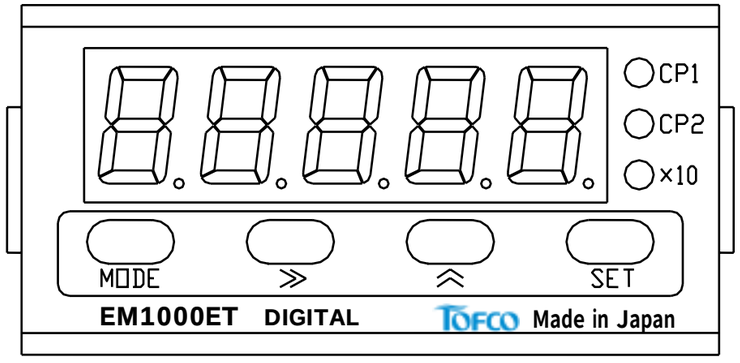
DIGITAL METER

INSTATANEOUS/INTEGRATED

FLOW INDICATOR

EM1000ET

Operation Manual



We highly appreciate your purchase of the Digital Meter “ EM1000ET “ Series. Before use, please read this Operation Manual thoroughly to achieve peak performance of the product and to ensure safe operation.

Warning

Before use, please read this Operation Manual with caution for your safety operation, as this contains the matters to be surely observed.

① Do not apply the device to such controlling devices of the main loop as a medical equipment which have a direct effect on the human lives, devices for space, atomic power control machine, marine vessel and the chemical apparatus for the military purpose regulated under control in “Export Trade Control Ordinance”.

② Pay a great attention to the rated power supply(12-24VDC) not to exceed them. Do the wiring service, after turning off the power supply. Otherwise it may cause malfunction, damage or fire.

③ Avoid using the device in the following place, where it may cause fire, danger in life by explosion and the device damage.

- In places, where the corrosive gases and flammable gases occur.
- In places, where water and oil splash and where there are dust, metal powder and where is too saline.
- In places, where is exposed to the direct rays of the sun and where exceeds the ambient temperature ranging from 0℃ to ＋55℃.
- In a place, where is humid and forms dew due to the abrupt change of temperature.
- In places, where there are great vibration and impact shock.
- In places, where is near to such devices as produce strong electromagnetic noises and high-frequency noises.

Precaution before use (Input/output signal lines)

① Do not connect any noise-generating unit to the sensor driver terminal at ＋12VDC.

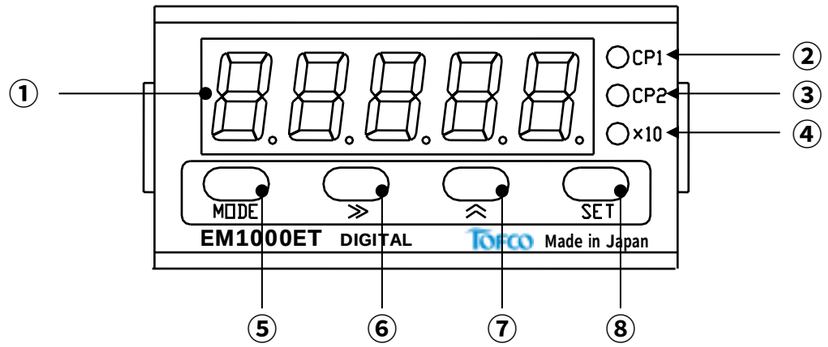
② Avoid wiring together with such power line, relay, electromagnetic valve and solenoid operated valve as they tend to breed the noise-generating. It may cause malfunction due to triggers.

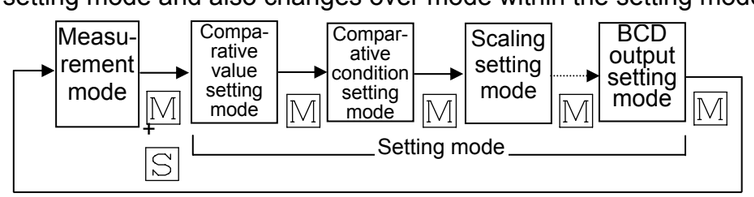
【Main features】

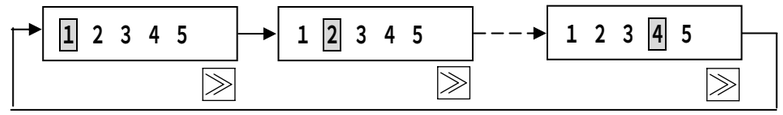
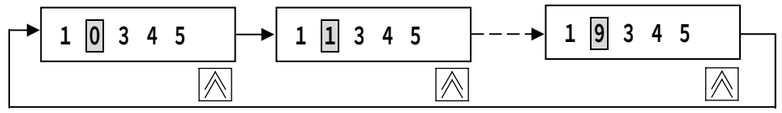
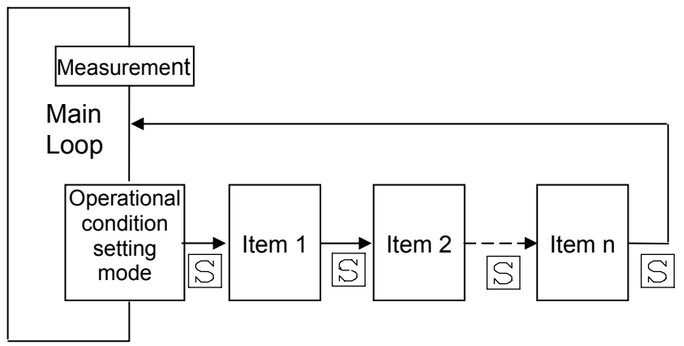
① The device can be used for either instantaneous flow indicator or integrated flow indicator.
② The device can be applied to represent such sensor signal value as rotation, circumferential velocity, passing time, speedmeter and the like in terms of pulse input/analog input.
③ Taking advantage of the two staged comparative output function, it controls upper/lower limits control, lower/lower limits control and upper/upper limits control and the integrated batch control.
④ Taking advantage of linearizing function, it compensates the nonlinearity in analog input to ensure the highly accurate flow measurement. It can output the analog value at 4-20mA proportional to the indicated value of instantaneous value or the indicated value of integrated value.
⑤ All the conditional settings needed in operation can be made easily by operating the key switches on the front panel.
⑥ The device is driven at 12-24VDC(D.C. voltage).
⑦ The driven power source is supplied at 12VDC and 25mA to the sensor to be externally connected.
⑧ The initial setting conditions are stored for around ten years by EEPROM at the time of power failure.
⑨ Outside dimensions are 24(H) x 48(W) [DIN type] .
⑩ BCD unit board can be connected as an optional.

Contents

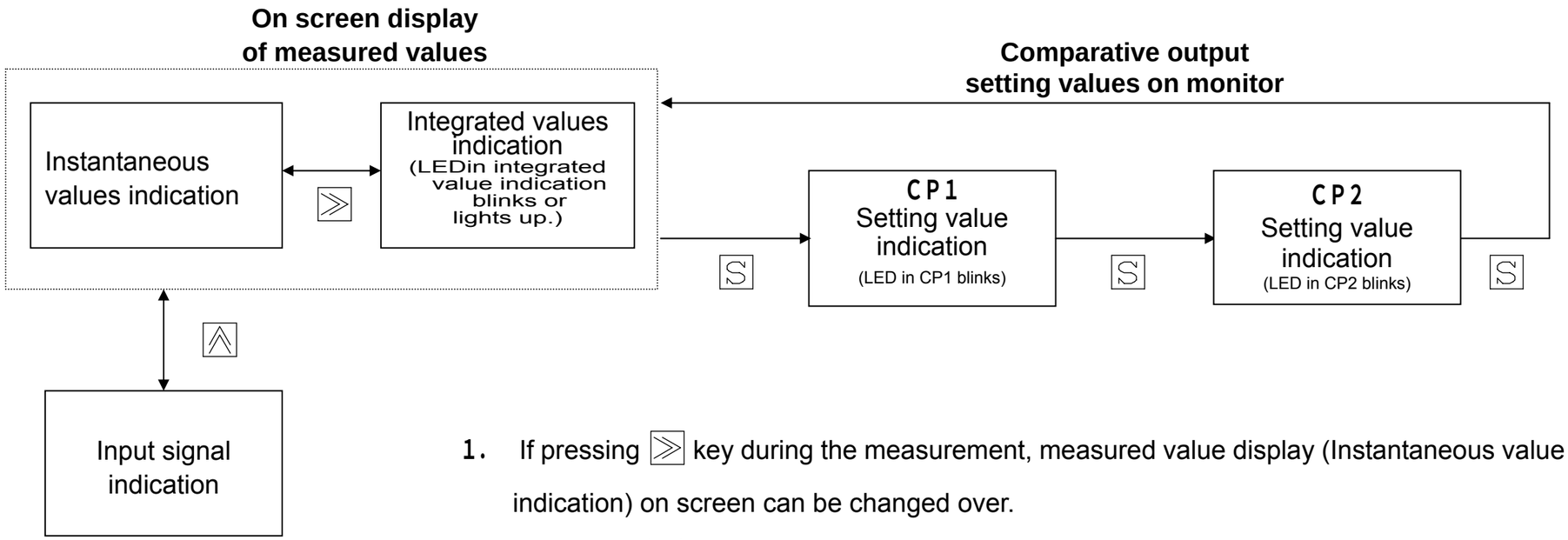
Explanations for display and their operational keys



Denominations	Functional contents
①Display section of measured values	At the time of measuring: It displays measured values(Instantaneous value/integrated value) and also displays input signal values and comparative output setting values on a monitor by means of operating keys. At the time of setting: It displays setting menus and setting parameters. Misc. : It displays error messages on hard ware and setting error.
② Indicator on CP1	At the time of measuring: LED lights up, when turning on comparative output and also LED blinks, when changing over the display to comparative output setting value monitor. At the time of setting: LED blinks during setting of comparative values and comparative conditions.
③ Indicator on CP2	At the time of measuring: LED lights up, when turning on comparative output and also LED blinks, when changing over the display to comparative output setting value monitor. At the time of setting: LED blinks during setting of comparative values and comparative conditions.
④ Indicator in display of integrated value display	At the time of measuring: It blinks in the operation of integrated value display and also shows by lighting up that integrated value has become ten times display mode, when exceeding “99999”. At the time of instantaneous flow indication it is in a status of no lighting up. At the time of setting: LED blinks or lights up during setting of comparative values and comparative conditions.
⑤ Mode key [M]	By using together with [S] key, it changes over from measuring mode to setting mode and also changes over mode within the setting mode. 

