to check whether the near zero signal is ON when starting weighing.
Weighing starts normally if near zero is ON; seq. error 4 is displayed if OFF.

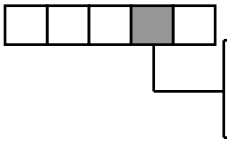
[At start NZ confirmation] (Setting item 2-1)



■ At start weight value confirmation

This setting is used to check whether the weighing value has reached the point of set point 1 (final - set point 1) when starting weighing.
Seq. error 5 is displayed when the weighing value has reached the point of set point 1.

[At start weight value confirmation]
(Setting item 2-1)

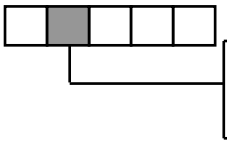


■ Compensation feeding/compensation feeding time

This setting is used to set whether to perform compensation feeding after weighing has been completed.
When ON is selected, set the time to perform compensation feeding after weighing has been completed.

(Set point 3 output turns ON only for the set period of time.)

[Compensation feeding] (Setting item 2-1)

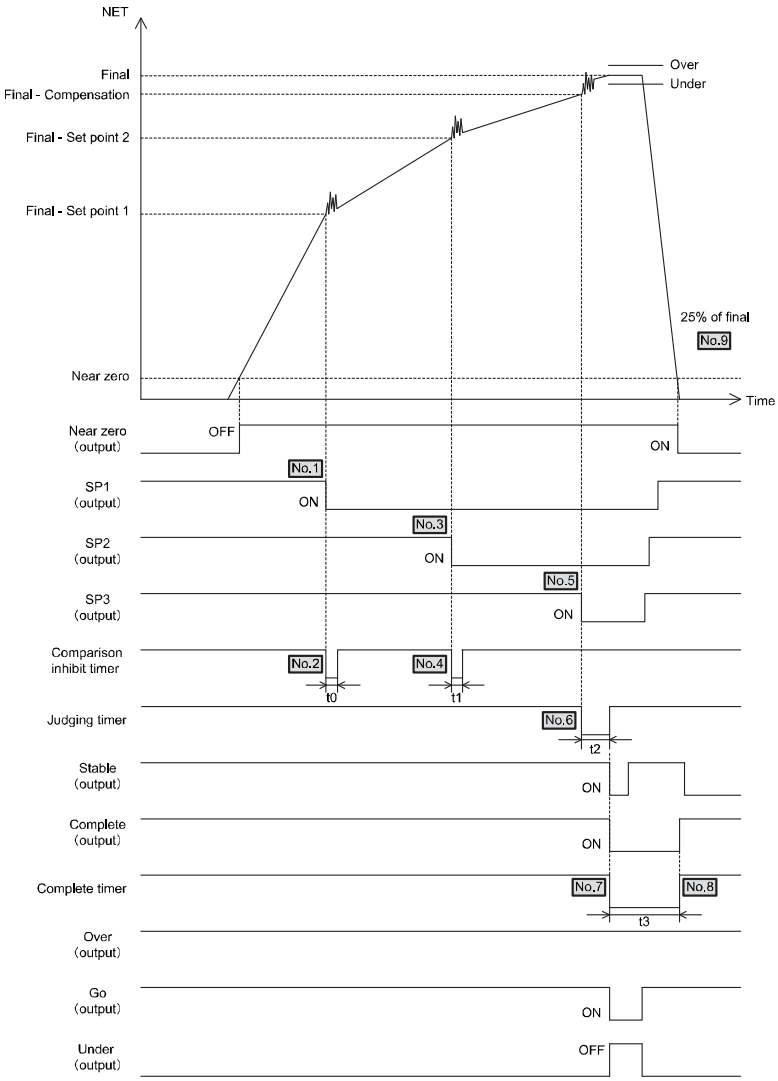


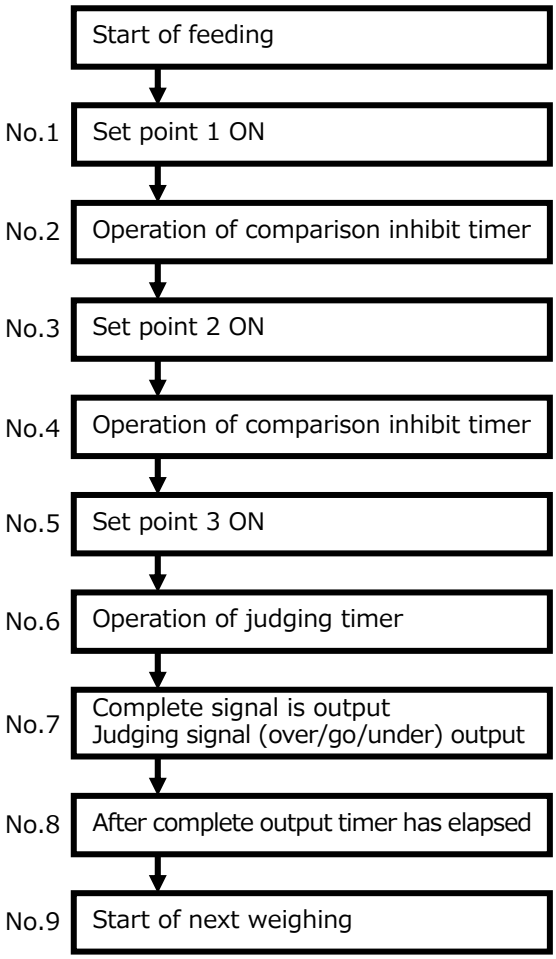
[Compensation feeding time]
(Setting item 1-5)

(Input range: 0.00 to 9.99 s)

5-8. Timing chart for final discharge control

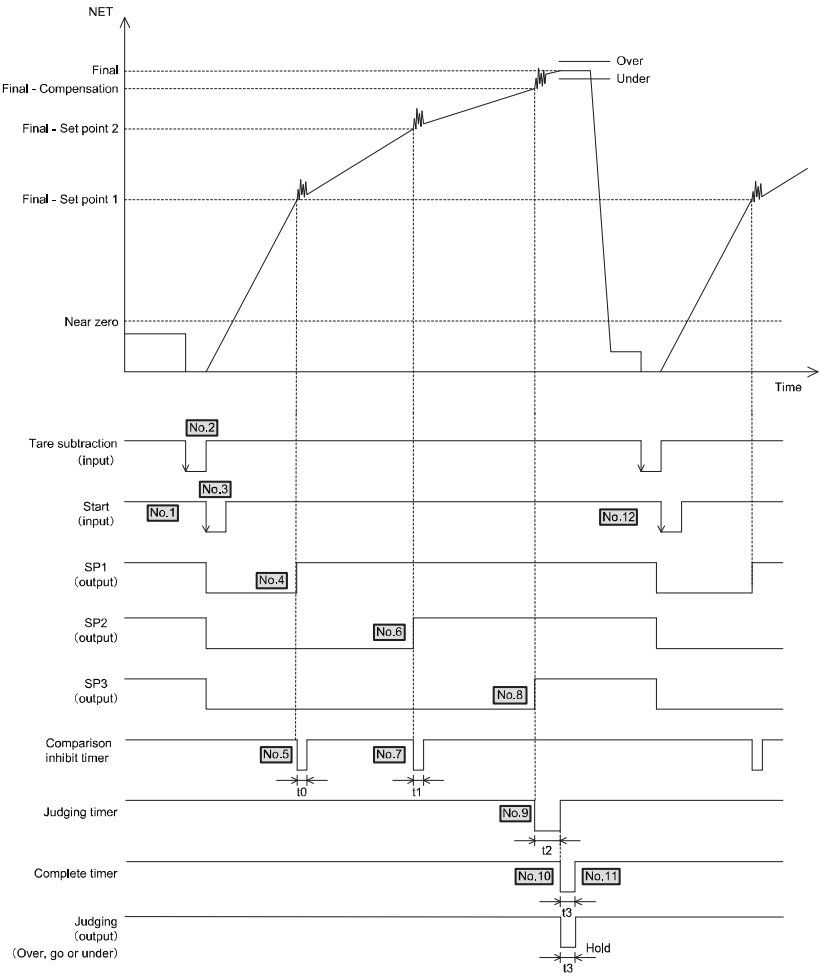
Simple comparison control





t0: Comparison inhibit time 1
t1: Comparison inhibit time 2
t2: Judging time
t3: Complete output time
SP1: Set point 1
SP2: Set point 2
SP3: Set point 3

Sequence control



t0: Comparison inhibit time 1
t1: Comparison inhibit time 2
t2: Judging time
t3: Complete output time
SP1: Set point 1
SP2: Set point 2
SP3: Set point 3

No.1 Waiting for start signal input

No.2 Execution of tare subtraction

No.3 Start signal ON input

Set points 1, 2, 3 ON

Start of feeding

No.4 Set point 1 OFF

No.5 Operation of comparison inhibit timer

No.6 Set point 2 OFF

No.7 Operation of comparison inhibit timer

No.8 Set point 3 OFF

No.9 Operation of judging timer

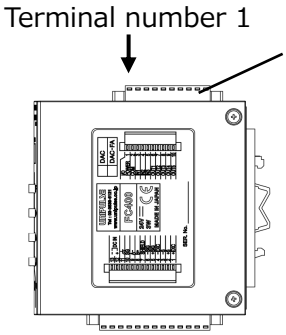
No.10 Complete signal is output
Judging signal (over/go/under) output

No.11 After complete output timer has elapsed

No.12 Waiting for start signal input for next weighing

6 External I/O signals

6-1. 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	

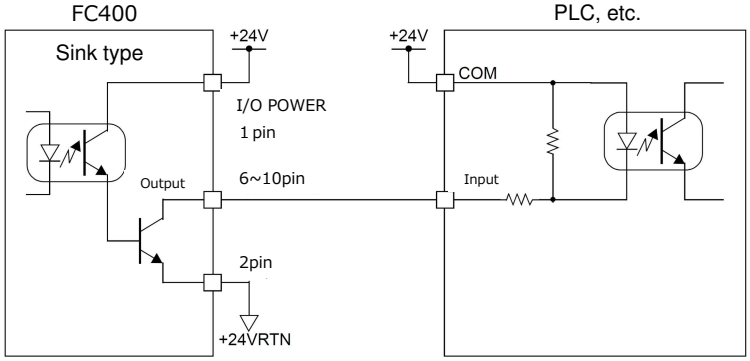
- An external DC24V (power supply for the external I/O signal circuit) must be prepared separately.
- I/O circuits and internal circuits are electrically insulated by a photo-coupler.

