



Handling Manual
Capacitive Electromagnetic Flowsensor
CX series

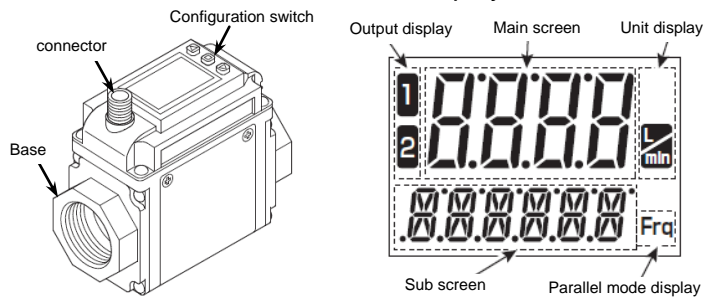
Follow the instructions given in this sheet when using the product. Failure to do so may cause a damage to the product or an incident. Keep this instructions sheet so that you can refer to it whenever necessary.

Caution

- *This product is for liquids that do not corrode wetted parts.
- *It is not a product that guarantees absolute accuracy.
- *Correct measurement is not ensured for fluids with lower conductivity (5µS/cm) are not guaranteed.
- *Do not touch the electrical wire connection to avoid electrical shock. Be sure to power off the product before connecting the wires. Also, Do not touch the current carrying parts with a wet hand.
- *Do not use the product with positive ground.
- *Refer to "12 Cautions" at the end of this sheet for other cautions.
- *Perform zero adjustment(F40)at the time of installation.

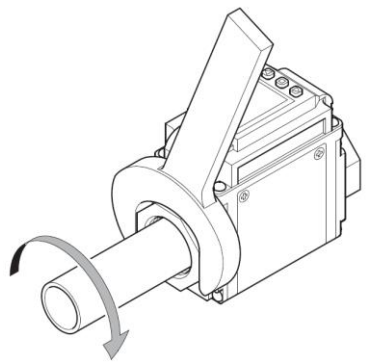
1 Part Names

Entire view



2 Piping

When attaching a pipe or joint to the product, be sure to hold the base on the installation side with a tool. Holding the base on the other side or body may damage the product.

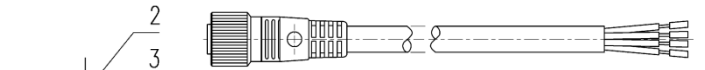


Caliber	Tightening torque
10A	22 - 24Nm
15A	28 - 30Nm
20A	34 - 36Nm

3 Wiring

Pin No.	Terminal name	Description
1	+V	24VDC power
2	OUT2	Analog output/switch input
3	0V	Power GND
4	OUT1	Switch output

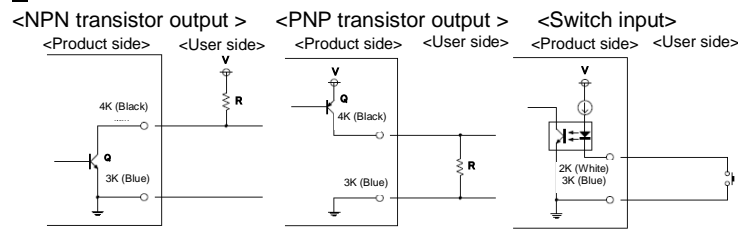
Body-side connector pin assignment



Pin No.	Lead color	Terminal name	Description
1	Brown	+V	24VDC power
2	White	OUT2	Analog output/switch input
3	Blue	0V	Power GND
4	Black	OUT1	Switch output

Cable-side connector pin assignment

4 Switch I/O Circuit

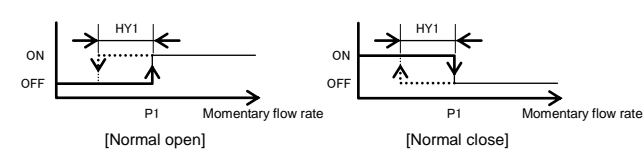


*Press F2 to set to Switch input (Remote zero adjustment and Accumulated output reset).