Denominations	Functional contents
⑥ Shift key [≫]	It moves digit of numerical values to set. Selecting setting contents by [≫] key, set it by [S] key.  And also it is used for changing over instantaneous value to integrated value.
⑦ Up key [∧]	It changes over setting contents and changes numerical value to set. Selecting setting contents by [∧] key, set it by [S] key. Digit to be set blinks in setting numerical values. Blinking numerical value operates incremental operation by pressing [∧] key.  And also it is used for monitoring input signal value during measurement.
⑧ Set key [S]	It changes over setting items within setting mode. Data and items which were set are set by [S] key. (For example)  Also it is used for monitoring setting value in comparative output.

Overview of screen display and how to change it over



1. If pressing ≫ key during the measurement, measured value display (Instantaneous value indication or integrated value indication) on screen can be changed over.

2. If pressing S key during the measurement, setting values on CP1 and CP2 in the comparative output can be monitored.

3. If pressing ∧ key during the measurement, input signal value can be monitored.

※ If there is no key operation during display of each kind of monitors for around one minute, it returns to measured value indication on screen automatically.
※ The comparative output always operates, even if it is during the display of each kind of monitors.

Explanations for each parameters

On screen display	Items	Setting contents		Setting ranges	Initial value
CoNP.	It sets up comparative values.				
C1__H or L	Setting of comparative value on CP1	It sets up value on CP1 in comparative output.	Setting of comparative input: SPEEd	0 - 9999	001.0
			Setting of comparative input: Count	0 - 999990	0100.0
C2__H or L	Setting of comparative value on CP2	It sets up value on CP2 in comparative output.	Setting of comparative input: SPEEd	0 - 9999	009.0
			Setting of comparative input: Count	0 - 999990	0200.0
CP.Co	It sets up comparative conditions.				
CP.in	Setting of comparative input.	It selects controlled objects in comparative output operation from instantaneous values and integrated values. SPEEd: It operates comparative output based on instantaneous values. Count: It operates comparative output based on integrated values.		SPEEd: Instantaneous value Count: Integrated value	SPEEd
CP.t	Setting of comparative output timing	It selects operational timing in comparative output. rEAL: It outputs internal measuring timing at 0.2 seconds. SynC: It outputs synchronizing with indicating sampling time.		rEAL: Realtime SynC: Synchronism	SynC
1__H.L	Setting of upper/lower limits on CP1.	It selects operational conditions on CP1 in comparative output. H: Output turns on, when setting at input value ≧ comparative value. L: Output turns on, when setting at input value ≦ comparative value.		1__H(Upper limit) 1__L (Lower limit)	1__H
2__H.L	Setting of upper/lower limits on CP2.	It selects operational conditions on CP2 in comparative output. H: Output turns on, when setting at input value ≧ comparative value. L: Output turns on, when setting at input value ≦ comparative value.		2__H (Upper limit) 2__L (Lower limit)	2__L
dLy	Setting of delay output.	It selects use or nonuse of delay output functions. ※It does not output, even if CP1 in comparative output is a status of being turning on, in turning on power supply. It starts operating comparative output operation from the time it once turned off. And also it operates similar operation for CP2 in comparative output.		d.on : Use d.oFF: Nonuse	d.oFF

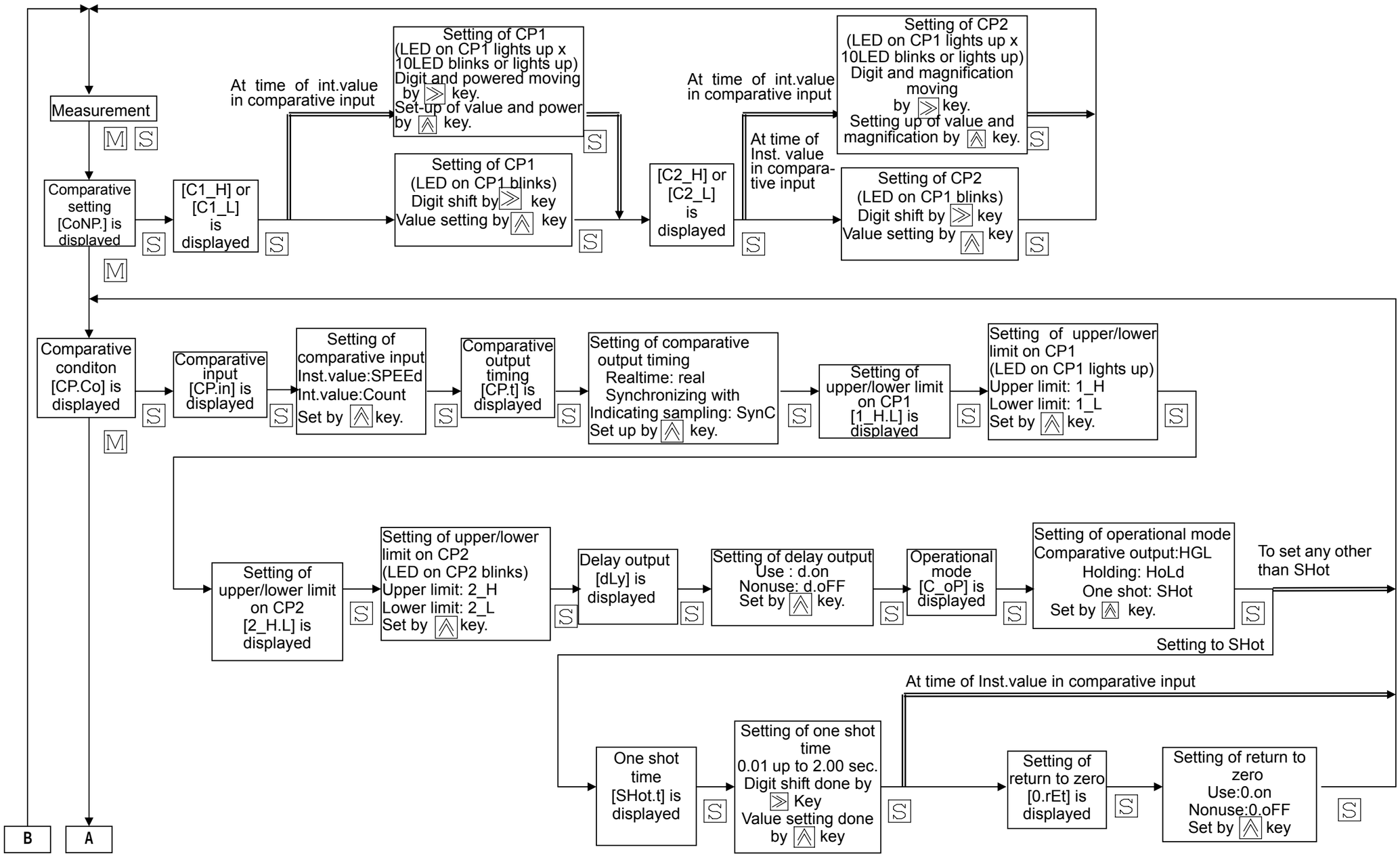
C__oP	Setting of operational mode.	It selects operational mode in comparative output. HGL ：It outputs changes of input values relating to setting values at real time. HoLd：It holds a status that comparative output turns on. SHot：It outputs, when comparative output turns on.	HGL ：Comparative output HoLd：Holding SHot：One shot	HGL
CP. Co	It sets up comparative output.			
SHot.t	Setting of one shot time.	It sets up on-time of one shot(Pulse signal), when setting SHot to operational mode.	0.01 - 2.00 seconds (Settable at unit of 0.01 sec)	0.20
0.rEt	Setting of return to zero.	It selects use or nonuse of zero clearing operation in integrated values. If making setting effective, it clears up integrated value, make it to null and starts operating integration operation once again, when integrated value reached setting value of CP2. ※ It can be set at the time that Count is set in comparative input, that H is set at upper/lower limits on CP2 and that SHot is set in operational mode.	0.on ： Use 0.oFF：Nonuse	0.oFF
SCAL	It sets up scaling.			
SPd.dP	Setting of decimal point position in indicating value.	It sets up decimal point position in instantaneous value indication.	∗.∗.∗.∗.	∗∗∗.∗
Cnt.dP		It sets up decimal point position in integrated value indication.	∗.∗.∗.∗.∗.	∗∗∗∗.∗
Fr.in	Setting of max input frequency.	It sets up max value of pulse frequency to input.【Effective at the time of pulse input 】	0 - 1500.0Hz	0100.0
SEnCE.	Setting of instantaneous value indication at the time of max input.	It sets up max value in instantaneous value indication. (It sets up instantaneous value to indicate at the time input signal is at max).	0 - 9999	010.0
	Setting of decimal point position in “Instantaneous value indication at the time of max input”.	It sets up decimal point position according to rated value of sensor to be used.	∗.∗.∗.∗.	∗∗∗.∗
oP.Co	It sets up operational conditions.			
inP	Setting of input signal	It selects input signal from pulse input and analog input.	PULSE：Pulse 4－20：Analog	4－20
dSP.t	Setting of indicating sampling time.	It sets up time to update indicating contents in measured value indication.	0.2 - 3.0 seconds (Settable at unit of 0.1 sec)	2.0