6-2. Connecting an external control device

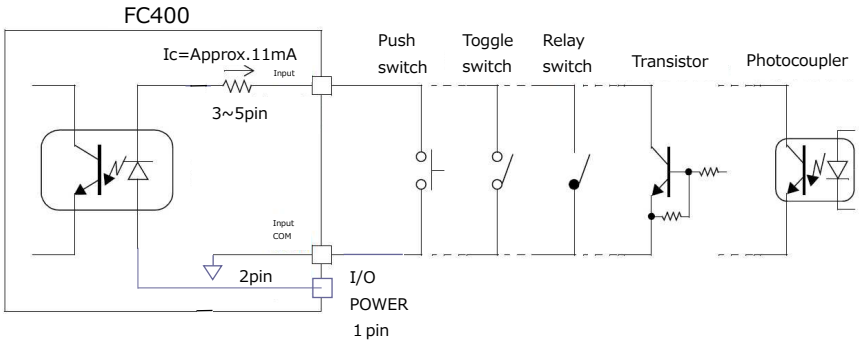
Input terminals ... Switches, relays, transistors, photo-couplers etc. can be connected.
Connect a sink type unit for connecting transistors, photo-couplers etc.

Output terminals ... Open collector output for transistors.

・ Output



・ Input

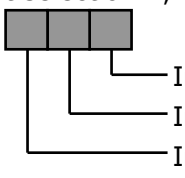


6-3. Selection of external I/O signal functions

Functions can be selected for each I/O terminal.

■Input selection 1, 2, 3

[Input selection 1, 2, 3] (Setting item 4-4)

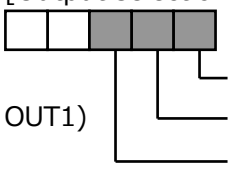


Input selection 1 (Sets IN1)
Input selection 2 (Sets IN2)
Input selection 3 (Sets IN3)

(Selection of functions)
0: GROSS/NET display switch, 1: Digital zero execution
2: Tare subtraction execution, 3: Tare subtraction reset
4: Feed/discharge, 5: HOLD/judgment
6: Comparison inhibit input, 7: Start
8: Stop

■Output selection 1, 2, 3

[Output selection 1, 2, 3] (Setting item 4-5)



Output selection 1 (Sets OUT1)
Output selection 2 (Sets OUT2)
Output selection 3 (Sets OUT3)

(Selection of functions)
0: Stable, 1: Over
2: Under, 3: Go

■Output selection 4

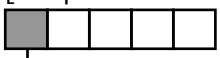
[Output selection 4] (Setting item 4-5)

Output selection 4 (Sets OUT4)

(Selection of functions)
0: Near zero, 1: Over
2: Under, 3: Go
4: Upper limit, 5: Lower limit
6: Complete, 7: Weight error

■Output selection 5

[Output selection 5] (Setting item 4-5)



Output selection 5 (Sets OUT5)

(Selection of functions)
0: Near zero, 1: Stable
2: Over, 3: Under
4: Go, 5: Complete
6: Weight error, 7: Seq. error

6-4. Description of external I/O signal functions

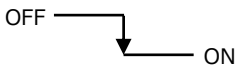
(Input signals)

Function	Input method	Description
GROSS/NET display switch	Edge input	Net weight (NET) is displayed at ON edge. Gross weight (GROSS) is displayed at OFF edge.
Digital zero execution	Edge input	Gross weight is reset to zero at ON edge.
Tare subtraction execution	Edge input	Tare subtraction is performed at ON edge and the net weight value is reset to zero.
Tare subtraction reset	Edge input	Releases (resets) tare subtraction executed at ON edge.
Feed/discharge	Level input	Enabled when "external selection" is selected for the discharging method. The function is feeding control when OFF, and discharging control when ON.

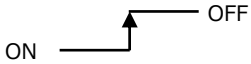
HOLD/Judgment	Level input	Functions as "judging" when "compare when external judging input is ON" is selected for either over/under comparison mode or upper/lower limit comparison mode, and as "HOLD" otherwise. <HOLD> Hold (maintain) weight value and comparison while ON when in simple comparison mode. (This input is disabled when in sequence mode.) <Judgment> Comparison judgment is performed while ON when in simple comparison mode.
Comparison inhibit input	Level input	Comparison of set point 3 is not performed while ON.
Start	Edge input	Used in sequence mode. Weighing starts at ON edge (OFF → ON).
Stop	Level input Edge input	Used in sequence mode. Seq. error is displayed and weighing stops when this signal is turned ON during weighing. In addition, seq. error is cleared at ON edge.

<Edge input>

- ON edge (OFF → ON)



- OFF edge (ON → OFF)

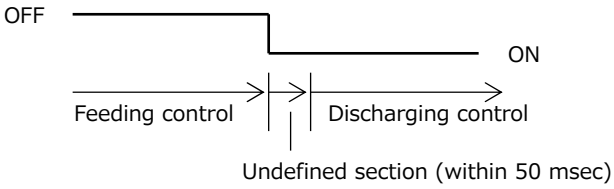


* Pulse range of 50 msec or more

<Level input>

Switch processes when external input is ON and OFF.

Example) Feed/discharge switching



(Output signals)

Function	Description
Stable	Output turns ON when the weight value is stable. (Refer to "Motion detection" on p13.)
Over Under Go	● In simple comparison mode Comparison timing is selected in over/under comparison mode. ● In sequence mode Ignores the over/under comparison mode settings, performs comparison when complete output is ON, and holds the weight value. (Only when judging is ON.) <Conditions for each signal to turn ON> - Under: Weight value ＜ final setting value - under setting value - Over: Weight value ＞ final setting value + over setting value (Selected in accordance with the final and over/under comparison weight) - Final: Final setting value + over setting value ≧ weight value ≧ final setting value - under setting value

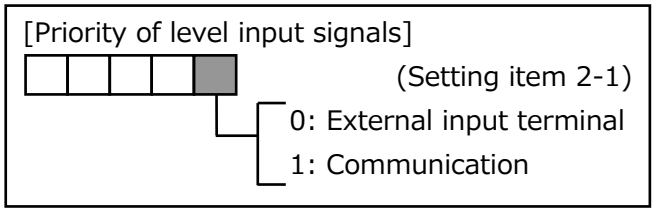
Upper limit Lower limit	Select whether to compare regularly or compare when judging input is ON for upper/lower limit comparison mode. Conditional equation: Lower limit output turns ON when weight value < lower limit setting value. Upper limit output turns ON when weight value > upper limit setting value. (Selected in accordance with the upper/lower limit comparison weight.)
Set point 1 Set point 2 Set point 3	● In simple comparison mode The conditions under which each signal turns ON are as follows: - SP1 output: Weight value ≧ final setting value - set point 1 setting value - SP2 output: Weight value ≧ final setting value - set point 2 setting value - SP3 output: Weight value ≧ final setting value - compensation setting value (Selected in accordance with the final and over/under comparison weight) ● In sequence mode When the start signal is turned ON, the weighing sequence starts and each signal turns ON. The conditions under which each signal turns OFF are as follows: - SP1 output: Weight value ≧ final setting value - set point 1 setting value - SP2 output: Weight value ≧ final setting value - set point 2 setting value - SP3 output: Weight value ≧ final setting value - compensation setting value (Selected in accordance with the final and over/under comparison weight)
Complete	● In simple comparison mode Output mode is selected in complete signal output mode. The timing with which output turns ON depends on the complete output time. ● In sequence mode [When judging is ON] Output mode is selected in complete signal output mode. The timing with which output turns ON depends on the complete output time. [When judging is OFF] Ignores the complete signal output mode settings, and complete output turns ON at OFF edge of the SP3 output signal. The timing with which output turns ON depends on the complete output time.
Near zero	Comparison is only performed when compare regularly is selected, and output turns ON when weight value (selected in near zero comparison mode) ≦ near zero setting value.
Weight error	Output turns ON when ±LOAD, OFL or ZALM (zero error) is displayed. (Refer to "Over scale display" on p55 for details regarding error display.)
Seq. error	Output turns ON when a sequence error occurs. (Refer to "Sequence error display" on p55 for details regarding seq. error.)
RUN	Output turns ON during normal operation.

6-5. Other settings

■ Priority of level input signals

Select interfaces for which the following level input signals will be enabled.

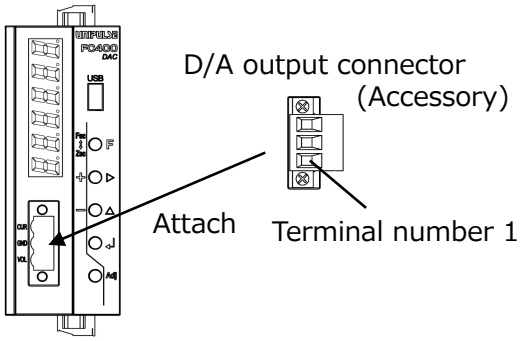
- "Start"
- HOLD operation of "HOLD/Judgment"
- "Comparison inhibit input"
- Sequence stop operation of "Stop"



7. 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.

