DIGITAL METER

⟨INSTANTANEOUS FLOW⟩ INDICATOR

EM30DT Series

Operation Manual

⟨Abridged edition⟩

Warning Before use, please read this Operation Manual with caution for your safety in operation, since this Manual contains important instructions to be surely observed.

① In no event should this EM30DT Series Instantaneous Flow Indicator be used as main loop controlling devices for use in a medical equipment which have a direct effect on the human lives, space devices, atomic power control machine, military marine vessel and chemical apparatus for the military purpose regulated under control in “Export Trade Control Ordinance”.

② Care must be taken not to exceed the rated power supply (24VDC±10%), and the wiring work should be done after turned off power. If not, it may cause malfunction, damage to the device or fire.

③ Avoid using EM30DT Series Instantaneous Flow Indicator in the following locations. If not, it may cause danger in life by fire, explosion and damage to the devices.

- In location where the corrosive gases and flammable gases will occur.
- In locations where water and oil splash and where there are much dust, metal powder and saline.
- In a location where is subjected to direct sunlight and where ambient temperature range between 0℃ and ＋55℃ is exceeded.
- In locations where is high in humidity, where temperature change occurs abruptly and where condensation of humidity will occur.
- In a location where is strong in vibration and impact shock.
- In a location where is in the vicinity of the devices which produce strong electromagnetic noises and high frequency noises.

! Precaution before use (Input/output signal lines)

① Do not connect any noise-generating devices to the power output pin at ＋5VDC for sensor.
② Avoid wiring together with such strong noise sources as power line, relay, electromagnetic valve and solenoid operated valve. Due to the induction it may cause malfunction.

1. Explanations for display unit and their operational keys

Names of the function keys	Functional contents
① Display unit of measured values	At the time of measuring: It displays measured values (Instantaneous flowrates), and also displays input signal values and comparative output setting values on a monitor by means of the key operations. At the time of setting: It displays the setting menus and setting parameters. Others: It displays erroneous messages on hardware and defective setting.
② Indicator on CP1	At the time of measuring: The display is lit up, when comparative output is turned on, and also if changed over the display to the comparative output setting value monitor, the display is blinked. At the time of setting: The display blinks during setting the comparative values and comparative conditions.
③ Indicator on CP 2	At the time of measuring: The display is lit up, when comparative output is turned on, and also if changed over the display to the comparative output setting value monitor, the display is blinked. At the time of setting: The display blinks during setting the comparative value and comparative conditions.
④ Mode key	It performs the changeover of the measuring mode to the setting mode by pressing longly for more than 3 seconds, and also performs the changeover of the setting items within the setting mode.
⑤ Shift key	It performs the digit shift of the numeric values to be set, and operates in monitoring the setting values on CP 1 and CP 2 during the measurement.
⑥ Up key	It performs the changeover of the mode within the setting mode, and also performs the changeover of the contents and the change of the numeric values to be set. It operates in monitoring the input signal during the measurement.

