

MODEL CT-100 CONTROL VALVE

PRODUCT MANUAL (POSITIONER)

Thank you very much for choosing the Yoshitake's product. To ensure the correct and safe use of the product, please read this manual before use. This manual shall be kept with care for future references. The symbols used in this manual have the following meanings.



	Warning	This symbol indicates a potentially hazardous situation that, if not avoided, could result in death or serious injury.
	Caution	This symbol indicates a hazardous situation that, if not avoided, may result in minor or moderate injury or may result in only property damage.

Table of Contents

A. E/P Positioner	
A.1 Specification.....	1
A.2 Electrical Wiring	1
A.3 Test run.....	2
A.4 Adjustment.....	3
B. Smart Positioner	
B.1 Specification.....	5
B.2 Electrical Wiring	5
B.3 Test run.....	6
B.4 Adjustment.....	7
C. Troubleshooting	17
D. Maintenance	17
Warranty Information	

YOSHITAKE

Caution

- (1) Please confirm that the indications on the product correspond with the specifications of the ordered product model before use.
* If they are different, do not use the product and contact us.
- (2) This product might be discontinued or improved without prior notice.
- (3) In order to ensure successful and safe operation of our valves the entire operation manual must have been read thoroughly and understood prior to installation and commissioning, maintenance, otherwise, serious injury or equipment malfunction could happen and control valve may be damaged. It is out of the guarantee repair or replacement are not uncompensated by us.

This manual is an extract of the necessary sections from the product supplier's manuals, please refer to the product supplier's manuals if necessary.

Positioner	Supplier	Model name of supplier
E/P Positioner	Rotork YTC Ltd.	YT-1000
Smart Positioner	3S Co., Ltd.	MP-100

A E/P Positioner

A.1 Specification

Input Signal	4 to 20mA DC
Supply Pressure	0.14 to 0.7MPa
Operating Temperature Range	-20 to 70°C*1
Air Connection	Rc1/4
Conduit Entry	G1/2
Explosion Proof	Non-explosion (Usual order products)
Linearity	±1% F.S.
Hysteresis	±1% F.S.
Flow Capacity	80 LPM (Sup.=0.14MPa)
Air Consumption	2.5 LPM (Sup.=0.14MPa@idle)
Weight	2.7kg

*1: While installed in the CT-100, it is prohibited to use it above 60°C.

A.2 Electrical Wiring

Warning

- (1) Electrical wiring must be done by expert or professional person.
- (2) This product is not available for the place (Atmosphere) where have the retention of explosive gas.
*Since it is not in the explosion-proof structure, there is a danger of fire.
- (3) When having the wiring work, please do the work in an environment where does not enter the rainwater or surrounding water. Also please make sure the rainwater or surrounding water so not enter the wiring port.
*In case of water enters there, there is the risk of electric shock
- (4) When wiring, please make sure the power supply is not provided.
- (5) Be sure to close the unused connection port with a blind plug.

- ① Remove the set screw of the terminal box (Use the hex wrench) and remove the terminal box cover.
- ② Please connect the positive terminal of the terminal block located in the terminal box to the positive line of external input line. (In case of negative terminal, please connect the negative terminal of the terminal block located in the terminal box to the negative line of external input line). To protect the positioner, earth the gland earth terminal. When connecting, please tighten the terminal fastening firmly so that there is no connection failure.
- ③ After connecting the external line, tighten and fix the set screw after closing the terminal box cover. (Tightening torque: $0.25\text{N} \cdot \text{m}$)