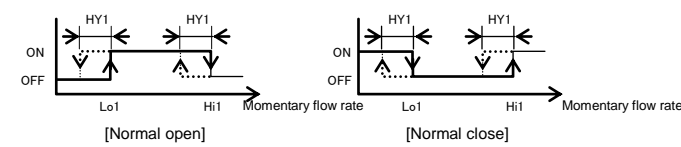
5 Output Mode and Output Operation

<OUT1 output >

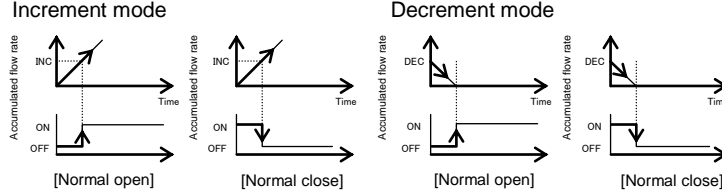
(1) Level judgment mode



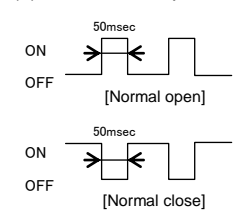
(2) Window mode



(3) Trip accumulated output mode

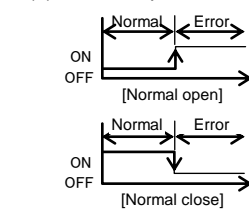


(4) Accumulated pulse output

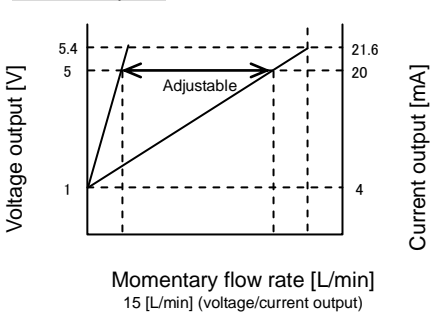


10msec when the pulse rate is 0.01L/Pulse

(5) Alarm output mode

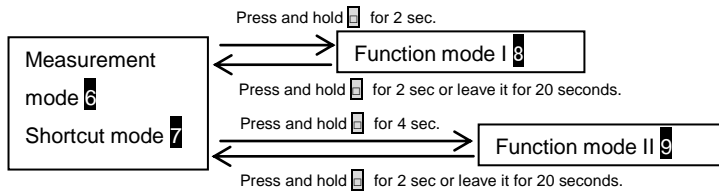


<OUT2 output >



6 Mode Selection

You can select the mode by shortcut mode operation in the measurement mode. You can move from the measurement mode to the Function mode I or Function mode II as shown below.

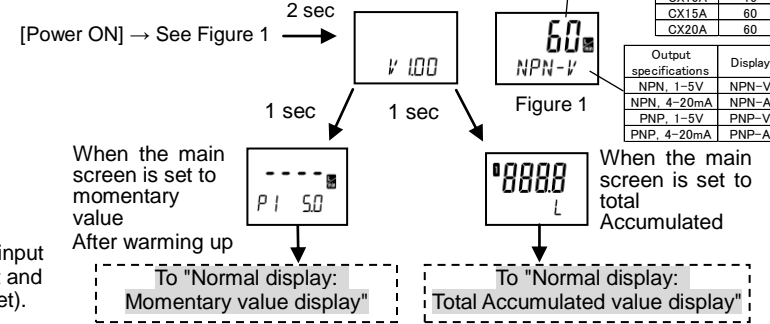


7 Normal Operation (Measurement Mode)

<Overview>
The measurement mode is the normal operation mode enabled after the startup display upon power-on to output and display measured values. By switching from the measurement mode to the shortcut mode or Function mode to change settings as necessary.

<Startup display>

The following startup display is shown upon power-on.



<Normal display: Momentary value display>

The main screen shows the momentary value.

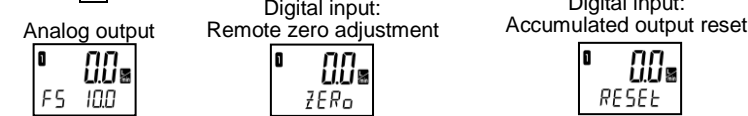
Flow rate	Momentary value display
0.0L/min to 110% of maximum flow rate or less	On
Over 110% of maximum flow rate to 120% or less	Blinking
Over 120% of maximum flow rate	E007 (Excessive flow rate error)

When the main screen shows the momentary value, the sub screen shows such codes as "OUT1" or "OUT2" in accordance with the setting of the Function mode (F4: Sub screen).