7-1. Names of components



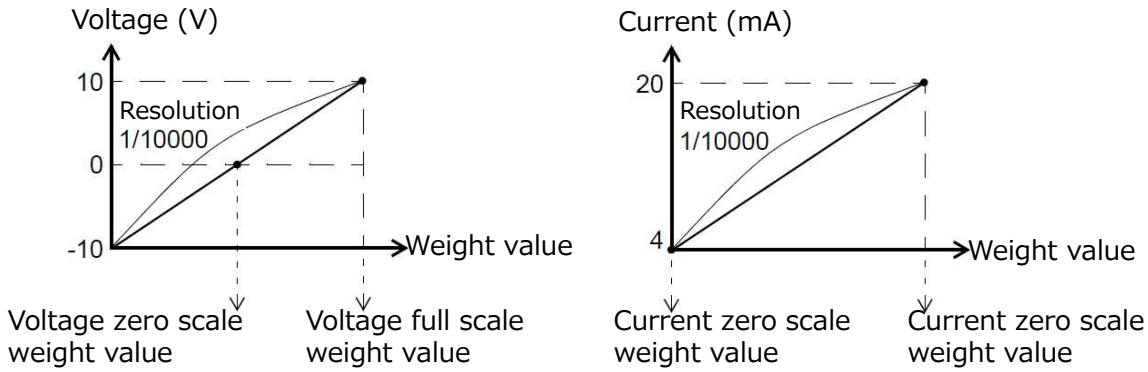
Terminal number	Terminal name	Description
3	CUR	Current output terminal
2	GND	Ground for voltage and current output (Common)
1	VOL	Voltage output terminal

7-2. Settings related to D/A

■ **Voltage zero scale weight value**
■ **Voltage full scale weight value**
■ **Current zero scale weight value**
■ **Current full scale weight value**

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

[Voltage zero scale weight value] (Setting item 8-1)
[Voltage full scale weight value] (Setting item 8-2)
[Current zero scale weight value] (Setting item 8-3)
[Current full scale weight value] (Setting item 8-4)
□□□□□ (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)
□
0: Gross weight
1: Net weight
2: Indicated value

7-3. D/A output fine adjustment

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

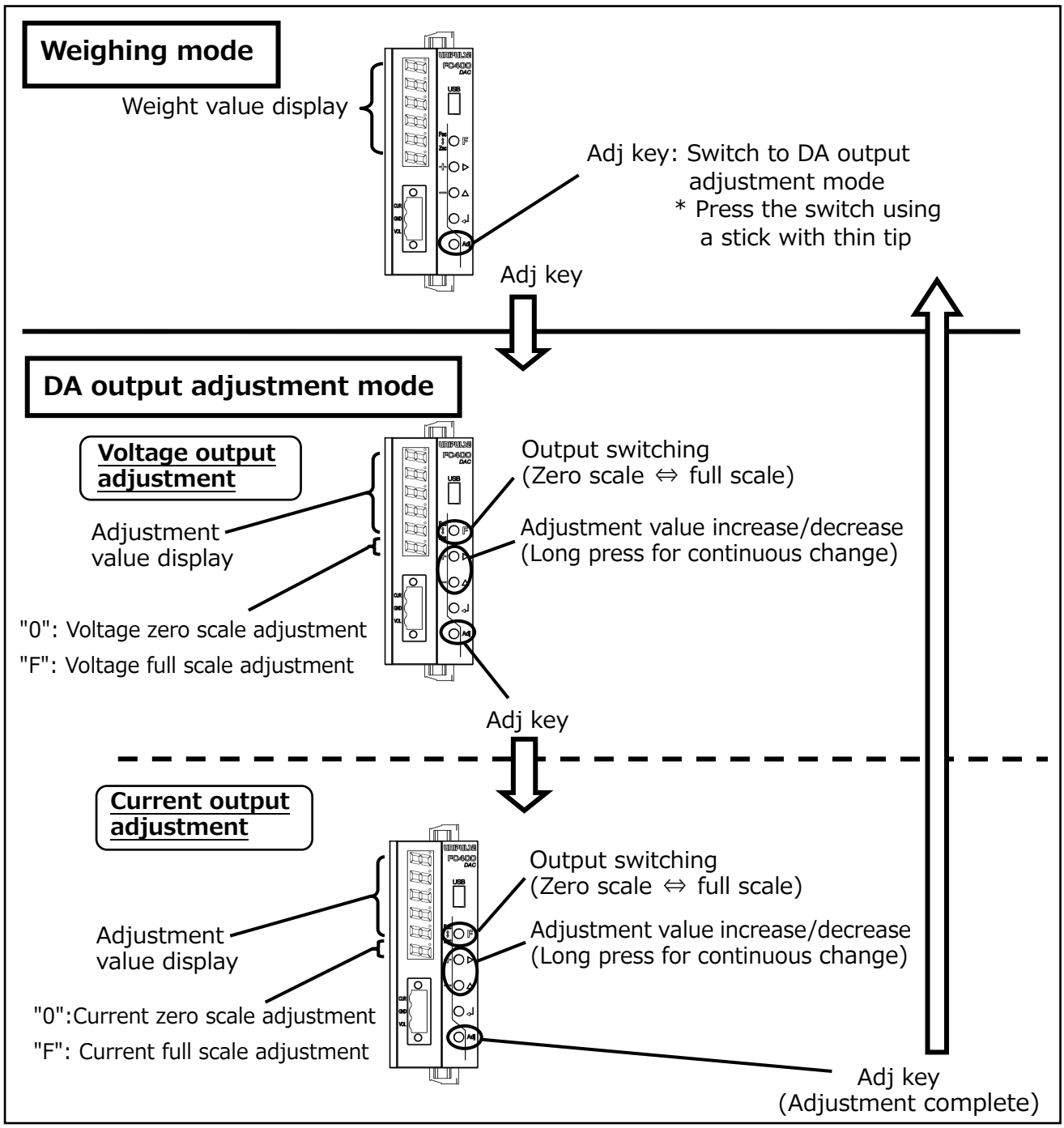
Fine adjustments can be made to the current and voltage zero scale output (0V/4mV) and full scale output (+10V/20mA).
(The adjustable range is about ±10% of the full scale)

[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)

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

(Setting operation)



8 RS-485 Interface

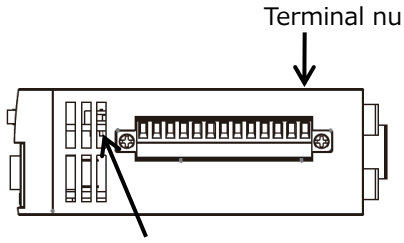
RS-485 is an interface to read the indicated values and status of the FC400 and read and write setting values.

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.

8-1. 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)	

8-2. RS-485 connection



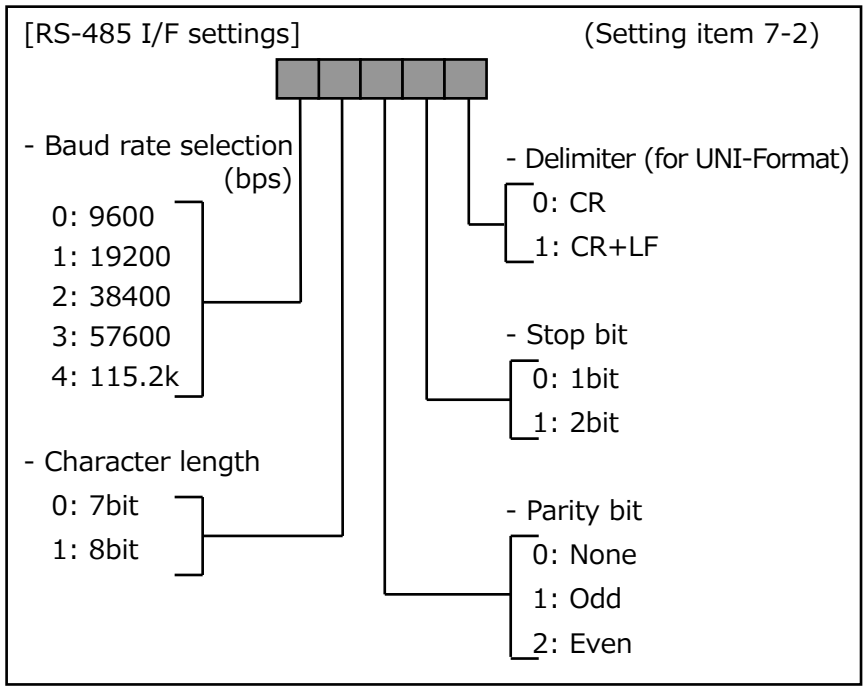
Terminal number	Terminal name	Description
8	B+	Signal wire B+ side
9	A−	Signal wire A- side
10	SG	Signal ground

- 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.