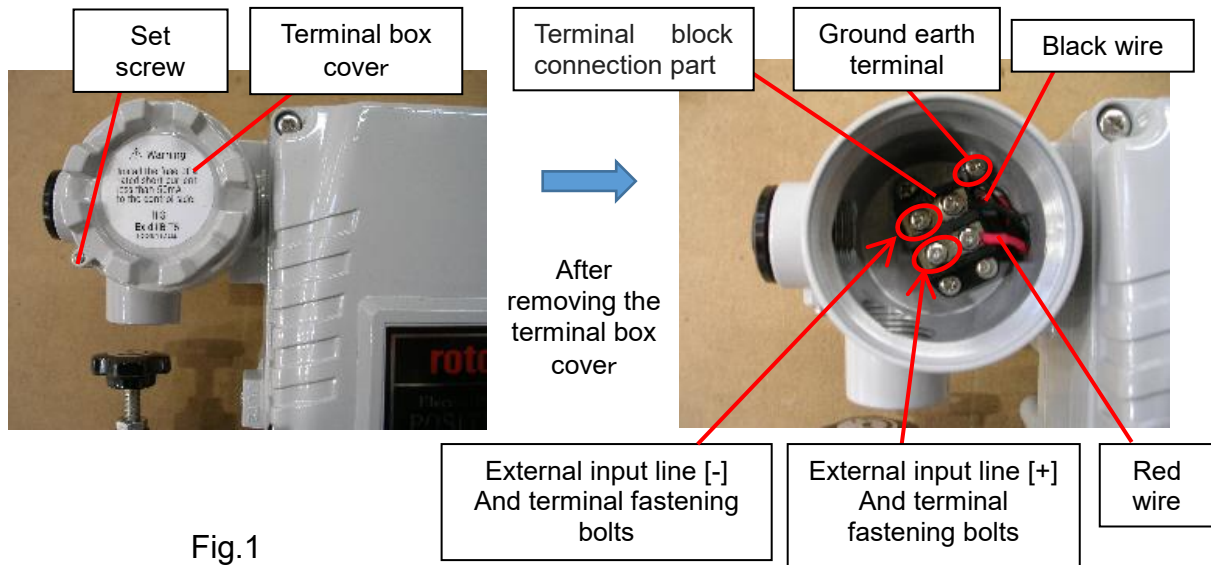


Fig.1

A.3 Test run

⚠ Caution

The product operates while a test run. Be sure to conduct a test run before operation. And, please have a test run in a pressure-free state with no fluid inside.

- (1) Connect a regulator or current generator so that the positioner receives a 4-20mA DC pseudo input signal.
- (2) With the air pressure applied to the air regulator, confirm the product operates with its opening from 0 to 100% when the pseudo input signal of 4 to 20mA DC (0 to 100%) is given to the positioner and changed between 0-100%.

If the opening is incorrect, readjust the positioner according to the next paragraph.

A.4 Adjustment

Caution

The product operates during the positioner adjustment, so make sure that there is no fluid inside the product, and readjust the positioner under no pressure.

- (1) Loosen 4 screws on the cover with a cross-head screwdriver and remove the cover. Then, readjust the zero-adjustment part and the span adjustment part. (Fig. 2)