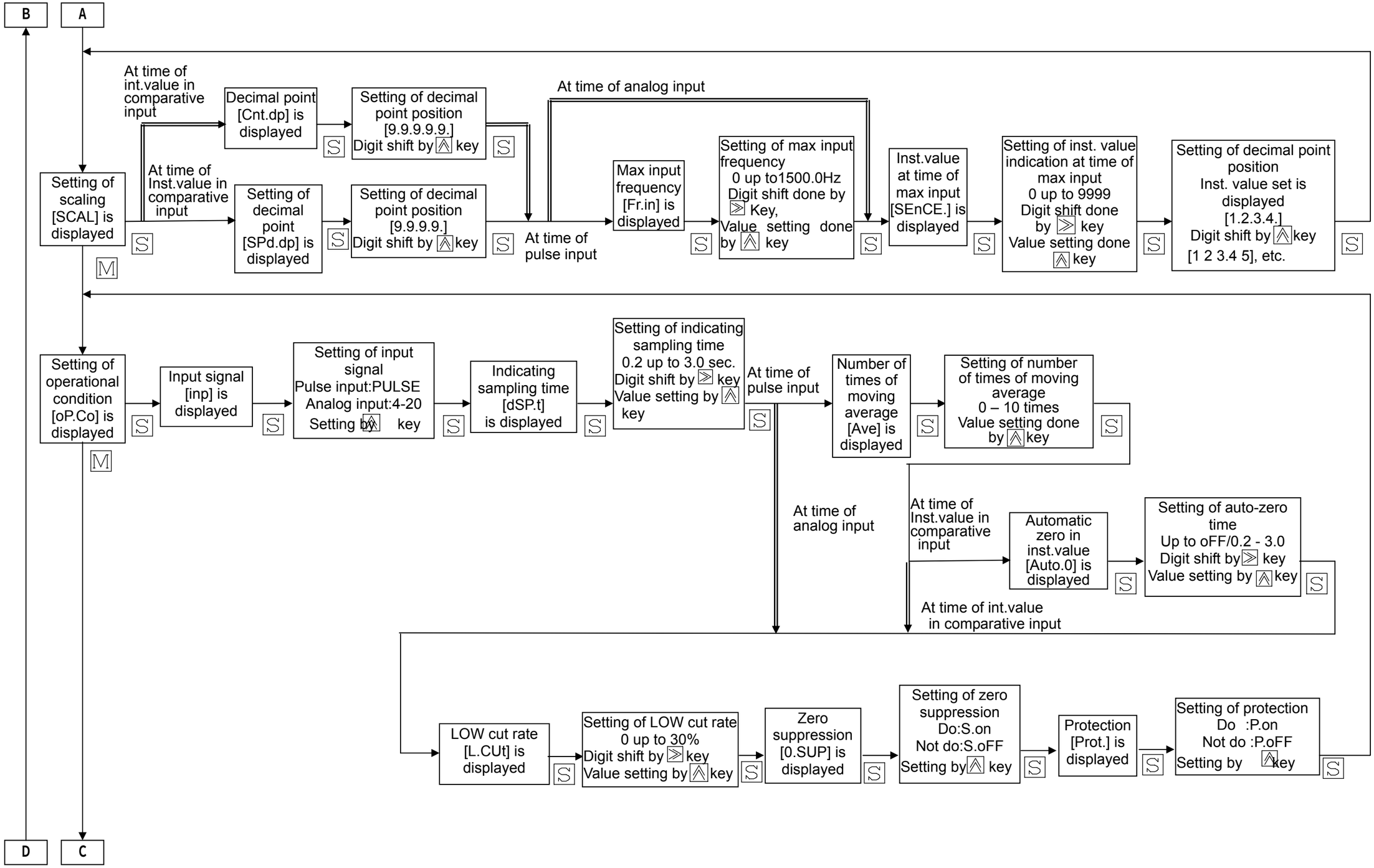
AvE	Setting of number of times of moving average.	It sets up number of times of moving average in pulse input signal. 【Available at the time of pulse input selection】 ※It functions to restrain from fluctuation of instantaneous value indication caused by that of input signal in terms of taking arithmetic average of past n times data and measured values this time.	0 - 10 times (Settable at unit of one time)	10
Auto.0	Setting of auto-zero time.	It sets up the time compulsorily to return instantaneous value indication to "Zero", if input signal is not inputted even one pulse within setting time. 【Available at the time of pulse input selection】 ※If making the setting oFF and pulse input has been gone out, the both instantaneous value and integrated value indications retain the current values until after the next pulse has been entered.	oFF／0.2 - 3.0 seconds (Settable at unit of 0.1 sec)	1.0
oP.Co	Setting of operational conditions			
L.CUt	Setting of Low cut rate	It sets up Low cut rate which make input value zero, when input signal is less than at a certain level. At the time of pulse input selection: It makes frequency zero, when it is less than L% for "setting of max input frequency". At the time of analog input selection: It makes current value zero, when it is less than L% for 16mA in the span of 4-20mA.	0 - 30% of F.S. (Settable at unit of 1%)	00
0.SUP	Setting of zero suppression	It selects use or nonuse of functions of zero suppression. If setting is run, it does not become to display higher-order zero than digit of decimal point in instantaneous value indication.	S.on :Use S.oFF:Nonuse	S.on
Prot.	Setting of protection	It selects use of nonuse of protection function. If setting is run, setting data can be confirmed, but cannot be changed.	P.on :Use P.oFF:Nonuse	P.oFF
A.oUt	Setting of analog output			
A.SPd	Setting of analog output	It selects analog output form instantaneous value output and integrated value output.	A.SPd:Inst. value A.Cnt:Int. value	A.SPd
AoUt.t	Setting of analog output timing	It selects operational timing in analog output. A. real: It outputs at internally measured timing(0.2 seconds). A. SynC: It outputs synchronizing with indicating sampling time.	A.rEAL:Realtime A.SynC:Synchronism	A.SynC
9999	Setting of indicating value at the time of max output	It sets up max value of instantaneous value output.	1 - 9999	9999
		It sets up max value of integrated value output.	1 - 999990	09999

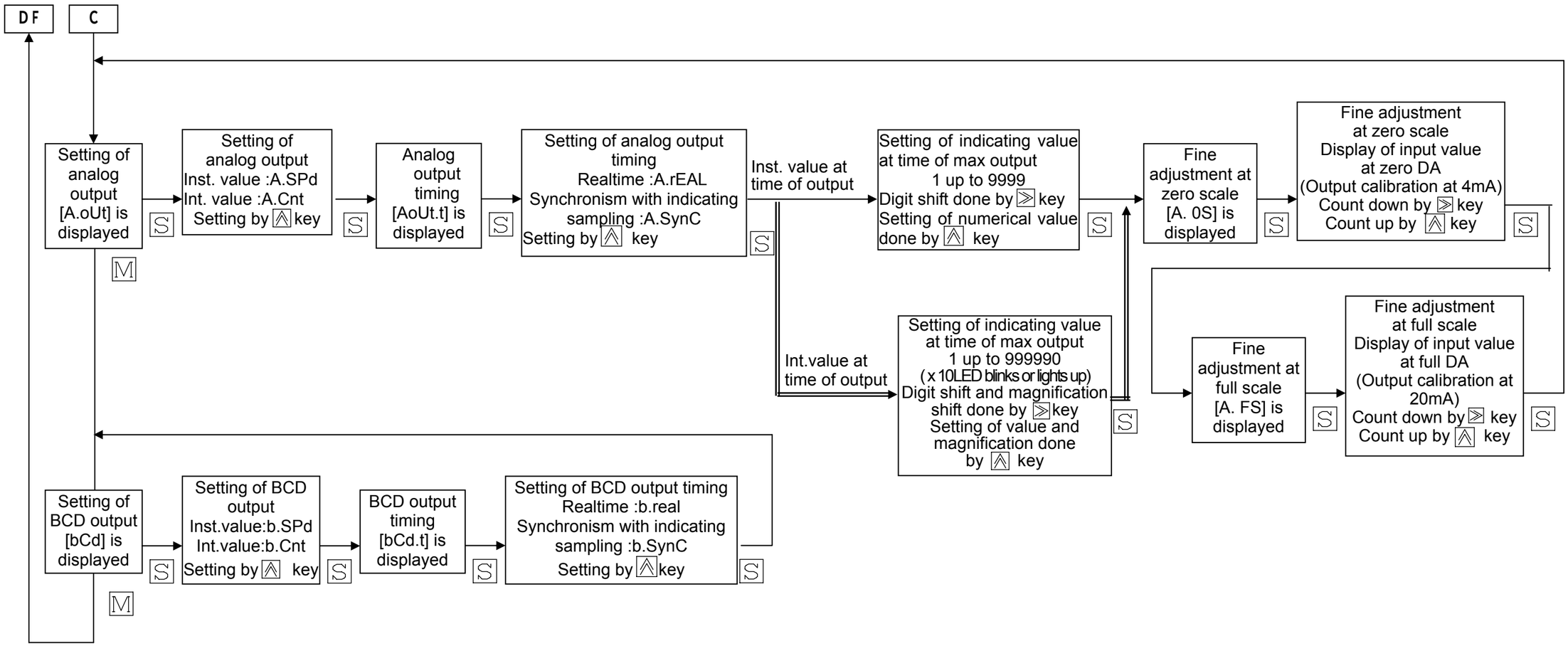
A. 0S	Fine adjustment at zero scale	It calibrates output at 4-mA output(Zero scale).	0 - 4095	—
A. FS	Fine adjustment at full scale	It calibrates output at 20mA output(Full scale).	0 - 4095	—
bCd	Setting of BCD output(Available for setting at the time of connecting to optional devices).			
b.SPd	Setting of BCD output	It selects BCD output form instantaneous value output and integrated value output.	b.SPd：Inst. value b.Cnt：Int. value	A.SPd
bCd.t	Setting of BCD output timing	It selects operational timing in BCD output. b.rEAL：It outputs at internal measuring timing(0.2 seconds). b.SynC：It outputs synchronizing with indicating sampling time.	b.rEAL：Realtime b.SynC：Synchronism	A.SynC

Setting loop of functions

Press [S] Key while pressing [M] key, when moving measurement mode to setting mode.
For moving main loop it is performed by pressing [M] key and also by [S] key for proceeding to each item.