8-3. Settings related to RS-485

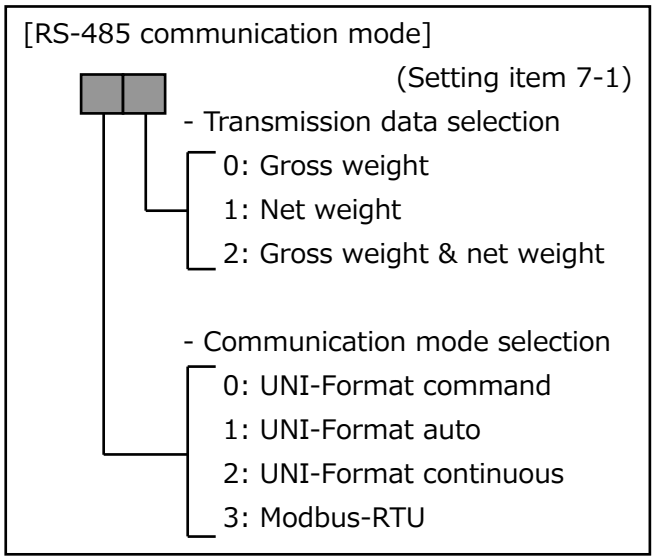
■ RS-485 I/F settings

These settings are for RS-485 communication.
Use the same settings as the connecting device.



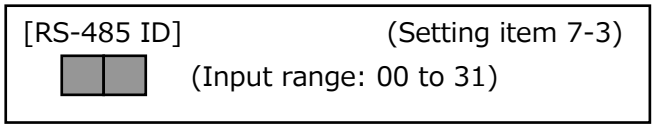
■ RS-485 communication modes

Select communication mode from Modbus-RTU or UNI-Format.
Also, select the transmission data for UNI-Format auto/continuous.



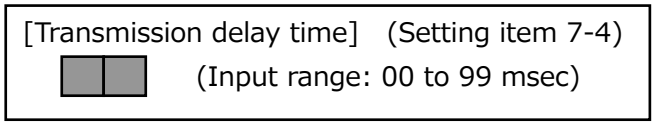
■ RS-485 ID

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.



8-4. 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

8-5. 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: Gross weight, B: Net weight, C: Tare weight

- Reading status 1 **RD**

N	O			R	D	CR

ID No.

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

ID No.

(1) HOLD, (2) Zero error, (3) Stable, (4) Tare subtraction ON (5) Weight display
0: OFF 0: GROSS
1: ON 1: NET

- Reading status 2 **RE**

N	O			R	E	CR

ID No.

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

ID No.

(1) Set point 1, (2) Set point 2, (3) Set point 3, (4) Under, (5) Go, (6) Over, (7) Complete
0: OFF
1: ON

- Reading status 3 **RF**

N	O			R	F	CR

ID No.

I	D			R	F	(1)	(2)	(3)	0	0	0	0	Delimiter

ID No.

(1) Near zero, (2) Lower limit, (3) Upper limit
0: OFF
1: ON

- Reading status 4 **RG**

N	O			R	G	CR

ID No.

I	D			R	G	(1)	(2)	(3)	0	(4)	(5)	(6)	(7)	(8)	Delimiter

ID No.

(1) Weight error, (2) Seq. error, (3) OFL1, (4) OFL3, (5) +LOAD, (6) -LOAD
0: OFF
1: ON

(7) Calibration error
2, 3, 5 to 9,
(0 :no error)

(8) Seq. error
1 to 5,
(0 :no error)

- Read out the completion data **RJ**

N	O			R	J	CR

ID No.

I	D			R	J	±	1	0	0	.	0	0	Delimiter

ID No. Sign, 5 or 6 digits, decimal point

* Up to 256 pieces of data can be stored in the buffer in memory.
Reading-out erases data chronologically.

I	D			R	J	Delimiter

ID No.

Data returned when there is no completion data in the buffer.

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.

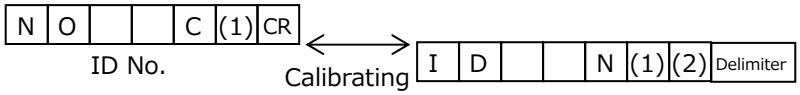
I	D			W	(1)	(2)							Delimiter

(1) Setting mode number, (2) Setting item number
* Refer to the list of setting values

The same as the setting value writing format

Calibration commands

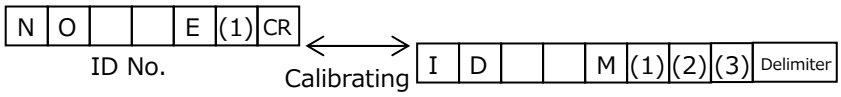
- Zero calibration/span calibration
- Equivalent zero calibration/equivalent span calibration



(1) Calibration mode
- A: Zero calibration
- B: Span calibration
- U: Equivalent input zero calibration
- V: Equivalent input span calibration

(2) Calibration error
2, 3, 5 to 9, (0 :no error)

- Linearization calibration

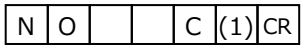


(1) Calibration mode
- A: Linearization calibration 1
- B: Linearization calibration 2
- C: Linearization calibration 3
- D: Span correction

(2) Linearization calibration error
1 to 8, (0 :no error)

(3) Linearization calibration error
P or F, (0 :no error)

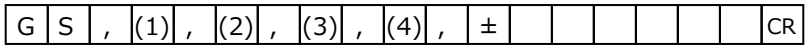
Execution command



(1) Command
C: Gross weight display, D: Net weight display, E: One-touch tare subtraction
F: One-touch tare subtraction reset, G: Digital zero, H: Digital zero reset
I: Hold ON, J: Hold OFF, K: Start, L: Stop ON, M: Stop OFF
N: Comparison inhibit ON, Q: Comparison inhibit OFF, O: Auto adjustment filter
R: Completion data clear

UNI-Format auto/continuous

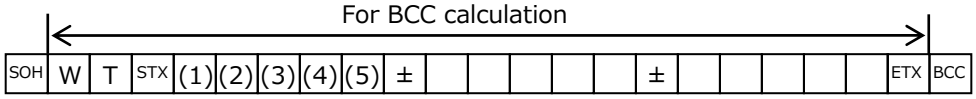
- Gross weight/net weight



GS: Gross weight
NT: Net weight

Sign, 5 or 6 digits, decimal point

- Gross weight & net weight



WT: Gross weight & net weight

Sign, 5 or 6 digits

Sign, 5 or 6 digits

(1) O: LOAD/OFL, S: Stable, M: Unstable H: Hold
(2) A: ZT OFF, T: ZT ON, Z: Zero error
(3) H: HI ON, L: LO ON, G: HI and LO OFF
N: HI and LO ON, F: COMP OFF

(4) N: Near zero OFF
Z: Near zero ON

(5) Decimal place
0: None, 1: 0.0, 2: 0.00, 3: 0.000

Each ASCⅡ code of SOH,STX and ETX

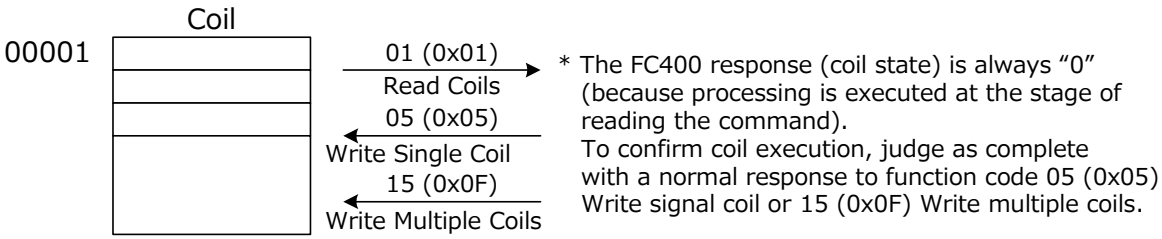
BCC:Block check character
It is calculated as the XOR of
the transmitted character(Hexadecimal)

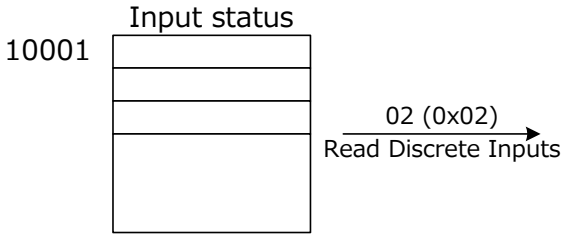
8-6. Modbus-RTU

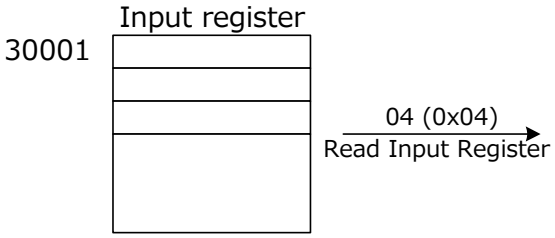
Introduction into a system with the same Modbus-RTU configuration can be easily performed by selecting Modbus-RTU for the communication mode. (Refer to the specifications for the Modbus protocol, which are open to the public.)

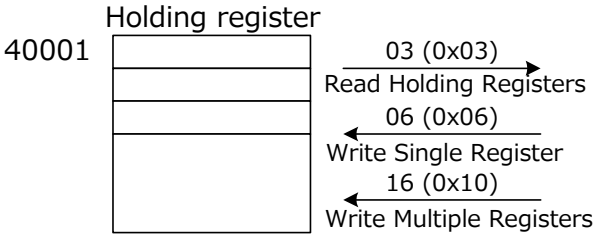
The FC400 operates as a slave to enable the following operations from the master side.

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 eqation.