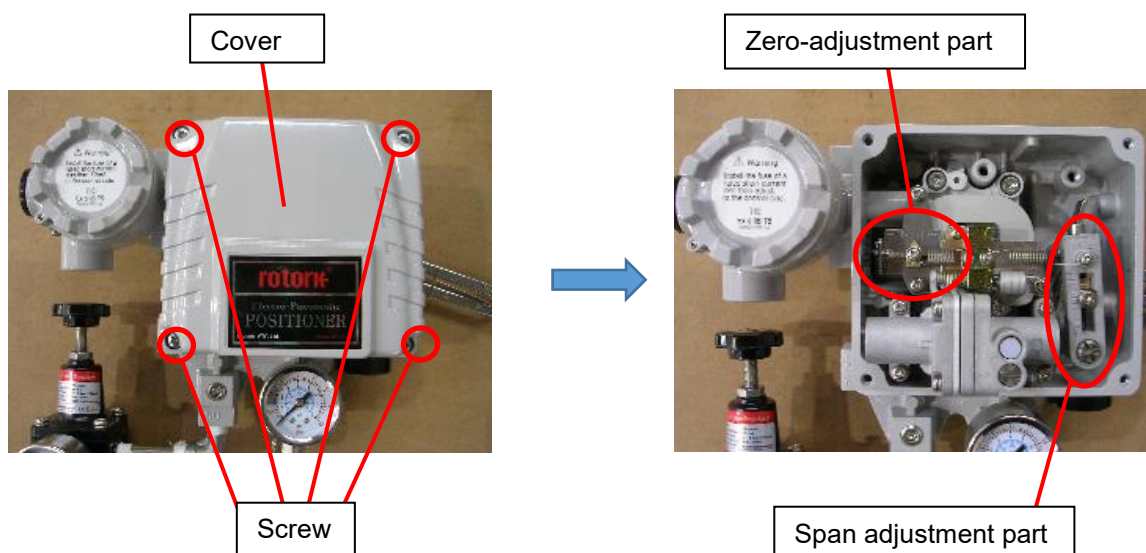


Fig.2

- (2) Supply air pressure by the air regulator, and input the signal (4mA DC) of zero opening into the positioner. Then turn the knob of the zero-adjustment part clockwise or counterclockwise to align the initial point (zero point) of the actuator. In the right figure, the "+" is the direction in which the zero point becomes higher, and the "-" is the direction in which the zero point becomes lower.

After that, check that the pointer of the pressure gauge attached to the positioner starts to move when the input signal is under 5.6 mA DC. If it does not move, adjust it to the position where the pointer of the pressure gauge starts to move with the zero adjuster.

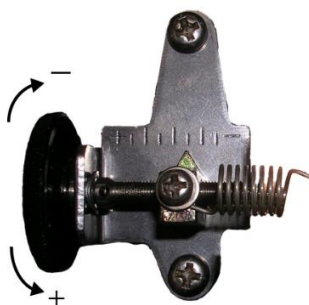


Fig.3

- (3) Loosen the lock screw of the span adjustment part. After finishing the zero-point adjustment, apply the input signal (12mA DC) of 50% opening into the positioner. In this state, adjust the scale position of the stroke indicator plate attached to the actuator to half of the position of the full stroke. If the position is low, turn the span in the "+" direction to increase the span, and if the position is high, turn the span in the "-" direction to decrease the span.

Next, apply the input signal (20mA DC) of 100% opening into the positioner. In this state, adjust the scale position of the stroke indicator plate attached to the actuator to the full stroke position.

If the above span adjustment is performed, the zero-point changes. So, after adjusting the span, check the zero point again with the input signal (4mA DC) of zero opening and readjust. Repeat steps (2) and (3) until the stroke position stabilizes in this process.

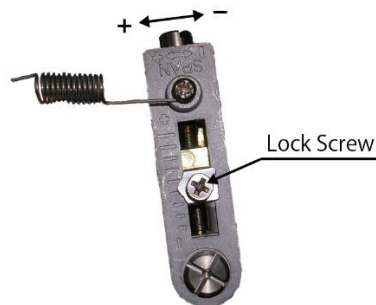


Fig.4

- (4) When the adjustment is completed, tighten the lock screw of the span adjustment part. And install the cover in the reverse order (1)

B Smart Positioner

B.1 Specification

Input Signal	4 to 20mA DC
Supply Pressure	0.14 to 0.7MPa
Operating Temperature Range	-20 to 80°C*1
Air Connection	Rc1/4
Conduit Entry	G1/2
Explosion Proof	Non-explosion (Usual order products)
Linearity	±1% F.S.
Hysteresis	1% F.S.
Flow Capacity	90 NI/min at 0.14MPa 200 NI/min at 0.40MPa
Air Consumption	3 NI/min at 0.14MPa 6.5 NI/min at 0.4MPa (Output pressure 50%)
Weight	Approx. 3.8kg

*1: While installed in the CT-100, it is prohibited to use it above 60°C.

B.2 Electrical Wiring

Warning

- (1) Electrical wiring must be done by expert or professional person.
- (2) This product is not available for the place (Atmosphere) where have the retention of explosive gas.
*Since it is not in the explosion-proof structure, there is a danger of fire.
- (3) When having the wiring work, please do the work in an environment where does not enter the rainwater or surrounding water. Also please make sure the rainwater or surrounding water so not enter the wiring port.
*In case of water enters there, there is the risk of electric shock
- (4) When wiring, please make sure the power supply is not provided.
- (5) Be sure to close the unused connection port with a blind plug.