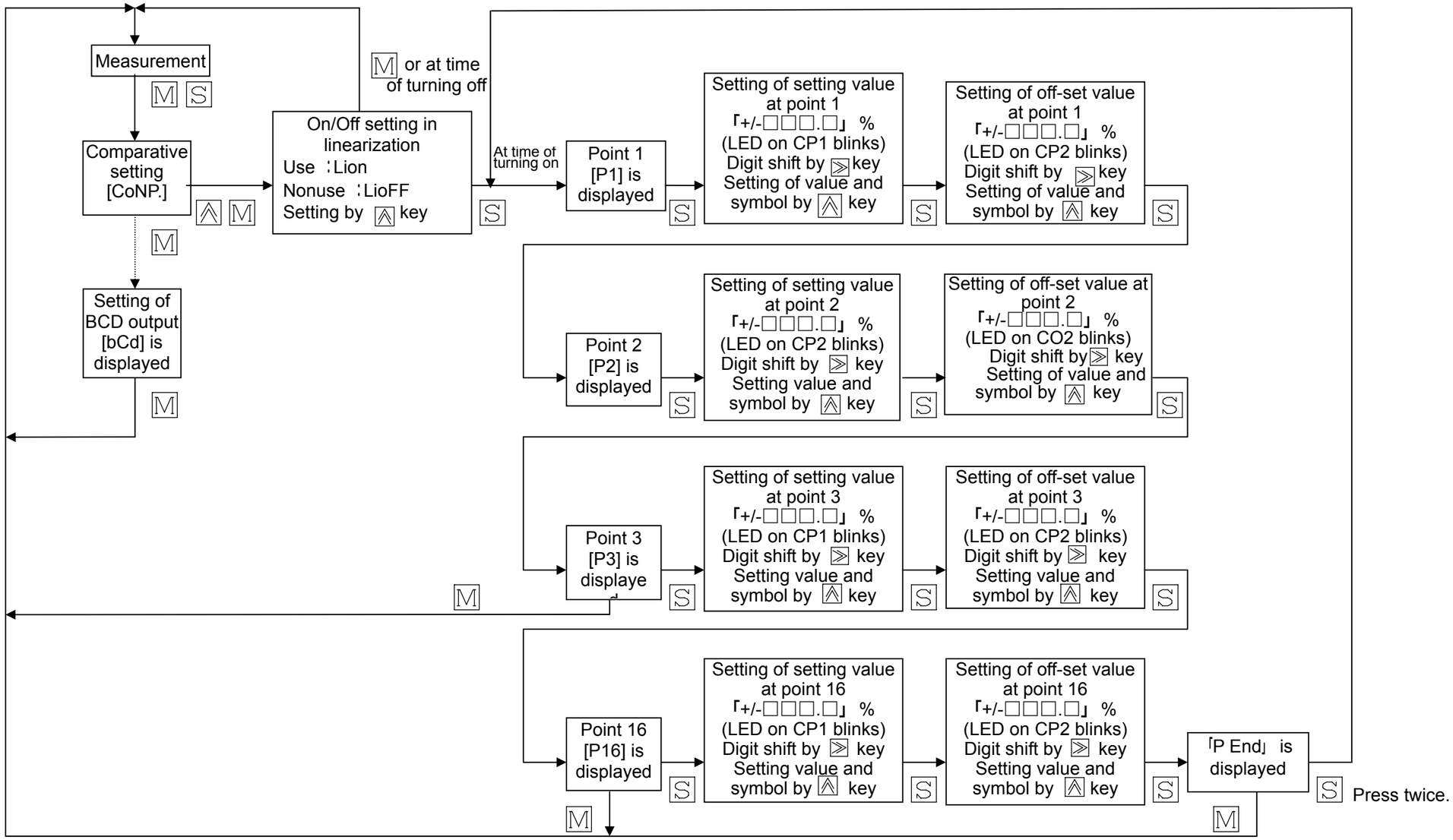

B
A
At time of int.value in comparative input
Decimal point [Cnt.dp] is displayed
Setting of decimal point position [9.9.9.9.9.] Digit shift by key
At time of analog input
At time of Inst.value in comparative input
Setting of scaling [SCAL] is displayed
Setting of decimal point [SPd.dp] is displayed
Setting of decimal point position [9.9.9.9.] Digit shift by key
At time of pulse input
Max input frequency [Fr.in] is displayed
Setting of max input frequency 0 up to1500.0Hz Digit shift done by Key, Value setting done by key
Inst.value at time of max input [SEnCE.] is displayed
Setting of inst. value indication at time of max input 0 up to 9999 Digit shift done by key Value setting done key
Setting of decimal point position Inst. value set is displayed [1.2.3.4.] Digit shift by key [1 2 3.4 5], etc.
Setting of operational condition [oP.Co] is displayed
Input signal [inp] is displayed
Setting of input signal Pulse input:PULSE Analog input:4-20 Setting by key
Indicating sampling time [dSP.t] is displayed
Setting of indicating sampling time 0.2 up to 3.0 sec. Digit shift by key Value setting by key
At time of pulse input
Number of times of moving average [Ave] is displayed
Setting of number of times of moving average 0 – 10 times Value setting done by key
At time of analog input
At time of Inst.value in comparative input
Automatic zero in inst.value [Auto.0] is displayed
Setting of auto-zero time Up to oFF/0.2 - 3.0 Digit shift by key Value setting by key
At time of int.value in comparative input
LOW cut rate [L.CUt] is displayed
Setting of LOW cut rate 0 up to 30% Digit shift by key Value setting by key
Zero suppression [0.SUP] is displayed
Setting of zero suppression Do:S.on Not do:S.oFF Setting by key
Protection [Prot.] is displayed
Setting of protection Do :P.on Not do :P.oFF Setting by key
D
C



- If pressing M key while setting the item within a setting mode, it moves to setting mode next to main loop.
- For changing the setting data, they are updated by pressing S key after changed the data on display.
  Even if changed data on display only and if passing by setting loop by M key without pressing S key, the data previously stored remain unmodified as they were.
- Magnifications such as “x1” and “x10” in the setting of integrated value are displayed as it follows.
  ”x1” → “by ___ 1” and “x10” → “by ___ 10”
- Setting of BCD output is not effective, until it is connected to optional devices.
- During setting mode, measurement stops and holds comparative operation.

Setting loop of linearization

If pressing [M] key while pressing [∧] key in a status of displaying the main loop (“C o N P”, etc.) in the setting mode, it moves to linearization calibrating mode.



- Symbol lights up only for “－”, but not for symbol “＋”.
- If pressing [M] key while setting the point 1 and 2(P1 and P2), it is cancelled and holds the previous setting.
- If pressing [M] key at the time of indicating each setting point, the point which is displayed at present and will be displayed after that are deleted. Also if pressing [M] key at the time of setting the numerical value, the settings are cancelled.

How to set scaling

Setting of instantaneous value indication at the time of max input : 10 is set, when using a flowmeter whose max flowrate is 10 L/min.
Setting of max input frequency : Pulse frequency obtained from a flowmeter whose flowrate is max 10 L/min is set.
(There is no need to set, since maximum value is set at 20mA automatically in case of analog input.)

Setting of above descriptions

Scaling functions

[Effective for inst. value indication]

Instantaneous value indication is scaled at setting values whose input signal is set at “Setting of instantaneous value indication at the time of max input”. The input which corresponds to max input is values set at “Setting of max input frequency”.

- At the time of pulse input

$$\text{Indicating value} = \frac{\text{Input signal frequency}}{\text{“Setting of max input frequency”}} \times \text{“ Setting of instantaneous value indication at the time of max input”}$$

- At the time of analog input

$$\text{Indicating value} = \frac{\text{Input signal current value} - 4\text{mA}}{(20\text{mA} - 4\text{mA})} \times \text{“ Setting of instantaneous value indication at the time of max input”}$$

In setting the scaling value in terms of “Setting of instantaneous value indication at the time of max input”, the decimal point position is also set in accordance with the rated value of sensor to be used.

[Function of Instantaneous value indication]

Instantaneous value indication becomes the one which is scaled by scaling value which has been set (the setting value set at “Setting of instantaneous value indication at the time of max input”) for the signal input whose measuring signal input pin is at present impressed.

- Instantaneous value indication is displayed in the last four digits of LED of the numerical indication.
- Indicated contents is updated at the time which has been set at “Setting of indicating sampling time”.
- “Zero” indication higher than decimal point digit does not become indicated, when making effective for “Setting of zero suppression”
- Instantaneous value indication is expressed in unit of “ L/min “.
- Instantaneous value indication blinks, when input signal and digit of instantaneous value indication overflows.

[Integrated value indication functions]

Integrated values indication is the one that integrated average values per unit of time gained from instantaneous value measurement.

- Integrated value can be indicated up to “99999” x 10 in term of five digits of LED of numerical value indication and LED of integrated value indication (x 10 times indication).
- LED of integrated value indication (x 10 times indication) blinks at the time of that of operation and lights up, when it exceeded “99999”.
- Decimal point position is indicated in the decimal digits set at “Setting of decimal point position in integrated value indication”.
- (It is settable independently of decimal point position set at “Setting of decimal point position in instantaneous value indication at the time of max input”.)
- Indicated contents is updated at the time which has been set at “Setting of indicating sampling time”.
- “Zero” indication higher than decimal point digit does not become indicated, when making effective for “Setting of zero suppression”
- Integrated value is backed up in the EEPROM for approximately one minute interval.
- Integrated value indication is expressed in unit of “ L/min “.
- Integrated value indication counts up from zero once again while blinking it, when overflowing the integrated value indicating digit.

On-screen display	Key operation	Explanatory comments
Measurement display	MODE + SET	When screen of measurement display appears, press SET key while pressing MODE key.
CoNP.	MODE	Comparative value setting screen appears. Press MODE key to go to next setting screen.
CP.Co	MODE	Comparative condition setting screen appears. Press MODE key to go to next setting screen.
SCAL	SET	Scaling setting screen appears. Press SET key to go to scaling details setting screen.
SPd.dP	SET	Screen of " Setting of decimal point position in instantaneous value indication" appears. Press SET key to go to setting screen of decimal point position.
✱999.9	≫ SET	Decimal point position moves, every time ≫ key is pressed. Press SET key to update the settings and go to next setting screen.
Fr.in	SET	Screen of "Setting of max input frequency" appears. Press SET key to go to numerical value setting screen.
✱0100.0	≫ ∧ SET	Blinking digits move, every time ≫ key is pressed, and also numerical value which is blinking digits run incremental operation, every time ∧ key is pressed. Press SET key to update the settings and go to next setting screen.
SEnCE.	SET	Screen of "Setting of instantaneous value at the time of max input" appears. Press SET key to go to next setting screen.
✱010.0	≫ ∧ SET	Blinking digits move, every time ≫ key is pressed, and also numerical value which is blinking digits run incremental operation, every time ∧ key is pressed. Press SET key to update the settings and go to next setting screen.
✱010.0	∧ SET	Decimal point position moves, every time ∧ key is pressed. Press SET key to update the settings and go to next setting screen.
SCAL	MODE	Scaling setting screen appears. Press MODE key to go to next setting screen.

Note✱: The numerical values given are for those of explanation only.

How to set input signal

How to set up, for example, kinds of input signals to “Pulse input”.

On-screen display	Key operation	Explanatory comments
Measurement display	MODE + SET	When screen of measurement display appears, press SET key while pressing MODE key.
CoNP.	MODE	Comparative value setting screen appears. Press MODE key to go to next setting screen.
CP.Co	MODE	Comparative condition setting screen appears. Press MODE key to go to next setting screen.
SCAL	MODE	Scaling setting screen appears. Press MODE key to go to scaling details setting screen.
oP.Co	SET	Operational condition setting screen appears. Press SET key to go to detail setting screen of operational condition.
inP	SET	Screen of “Input signal setting” appears. Press SET key to go to input setting screen.
✱4－20	^ / SET	“4-20” and “Pulse” are changed over, every time ^ key is pressed. Select input according to operating conditions. Press SET key to update settings and go to the next setting screen.
dSP.t	MODE	Screen of “Setting of indicating sampling time” appears. Press MODE key to return to main loop.
A.oUt	MODE	Analog output setting screen appears. Press MODE key to go to the next setting screen.
bCd	MODE	BCD output setting screen appears. Press MODE key to return to measurement display screen.
Measurement display		

Note✱: The Input signal is set up by using it.