2. Explanation for each parameter

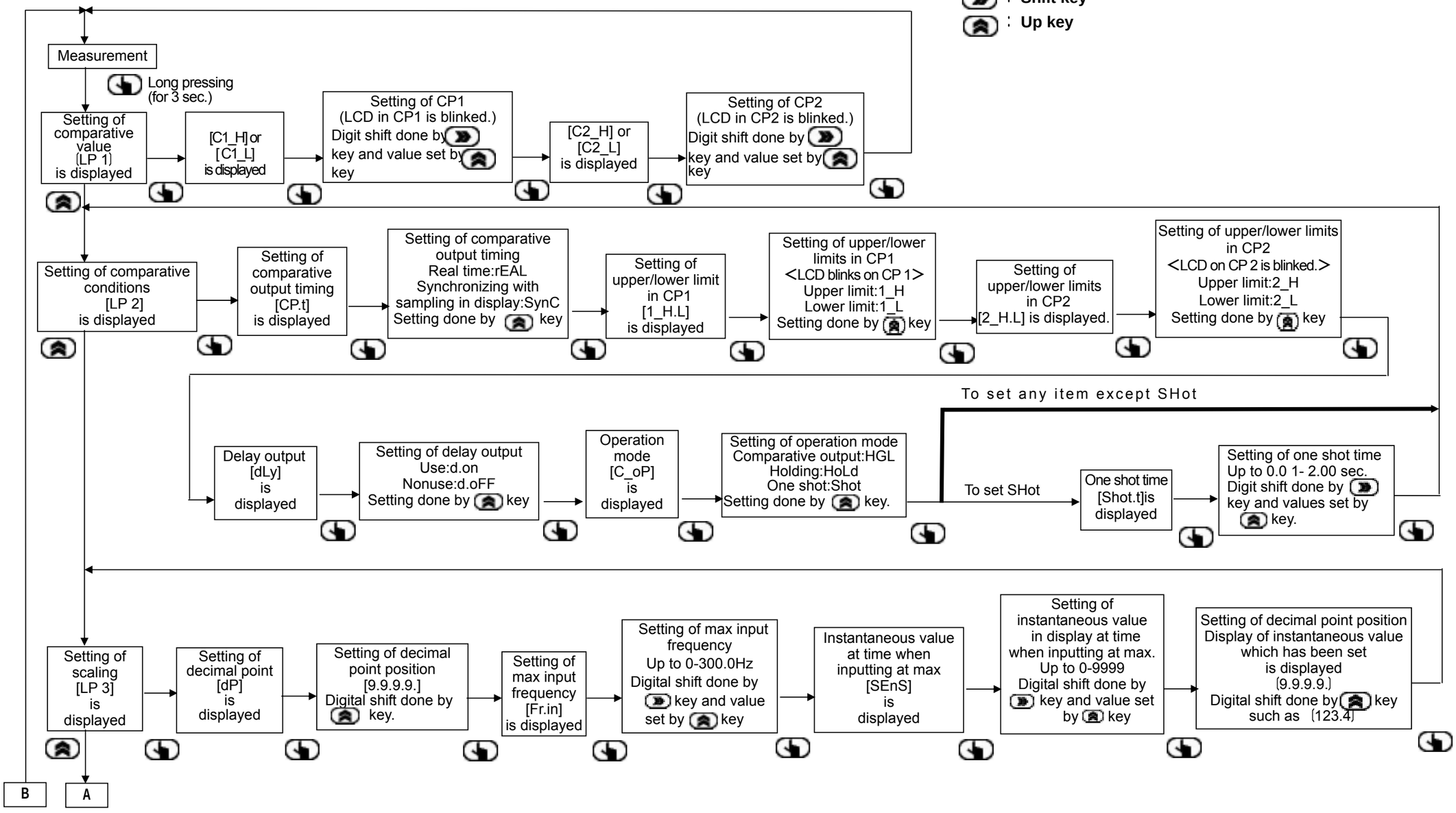
On-screen display	Items	Setting contents	Setting ranges	Initial values
L P 1	Setting of comparative values			
C 1_H or L	Setting of comparative values on CP1	It sets the values on CP1 in comparative output.	0 - 9999	001.0
C 2_H or L	Setting of comparative values on CP2	It sets the values on CP2 in comparative output.	0 - 9999	009.0
L P 2	Setting of comparative conditions			
C P. t	Setting of timing in comparative output	It selects the operation timing in comparative output. r EAL: It outputs by internal measuring timing(0.1 sec.) S y n C: It outputs by synchronizing with display sampling time.	rEAL:Real time SynC:Synchronism	SynC
1_H. L	Setting of upper/lower limits on CP1	It selects the operation conditions on CP1 in comparative output. H: Output is turned on, when setting the input values ≧ comparative values. L: Output is turned on, when setting the input values ≦ comparative values	1__H (Upper limit) 1__L (Lower limit)	1__H
2_H. L	Setting of upper/lower limits on CP2	It selects operation conditions on CP2 in comparative output. H: Output is turned on, when setting the input values ≧ comparative values. L: Output is turned on, when setting the input values ≦ comparative values	2__H (Upper limit) 2__L (Lower limit)	2__L
D L y	Setting of delay output	It selects the use or nonuse of delay output functions. ※ At the time of turning on the power, CP1 in comparative output is not outputted, until it has once been turned off, although power supply had been turned on. Also it operates in the same manner as to CP2 in comparative output.	d. on :Use d. oFF:Nonuse	d. oFF
C_o P	Setting of operation mode	It selects operation mode in comparative output. HGL :It outputs the changes of input values to the setting values at a real time. HoLd:Comparative output holds the ON state. Shot:Comparative output produces one shot, when the comparative output was turned on.	HGL :Comparative output HoLd:Holding Shot:One shot	HGL
S h t. t	Setting of one shot time	It sets the ON-time of one shot (Pulse signal), when the Shot is set to the operation mode.	0.01 - 2.00 sec. (Settable at unit of 0.1 sec.)	0.20
L P 3	Setting of scaling			
d P	Setting of decimal position on instantaneous value display	It sets the decimal point position in the instantaneous value display.	∗.∗.∗.∗.	∗∗∗.∗
F r. i n	Setting of max. input frequency	It sets the maximum value of pulse frequency to be entered.	0 - 300.0Hz	100.0