- ① Remove the set screw of the terminal box (Use the hex wrench) and remove the terminal box cover.
- ② Please connect the positive terminal of the terminal block located in the terminal box to the positive line of external input line. (In case of negative terminal, please connect the negative terminal of the terminal block located in the terminal box to the negative line of external input line). To protect the positioner, earth the gland earth terminal. When connecting, please tighten the terminal fastening firmly so that there is no connection failure.
- ③ After connecting the external line, tighten and fix the set screw after closing the terminal box cover. (Tightening torque: 0.25N · m)

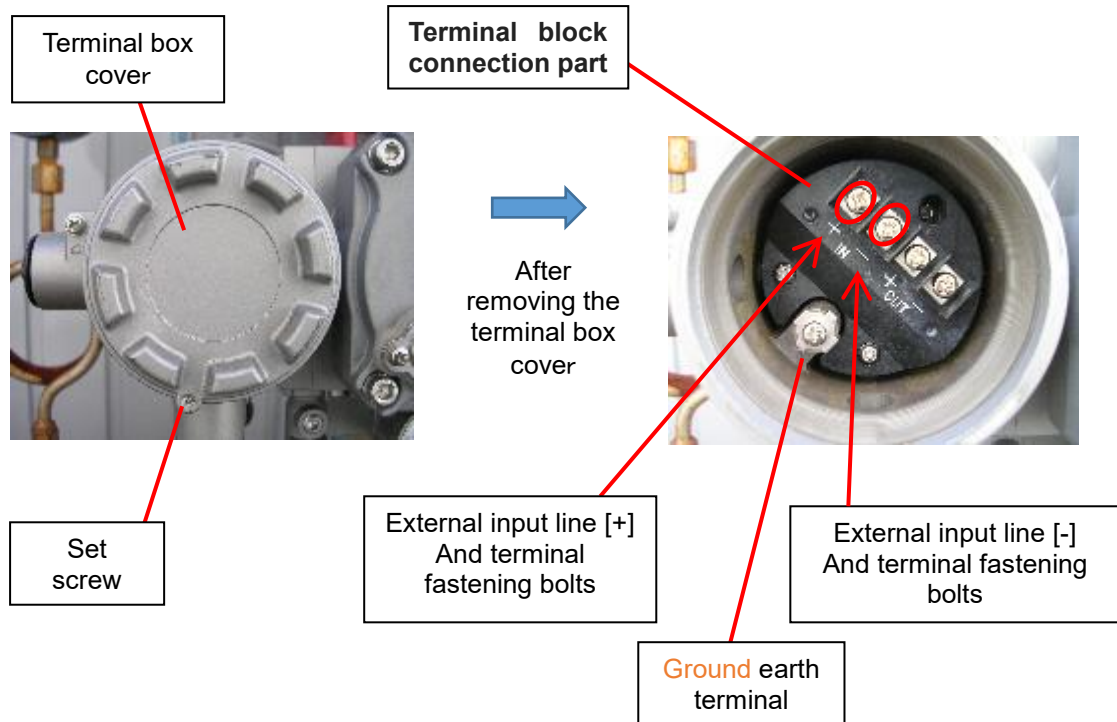


Fig.5

B.3 Test run

⚠ Caution

The product operates while a test run. Be sure to conduct a test run before operation. And, please have a test run in a pressure-free state with no fluid inside.

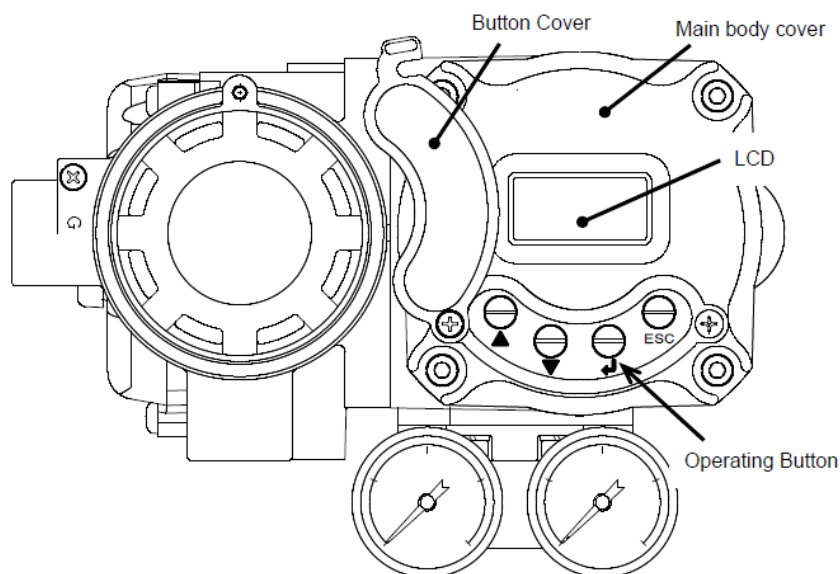
- (1) Connect a regulator or current generator so that the positioner receives a 4-20mA DC pseudo input signal.
- (2) With the air pressure applied to the air regulator, confirm the product operates with its opening from 0 to 100% when the pseudo input signal of 4 to 20mA DC (0 to 100%) is given to the positioner and changed between 0-100%.