Relative address=Last 4 digits of address No. − 1

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

8-7. Modbus-RTU address map

Data type	Address	Data name	Data format	LOCK	
				1	2
Coil 0XXXX	00001	GROSS	B1		
	00002	NET			
	00003	One-touch tare subtraction			
	00004	One-touch tare subtraction reset			
	00005	Digital zero			
	00006	Digital zero reset			
	00007	Hold ON			
	00008	Hold OFF			
	00009	Start ON			
	00010	Stop ON			
	00011	Stop OFF			
	00012	Comparison inhibit ON			
	00013	Comparison inhibit OFF			
	00014	Auto adjustment filter			◎
	00015	Backup (not allocated)			
	00016				
	00017	Zero calibration		◎	◎
	00018	Span calibration		◎	◎
	00019	Equivalent input zero calibration		◎	◎
	00020	Equivalent input span calibration		◎	◎
	00021	Linearization calibration 1		◎	◎
	00022	Linearization calibration 2		◎	◎
	00023	Linearization calibration 3		◎	◎
	00024	Span correction		◎	◎
	00025	Reserved area (cannot be used)			
	to				
	09999				

Data type	Address	Data name	Data format	LOCK	
				1	2
Discrete input 1XXXX	10001	Upper limit	B1		
	10002	Lower limit			
	10003	Over			
	10004	Go			
	10005	Under			
	10006	Set point 1			
	10007	Set point 2			
	10008	Set point 3			
	10009	Near zero			
	10010	Complete			
	10011	Stable			
	10012	Hold			
	10013	Tare subtraction			
	10014	Gross weight/net weight display			
	10015	Zero tracking			
	10016	LOCK1			
	10017	LOCK2			
	10018	RUN			
	10019	Weight error			
	10020	Seq. error			
	10021	Zero error			
	10022	Reserved area (cannot be used)			
	to				
	19999				

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	Gross weight (HI) *4	I32		
	30006	Gross weight (LO) *4			
	30007	Net weight (HI) *4			
	30008	Net weight (LO) *4			
	30009	Tare weight (HI) *4			
	30010	Tare weight (LO) *4			
	30011	Gross weight (HI) *5			
	30012	Gross weight (LO) *5			
	30013	Net weight (HI) *5			
	30014	Net weight (LO) *5			
	30015	Tare weight (HI) *5			
	30016	Tare weight (LO) *5			
	30017	Reserved area (cannot be used)			
	to				
	39999				

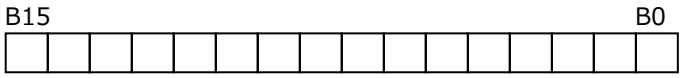
Data type	Address	Data name	Data format	LOCK	
				1	2
Holding register 4XXXX	40001	Set point 1 (HI)	I32	◎	
	40002	Set point 1 (LO)		◎	
	40003	Set point 2 (HI)		◎	
	40004	Set point 2 (LO)		◎	
	40005	Final (HI)		◎	
	40006	Final (LO)		◎	
	40007	Auto free fall compensation regulation value (HI)		◎	
	40008	Auto free fall compensation regulation value (LO)		◎	
	40009	Upper limit (HI)		◎	
	40010	Upper limit (LO)		◎	
	40011	Lower limit (HI)		◎	
	40012	Lower limit (LO)		◎	
	40013	Near zero (HI)		◎	
	40014	Near zero (LO)		◎	
	40015	Tare setting (HI)		◎	
	40016	Tare setting (LO)		◎	
	40017	Balance weight value (HI)		◎	◎
	40018	Balance weight value (LO)		◎	◎
	40019	Net over (HI)			◎
	40020	Net over (LO)			◎
	40021	Gross over (HI)			◎
	40022	Gross over (LO)			◎
	40023	Gravitational acceleration (HI)		◎	◎
	40024	Gravitational acceleration (LO)		◎	◎
	40025	Equivalent input zero calibration (HI)		◎	◎
	40026	Equivalent input zero calibration (LO)		◎	◎
	40027	Equivalent input span calibration (HI)		◎	◎
	40028	Equivalent input span calibration (LO)		◎	◎
	40029	Linearization calibration 1 (HI)		◎	◎
	40030	Linearization calibration 1 (LO)		◎	◎
	40031	Linearization calibration 2 (HI)		◎	◎
	40032	Linearization calibration 2 (LO)		◎	◎
	40033	Linearization calibration 3 (HI)		◎	◎
	40034	Linearization calibration 3 (LO)		◎	◎
	40035	Output selection (HI)			◎
	40036	Output selection (LO)			◎
	40037	Sequence mode (HI)			◎
	40038	Sequence mode (LO)			◎
	40039	Compensation (HI)		◎	
	40040	Compensation (LO)		◎	
	40041	Setting value LOCK (HI)			
	40042	Setting value LOCK (LO)			

Data type	Address	Data name	Data format	LOCK	
				1	2
Holding register 4XXXX	40043	Voltage zero scale weight value(HI)	I32	◎	◎
	40044	Voltage zero scale weight value(LO)		◎	◎
	40045	Voltage full scale weight value(HI)		◎	◎
	40046	Voltage full scale weight value(LO)		◎	◎
	40047	Current zero scale weight value(HI)		◎	◎
	40048	Current zero scale weight value(LO)		◎	◎
	40049	Current full scale weight value(HI)		◎	◎
	40050	Current full scale weight value(LO)		◎	◎

Data type	Address	Data name	Data format	LOCK	
				1	2
Holding register 4XXXX	40051	Linearization calibration ON/OFF	I16	◎	◎
	40052	Over		◎	
	40053	Under		◎	
	40054	Comparison inhibit time 1			◎
	40055	Comparison inhibit time 2			◎
	40056	Judging time			◎
	40057	Complete output time			◎
	40058	Compensation feeding time		◎	
	40059	Number of times for AZ			◎
	40060	Number of times for judging			◎
	40061	Weighing function 1			◎
	40062	Weighing function 2			◎
	40063	Weighing function 3			◎
	40064	Extended function selection 1			◎
	40065	Extended function selection 2			◎
	40066	Motion detection (period - range)			◎
	40067	Zero tracking (period)			◎
	40068	Zero tracking (range)			◎
	40069	DZ regulation value			◎
	40070	Display selection		◎	◎
	40071	Digital low-pass filter			◎
	40072	Moving average filter			◎
	40073	Input selection			◎
	40074	Min. scale division		◎	◎
	40075	Calibration point confirmation			◎
	40076	D/A output link setting			◎
	40077	Voltage zero scale adjustment		◎	◎
	40078	Voltage full scale adjustment		◎	◎
	40079	Current zero scale adjustment		◎	◎
	40080	Current full scale adjustment		◎	◎
	40081	Excitation voltage selection		◎	◎
	40082	Reserved area (cannot be used)			
	to				
	49999				

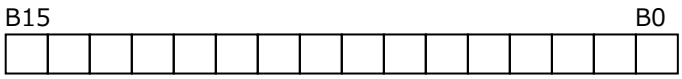
B1: 1bit, I16: 16bit integer, I32: 32bit integer

*1: Status 1



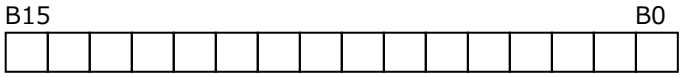
B15: Undefined, B14: OFL3, B13: OFL1, B12: Undefined
B11: -LOAD, B10: +LOAD, B9: Zero error, B8: Calibrating
B7 to B4: Calibration error No. , B3 to B0: Seq. error No.

*2: Status 2



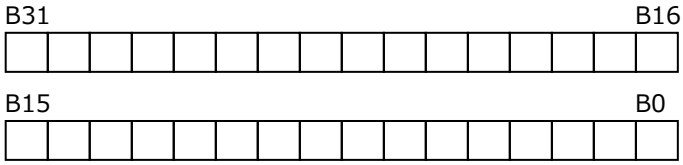
B15 to B10: Undefined, B9: Complete, B8: Near zero
B7: Set point 3, B6: Set point 2, B5: Set point 1, B4: Under
B3: Go, B2: Over, B1: Lower limit, B0: Upper limit

*3: Status 3



B15 to B13: Undefined, B12: RUN, B11: LOCK2, B10: LOCK1
B9: ZT, B8: Net weight being displayed, B7: Tare subtraction ON
B6: HOLD, B5: Stable, B4 to B2: Undefined, B1 to B0: Decimal place

*4 Weight value



B31: Undefined, B30: ▲, B29: CZ, B28: ▼
B27: Over (OFL1, OFL3), B26 to B25: Undefined, B24: Sign (positive:0, negative:1)
B23 to B0: Weight value (binary)
*For details on ▲,CZ,▼, refer to (Setting item 5-4) 1/4 scale division. (P15)

*5 Negative numbers of the weight value (without status) are represented in two's complement.

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.

9 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.

9-1. USB interface

Communication specifications

Communication standard USB Ver.2.0 compliant, full speed (12Mbps)
Connector mini-B TYPE

9-2. 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

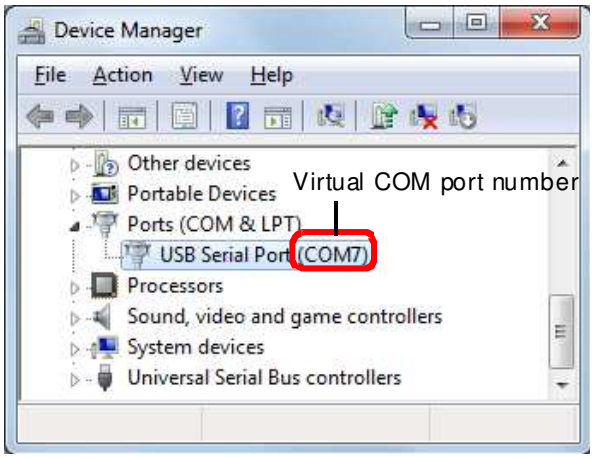
USB driver installation

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 included 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

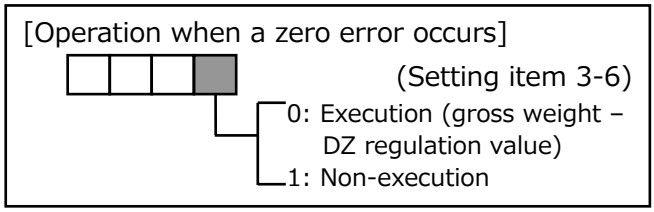
The COM port selection screen will appear when the PC application is activated for the first time after installation.