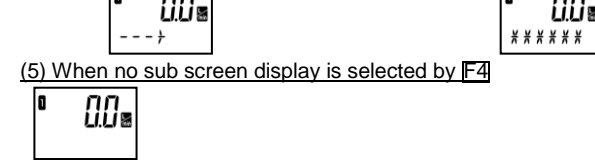
(1) When OUT1 is selected by F4
One of the following is displayed according to the setting of the Function mode F1: OUT1.



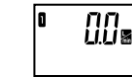
(2) When OUT2 is selected by F4
One of the following is displayed according to the setting of the Function mode F2: OUT2.



(3) When flow direction is selected by F4
(4) When arbitrary text is selected by F4



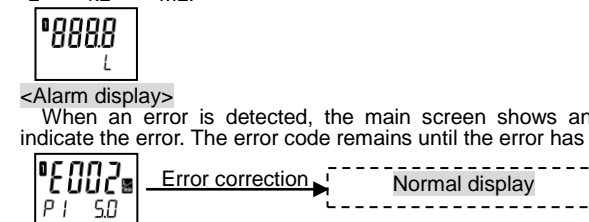
(5) When no sub screen display is selected by F4



<Normal display: Total Accumulated value display>

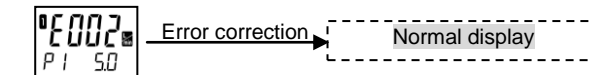
The main screen shows the Accumulated value and sub screen shows the unit for the Accumulated value.

You can use the [] and [] buttons to change the unit in the sequence of "L" -> "kL" -> "ML."



<Alarm display>

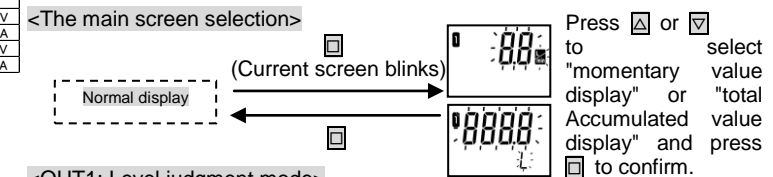
When an error is detected, the main screen shows an error code to indicate the error. The error code remains until the error has been resolved.



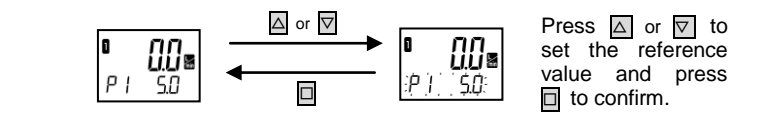
Error code	Error	Description	Countermeasure
E002	Memory error	An error occurred with the internal data.	Power off the product and then power it on again.
E003	Excitation abnormality	An error occurred with the internal circuit.	Power off the product and then power it on again.
E004	Excessive current	An excessive current has flowed in the switch output.	Power off the product and check the load.
E005	Measurement target fluid error	The flow rate cannot be measured correctly due to an abnormal current flowing in the target fluid or air is mixed with it.	Power off the product and check the target fluid for abnormality.
E006	Reverse flow	The fluid flows in the direction opposite to the set direction.	Check the flow direction setting.
E007	Excessive flow rate	The flow rate exceeds 120% of the maximum flow rate.	Check the flow rate and decrease it as necessary.

8 Easy Setup (Shortcut Mode)

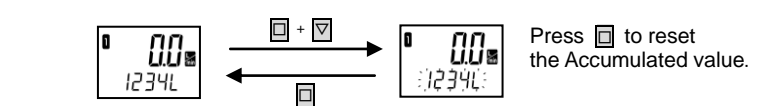
You can select frequently used settings by a shortcut operation from the normal display.