If the opening is incorrect, readjust the positioner according to the next section.

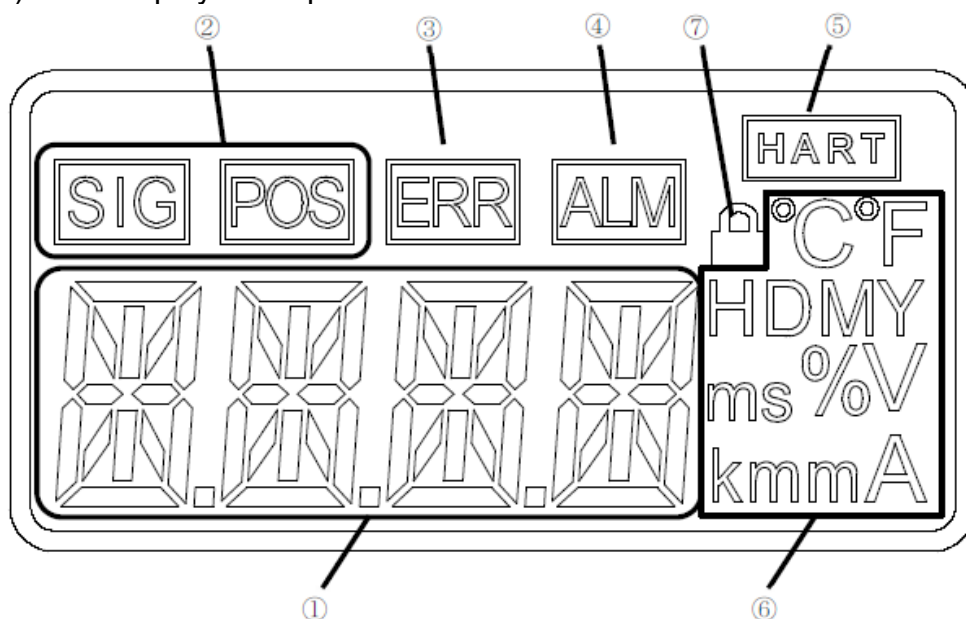
B.4 Adjustment

Warning

- (1) Do not open Main body cover and Terminal box cover with its power tuned on. Always check that there is no explosive gas or vapor in that location to remove the cover (Main body cover or Terminal Box cover) of Flame-proof enclosure with the power on.
*Button Cover is not Flame-proof enclosure.
- (2) Opening button cover and operating button with its power turned on is allowed. But do not open the Main body cover.
- (3) Be sure never to cause mechanical sparks with tools.



(1) LCD-Display description



① Numerical display

Display the numeric position of setting parameters, input signal, or position valve

② Mode

Display the mode of the valve shown, SIG means 'Displaying input signal valve' and POS means 'Displaying position signal valve'

③ Error

Blinking when the device is occurred to controller error

④ Alarm

Blinking when the valve exceed alarm set limit

⑤ HART

Displayed when HART communication function works

* Usual order products do not have this function.

⑥ Unit

Display the unit corresponding to the valve

⑦ Lock

Displayed during the setting function is locked

(2) Menu description

Operation

- Use four buttons ▲, ▼, ↵, ESC.
- Press the ↵ button to complete the operation.
- Press the ESC button to cancel the operation.
- Input signal should be kept to a minimum 4mA.
- After finishing operation, press ESC button to get back to the operating mode (It would not be switched automatically).

(3) Lock/Unlock

Enable/Disable to change setting.

When locked, the key mark will light up.