How to set up comparative input

How to set up, for example, the controlled object in comparative output operation to the integrated value.

On-screen display	Key operation	Explanatory comments
Measurement display	MODE + SET	When screen of measurement display appears, press SET key while pressing MODE key.
CoNP.	MODE	Comparative value setting screen appears. Press MODE key to go to next setting screen.
CP.Co	SET	Comparative condition setting screen appears. Press SET key to go to next setting screen.
CP.in	SET	Screen of “Input signal setting” appears. Press SET key to go to input setting screen.
∗SPEEd	▲ SET	「SPEEd」 and 「Count」 are changed over, every time ▲ key is pressed. Select the controlled object according to the operating conditions. Press SET key to update and go to next setting screen.
CP.t	MODE	Screen of “Comparative output timing” appears. Press MODE key to return to main loop.
SCAL	MODE	Scaling setting screen appears. Press MODE key to go to next setting screen.
oP.Co	MODE	Setting screen of operating conditions appears. Press MODE key to go to next setting screen.
A.oUt	MODE	Analog output setting screen appears. Press MODE key to go to next setting screen.
bCd	MODE	BCD output setting screen appears. Press MODE key to return to measurement display screen.
Measurement display		

Note∗: The controlled object in the comparative output operation is set up by using it.

How to set up analog output

The function of analog output functions in order to output the values which is proportional to the indicated instantaneous value or the indicated integrated value in term of 4-20mA.

How to set up

- Setting up of output form

  If outputting the analog output in term of instantaneous value, select “A.Spd”, and if outputting, on the other hand, in term of integrated value, select “A.Cnt”.

- Setting up of output timing

  Select “A.rEA”, if performing the timing to update the analog output at realtime, and select “A.SynC”, if performing it synchronizing with the indicating sampling.

- Setting up of Scaling

  Analog output outputs the 4-20mA as a scaling value where has been set at “Setting of indicating value at the time of max output”.

For example 1) In case of outputting the analog output in terms of instantaneous value

If the “Setting of decimal point position in the instantaneous value indication” in the scaling setting item is “∗∗. ∗∗” and the “Setting of instantaneous value indication at the time of max input” is “010.0”, input “1000” to the setting value. (Instantaneous value is outputted in terms of analog by the value scaled at 100.00.)

For example 2) In case of outputting the analog output in terms of integrated value

If the “Setting of decimal point position in the integrated value indication” in the scaling setting item is “∗∗∗. ∗” and make maximum integrated value 100, input “01000” to the setting value. (Integrated value is outputted in terms of analog output by the value scaled at 100.00.)

※ If outputting the analog output in terms of instantaneous value, make the setting values of the “Setting of indicating value at the time of max output” and “Setting of instantaneous value indication at the time of max input” same values. Also the decimal point position in “Setting of indicating value at the time of max output” becomes identical with the position where has been set at “Setting of decimal point position in instantaneous indication”. (Decimal point position is not indicated at the time of setting).

※ If outputting the analog output in terms of integrated value, the decimal point position in “Setting of indicating value at the time of max output” becomes identical with the position where has been set at “Setting of decimal point position in integrated value indication”. (Decimal point position is not indicated at the time of setting).

- Output calibration

The output values of analog are calibrated at 4mA and 20mA. Please prepare an ammeter separately for monitoring analog signal.

Calibration can be made at zero scale in terms of “A.OS”. Adjust the value of ammeter so as to approach 4mA.

Calibration can be made at full scale in terms of “A. FS”. Adjust the value of ammeter so as to approach 20mA.

For example) In case that “Setting of decimal point position in instantaneous value indication” is “∗∗∗. ∗” and that “Setting of instantaneous value indication at the time of max input” is “0020”.

On-screen display	Key operation	Explanatory comments
Measurement display	MODE + SET	When screen of measurement display appears, press SET key while pressing MODE key.
CoNP.	MODE	Comparative value setting screen appears. Press MODE key to go to next setting screen.
CP.Co	MODE	Comparative condition setting screen appears. Press MODE key to go to next setting screen.
SCAL	MODE	Scaling setting screen appears. Press MODE key to go to next setting screen.
oP.Co	MODE	Setting screen of operating conditions appears. Press MODE key to go to next setting screen.
A.oUt	SET	Analog output setting screen appears. Press SET key to go to next setting screen.
∗A.SPd	∧ SET	“A.SPd” and “A.Cnt” are changed over, every time ∧ key is pressed. (For example: In case that analog output is outputted in terms of instantaneous value). Press SET key to update the setting and go to the next setting screen.
AoUt.t	SET	Screen of “Setting of analog output timing” appears. Press SET key to go to the setting screen of output timing.
∗A.rEAL	∧ SET	“A.real” and “A.SynC” are changed over, every time ∧ key is pressed. (For example: It outputs analog output at realtime). Press SET key to update the settings and go to the next setting screen of “Setting of indicating value at the time of max output”.
∗0200	> ∧ SET	Blinking digits move, every time > key is pressed, and also numerical value which is blinking digits run incremental operation, every time ∧ key is pressed. Press SET key to update the settings and go to next setting screen.(Decimal point is not indicated.)
A. 0S	SET	Screen of “Fine adjustment at zero scale” appears. Press SET key to go to numerical value setting screen.
∗0716	> ∧ SET	Numerical value counts down, every time > key is pressed, and also numerical value counts up, every time ∧ key is pressed. Press SET key to update the settings and go to the next setting screen.(Adjust analog output while monitoring by using ammeter).
A. FS	SET	Screen of “Fine adjustment at full scale” appears. Press SET key to go to numerical value setting screen.
∗3599	> ∧ SET	Numerical value counts down, every time > key is pressed, and also numerical value counts up, every time ∧ key is pressed. Press SET key to update the settings and go to the next setting screen.(Adjust analog output while monitoring by using ammeter).
bCd	MODE	BCD output setting screen appears. Press MODE key to return to measurement display screen.
Measurement display		

Note∗: The values given are for the purpose of explanation only.

How to set up linearization

The linearizing function compensates the nonlinearity in analog input in order to carry out a higher accurate measuement.

The function of turning on/off can be changed according to the settings.

There are max 16 points in linearizing values of the setting point and they can be set up in an arbitrary position.

How to set up

● Set up the setting value of setting point in ascending order.

For example) 0% → 25% → 50% → 75% → 100%

● Numerical value is inputted for the part which is to be offset.

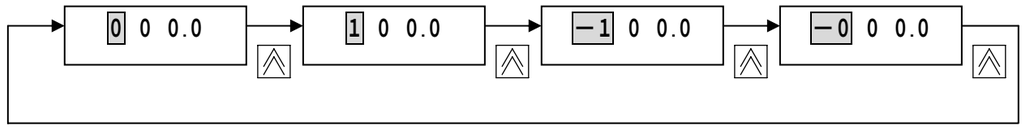
For example) When going up to 55% at the time of 50% at full scale, input as it follows.

Setting value 50%

Offsetting value 5%

● The setting of the symbol is carried out, when setting the most significant digit.

There is no symbol indication, when it is “+”, but there is indication, when it is “−”.

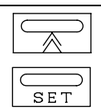
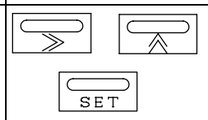
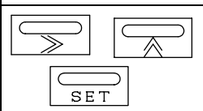
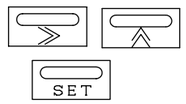
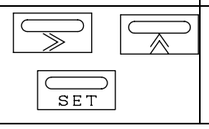


● “ P End” is indicated, when setting all the 16 points of setting values.

※ Linearizing function can be set up, only when input signal is “analog input”, but cannot be used for “pulse input”.

※ For setting up linearizing value, set it at least more than two points. (If it is less than one point, it indicates “E r 10” and blinks.)

※ If the low-cut function is set up, it functions low-cut function for the data after linearizing.

On-screen display	Key operation	Explanatory comments
Measurement display	MODE + SET	When screen of measurement display appears, press SET key while pressing MODE key.
CoNP.		Comparative value setting screen appears. Press key while pressing MODE key.
Lion		Turning on/off setting screen in linearizing function appears. Turning on/off is changed over, every time key is pressed. Press SET key to update the settings and go to the next setting screen. (Set up to turn on, if using the linearizing function, but turn off, if it is not used.)
P1		Point 1 setting screen appears. Press SET key to go to numerical value setting screen.
000.0		Setting value input screen appears. Blinking digits move, every time key is pressed, and also numerical value which is blinking digits run incremental operation, every time key is pressed. Input numerical value(0%, for example) and press SET key to go to next setting screen.
000.0		Offset input screen appears. Blinking digits move, every time key is pressed, and also numerical value which is blinking digits run incremental operation, every time key is pressed. Input numerical value(0%, for example) and press SET key to go to next setting screen.
P2		Point 2 setting screen appears. Press SET key to go to numerical value setting screen.
025.0		Setting value input screen appears. Input numerical value(25%, for example) and press SET key to go to the next setting screen.
002.0		Offsetting value input screen appears. Input numerical value(2%, for example) and press SET key to go to next setting screen.

On-screen display	Key operation	Explanatory comments
P3	SET	Point 3 setting screen appears. Press SET key to go to numerical value setting screen.
075.0	≫ ∧ SET	Setting value input screen appears. Input numerical value(75%, for example) and press SET key to go to next setting screen.
−002.0	≫ ∧ SET	Offsetting value input screen appears. Input numerical value(-2%, for example) and press SET key to go to the next setting screen.
P4	SET	Point 4 setting screen appears. Press SET key to go to numerical value setting screen.
100.0	≫ ∧	Setting value input screen appears. Input numerical value(100%, for example) and press SET key to go to next setting screen.
000.0	≫ ∧ SET	Offsetting value input screen appears. Input numerical value(0%, for example) and press SET key to go to next setting screen.
P5	MODE	Point 5 setting screen appears. Press MODE key to return to measurement display screen.
Measurement display		

Initialization of settings

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

1) Continue to press [M] key for five seconds while pressing [≫] key in an indicating status of such as main loop of the setting mode (as “CoNP”, etc.).
2) It enters initial setting mode, displays “i n i t. ” on the screen and blinks.
3) If pressing [S] key, all the setting parameters returns to initial setting values as shown in a table right. If not initializing settings, press the key other than [S] Key to return to the setting mode without initializing.

※ The initial setting values of EM1000ET purchased together with a set of our Flowmeter are not applicable to that of contents listed right.
When initializing settings, be sure to make a copy of all parameters which are set up at present. The setting values necessary for such scaling as “Setting of max input frequency” and “Setting of instantaneous value indication at the time of max input” vary with the types you selected.