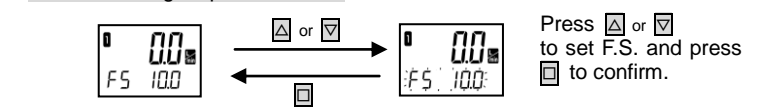
<OUT1: Level judgment mode>



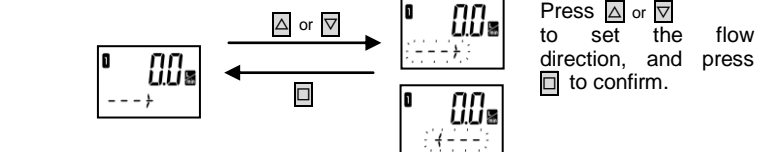
<OUT1: Trip accumulated output mode>



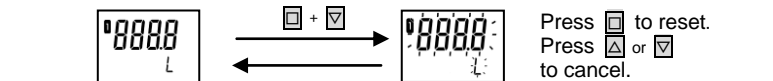
<OUT2: Analog output FS mode>



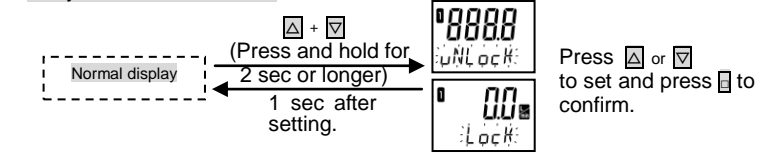
<Flow direction>



<Total Accumulated value reset>



<Key lock enable/disable>



* While key lock is enabled, any other operations than key lock operation are disabled. Disable the key lock in the same method. When you press a key while key lock is enabled, "LOCK" is shown on the sub screen for 2 seconds.

9 Basic Settings (Function Mode I)

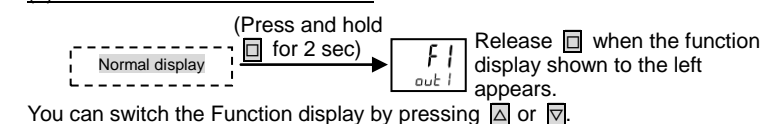
<Overview>

(1) List of items for Function mode I

The Function mode I provides the following setting items.

Display	Item	Description
F1	OUT1	Specifies the output method for OUT1.
F2	OUT2	Selects from analog output and digital input.
F3	Response time	Sets the response time
F4	Sub screen	Sets the contents of the sub screen.
F5	Flow direction	Sets the flow direction of the target fluid.
F6	Total Accumulated display unit	Selects the unit for total Accumulated value display.

(2) How to switch to Function mode I



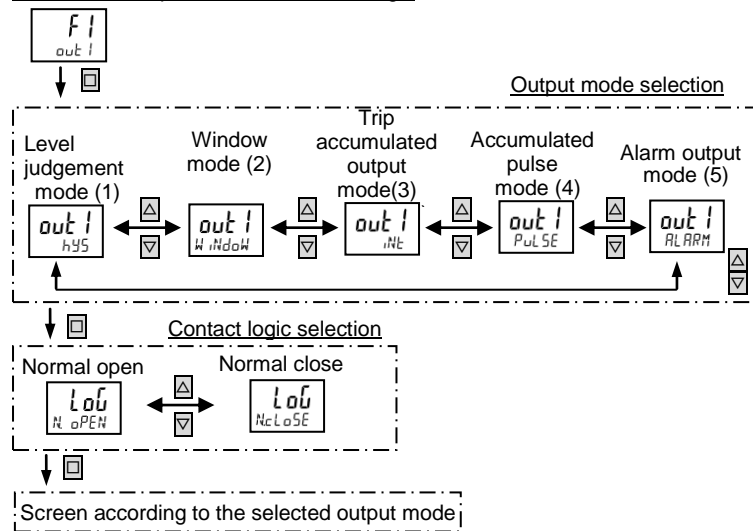
You can switch the Function display by pressing [] or [].

(3) How to return to normal display

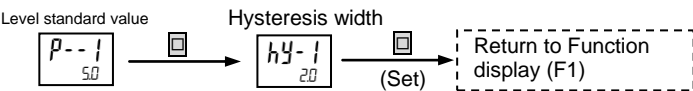
* Press and hold [] for 2 sec while "F*" is shown to return to the normal display.
* The screen also returns automatically to the normal display if you do nothing for 20 seconds. Note that if you do nothing for 20 seconds without confirming the selected value and the screen automatically returns to the normal display, the selected value will be cancelled.