○Sequence

①Unlock

Lock ↵ LK? ▼ ULK? ↵

②Operation

Lock ↵ ULK? ▼ LK? ↵

○Notice

- After completing set up, lock the setting function to prevent misoperation.
- Before you start operations, set to unlock.
- When the input signal is shut with this status unlocked, it will be locked when the signal recovered.

(4) Auto-tuning

Auto-tuning is recommended due to easy operation to set the positioner.

ALL: Start Auto-tuning for all setting

A-1: Start Zero-span and operation direction setting

A-2: Adjust torque motor setting

A-3: Adjust PID constant and input signal filter

○Sequence

①Unlock

Lock ↵ LK? ▼ ULK? ↵

②Tuning

TUNE ↵ ALL? ↵ ---> DONE :Full tuning

▼ A-1? ↵ ---> DONE :A-1 Tuning

▼ A-2? ↵ ---> DONE :A-2 Tuning

▼ A-3? ↵ ---> DONE :A-3 Tuning

○Notice

- Do not touch the moving parts during turning is in progress.
- Input signal should be kept to a minimum 4mA while operating.
- After the Auto-tuning is complete, **DONE** is shown on the display.
- By the actuator, there is a case the proper dynamic characteristics can not be obtained. You can also go into manual mode and set the dynamic characteristics. Please refer to the section “(6) PID”.
- Recommend to perform full Auto tuning first, after you have installed device.

■ Important

Operate below three configuration before operate auto tuning.

(8) Actuator

(9) Single/Double action

(10) Direction of rotation

(5) FB

Set open/close position manually

Set linearity correction of valve position

○Sequence

①Unlock

Lock ↵ LK? ▼ ULK? ↵

②Operation

MANU ↵ SPLT ▼ FB ↵ ZERO ↵ ZST? ↵

:Set current value as 0% position

▼ SPAN ↵ SST? ↵

:Set current value as 100% position

▼ P50P ↵ *. **% ↵

:Correct the linearity of the valve position with reference to the 50 % position

▼ SPAN? ↵ ***. *% ↵

:Set the SPAN value multiplied by the value (%) as 100% position

○Notice

- For setting of P50P, refer to the following.
Set to -2.00%, when the position value of LCD is 50.0% and the exact position value is 48.0%.
Set to +1.00%, when the position value of LCD is 50.0% and the exact position value is 51.0%.
- The value of P50P is initialized (valve is 0.00%) by Full tuning or A-1 tuning.

(6) PID

Adjust PID Parameter, input signal filter and dead band

○Sequence

①Unlock

Lock ↵ LK? ▼ ULK? ↵

②Operation

MANU ↵ SPLT ▼ PID ↵ P-GN ↵ *** ↵

:Set the total gain

▼ I-GN ↵ **. ** ↵

:Set the integral gain

▼ D-GN ↵ **. * ↵

:Set the differential gain

▼ TF ↵ **. * ms ↵

:Set the constant for input signal filter

▼ DBND ↵ **. * % ↵

:Set the dead band

○Notice

- The total gain, integral gain and differential gain are automatically set in the Full tuning or A-3 tuning. Case of changing, refer to the following matters.
- Effect of every parameters will increase along with the figure increase.
- Integral gain and differential gain can be set to OFF.
- Input signal filter is set to smooth the follow-up to the target valve. It is automatically set in the Full tuning or A-3 tuning. Case of changing, refer to the following matters.
 - OFF: Non-filter (for big size actuator)
 - 1: Equal to the target valve after about 3 seconds
 - 10: Equal to the target valve after about 5 seconds
- The set value of the dead band is \pm .
- Where deflection is in valid range, integral calculation within the dead band is suspended.

(7) Valve closing function
Set shut off or full open of the valve

○Sequence

①Unlock

Lock ↵ LK? ▼ ULK? ↵

②Operation

MANU ↵ SPLT ▼ VSHT ↵ MIN ↵ **. *% ↵

:Set the input signal value (%) where
output pressure of OUT1 is shut

▼ MAX ↵ ***. *% ↵

:Set the input signal value where
output pressure of OUT1 is
maximized

○Notice

- 0.05 mA of hysteresis exists while opens and shuts valve (Each 1 cycle).
- The default setting is, MIN=0.5%, MAX=OFF.

