

Tefulong

Intelligent Electric Actuator

AVA, AVAM, AVAMD ; AVAT(AVAQ), AVATM Range

Instruction

Edition: V2.2
Date of issue: 2007.4

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1. General Instructions of Tefulong Actuator

Tefulong Actuator can be commissioned without opening the electrical cover. Using the supplied infra-red setting tool to access the actuator set up procedures, setting of torque values, position limits and all other control, and indication functions can be made quickly and conveniently even in explosion proof locations. The actuator allows commissioning and adjustment to be carried out the main power supply to the actuator switched on or off.

The On-off motor duty of Tefulong Actuator is a short time duty which is S2-15min, and the duty of modulating one is S4-50%.

The ambient standard operating temperature of Tefulong actuator is from -30°C to 70°C.

Help menus can diagnose the status of the control system, valve and actuator, which are displayed by display icons and help screens. This function infinitely shortens users' troubleshooting time and brings more convenience on using.

This manual is made to enable a user to install, operate, adjust and inspect Tefulong range actuators.

If the actuator has a nameplate with the sign of explosion-proof, the actuator is suitable for use in Zone 1 and Zone 2 explosive atmospheres only. It should not be installed in atmospheres where gases are present with an ignition temperature less than 135°C.

Under no circumstances should any modification or alteration be carried out on the actuator as this will invalidate the conditions under which its certification have been granted.

The actuator should be moved to a non-hazardous area for repair or maintaince. Only the trained persons can be allowed to install, maintain and repair the actuator. Work undertaken must be carried out in accordance

with outlines in the manual.

Warning:

Motor Temperature

With excessive use, the motor surface temperature could reach 132°C (270°F).

Motor Thermostat Bypass

If the actuator is configured to be motor thermostat bypass, when using the ESD function, the hazardous area certification will be invalidated.

Enclosure Materials

AVA01 to AVA06 enclosures are manufactured in aluminum alloy with stainless steel fasteners and the thrust bases are manufactured in cast iron. AVA07 to AVA10 enclosures are manufactured in aluminum alloy and cast iron with stainless steel fasteners and the thrust bases are manufactured in cast iron.

The user must ensure that the operating environment is good, and the hazard cannot lead to the protection afforded by the actuator. The user must suitably protect the actuator against its operating environment.

Actuator Storage

If your actuator cannot be installed immediately, store it in a dry place.

If the actuator has been installed, but cannot be cabled, it is recommended that the plastic transit cable entry plugs are replaced with metal plugs, which are sealed with PTFE tape.

2. Mounting the Tefulong Actuator

2.1 Mounting the Actuator with Drive Base

Normally, the Tefulong actuator is mounted on the valve with drive base. The drive base includes two kinds- thrust base and non-thrust base. Both of their key parts are drive bush which are directly mounted on the valve stem. The drive bush for thrust base has the type of trapezoidal screw threads, and for non-thrust base has the key, three jaws or square shaft. In general, before leaving the factory, the drive bush is either machined depending on the data from valve factory or machined by users (It should be removed before machining).

The flange standard of drive bases are under national standard. For multi-turn actuators, flanges are F07, F10, F14, F25, F30, F35, and F40; for quarter-turn actuators, flanges are F05, F07, F10, F12, and F14. However, the flange can be made depending on drawing on request.

The actuator can be mounted on the valve directly with the drive base (except unmachined) before leaving the factory.

a) Before the thrust actuator is mounted on the valve, enable the drive bush onto the threaded valve stem, then engage “hand” and wind the handwheel anticlockwise to engage the drive bush onto the stem. Continue winding until it closes to the valve flange. Wind two further turns, fit securing bolts and tighten fully.

b) When the non-thrust actuator is mounted on the valve, place the drive bush on the valve stem, fit securing bolts and tighten fully.

There is a hollow shaft in AVA range actuator which is for the rising stem valve. In order to ensure that moisture does not intrude the hollow shaft of the actuator, PTFE tape should be wound around the cover and fully tightened.

2.2 Mounting the Linear Actuator

Comparing Tefulong actuator installation of linear range to that of other range which is with drive bush. The common point is that both of them have the same actuator and a thrust base, but the different point is that the linear one has a transforming bracket and a screw, of which one end are trapezoidal screw threads, and the other end is hexagon column.

Assemble the actuator with a screw and a bracket, couple the bracket to the valve flange with fasteners, and couple the screw to valve stem with wafer nuts.

Note: The valve should be at its fully closed position when coupling.

2.3 Mounting the Actuator with Gearbox

Usually, a part-turn valve needs a 90° gearbox, and a large torque multi-turn valve needs a bevel gearbox or a spur gearbox.