F1 <OUT1 setting> Initial setting: Level judgement, Normal open

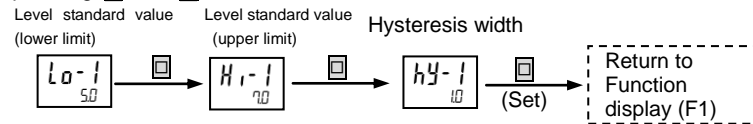
Selection of output mode and contact logic



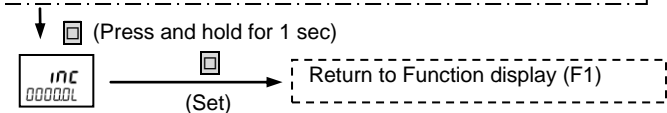
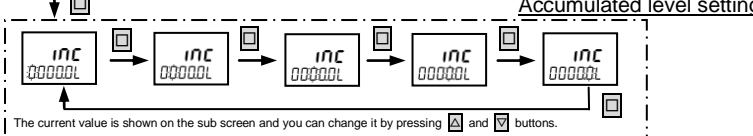
(1) Output mode: Level judgement mode
The current value is shown on the sub screen and you can change it by pressing Δ and ∇ buttons.



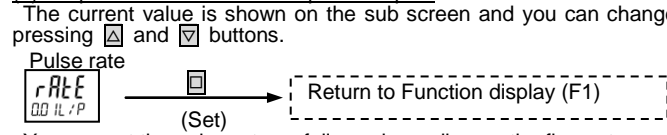
(2) Output mode: Window mode
The current value is shown on the sub screen and you can change it by pressing Δ and ∇ buttons.



(3) Output mode: Accumulated output mode (Increment/Decrement)



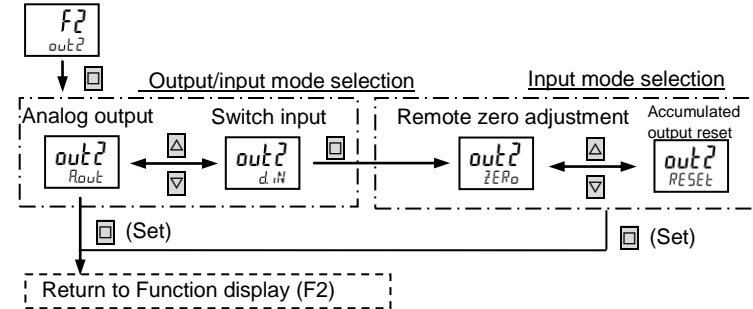
(4) Output mode: Accumulated pulse output
The current value is shown on the sub screen and you can change it by pressing Δ and ∇ buttons.



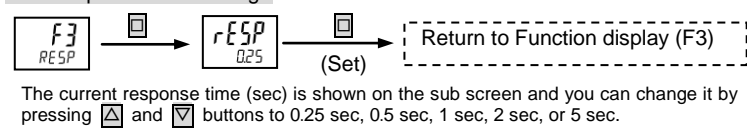
You can set the pulse rate as follows depending on the flow rate range.

Pulse rate [L/Pulse]	Flow rate range	
	0.5 to 15L/min	2.0 to 60L/min
0.01	○	×
0.1	○	○
0.2	×	○
1	○	○
10	×	○

F2 <OUT2 setting> Initial setting: Analog output mode

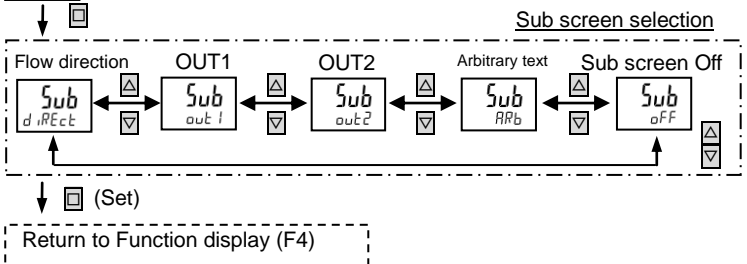


F3 <Response time setting>

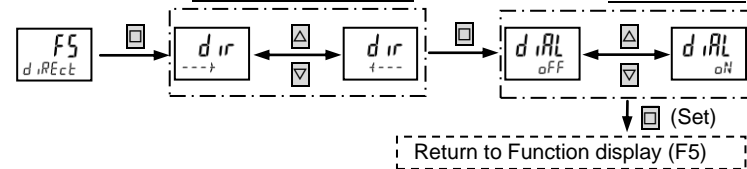


The current response time (sec) is shown on the sub screen and you can change it by pressing Δ and ∇ buttons to 0.25 sec, 0.5 sec, 1 sec, 2 sec, or 5 sec.