(8) Actuator

Choose Linear/Rotary mode

Choose mounting of the transmission pin in the case of Linear actuator.

○Sequence

①Unlock

Lock ↵ LK? ▼ ULK? ↵

②Operation

MANU ↵ SPLT ▼ L/R ↵ LIN? ↵

: Linear actuator mode, fixed
transmission pin to the actuator side

▼ ROT? ↵

: Rotary actuator mode

▼ LINS? ↵

: Linear actuator mode, fixed
transmission pin to the positioner side

○Notice

- When the section is wrong, linearity is worse.

(9) Single/Double action

Choose Single/Double acting mode

○Sequence

①Unlock

Lock ↵ LK? ▼ ULK? ↵

②Operation

MANU ↵ SPLT ▼ S/D ↵ SIN? ↵ : Single acting mode

▼ DOB? ↵ : Double acting mode

○Notice

- The default setting is SIN.

(10) Direction of rotation

Choose the direction of rotation

This is usually CW mode, it is possible to match the position display by the CCW mode when the direction of rotation has changed.

○Sequence

①Unlock

Lock ↵ LK? ▼ ULK? ↵

②Operation

MANU ↵ SPLT ▼ SENS ↵ CW? ↵

: Position is reduced in the clockwise.

▼ CCW? ↵

: Position is reduced in the
counter-clockwise

○Notice

- The default setting is CW.
- When changing this setting, section (11) Direction D/R changes. Please execute the A-1 tuning once again.

(11) Direction D/R

Choose Direct/Revers acting mode. It is set the valve adapted to the conditions of use in the A-1 tuning. It is not recommended to change.

○Sequence

①Unlock

Lock ↵ LK? ▼ ULK? ↵

②Operation

MANU ↵ SPLT ▼ SUB ▼ DIAG ▼ D/R ↵ DA? ↵

: Direct acting mode

▼ RA? ↵

: reverse acting mode

○Notice

- DA means that the valve position is reduced when the input signal is increased.
- RA means that the valve position is increased when the input signal is increased.

(12) Alarm display

ALM , **ERR** and each code displayed at the top of the LD when malfunction occurs. Refer to the following table for further details.

Alarm code

It will be displayed when it exceeds the alarm set value.

Code	Meaning	Details
A1-1	SIG lower limit alarm	Input signal was below the lower limit setting.
A1-2	SIG upper limit alarm	Input signal was above the upper limit setting.
A2-1	Uptime alarm	Uptime was above the limit setting.
A3-1	POS lower limit alarm	Position signal was below the lower limit setting.
A3-2	POS upper limit alarm	Position signal was above the upper limit setting.
A4-1	Change direction times alarm	Change direction times of the actuator was above the limit setting.
A5-1	Travel distance alarm	Travel distance was above the limit setting.
A6-1	Ambient temperature upper limit alarm	Ambient temperature was above the upper limit setting.
A6-2	Ambient temperature lower limit alarm	Ambient temperature was below the lower limit setting.
A7-1	PST processing	PST is processing *Automatically disappears.

○Displaying Sequence

To display alarm code, follow below procedures.

MANU ▼ **WARN** ↵ **ERR** ↵ **ALRM** ↵

○Notice

- To display more alert, click ▲ ▼ buttons.
- **ALM** mark will be disappeared when problem have solved.
- [- - -] means 'nothing alarm'.

Error code

Code	Meaning	Details
E1	CPU Error 1	CPU was hung-up and restarted.
E2	CPU clock error	CPU clock error.
E3	EEPROM Error1	ROM data which normally replaced is broken. *This error indicates the data of accumulation, open/close position, PID parameter is broken.
E4	EEPROM Error2	Data loss (Not E3. Mainly settings).
E5	Temperature Sensor Error	Temperature sensor were damaged *Not E15.
E6	SW Error	SW has been on over 5 minutes.