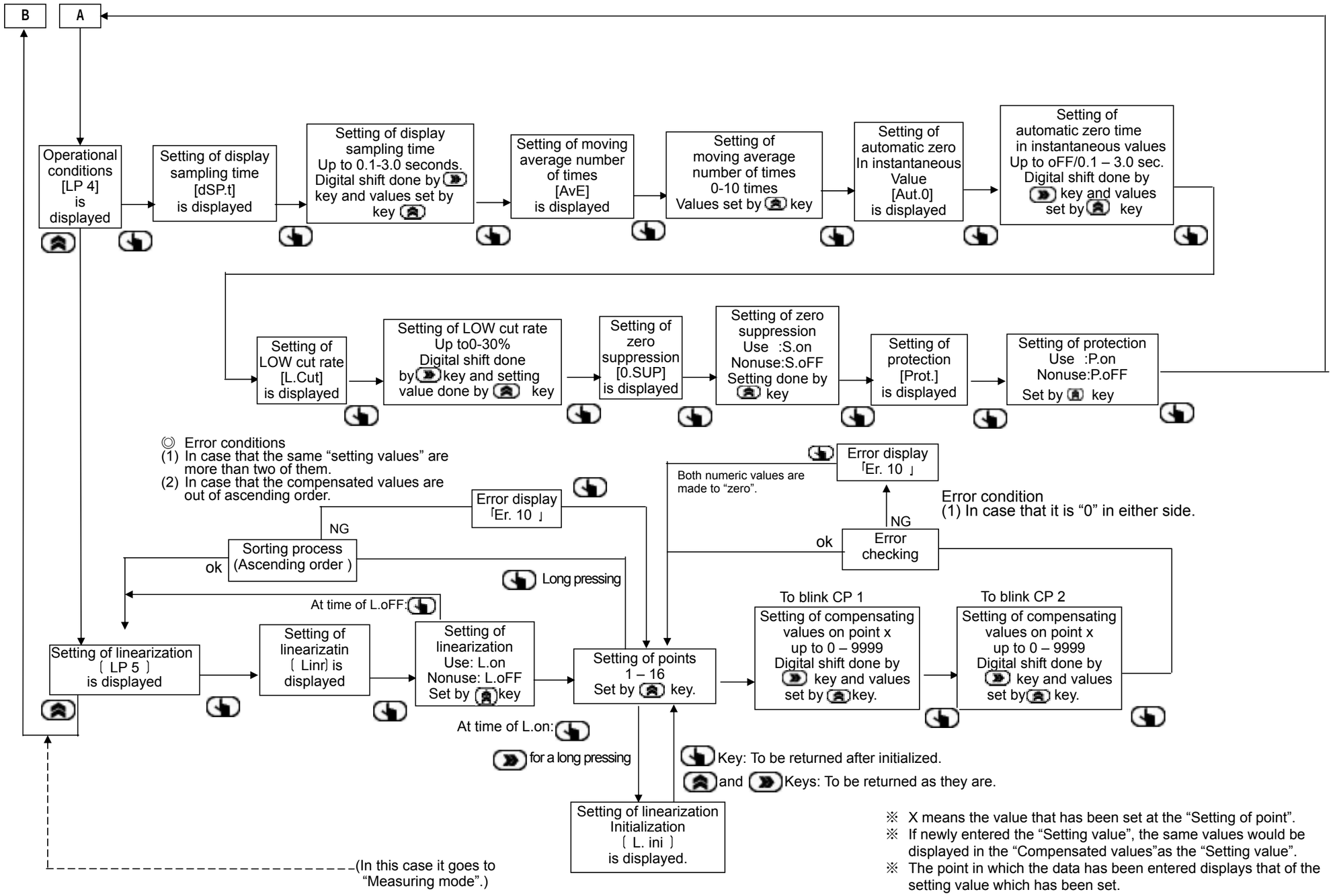
On-screen display	Items	Setting contents	Setting ranges	Initial values
SEnS	Setting of instantaneous value display at the time of inputting at max.	It sets maximum value in instantaneous value display. (It sets the instantaneous value which is to make it display at the time when input signal is maximum.)	0 - 9999	100.0
	Setting of decimal position in “Instantaneous value display at the time of inputting at max”.	It sets the decimal point position to meet the rated value of sensor to be used.	∗.∗.∗.∗.	∗∗∗.∗
LP4	Setting of operational conditions			
dSP.t	Setting of display sampling time	It sets the time which will update display contents in instantaneous value display.	0.1 - 3.0sec. (Settable at a unit of 0.1 sec.)	2.0
AvE	Setting of moving average number of times	It sets the moving average number of times in input signal. ※It functions to restrain from fluctuation of instantaneous value display caused by that of input signal in terms of taking the arithmetic average of past n times and measured values this time.	0 - 10 times (Settable at a unit of one time)	10
Aut.0	Setting of automatic zero time	It sets the time compulsorily to make the instantaneous value display zero, if input signal had not inputted even one pulse within setting time. ※If setting was made to oFF and pulse input went out, instantaneous values are not updated and it displays the value as it is, until next pulse is entered.	oFF／0.1 - 3.0 sec. (Settable at a unit of 0.1 sec.)	1.0
L.Cut	Setting of low cut rate	For “setting of max input frequency” it sets Low cut rate that makes input signal less than 0-30% zero.	0 - 30% at F.S. (Settable at a unit of 1 %)	00
0.SUP	Setting of zero suppression	It selects use or nonuse of zero suppression function. The higher-order zero than decimal point in instantaneous value display will not become to be displayed, if setting is made effective.	S.on :Use S.oFF:Nonuse	S.on
Prot.	Setting of protection	It selects use or nonuse of protection function. If having made the setting effective, the setting data can be confirmed, but not changed them.	P.on :Use P.oFF:Nonuse	P.oFF
LP5	Setting of linearization			
Linr	Setting of linearization	It selects use or nonuse of linearizing function.	L. on : Use L. oFF : Nonuse	L. oFF
	Setting of point setting value	It sets the setting value at each point.	0 - 9999	000.0
	Setting of point compensating value	It sets the compensating value at each point.	0 - 9999	000.0

3. Setting loop of functions

Press key for three seconds, when moving from measuring mode to the setting mode.
For moving the main loop press the key of , and press key to step to each item.

: **Mode key**
: **Shift key**
: **Up key**





※ X means the value that has been set at the “Setting of point”.
※ If newly entered the “Setting value”, the same values would be displayed in the “Compensated values”as the “Setting value”.
※ The point in which the data has been entered displays that of the setting value which has been set.

- For changing the setting data, they are updated by pressing key after changed the data on display.
- During the setting mode it stops measuring, but the comparison operation is held.
- As to the linearization
  - Set the " Setting value" and "Compensated value" at each point.
    ※ It displays "Er 10", if it is "0" in either case.
  - In the item of "Setting of point" if pressing key for three seconds, the setting data are sorted in ascending order.
    ※ If an error occurred at that time, it would display "Er 10".
    ◎ Error conditions
    (1) In case that there has been the same setting value more than two of them.
    (2) In case that the compensated values are not sorted in ascending order.
    ※ When the setting values of the point are all "0", they are returned to "Linearizing setting".
  - Set more than at least two points, when setting the linearizing. (It displays "Er 10", when the setting is less than one point.)
  - For the setting values and the compensated values at the last point, set the "Instantaneous value at the time when inputting at max.".

4. Overview of screen display and how to change over

1. If pressing the key during the flow measurement, setting values on CP1 and CP2 in comparative output can be monitored.
2. If pressing the key during the flow measurement, input signal values (Pulse signal [Hz]) can be monitored.