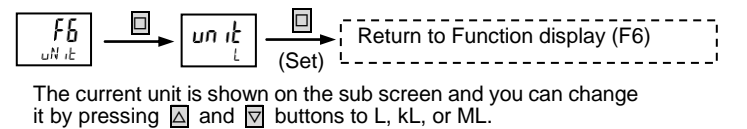
F4 <Sub screen setting>



F5 <Flow direction setting>



F6 <Total Accumulated value unit setting>

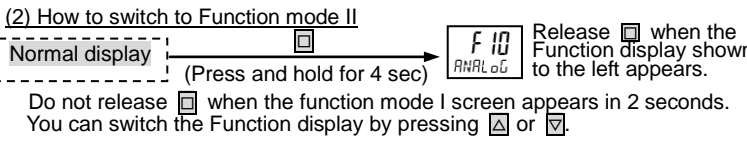


The current unit is shown on the sub screen and you can change it by pressing Δ and ∇ buttons to L, KL, or ML.

10 Advanced Settings (Function Mode II)

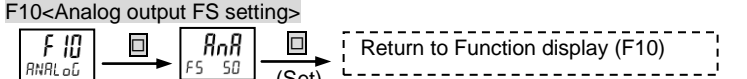
<Overview>
(1) List of items for Function mode II
The Function mode II provides the following setting items.

Display	Item	Description
F10	Analog output FS	Sets the free scale Function for the analog output.
F20	Display color	Sets the display color for the main screen.
F30	ECO mode	Enables/disables the ECO mode.
F40	Zero adjustment	Runs zero adjustment.
F50	Forced output	Selects output functions to forcibly run.
F60	Parallel mode	Selects the parallel mode.
F70	Arbitrary text	Selects arbitrary text shown on the sub screen.
F80	Reverse display	Reverse the display direction upside down.
F90	Factory defaults	Returns the setting to the factory defaults.

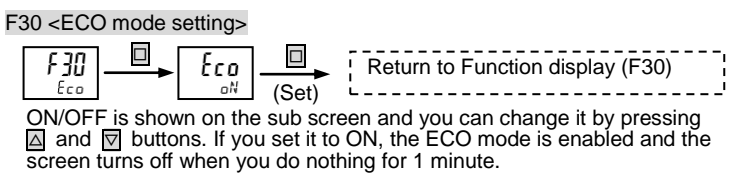
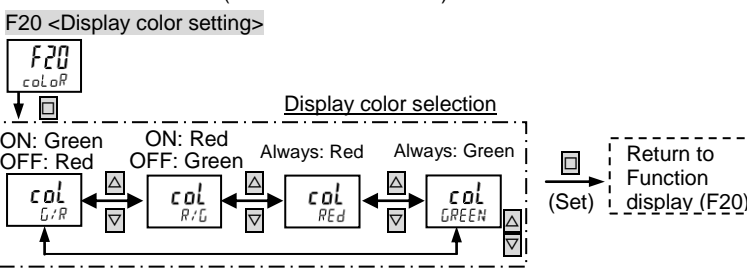


(2) How to switch to Function mode II
Normal display (Press and hold for 4 sec) → F10 (Release \square when the Function display shown to the left appears.)
Do not release \square when the function mode I screen appears in 2 seconds. You can switch the Function display by pressing Δ or ∇ .

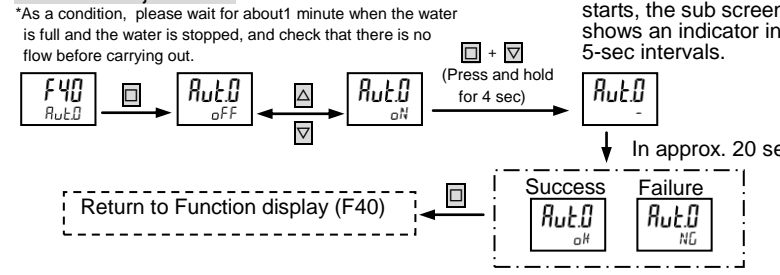
(3) How to return to normal display
• Press and hold \square for 2 sec while "F*" is shown to return to the normal display.
• The screen also returns automatically to the normal display if you do nothing for 20 seconds. Note that if you do nothing for 20 seconds without confirming the selected value and the screen automatically returns to the normal display, the selected value will be cancelled.