E7	Input signal Error	Input signal is out of range. *Input signal is less than 3.91mA.
E8	Actuator Setting Error	Position keeps MAX for more than 30 seconds while output of torque motor is 0 (unconforming). *RA/DA setting is not correct.
E9	Output Error	Position keeps MAX for more than 30 seconds while output of torque motor is MAX (unconforming). *Clogging fixed orifice.
E10	TORQ value Error	TORQ_MIN or MAX is out of range. *Occur in A-2 tuning.
E11	Shut off Error	Input signal is shut off but position does not reach shut off ($\pm 1.0\%$) in 40 seconds.
E12	Full open Error	Input signal is full open but position does not reach full open (more than 99%) in 40 seconds.
E13	Install Error1	Sensor angle is less than -50° .
E14	Install Error2	Sensor angle is more than 50° .
E15	Temperature Error	Beyond the opening temperature range.
E16	PST Error	During PST Processing, position does not change.
E21	AT Time out Error	Could not finished auto tuning in time.
E22	Install Error3	Setting for open/close position is less than -50° . *Occur in A-1 tuning.
E23	Install Error4	Setting for open/close position is more than 50° . *Occur in A-1 tuning.
E28	Low Input signal	Unable to save setting because input signal is less than 3.91 mA.

○Displaying Sequence

To display error code, follow bellow procedures.

Lock  LK?  ULK?   MANU  WARN  ERR 

○Notice

- To display more results of Error, click ▲ ▼ buttons.
- Except E1, 3, 4 and 16, ERR mark will be disappeared when problem solved.
- E1, 3, 4, 16 would not be recovered automatically. Press  button to clear the error code.
- [- - -] means 'nothing error'.

C Troubleshooting

Problem	Cause	Solution
LCD doesn't display (Smart Only)	Bad connection	Tighten terminal
	Wrong with +/- wiring	Re wiring
	Breakdown of LCD	Replace circuit board
	Input signal is less than 3.8mA	Input signal is more than 3.8mA
Not working	Lack of supply air pressure	Supply prescribed air pressure
	Input signal is incorrectly supplied	The signal should be 4-20mA DC
	Broken wires	Replace broken wires
	Clogging of fixed orifice	Replace fixed orifice
	Feedback lever is incorrectly set	Install the lever properly
	Device is in manual mode (Smart Only)	Change to auto mode
	Settings were changed (Smart Only)	Re tuning
	Ruptures of diaphragm (Smart Only)	Replace pilot relay
Shift the set point	Wear on the levers Levers have worked loose	Replace levers Re-tightening
	Sensor was damaged (Smart Only)	Replace sensor
	Clogging of fixed orifice	Replace fixed orifice
Continuous hunting occurs	Mismatching in PID (Smart Only)	Re-tuning Adjust manually

Please refer to the positioner supplier's instructions for further troubleshooting.
Please also contact us if necessary.

D Maintenance

D.1 Daily inspection

Please check the leakage from the pipe and the body portion (leak sound, etc.) following items during operation of facilities.

D.2 Regular inspection (1time/Month)

- (1) Please make sure that there is no looseness on the installed piping of inlet and outlet side of the product.
- (2) Giving a suspected signal of 4-20mA DC to positioner, when it is changed by the opening signal from 0 to 100%, please make sure that the product is operated by the opening degree of 0 to 100%
*If the abnormality is found, please contact us.

Warranty Information

1. Limited warranty

This product has been manufactured using highly-advanced techniques and subjected to strict quality control. Please be sure to use the product in accordance with instructions on the manual and the label attached to it.

Yoshitake warrants the product to be free from any defects in material and workmanship under normal usage for a period of one year from the date of receipt by the original user, but no longer than 24 months from the date of shipment from Yoshitake's factory.

2. Parts supply after product discontinuation

This product may be subject to discontinuation or change for improvement without any prior notice. After the discontinuation of the product, Yoshitake supplies the repair parts for 5 years otherwise individually agreed.

3. This warranty does not cover the damage due to any of below:

- (1) Valve seat leakage or malfunction caused by foreign substances inside piping.
- (2) Improper handling or misuse.
- (3) Improper supply conditions such as abnormal water pressure/quality.
- (4) Water scale or freezing.
- (5) Trouble with power/air supply.
- (6) Any alteration made by other than Yoshitake.
- (7) Use under severe conditions deviating from the design specifications (e.g. in case of corrosion due to outdoor use).
- (8) Fire, flood, earthquake, thunder and other natural disasters.
- (9) Consumable parts such as O-ring, gasket, diaphragm and etc.

Yoshitake is not liable for any damage or loss caused by malfunction or defect of the product.