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

10 Other functions

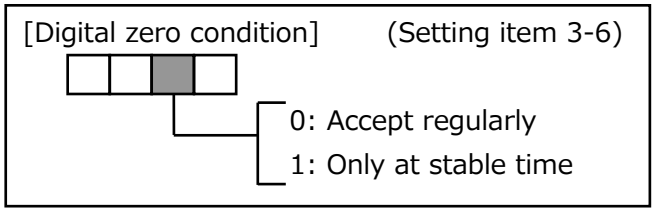
■Operation when a zero error occurs

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



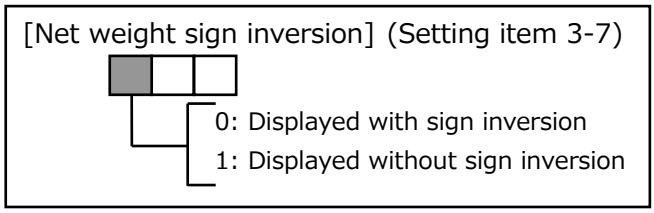
■Digital zero condition

Set the operating condition for digital zero.



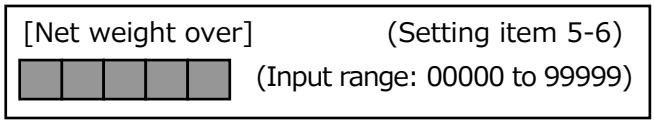
■Net weight sign inversion

The net weight becomes a negative value in the case of discharge weighing.
The sign can be inverted to display a positive value.
This setting will be ignored in the case of feed weighing.



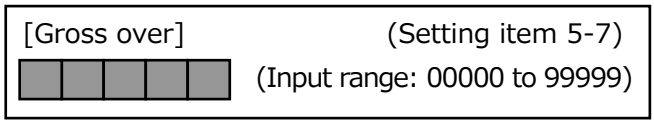
■Net weight over

Set the weight value for over scale (OFL1) to be displayed.



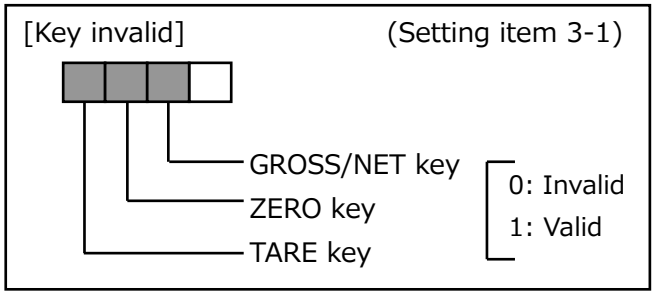
■Gross over

Set the weight value for over scale (OFL3) to be displayed.



■Key invalid

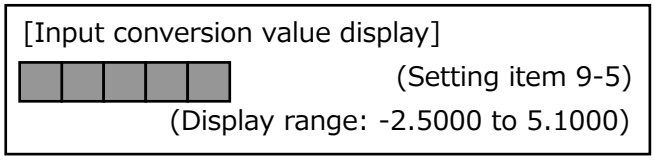
Makes key operations for digital zero, tare subtraction and gross/net weight switch invalid/valid.



■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 tare etc.



■Setting value restoration

[password] (Setting item 9-9)

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.

11 Troubleshooting

11-1. Over scale display

Display	Error name	Error content/countermeasures
LoAd	A/D converter input over	Signals that exceed the FC400 signal input range are input. Confirm that the load cell output does not exceed the span calibration range and that the cable connecting the FC400 to the load cell is not disconnected. This may also appear if nothing is connected to the load cell input on the terminal block.
- LoAd	A/D converter minus over	Signals lower than the signal input range of the FC400 are input. Confirm that the load cell output is not below the span calibration range and that the cable connecting the FC400 to the load cell is not disconnected. This may also appear if nothing is connected to the load cell input on the terminal block.
oFL 1	Net weight over	Net weight value exceeds the net over setting value. In order to return to a normal weight display from this over scale display, reduce the input signal from the load cell until the over scale display disappears, or change the net over setting value.
oFL3	Gross over	Gross weight value exceeds the gross over setting value. In order to return to a normal weight display from this over scale display, reduce the input signal from the load cell until the over scale display disappears, or change the gross over setting value.
ZE-AL	Digital zero over	Digital zero is executed with a gross weight exceeding the DZ regulation value. Change the DZ regulation value, and restart the digital zero operation. You can also press △ of the front panel + ENT key at the same time to disable.
Io-AL	External output error	External output is overloaded.(Over current) Please check if the wires are properly connected.

11-2. Sequence error display

Display	Error name	Error content/countermeasures
Err1	Seq. error 1	The stop signal is ON when the weighing start signal is turned ON. Turn OFF the stop signal and re-input a start signal to start weighing.
Err2	Seq. error 2	This is displayed when the stop signal turns ON while weighing with sequence control. Turn the stop signal OFF → ON.
Err3	Seq. error 3	This is displayed when ZALM status occurs while performing auto-zero with sequence control. Remove the cause of zero drift (such as adhering substances) and reset digital zero.

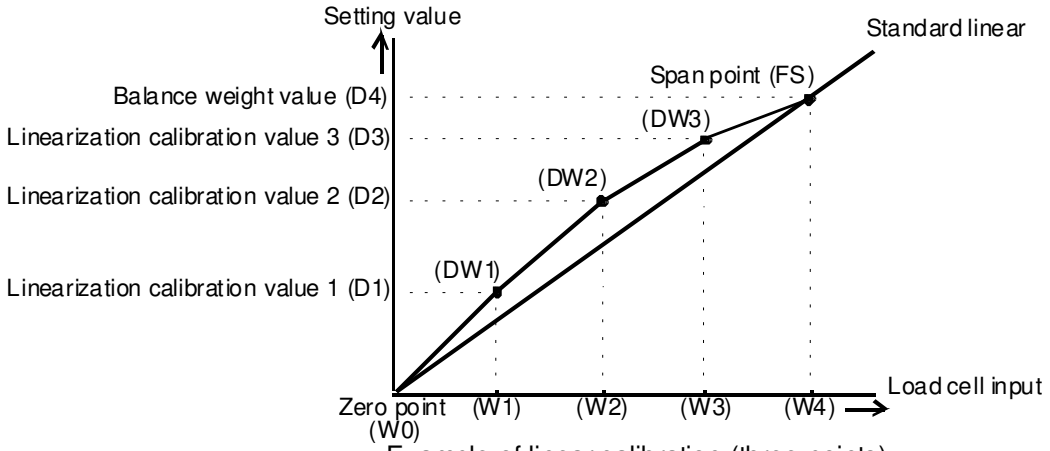
Err4	Seq. error 4	This is displayed when near zero signal is OFF when weighing starts (only when "setting mode 2-4: At start NZ confirmation" is enabled). First, check the near zero setting value and near zero comparison target. Then, confirm that a situation such as "the device was started before discharge was complete", "the start signal was turned ON too early" and "discharged substances have caused clogging" has not occurred, and turn the stop signal OFF → ON.
Err5	Seq. error 5	This is displayed when set point 1 output (SP1) signal is ON when weighing starts (only when "setting mode 2-1: confirm weight value at start" is enabled). First, check the setting values for SP1 and final. Then, confirm that a situations such as "the device was started before discharge was complete" has not occurred, and turn the stop signal OFF → ON.

11-3. Calibration error display

Display	Error name	Error content/countermeasures
c Err2	Calibration error 2	The amount of initial tare elimination exceeds the zero adjustment range of the FC400. Confirm that there is no unnecessary load applied to the load cell.
c Err3	Calibration error 3	The amount of initial tare elimination 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.
c Err5	Calibration error 5	The balance weight value is [00000]. Set adequate value to balance weight. Re-do span calibration.
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.
c Err9	Calibration error 9	The value indicated on the FC400 fluctuates during calibration, and calibration cannot be completed properly. Adjust stable setting parameters (period and range) and re-perform calibration when it is stable.

11-4. Linearization calibration error display

Display	Error name	Error content/countermeasures
F Err 1	Linearization error 1	D3≧D4 or W3≧W4 when linearization calibration 3 is executed.
F Err2	Linearization error 2	D3≦D2, D1 or D3=0, or W3≦W2, W1, W0 when linearization calibration 3 is executed.
F Err3	Linearization error 3	D2≧D3, D4 or W2≧W3, W4 when linearization calibration 2 is executed.
F Err4	Linearization error 4	D2≦D1 or D2=0, or W2≦W1, W0 when linearization calibration 2 is executed.
F Err5	Linearization error 5	D1≧D2, D3, D4 or W1≧W2, W3, W4 when linearization calibration 1 is executed.
F Err6	Linearization error 6	D=0 or W1≦W0 when linearization calibration 1 is executed.
P Err 1	Linearity error 1	More than +2% deviation from standard linear when linearization calibration 3 is executed.
P Err2	Linearity error 2	Less than -2% deviation from standard linear when linearization calibration 3 is executed.
P Err3	Linearity error 3	More than +2% deviation from standard linear when linearization calibration 2 is executed.
P Err4	Linearity error 4	Less than -2% deviation from standard linear when linearization calibration 2 is executed.
P Err5	Linearity error 5	More than +2% deviation from standard linear when linearization calibration 1 is executed.
P Err6	Linearity error 6	Less than -2% deviation from standard linear when linearization calibration 1 is executed.
P Err7	Linearity error 7	More than +2% deviation from standard linear when span correction is performed.
P Err8	Linearity error 8	Less then than -2% deviation from standard linear when span correction is performed.