※ The screen display returns to the screen of the instantaneous value display automatically, when key operations has been stopped for one minute while representing various kinds of monitor.
※Comparative output always operates, even if it is during the display of various kinds of monitor.

5. Initialization of the settings

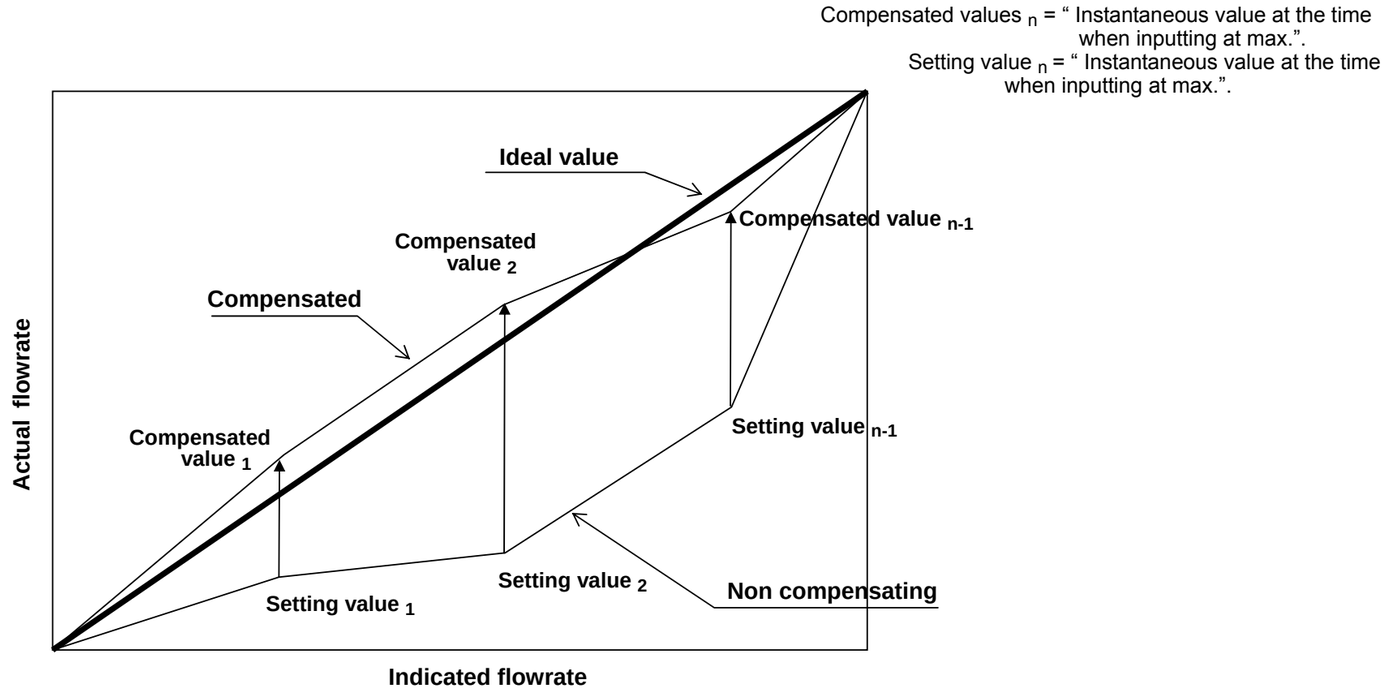
It functions compulsorily to return all the setting contents to a state of initial setting.

1) Hold key and continue to press for more than five seconds in a state of displaying the setting modes such as "LP 1", "LP 2" and "LP 3", or "LP 4".
2) It enters into the initial setting mode, displays "i n i t ." on screen and blinks.
3) If pressing key, all setting parameters return to the initial setting values.
   If not initializing the settings, press any keys other than key, and it would return to the setting mode without being initialized.

6. Linearizing functions

Linearizing fuction is a function to meet the actual flowrate and the indicated flowrate on the EM30DT Flow Indicator, when there was a difference between the actual flowrate and the indicated flowrate on EM30DT indicator.

- The indicated flowrate on the EM30DT is entered to the ”Setting value”. For the “Compensated flowrate” set the actual flowrate.
- The settable points are maximum 16 points. (When setting, they would be sorted in ascending order.)
- It is settable to set the points at arbitrary point.
- For the setting value and compensated value at the last point, set the “Instantaneous value at the time when inputting at max.”.



7. How to awake HoLd(Holding) operation in comparative output

1) Hold key and continue to press for more than five seconds in a state of the measured values display screen (Instantaneous value display screen).
※ The setting of operation mode “C_oP” is effective for the time when it is “HoLd”.
2) It enters into the comparative output awaking mode, displays “CP. rE” on screen and blinks.
3) Press key to awake the holding (ON) status in the comparative output.
If not awoken, press any other key than key to return to the measured value display screen.