Initial setting values

Items	Contents
Indicating mode	Instantaneous value indication
Setting of comparative value on CP1	001.0 (integration :0100.0)
Setting of comparative value on CP2	009.0 (Integration :0200.0)
Setting of comparative input	SPEEd
Setting of comparative output timing	SynC
Setting of upper/lower limits on CP1	H
Setting of upper/lower limits on CP2	L
Setting of delay output	oFF
Setting of comparative output operating mode	HGL
Setting of one shot time	0.20[seconds]
Setting of return to zero	oFF
Setting of decimal point position in instantaneous value indication	＊＊＊.＊ (integration：＊＊＊＊.＊)
Setting of max input frequency	0100.0[Hz]
Setting of instantaneous value indication at time of max input	010.0 (10.0L/min)
Setting of decimal point position in “Setting of instantaneous value indication at time of max input”.	＊＊＊.＊
Setting of input signal	4－20
Setting of sampling time	2.0[seconds]
Setting of number of times of moving average	10[times]
Setting of auto-zero time	1.0[seconds]
Setting of Low cut rate	00[%]
Setting of zero suppression	on
Setting of protection	oFF
Setting of analog output	SPd
Setting of analog output timing	SynC
Setting of indicated value at the time of max output	9999 (Integration：09999)
Setting of BCD output	SPd (Effective only at time of connecting to optional device)
Setting of BCD output timing	SynC (Effective only at time of connecting to optional device)

How to awake operation of HoLd(Holding) in comparative output

【In case that setting of comparative input is instantaneous value】

1) Continue to press ⩓ key for more than five seconds while pressing M key in a status of instantaneous value indication screen.
2) It enters comparative output awaking mode, displays “CP. RES” on screen and blinks.
3) If pressing S key, holding status of comparative output is awaken.
If not awaken, press the key other than S key to return to the instantaneous value indication screen without awaking holding status.

【In case that setting of comparative input is integrated value】

1) 1) Continue to press ⩓ key for more than five seconds while pressing M key in a status of integrated value indication screen.
2) It enters integrated value resetting mode, displays ”rESEt” on screen and blinks.
3) If pressing S key, holding (ON) status of comparative output is awaken. (※ Integrated value is also co
If not awaken, press the key other than S key to return to the integrated value indication screen without awaking holding status.

How to reset integrated value

● How to reset by means of operational keys

1) Continue to press ⩓ key for more than five seconds while pressing M key in a status of integrated value indication screen.
2) It enters integrated value resetting mode, displays “rESEt” on screen and blinks.
3) If pressing S key, integrated value is reset. (※ If the setting of comparative input is integrated value, output status of comparative output is also reset once.)
If not awaken, press the key other than S key to return to the integrated value indication screen without reset.

●How to reset from outside (Integration resetting input pin)

Integrated value is reset either by connecting integration resetting input pin”/RST” to digital common pin”DCOM” or by impressing “L” level signal.
(※ If the setting of comparative input is integrated value, output status of comparative output is also reset once.)

● How to reset by means of inside operation (Zero return)

Integrated value is reset, when it reaches setting value on CP2 in case that setting of return to zero within comparative condition setting parameter is effective.

Functions of overflow display

【In case of instantaneous value indication screen】
If signal whose measuring signal input pin is impressed exceeded input ranges(Analog input:20mA and pulse input: 1500Hz),, or if instantaneous value display exceeded digit which can be displayed, instantaneous value display which is currently displayed blinks and shows overflow, but measuring values are displayed, if including measuring ranges(Approx 10% of span area) even at the time when overflowing.

【In case of integrated value indication screen】
When the integrated value indication exceeded the digits which can be displayed, it makes the integrated value indication blink, counts up from zero once again and shows overflow.

※ Overflow display operates the display mode operation which is currently set up.

Even if overflowing the instantaneous value at present, the LED of numerical value indication does not blink, only if display mode is the integrated value display screen. On the contrary even if the integrated value is overflowing, the LED of numerical value display does not blink, only if the display mode is instantaneous value display screen.

※ The indication becomes zero, if the input signal is less than 4mA in analog input.

Functions of error display

When error occurred, error number is displayed and blinks in the measured value display screen.

Error No.	Contents	Countermeasures and their actions to take
Er01	Mask ROM memory error	MPU is out of order. It is necessary to repair hardware.
Er02	Backup memory error (Setting value)	Memory which backs up setting contents is out of order. It is necessary to repair hardware.
Er03	Measurement error	Internal measurement error. It is necessary to repair hardware.
Er04	Backup memory error (Interface signal)	Memory which backs up setting contents is out of order, It is necessary to repair hardware.
Er05	Backup memory error (Integrated value)	Memory which backs up setting contents is out of order, It is necessary to repair hardware.
Er10	Setting error in setting value	Erroneous setting value input. Press [M] key to retype parameter.
Er21	Warning of disconnection	Analog input is less than 1mA. Check to ensure that signal line is connected.

Note※: “Er21” is displayed, when the display mode is on screen display of instantaneous value.
If it is on screen display of integrated value, it is no display on screen.

Setting of comparative output operation and characteristics of output patterns

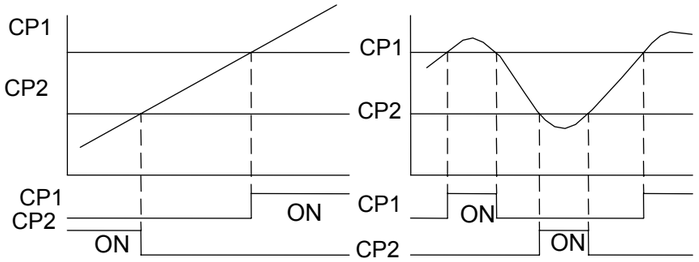
Setting of comparative conditions

A	Setting of comparative output timing	rEAL		Sync
B	Setting of upper/lower limits on CP1	H		L
C	Setting of upper/lower limits on CP2	H		L
D	Setting of delay output	on		oFF
E	Setting of operational mode	HGL <Comparative output >	HoLd <Holding>	SHot <One shot output >
F	Setting of one shot time	0.01 up to 2.00 sec.		
G	Setting of return to zero	on		oFF

Setting instances of comparative condition operation

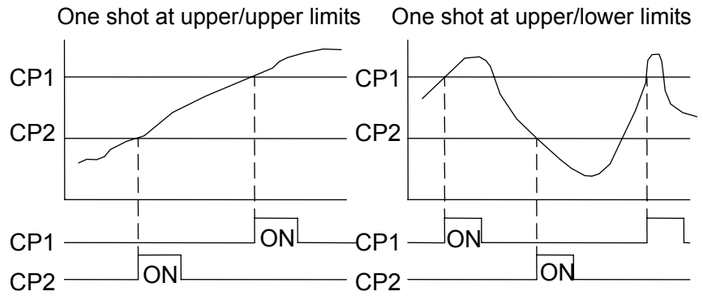
	Pattern 1	Pattern 2	Pattern 3	Pattern 4	Pattern 5	Pattern 6	Pattern 7
Setting A	rEAL	rEAL	rEAL	rEAL	rEAL	rEAL	rEAL
B	H	H	H	H	L	H	H
C	L	H	L	L	L	L	H
D	oFF	oFF	oFF	on	on	oFF	oFF
E	HGL	SHot	SHot	HGL	HGL	HoLd	SHot
F	—	0.2	0.2	—	—	—	0.2
G	oFF	oFF	oFF	oFF	oFF	oFF	on

Comparative output operation



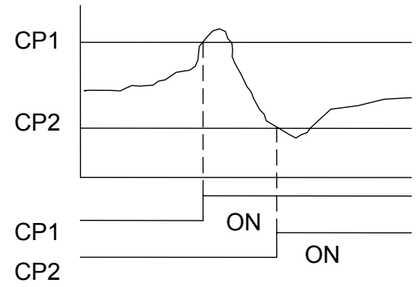
(Patern 1)

One shot operation



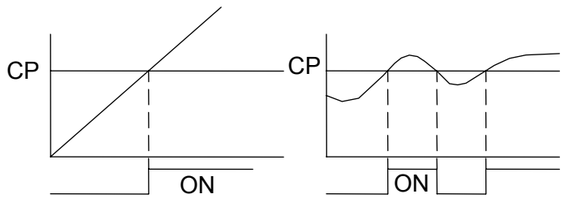
(Pattern 2) (pattern 3)

Holding operation



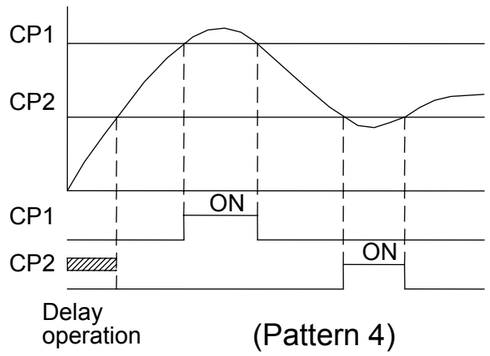
(Pattern 6)

1) At time when setting upper limit



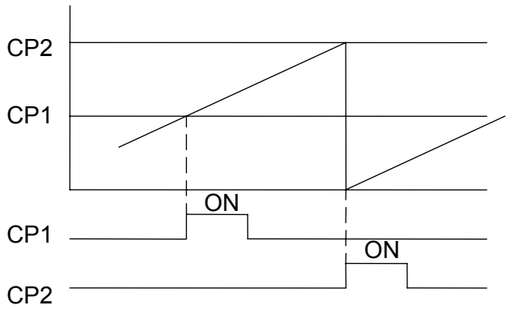
Delay operation

1) At time when setting upper/lower limit



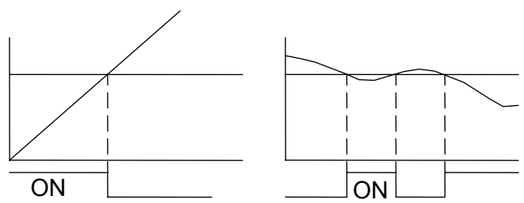
(Pattern 4)

Return to zero operation

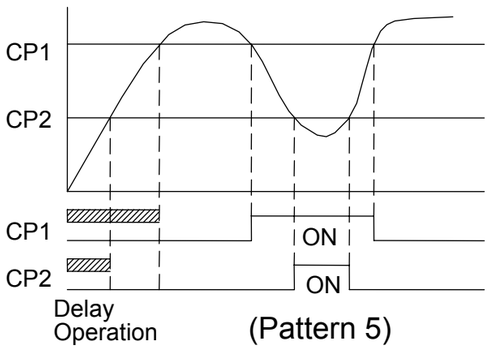


(Pattern 4)