Example of linear calibration (three points)

12 List of setting values

Setting mode 0

Setting item	Name	Initial value	Setting range	LOCK 1	LOCK 2	Page
1	Upper limit	000.00	00000 to 99999	◎		P18
2	Lower limit	000.00	00000 to 99999	◎		P18
3	Near zero	000.00	00000 to 99999	◎		P18
4	Set point 1	000.00	00000 to 99999	◎		P17
5	Set point 2	000.00	00000 to 99999	◎		P17
6	Compensation	00.00	-9999 to 9999	◎		P17
7	Over	00.00	0000 to 9999	◎		P18
8	Under	00.00	0000 to 9999	◎		P18
9	Final	000.00	00000 to 99999	◎		P17

Setting mode 1

Setting item	Name	Initial value	Setting range	LOCK 1	LOCK 2	Page
1	Comparison inhibit time 1	0.50	0.00 to 9.99		◎	P19
2	Comparison inhibit time 2	0.50	0.00 to 9.99		◎	P19
3	Judging time	1.50	0.00 to 9.99		◎	P19
4	Complete output time	3.00	0.00 to 9.99		◎	P19
5	Compensation feeding time	1.00	0.00 to 9.99	◎		P21
6	Auto free fall compensation regulation value	098.00	00000 to 99999	◎		P20
7	Weighing function 1	0000				
	Near zero comparison mode		0: Gross weight ≦ near zero 1: Net weight ≦ near zero 2: |Gross weight| ≦ near zero 3: |Net weight| ≦ near zero 4: Comparison OFF			P18
	Upper/lower limit comparison weight		0: GROSS 1: NET 2: Comparison OFF		◎	P18
	Final and over/under comparison weight		0: GROSS 1: NET 2: Comparison OFF			P18
	Weighing procedure selection		0: Feed weighing 1: Discharge weighing 2: External selection			P17
8	Weighing function 2	000				
	Complete signal output mode		0: On for the complete output time from when the judging timer has expired 1: On for the complete output time from when the weight value becomes stable after the judging timer has expired 2: On for the complete output time from when the judging timer has expired or from when the weight value becomes stable			P19
	Upper/lower limit comparison mode		0: Compare regularly 1: Compare when external judging input is ON		◎	P18
	Over/under comparison mode		0: Compare regularly 1: Compare when external judging input is ON 2: Compare when complete output is ON 3: Compare and HOLD when complete output is ON			P18

9	Weighing function 3	0011				
	Preset tare subtraction		0: OFF 1: ON			P15
	Average count of auto free fall compensation		1 to 9			P20
	Auto free fall compensation		0: OFF 1: ON 2: ON (Changing compensation via a network is disabled)		◎	P20
	Auto free fall compensation coefficient		0: 1 1: 3/4 2: 2/4 3: 1/4			P20

Setting mode 2

Setting item	Name	Initial value	Setting range	LOCK 1	LOCK 2	Page
1	Sequence mode	00000				
	Priority of level input signal		0: External input terminal priority 1: Communication priority			P27
	At start weight value confirmation		0: OFF 1: ON			P21
	At start NZ confirmation		0: OFF 1: ON		◎	P21
	Compensation feeding		0: OFF 1: ON			P21
	Control mode		0: Simple comparison mode 1: Sequence mode			P17
2	Number of times for AZ	01	00 to 99		◎	P21
3	Number of times for judging	01	00 to 99		◎	P20

Setting mode 3

Setting item	Name	Initial value	Setting range	LOCK 1	LOCK 2	Page
1	Key invalid/LOCK	1110				
	Setting value LOCK		0: Lock1 OFF, Lock2 OFF 1: Lock1 ON, Lock2 OFF 2: Lock1 OFF, Lock2 ON 3: Lock1 ON, Lock2 ON			P8
	GROSS/NET key		0: Invalid 1: Valid			P43
	ZERO key		0: Invalid 1: Valid			
	TARE key		0: Invalid 1: Valid			
2	Preset tare weight	000.00	00000 to 99999	◎		P15
3	Motion detection (period - range)	1.5-05	0.0 to 9.9 – 00 to 99		◎	P13
4	Zero tracking (period)	0.0	0.0 to 9.9		◎	P13
5	Zero tracking (range)	0000	0000 to 9999		◎	P13
6	Extended function selection 1	0000				
	Operation when a zero error occurs		0: Execution (gross weight - dz regulation value) 1: Non-execution			P43
	Digital zero condition		0: Accept regularly 1: Only at stable time		◎	P43
	Preset tare subtraction limit		0: Setting enabled during one-touch tare subtraction 1: Setting disabled during one-touch tare subtraction			P15
	One-touch tare subtraction condition		0: Accept regularly 1: Only at stable time			P14
7	Extended function selection 2	100				
	Filter in stable condition		0: Insert (512 times) 1: Do not insert			P12
	Motion detection mode		0: Stable mode 1: Checker mode		◎	P13
	Net weight sign inversion		0: Displayed with sign inversion 1: Displayed without sign inversion			P43

Setting mode 4

Setting item	Name	Initial value	Setting range	LOCK 1	LOCK 2	Page
1	Digital low-pass filter	002.0	0.1 to 300.0		◎	P12
2	Moving average filter	030	1:OFF、2 to 512		◎	P12
3	Auto adjustment filter	0			◎	P12
4	Input selection	210			◎	P25
	Input selection 1 Input selection 2 Input selection 3		0: GROSS/NET display switch 1: Digital zero ON 2: Tare subtraction ON 3: Tare subtraction OFF 4: Feed/discharge 5: HOLD/Judgment 6: Comparison inhibit input 7: Start 8: Stop			
5	Output selection	60540			◎	
	Output selection 1 Output selection 2 Output selection 3		0: Stable 1: Over 2: Under 3: Go 4: Upper limit 5: Lower limit 6: Set point 1 7: Set point 2 8: Set point 3 9: Complete			P25
	Output selection 4		0: Near zero 1: Over 2: Under 3: Go 4: Upper limit 5: Lower limit 6: Complete 7: Weight error 8: Seq. error 9: RUN			P25
	Output selection 5		0: Near zero 1: Stable 2: Over 3: Under 4: Go 5: Complete 6: Weight error 7: Seq. error			P25

Setting mode 5

Setting item	Name	Initial value	Setting range	LOCK 1	LOCK 2	Page
1	Balance weight value	100.00	00000 to 99999	◎	◎	P8
2	Min. scale division	0.01	01 to 50	◎	◎	P8
3	DZ regulation value	02.00	0000 to 9999		◎	P14
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	◎	◎	P12
	1/4 scale division		0: OFF 1: ON			P15
	Decimal place		0: None 1: 0.0 2: 0.00 3: 0.000			P8
	6 digit display		0: 5 digit display 1: 6 digit display			P15
5	Gravitational acceleration	9.7980	9.7500 to 9.8500	◎	◎	P8
6	Net weight over	999.99	0 to 99999		◎	P43
7	Gross over	999.99	0 to 99999		◎	P43

Setting mode 6

Setting item	Name	Initial value	Setting range	LOCK 1	LOCK 2	Page
1	Linearization calibration 1	025.00	00000 to 99999	◎	◎	P11
2	Linearization calibration 2	050.00	00000 to 99999	◎	◎	P11
3	Linearization calibration 3	075.00	00000 to 99999	◎	◎	P11
4	Span correction	100.00	00000 to 99999	◎	◎	P11
5	Linearization calibration ON/OFF	1	0: OFF 1: ON	◎	◎	P11
6	Calibration point confirmation	000				
	Linearization calibration 3		0: OFF 1: ON			P11
	Linearization calibration 2		0: OFF 1: ON			
	Linearization calibration 1		0: OFF 1: ON			
7	Excitation voltage selection	0	0: 5V 1: 2.5V	◎	◎	P9

Setting mode 7

Setting item	Name	Initial value	Setting range	LOCK 1	LOCK 2	Page
1	RS-485 communication mode	00				
	Transmission data selection (for auto, continuous)		0: Gross weight 1: Net weight 2: Gross weight & net weight			P31
	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			P31
	Stop bit		0: 1bit 1: 2bit			
	Parity bit		0: None 1: Odd 2: Even			
	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		◎	P31
4	Transmission delay time	00	00 to 99		◎	P31

Setting mode 8

Setting item	Name	Initial value	Setting range	LOCK 1	LOCK 2	Page
1	Voltage zero scale weight value	000.00	-99999～99999	◎	◎	P28
2	Voltage full scale weight value	100.00	-99999～99999	◎	◎	P28
3	Current zero scale weight value	000.00	-99999～99999	◎	◎	P28
4	Current full scale weight value	100.00	-99999～99999	◎	◎	P28
5	D/A output link setting	0	0: Gross weight 1: Net weight 2: Indicated value		◎	P28
6	Voltage zero scale adjustment(※)	0000	-5461～5461	◎	◎	P29
7	Voltage full scale adjustment(※)	0000	-5461～5461	◎	◎	P29
8	Current zero scale adjustment(※)	0000	-4194～4194	◎	◎	P29
9	Current full scale adjustment(※)	0000	-4194～4194	◎	◎	P29