8. Overflow display function

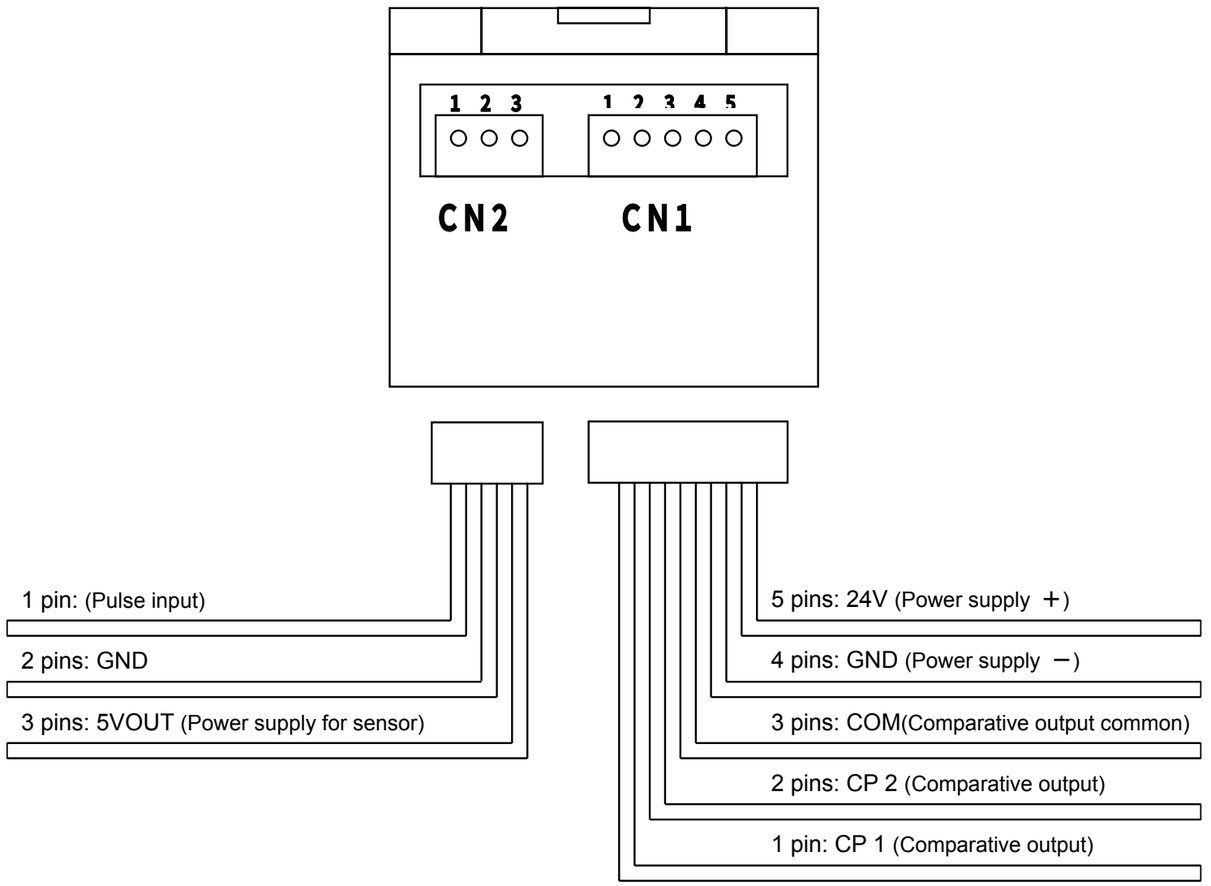
If the signal whose measuring signal input pin is impressed exceeded the input ranges (Pulse input：300Hz), or if instantaneous value display exceeded a possible display digit, it would let the instantaneous value display which is during display blink and indicate the overflow. Even if it was at the time when overflowing, the measured values would be displayed within a measurable ranges (Approx 10% of span area).

9. Error display function

When error occurred, error number is displayed and blinks on the measuring value display screen (Instantaneous value display screen).

Error No.	Contents	Measures and their actions to take
E r 0 1	Mask ROM memory error	MPU is out of order. It is necessary to repair hardware.
E r 0 2	Backup memory error	Backup of EEPROM is out of order. It is necessary to repair hardware.
E r 1 0	Setting error for the set values	Erroneous setting values are inputted. Press key to retype parameters.

10. Explanation for external input/output pins



CN 1: Applicable connector
Made by J.S.T. Mfg. Co., Ltd.
Housing: PHR-5
Contact: SPH-002T-P0. 5S
Applicable wire: AWG30 – 24
Wire coating diameter: Φ0.9 – 1.5

CN 2: Applicable connector
Made by J.S.T. Mfg. Co., Ltd.
Housing: PHR-3
Contact: SPH-002T-P0. 5S
Applicable wire: AWG30 – 24
Wire coating diameter: Φ0.9 – 1.5

Tools
Made by J. S. T. Mfg. Co., Ltd.
Pressure tool: YRS-240
Pullout tool: EJ-PH

11. How to connect wires

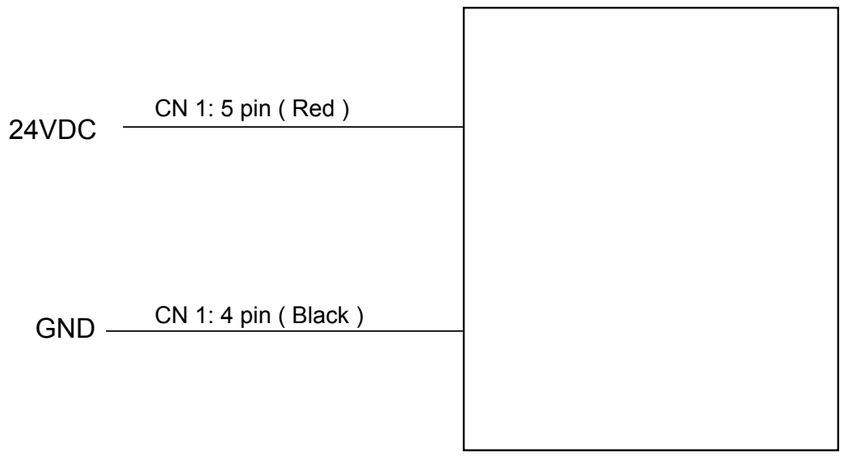
Caution

Wiring should be done under the condition that power source has been securely turned off. If not, it might cause damage to devices.