2) At time when setting lower limit



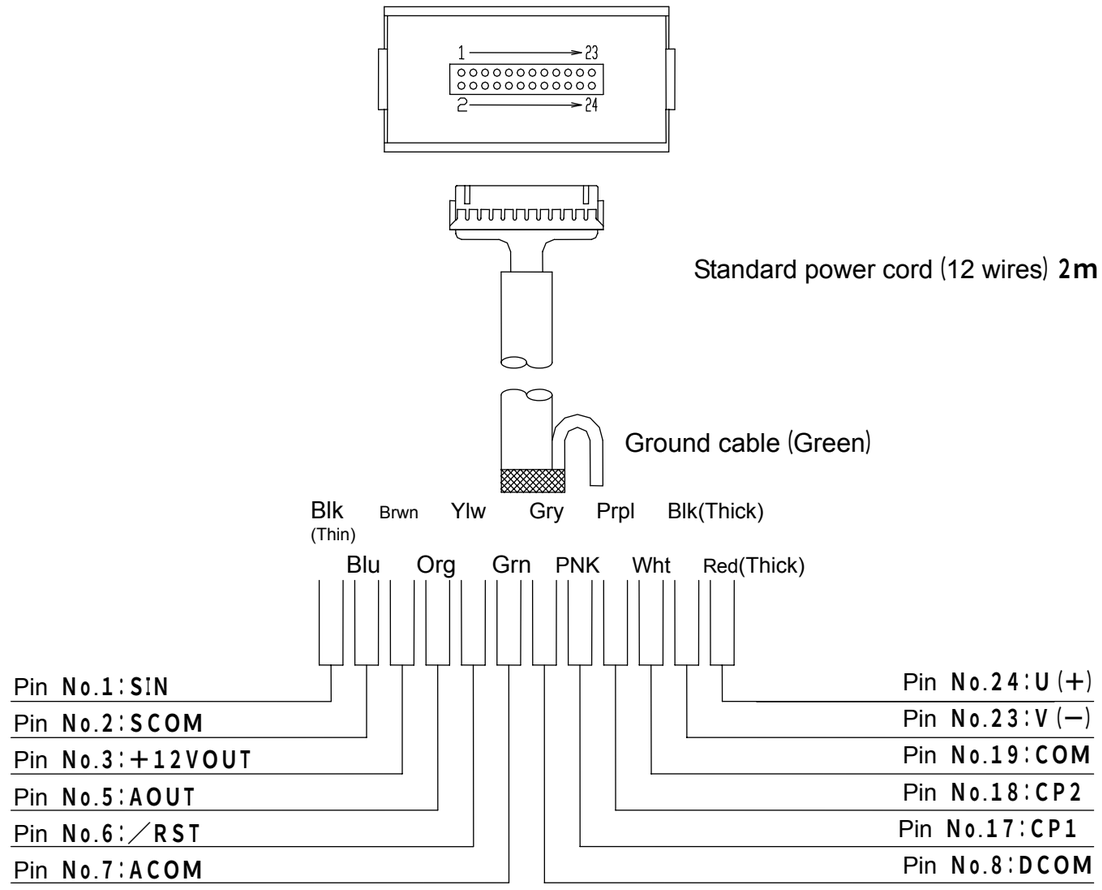
2) At time when setting lower/lower limits



(Pattern 5)

Explanations for external input/output pins

Rear view of EM1000ET



※ Pins not described here are not connected any. Also do not connect any to these empty pins.

Pin No.	Names of signal	Std. color of cable	Functional contents
1	SIN	Black(Thin)	Input pin for measuring signal. It inputs analog signal or pulse signal from sensor.
2	SCOM	Blue	Common pins to measuring signal input and power source for sensor
3	+12VOUT	Brown	Output pins for sensor at power source of +12V. It supplies 12VDC ・ 25mA(at max).
5	AOUT	Orange	Output pin for analog output It outputs at 4-20mA.
6	/RST	Yellow	Input pin for integrated value resetting Negative logic input
7	ACOM	Green	Common pin to analog output
8	DCOM	Gray	Common pin to integrated value resetting input
11	LAT	—	Data latch pin for optional BCD output It outputs data latch signal for optional board.
12	DCOM(ISO)	—	Common pin to BCD optional output
13	DATA	—	Data output pin for BCD optional output It outputs data to optional board.
14	CLK	—	Clock output pin for BCD optional output It outputs data clock to optional board.
17	CP1	Pink	Comparative output pin on CP1. It outputs at NPN transistor. It turns on at the time that comparative conditions which are set up are fulfilled.
18	CP2	Purple	Comparative output pin on CP2. It outputs at NPN transistor. It turns on at the time that comparative conditions which are set up are fulfilled.
19	COM	Whit	Common pin for comparative output.
23	V(−)	Black(Thick)	Input pin for power source. It supplies power source for driven from outside and connects “0V” of power source.
24	U(+)	Red(Thick)	Input pin for power source. It supplies power source for driven from outside and connects “+12 – 24V” of power source.

① The third class of ground shall be used for grounding(Below 100Ω.
② Single end type is used for analog input and pulse input.
③ Comparative output on CP1 and CP2 are NPN open collector output.
④ DCOM pin and DCOM(ISO)pin are independent common pin respectively.
⑤ Pin No. 11-14 ia a signal for controlling optional device. However, these signal lines are not included in the standard cable.
If necessary for BCD optional device, it is required to use a special cable to be attached separately.
⑥ Nothing is connected in pin No. and pin No. 11 –14 which are not included in a table above and alos do not connect any to these empty pins.
⑦ Securely fix a standard cable to panel and the like, and do not exert excessive forces on indicator body as such.

How to connect wires

Warning

Do wiring under the condition that power source is securely turned off. If not, it may cause operating failure and damage of devices, or fire.

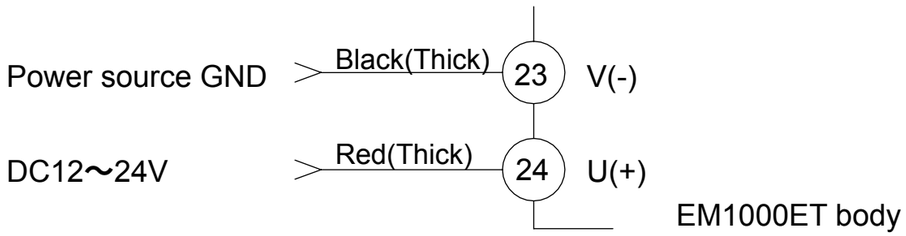
If connector treatment is done by our user for reasons of wiring, use parts as it follows.

- Applicable wire : 0.13 – 0.33 sq(AWG26-22O equivalent). Use cord of 1.0 – 1.5mm in diameter.
- Applicable connector: Use hausing (Model: PHDR-24VS) and contact (Model: BPHD-001T-P0.5) made by NICHIATSU K. K.

1. Connecting power source

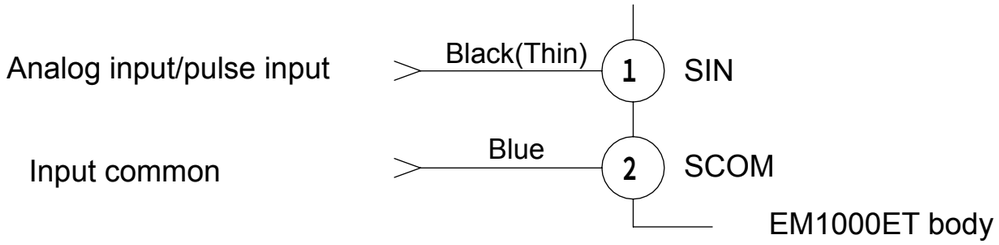
Connection to power source is for No. 23(Black/Thin) and No.24(Red/Thick).

- Power source voltage：12-24VDC（－10%／＋25%）



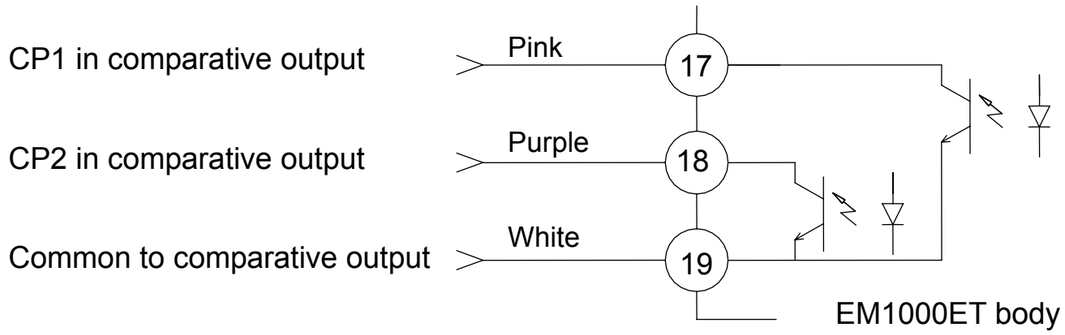
2. Connection to input signal

Connection to input signal is for No. 1(Black/Thin) and No. 2(Blue)



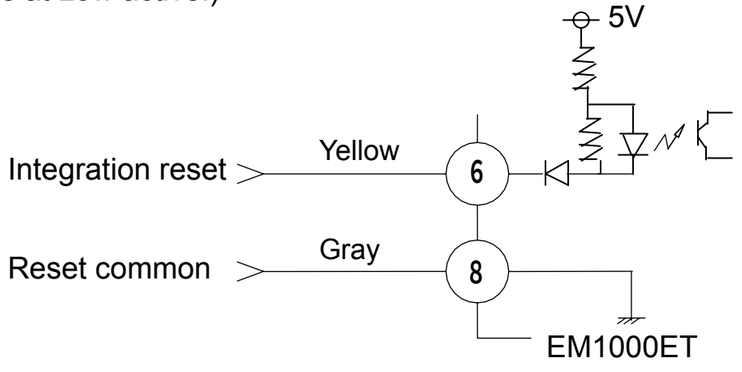
3. Connection to comparative output

Connection to CP1 in comparative output is for No.17(Pink) and No.19(White).
Connection to CP2 in comparative output is for No. 18(Purple) and No.19(White).