(※) Adj key

Setting mode 9

Setting item	Name	Initial value	Setting range	LOCK		Page
				1	2	
1	Zero calibration	0		◎	◎	P9
2	Span calibration	100.00	00001 to 99999	◎	◎	P9
3	Equivalent input zero calibration	0.0000	-0.5000 to 2.0000	◎	◎	P9
4	Equivalent input span calibration	2.0000	0.0100 to 3.0000	◎	◎	P9
5	Input conversion value display	---	-2.5000 to 5.1000			P43
7	Version display	***				
8	Checksum display	****				
9	Password	0000				

13 Specifications

13-1. 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)
Signal input range	-2.5 to 5.1 mV/V
Zero adjustment range	Automatically adjusted by digital computation -0.5 to 2.0 mV/V
Span adjustment range	Automatically adjusted by digital computation 0.01 to 3.0 mV/V
Minimum input sensitivity	0.15μV/count
Accuracy	Non-linearity0.01%FS or less Zero drift　0.0002%FS/℃　Typ Gain drift　1 ppm/℃　Typ
Filter	Low-pass filter 0.1 to 300.0 Hz Moving average filter 1:OFF、2 to 512 times
A/D converter	Conversion rate　1200 times Conversion resolution　24bit (binary)
Minimum indicated resolution	1/10000

13-2. Display section

Weight display unit	Numbers are displayed by a 7-segment green LED with a character height of 8 mm (5 digit)
Weight display value	Max. 6 digits
Min. scale division	Can be set from 1 to 50
Decimal place	Selectable from 0, 0.0, 0.00, and 0.000 (zero blanking display based on decimal place)
Over scale display	A/D converter input over　LOAD A/D converter input minus over　-LOAD Net weight over　OFL1 Gross over　OFL3

13-3. Settings section

Setting procedure	Settings made using four tact switches Settings can also be made using an interface (CC-Link, 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

13-4. External signal input/output

Compatible plug	20020000-C101B01LF (10 pin), 20020000-C131B01LF (13 pin) (manufactured by FCI)
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 (Vceo = 30 V, Ic = 50 mA)

13-5. Interface

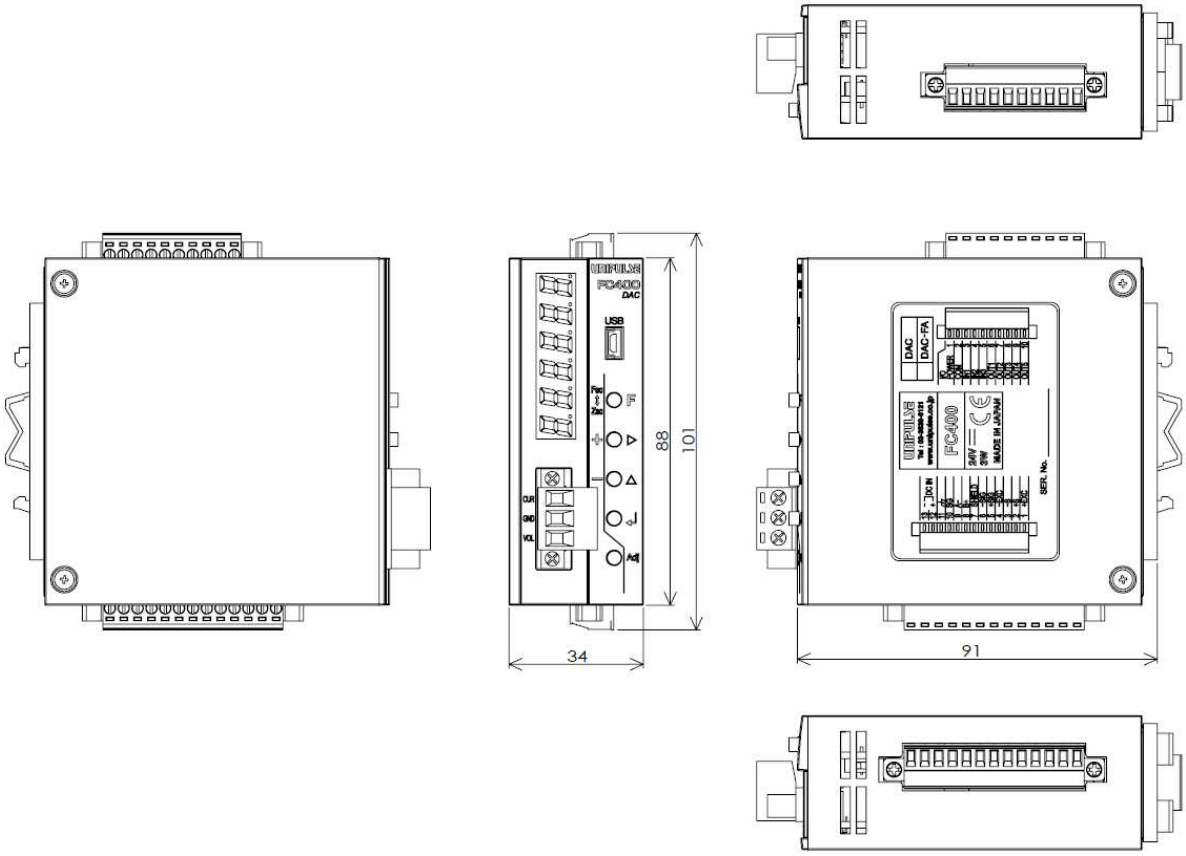
D/A converter interface		
	Voltage output	Current output
Output range	-10V to 10V (Load resistance of 2 kΩ or more)	4mA to 20mA (Load resistance of 500 Ω or less)
D/A conversion rate	1200 times	1200 times
Resolution	1/10000	1/10000
Over range	Approx. ±10%FS	Approx. ±10%FS
Zero adjustment range	Approx. ±10%FS	Approx. ±10%FS
Gain adjustment range	Approx. ±10%FS	Approx. ±10%FS
Zero drift	0.6 mV/ºC or less	0.5μA/℃ or less
Gain drift	50ppm/℃ or less	50ppm/℃ or less
Non-linearity	0.05%FS or less	0.05%FS or less
Compatible plug	BCP-508F-3GN (Manufactured by PHOENIX CONTACT)	

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 Character length Stop bit Parity bit	1bit Selectable from 7 or 8bit Selectable from 1 or 2bit Selectable from none, odd or even
Code	ASCII (for UNI-Format) Binary (for Modbus-RTU)	

13-6. General performance

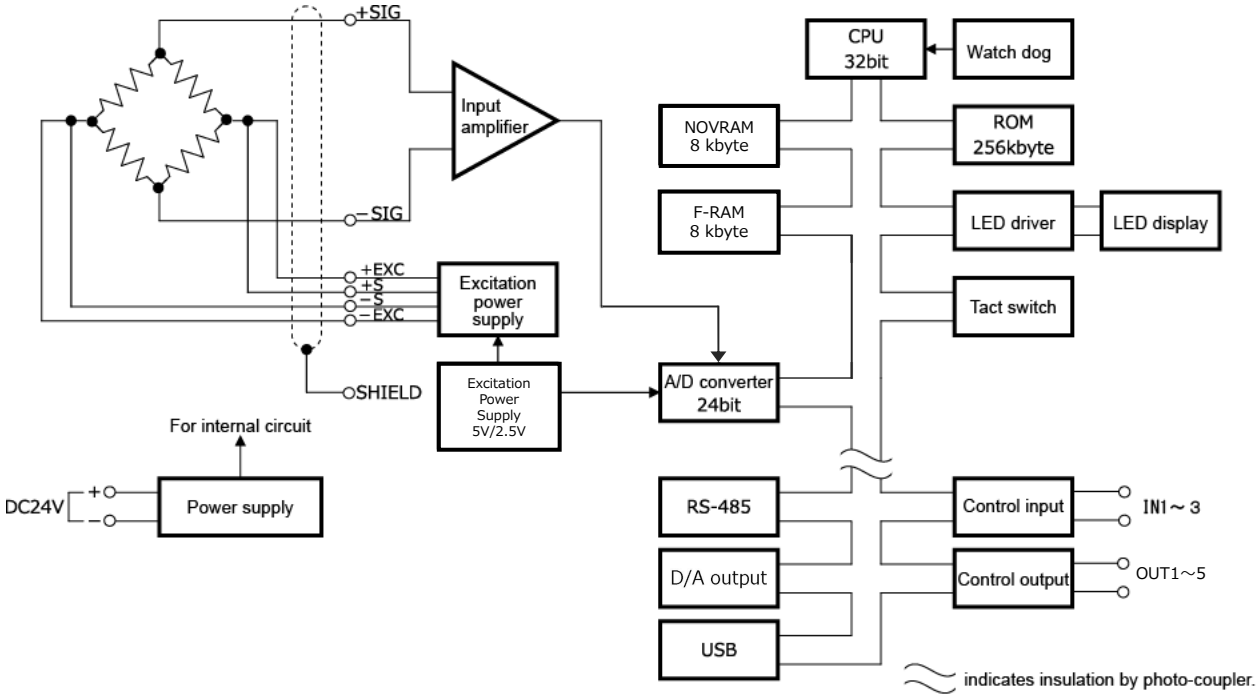
Power supply voltage	DC24V (±15%)	
Power consumption	3W	
Operating conditions	Temperatures	temperature range -10 to 50 ℃ Storage temperature range -20 to 85 ℃
	Humidity	85%RH or below (no condensation)
External dimensions	34 (W) × 88 (H) × 91 (D) (* not including protruding sections)	
Weight	Approx.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

13-7. External dimensions



Unit : mm

13-8. Block diagram



13-9. Compliance with EC directives

***The FC400 is CE-comliant. With using it, observe the follwing:**

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 shoud 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(⏚).