- Avoid wiring together with such power supply line and power line.
- Since this EM30DT Series Flow Indicator is not made on the water proof specification. avoid using in a place where water splashes.

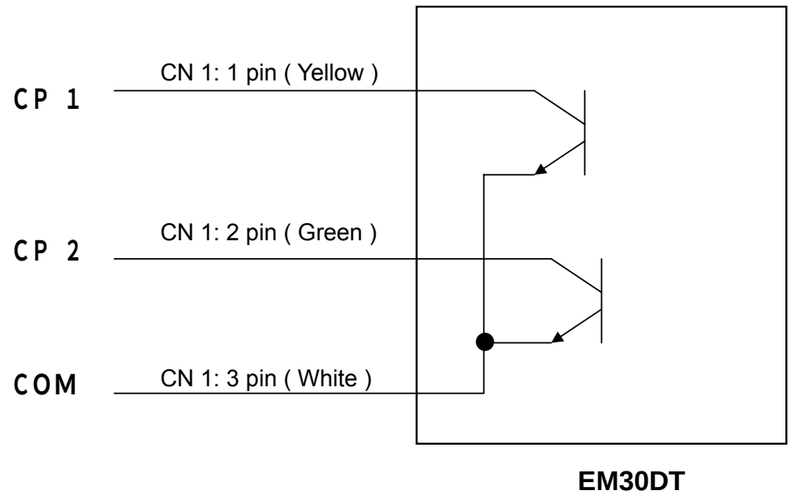
1. Power supply

Power supply is connected to No. 5 and No. 4 pins in CN 1.
The voltage should be used within 24VDC±10% and also the power supply should be used the one that does not produce noise as much as possible.



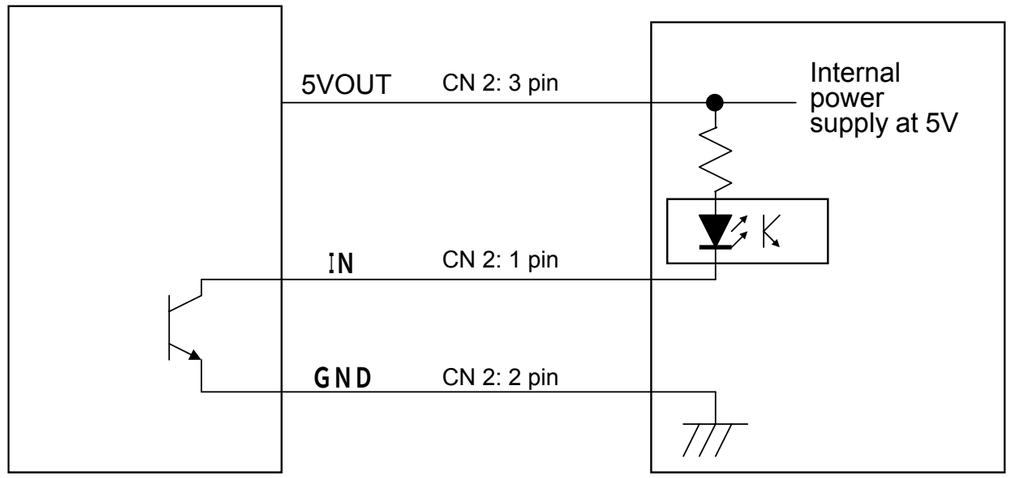
2. Comparative output

CP 1 is connected to No.1 and No. 3 pins in CN 1.
CP 2 is connected to No. 2 and No. 3 pins in CN 1.
Maximum voltage is 35V which can be impressed to comparative output, and in no event should the current be used in excess of 100mA. (Vol 2.0V)



3. Connecting to sensor

The power supply for sensor is connected to No. 3 and No. 1 pins in CN 2.
Voltage is 5V±10% and current capacity is 10mA at maximum, and do not connecdt any load in excess of 10mA.



12. Specifications

1. Measuring input

Items	Conditions	Specifications
Input form	—	Single end input (Isolated from power supply)
Pulse input	—	Driven by open collector output devices Input response frequency 0 - 300Hz(duty50%)
Allowable excessive input	—	DC35V
Pulse measuring form	—	Periodic measuring form
Periodic measuring sampling	—	0.1 sec. (Sampling time is put off in lower frequency due to input frequency)
Scaling form	—	Digital scaling form In terms of “Setting of max input frequency” and “Setting of instantaneous value display at the time of inputting at max”.
Max input frequency	—	Setting ranges：0-300Hz
Number of times in moving average	—	Setting ranges：0 – 10 times
Instantaneous value Measurement	Ta＝+23℃±5℃ 35-85%RH,Setting of scaling for one year (9999)	±0.05% at F.S.+1digit
Instantaneous value temperature drift	Ta＝0 - +50℃	±100ppm at F.S./℃

2. Display

Items	Conditions	Specifications
Instantaneous flowrate display	—	Four digits (9999) are displayed Character height:8 ㎜, LCD display
Comparative output display	Two staged display	LCD displays when turning on comparative output. Character display in CP 1 and CP 2
Display sampling time	—	Setting ranges：0.1 - 3.0 sec.
Decimal position in Instantaneous value display	—	Setting position：*.*.*.*.
Overflow display	—	LCD in instantaneous value display blinks.
Zero suppression	—	Zero suppression is made in higher digit than that of decimal point.