4. Connection to Integration reset signal

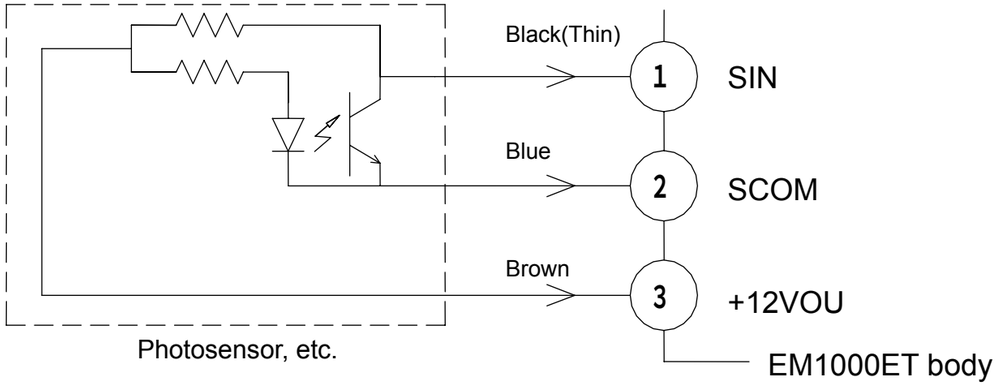
Connection to integration reset signal is for No.6(Yellow) and No. 8(Gray).
(Reset operation is at Low active.)



6. Connection to power source for sensor

Connection to power source at ＋12V for sensor is for No. 2(Blue) and No. 3(Brown).

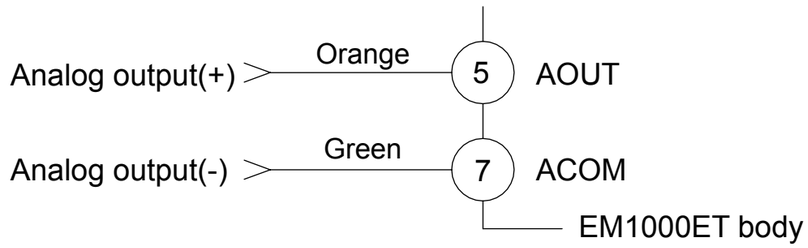
It supplies sensor with 12VDC ・ 25mA (at max).



7. Connection to analog output

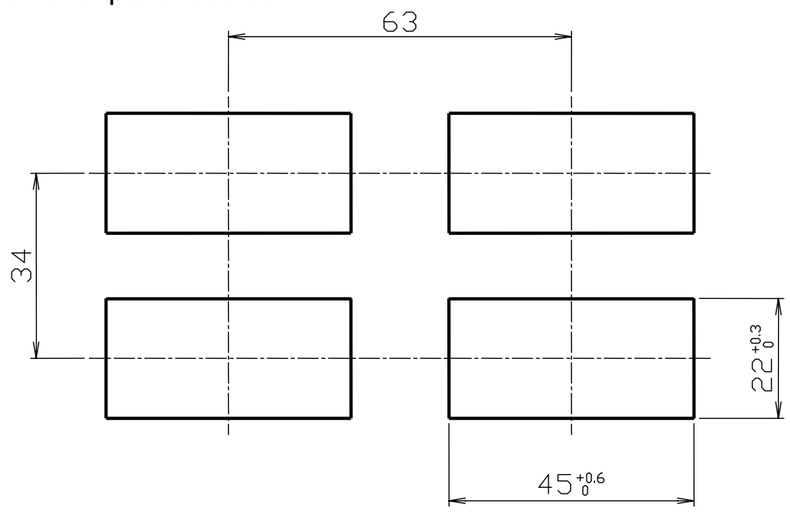
Connection to analog output is for No. 5(Orange) and No. 7(Green).

● Load resistance：Below **３５０Ω**



For panel cut-out

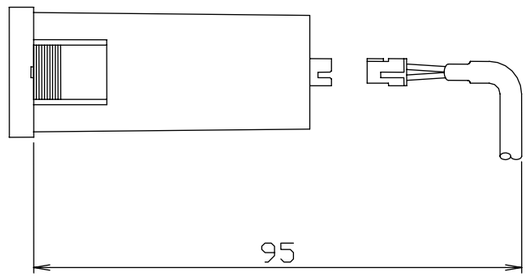
● Dimensions for panel cut-out



※Panel in thickness：**0.5mm～4mm**

● Panel in depth

Take mounting space for 95mm and more for panel depth considering installing and removing connectors.



Specifications

1. Measuring input

Items	Conditions	Specifications
Input form	—	Single end input (Isolated from power source)
Analog input	—	4-20mA, Input resistance: 20Ω
Pulse input	—	Open collector input Input responding frequency:0-1500Hz(duty 50%)
Allowable excessive input	Analog input	100mA
	Pulse input	DC35V
A-D conversion form	Analog input	Double integral form
Pulse measuring form	Pulse input	Periodic measurement form
Periodic measuring sampling	—	0.2 sec. (Sampling time puts off according to input frequency at lower frequency)
Scaling form	Instantaneous value	Digital scaling form In terms of “Setting of max input frequency” and “Setting of instantaneous value indication at the time of max input”.
Max input frequency	Pulse input	Setting ranges：0 - 1500Hz
Number of times of moving average	Pulse input	Setting ranges：0 - 10 times
Instantaneous value measurement	Ta＝+23℃±5℃ 35 - 85%RH、 Setting up of scaling for one year (9999)	±0.1% of F.S.±1digit(Analog input) ±0.05% of F.S.±1digit(Pulse input)
Temperature drift at instantaneous value	Ta＝0 - +50℃	±100ppm of F.S./℃

2. Display

Items	Conditions	Specifications
Indicating digit number	Inst. value indication	Four digits (9999) indication
	Int. value indication	Five digits (99999) indication + ×10 times indication
Indicating character in height	—	Character height: 8mm, Red LED indication
Comparative output indication	Two staged indication	Green LED lights up at time comparative output turns on.
Integrated indication	Int. value indication	Orange LED blinks at time of integrated value indication.
Integrated value x 10 times indication	Int. value indication	Orange LED lights up when integrated value exceeded five digits (99999) indication.
Indicating sampling time	—	Setting ranges：0.2 - 3.0 sec.
Decimal point position in measured value indication	Inst. value indication	Setting position：*.*.*.*.
	Int. value indication	Setting position：*.*.*.*.*.
Overflow indication	—	LED of numerical value indication blinks.
Zero suppression	—	Zero suppressed in higher digit than that of decimal digit.
Measured value indication on screen	—	Changing over inst. value indication and int. value indication

3. Comparison

Items	Conditions	Specifications
Comparative operation	Instantaneous value	Alarm output operation at two staged upper/lower limits(Upper/upper limits, upper/lower limits and lower/lower limits)
	Integrated value	Integrated batch output operation (Upper/upper limits, upper/lower limits and lower/lower limits)
Setting of comparative operation	—	Changing over alarm output operation at two staged of upper/lower limits and integrated batch output operation
Setting of comparative value	Instantaneous value	Setting ranges：0 - 9999
	Integrated value	Setting ranges：0 - 999990
Comparative output	—	Transistor NPN open collector output Output impressed voltage：Below DC35V Sink current：Below 100mA (Vol=1.3V)

4. Functions

Items	Conditions	Specifications
Memory backup	EEPROM	Backup of each setting data(Backup of integrated value in every one minute) Writable times：Approx ten million times Storage life：Approx ten years
Resetting functions in integrated value	Integrated value indication	Reset by key switching input or outside input(/RST pin) Make-break contact or NPN open collector input
LOW cut rate	—	Setting ranges：0 - 30% of F.S.
Input signal monitoring function	—	Raw value indication of signal input
Comparative output monitoring function	—	Selective indication of setting values on CP1 and CP2 in comparative output
Function of jpretection	—	Selective setting for protection of setting value
Function of linearization	Analog input	Input by setting value and offset value Number of inputs：16 points (at max) Setting ranges ：-30%≦Setting value≦+110%

5. Analog output

Item	Condition	Specifications
Analog output	4-20mA	Load resistance：Below 350Ω Resolution：Approx 2500

6. Power source for sensor

Items	Conditions	Specifications
Output voltage	Ta=+23℃±5℃	DC12V±10%
Output current	—	25mA (max)

7. Supply power source

Items	Conditions	Specifications
Voltage	—	12-24VDC(-10% / +25%)
Current	DC24V(DC12V)	Approx 70mA (Approx 155mA)

8. Environment

Items	Conditions	Specifications
Operating temperature	—	0 - +55℃
Operating relative humidity	—	35 - 85%RH (No dewing)
Storing temperature	—	-20 - +70℃

9. Miscellaneous

Items	Conditions	Specifications
Noise resistance(Impuse)	24VDC vs 0V Power source vs Panel Panel vs SCOM	Power line：800V(Normal mode power source noise) Common mode：600V(Common mode power source noise) Common mode：600V(Common mode noise)
Withstand voltage	Power source vs Alarm output Total charging section vs case	For one minute at 500VAC
Insulating resistancae	Power source vs Alarm output Total charging section vs Case	Measured by megger at500VDC More than 20MΩ
Withstand vibration	—	Vibration frequency：10～55Hz、Double amplitude of vibration：1.5mm directed to X, Y and Z direction each for two hours Sweeping time: For one minute (In terms of JIS-C0911-1984)
Withstand shock	—	Impact strength：294m/s^2(Approx 30G) Impact pulse working time：11ms X,Y and Z to six directions for three times (In terms of JIS-C0912-1984)
Outside dimensions	—	24H×48W×Approx 62D(mm)
Weight	—	Approx 51g
Case	—	Made of plastic mold

Warranty

- The warranty period of the product shall be one year commencing on the date of delivery.
  We will repair or replace any fault occurred during this period for which we obviously are liable at a cost of no charge.
- As to how to repair it, you are kindly requested to send back the faulty product to our company and to let us do the take-back repair.
- To avoid processing delays, please be sure to put the memoranda on the faulty contents in detail on the product.
- Please approve that the following items shall be excluded from the warranty.
    - Any fault or damage caused by abuse or improperly handling by user side.
    - Any fault or damage caused by any other reasons except for the cases for which our company is liable.
    - Any fault caused by remodeling or repairing except done by our company.
    - Any fault or damage caused by such disasters as fire, earthquake or flood damage.
    - Any damage induced by the fault of this product

《Judgment based on the attached sheet the first to Export Trade Control Ordinance》

This product is an electronic digital indicator which measures the direct-current electricity and voltage. Relating to the said goods above for which we have carefully checked in accordance with a list of the permitted items regulated under control in the attached sheet the first to Export Trade Control Ordinance, we hereby judged that the products are no correspondence items and also that they have no technology regulated under control in ministerial ordinance, and we judged it as goods to be out of strategic goods exporting control.

Judgment: Nonrelevant products

Self-judgment date: June 12, 2002

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