The current value is shown on the sub screen and you can use Δ and ∇ buttons to set the full scale value of the analog output from 10 to 100% of the maximum flow rate. (The unit enter is L/min)



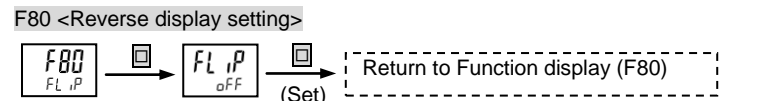
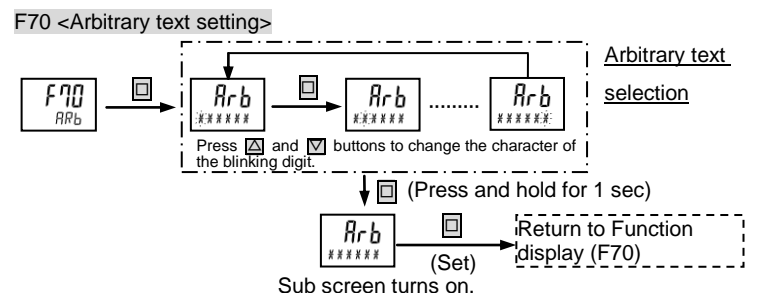
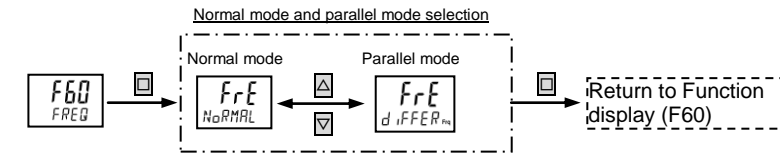
F40 <Zero adjustment>



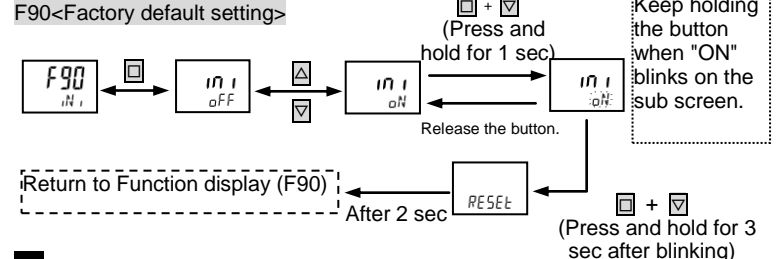
When zero adjustment starts, the sub screen shows an indicator in 5-sec intervals.
Success (AutD ON) / Failure (AutD NG)
In approx. 20 sec
Return to Function display (F40)

F50 <Zero adjustment>
OUT1: Outputs switch output ON. Output display 1 turns on.
OUT2: Outputs 5V or 20mA for analog output. Output display 2 turns on. For digital input, output display 2 turns on synchronously with input ON. During forced output, the screen does not return to the normal display automatically even when you do nothing for 20 sec.

F60 <Parallel mode setting>
If you install the devices next to each other, the devices should be set as normal mode and parallel mode.



ON/OFF is shown on the sub screen and you can change it by pressing Δ and ∇ buttons. OFF means the normal display and ON means the reverse display.



11 Specifications

<Model name>
C X \square \square \square - \square \square
(1) (2) (3)

(1): Size 10 (3/8), 15 (1/2), 20 (3/4)
(2): Connection A (Pipe taper thread Rc)
(3): Output NV (NPN, voltage output), NA (NPN, current output), PV (PNP, voltage output), PA (PNP, current output)

<Specifications>

	10	15	20
Caliber	10	15	20
Applicable fluid	Water and fluid which are not corrosive to the fluid contact material.		
Applicable conductivity of fluid	5 μ S/cm to 3mS/cm		
Detection method	Capacitance Electromagnetic		