3. Comparison

Items	Conditions	Specifications
Comparative operation	—	(Upper/upper limits, upper/lower limits and lower/lower limits)
Setting of comparative value	Two staged setting	Setting ranges：0 – 9999
Comparative output	—	Transistor NPN open collector output Output impressed voltage：Below 35VDC Sink current：Below 100mA(Vol=2.0V)

4. Functions

Items	Conditions	Specifications
Guarantee against power failure	EEPROM	Backup of each setting data Writable number of times：Approx one million times Storage life：Approx 10 years
LOW cut rate	—	Setting ranges：0-30% at F.S.
Input signal monitoring function	—	Displayed at raw value of signal input
Comparative output monitoring function	—	Selectable display from setting values in CP1 and CP2 in comparative output
Protective function	—	Selectable setting from protection of setting values.
Linearizing function	—	Input in terms of the setting value and the compensated value Input score : 16 points at max.

5. Power supply for sensor

Items	Conditions	Specifications
Output voltage	Ta=+23℃±5℃	5VDC±10%
Output current	—	10mA max

6. Service power supply

Items	Conditions	Specifications
Voltage	—	24VDC±10%
Current	—	Approx. 90mA at max. (Inrush current: Less than 180mA)

(Nonisolated power line)

7. Environment

Items	Conditions	Specifications
Operating temperature	—	0 - +55℃
Operating relative humidity	—	35 - 85%RH (Non condensing)
Storage temperature	—	-20 - +70℃

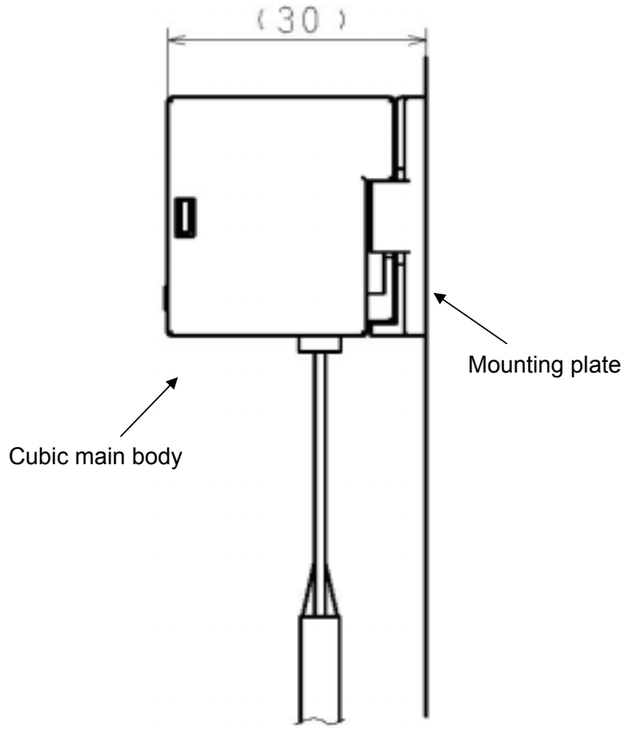
8. Others

Items	Conditions	Specifications
Noise resistance (Impulse)	24VDC VS 0V Power supply VS Panel Panel VS SCOM	Power supply line：800V (Normal mode, Power supply noise) Common mode：600V (Common mode, Power supply noise) Common mode：600V(Common mode noise)
Withstand voltage	Power supply VS Alarm output Live part on block VS Case	500VAC ・ for one minute
Insulating resistance	Power supply VS Alarm output Live part on block VS Case	Measured at 500VDC megger. 20MΩ and more
Withstand vibration	—	Number of vibrations：10～55Hz、Double amplitude： 1.5mm X,Y,Z each direction for 2 hours、Sweep time： For one minute (In terms of JIS-C0911-1984)
Withstand shock	—	Strength of shock：294m/s^2(Approx 30G) Duration of shock pulse：11ms X,Y,Z six directions for 3 times (JIS-C0912-1984)
Outside dimensions	—	30H×30W×approx 26.2D(mm)
Weight	—	Approx 20g
Case	—	Made of plastic molding

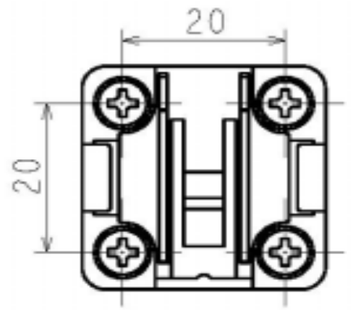
13. Explanation for mounting plate

1. In the first,

● **Assembling drawing**

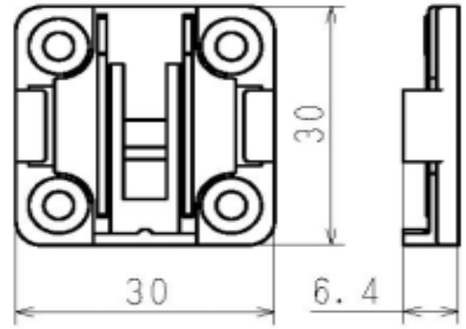


● **Mounting screw thread pitch**



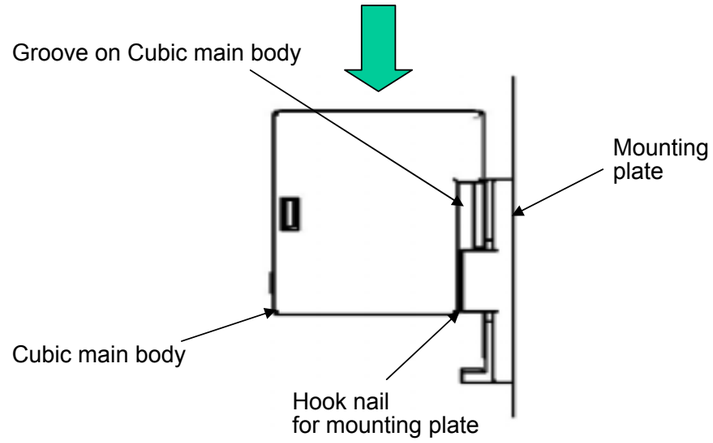
Recommended screw: Countersink tapping screw
(M3 class 2nd with groove)