	10	15	20
Caliber	10	15	20
Rated flow rate range	0.5 to 15 L/min	2.0 to 60 L/min	
Low flow cut flow rate	3% of the maximum flow rate within the measurement range		
Fluid temperature	0 to 85°C (no freezing)		
Display unit	Momentary flow rate L/min, Accumulated flow rate L, kL, ML		
Repeat precision*	±2.0% F.S.		
Temperature	Environmental	±5.0 F.S. (@25°C)	
	Fluid	±5.0 F.S. (@25°C)	
Pressure range	0 to 1.0MPa (0 to 85°C), 0 to 2.0MPa (0 to 50°C)		
Pressure resistance	3.0MPa		
Response time	0.25s/0.5s/1s/2s/5s (initial setting: 1s)		
Accumulated flow rate range	0.0 to 9999999.9L		
	In 0.1L units		
Switch output	NPN or PNP transistor output		
	Maximum load current	50mA	
	Maximum applied voltage	30VDC	
	Internal voltage drop	NPN: 2.0V or less PNP: 2.4V or less	
	Output protection	Rush current alarm, rush current protection	
Output mode	Selectable from level judgement mode, window mode, trip accumulated output mode, accumulated pulse output mode, alarm output mode		
Analog output	Voltage output	Voltage output: 1 to 5V Load impedance: 50k Ω or more	
	Current output	Current output: 4 to 20mA Load impedance: 500 Ω or less	
Switch input	Input time	20ms or more	
	Short current	Approx. 2mA	
Display method	Dual screen (main screen green/red display, sub screen White display) Display refresh interval 5 times/s		
Power supply voltage	24VDC±10% Ripple P-P±10% or less		
Current consumption	65mA or less		
Environment	Protection structure	IP65 or equivalent (with cable option C3)	
	Usage temperature range	0 to 50°C (no dewing)	
	Usage humidity range	35 to 85%RH (no dewing)	
Fluid contact material	PPS, FKM, CAC804		
Weight (body)	Approx. 460g	Approx. 490g	Approx. 520g

*The repeatability is the variation of the average value when measured for 240 seconds under the same conditions.

12 Cautions

- Use the product within the rated specification ranges.
- Do not use the product in a way where it directly contacts beverage, food, or medical fluid.
- Do not use the product in a flammable gas atmosphere.
- Do not use the product where condensation can form inside the product. Note that if a fluid with a lower temperature than the ambient temperature flows through the product, condensation may form inside the product, which may adversely affect its performance.
- Observe the rated fluid temperature range and take a freezing prevention measure (e.g., using antifreeze) in a cold environment.
- Observe the rated pressure range.
- Observe the rated flow rate range.
- Ensure that no gas is mixed in the pipe.
- Stop the product before changing any of the settings.
- Do not use any display or output during the warming up period (10 seconds) after power-on.
- Do not press the button with a sharp-pointed object.
- Do not place the product where it is exposed to a direct sunlight or heat radiated from a heat source.
- The product can be installed in any orientation, however, for horizontal piping, it is recommended to install it so that the display surface is parallel to the ground in order to minimize influence by bubbles.
- Set the flow directions of pipes and flowsensor correctly.
- Do not drop, hit, or apply an excessive impact to the product. Hold the body when you handle the product (never hold the cables).
- Do not install the product where it is exposed to a strong compression power, tension, load, or vibration.
- Do not install the product on a footstep or do not place a heavy object on it.
- Be careful so that sealing tape or adhesive does not get out of the piping connection.
- Use a straight pipe immediately before the sensor as much as possible and be sure that there is no obstacle (e.g., extra packing) which disturbs the flow.
- Attach the flow rate adjustment valve and other parts at the downstream of the sensor.
- If there is a foreign material or oil inside the pipe, wash it before installing the sensor.
- Wrong wiring may cause a failure.
- Check the wire colors before wiring.
- It is recommended to isolate the power supply and receivers electrically from other devices.
- Do not apply an excessive tension to the cables.
- Keep the cables away from the power and motor cables.
- Keep the product away from a strong magnet or magnetic field.
- Pressure within a fluid seal circuit can increase due to temperature change and may damage the product. Provide the system with a relieve valve to avoid a fluid seal circuit.
- With sensors arranged in parallel, if the display readings and analog output do not stabilize, they can be stabilized by setting longer response time or using parallel mode.
- In case of consideration to arrange plural pieces of the products for a Flow Rate Type Filling Apparatus, please judge such usage after checking the Patent Number JP3916032B2.