● **Mounting plate**



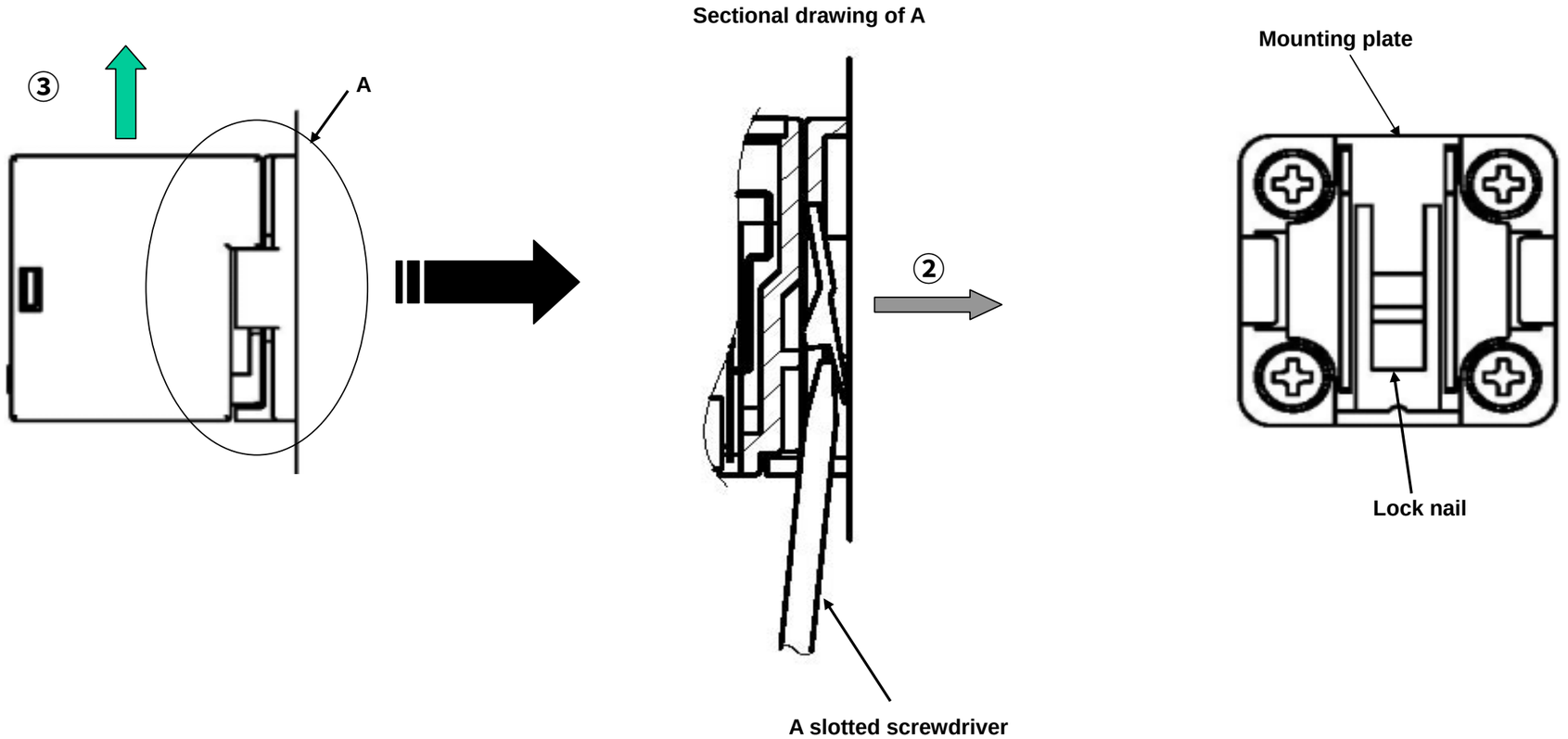
2. How to mount

① Secure the mounting plate with screws.
② Fit the mounting plate so as to enter the hook nail into the groove at the back of the Cubic main body.
③ Push the Cubic main body into the place until it clicks and stops.
④ Connect the connector cable, etc..



3. How to dismount

① Remove the connector cable, etc..
② Push the lock nail of the mounting plate into the arrowhead direction of ② as shown in the illustration below
by using a slotted screwdriver from the bottom of the mounting plate.
③ With the lock nail is left in a state of ②, bring the Cubic main body to the arrowhead direction of ③ to remove it from the mounting plate.



14. Warranty

- The warranty period of the product shall be one year commencing on the date of delivery.
- We will repair or replace any faults occurred during this period which is obviously liable for us at a cost of no charge.
- As to how to repair, we would like to request you to send back the faulty product to our company and to let us do the take-back repair.
- In case of the following items they shall not be covered by warranty.
  - ① The secondary loss arising from the failure of this product (such as damage to equipment, passive damages and so forth) and any other damages shall not be covered by warranty.
  - ② Any failure caused by abuse or improperly handling by user side.
  - ③ Any failure caused by other reasons except for the liability for which we are liable.
  - ④ Any failure caused by remodeling or repairing except done by our company.
  - ⑤ Any failure caused by such disasters as fire, earthquake or damage by wind and flood
  - ⑥ .Any failure due to unpredictable reasons considering from the level of technology at the time when shipping the product.

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