Gearbox has a removable drive bush which is machined depending on the measure of the valve stem and connections.

Gearbox is always coupled to the damper with a rocker and spherical linkage.

2.4 Cable Connections and Wiring Diagram

Check that power supply voltage whether agrees with that stamped on the actuator nameplate.

The breaker or fuse for the actuator should be selected depending on the rated current of the motor.

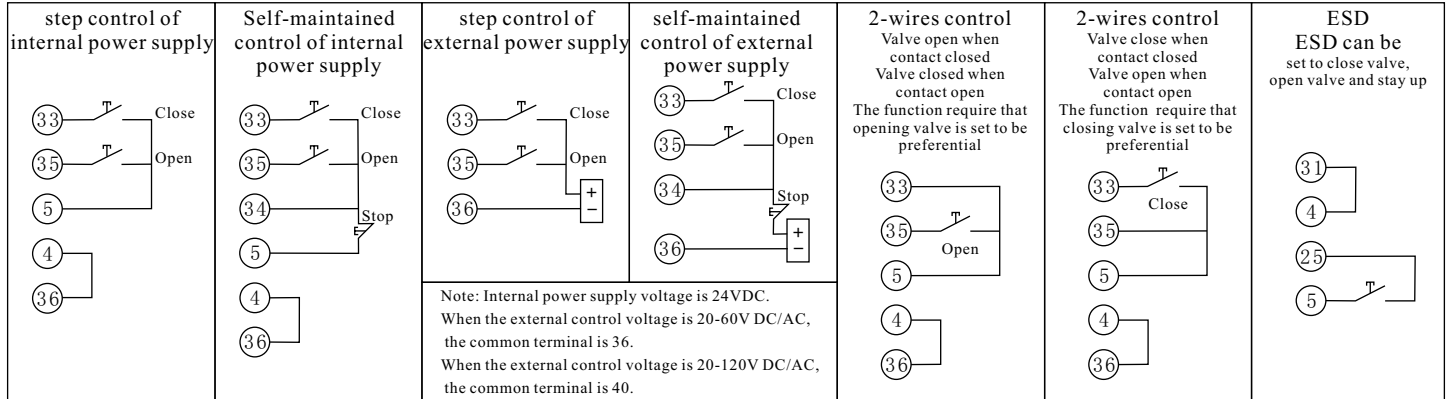
Earth/Ground Connections

A lug with a 6mm diameter hole is cast adjacent to the conduit entries for attachment of an external protective earthing strap by a nut and bolt. An internal earth terminal is also provided.

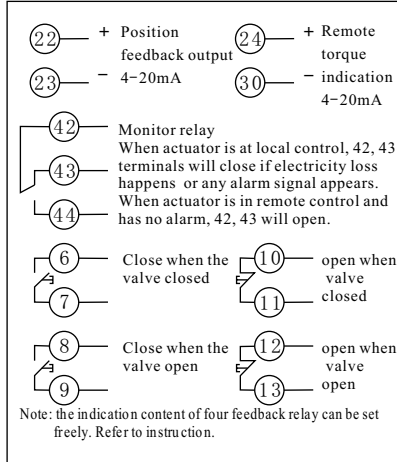
Cable Entry

In explosion-proof zone, explosion-proof cable joint should be used at the cable entry. Make the cable joint appropriate to the outer diameter of the cable. Ensure that cable glands or conduit are tight and fully waterproof. Seal unused cable entries with a steel or brass threaded plug.

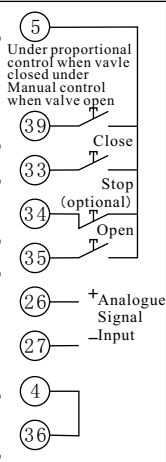
AVA/ AVAT Range Control Diagram



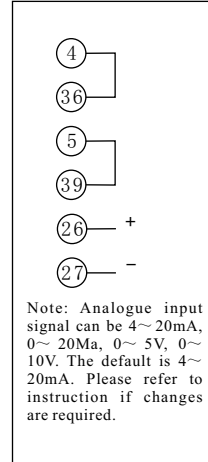
Feedback



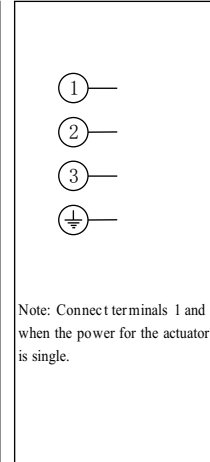
analogue proportional control and remote manual control



AVAM/AVATM Range Control Diagram



power



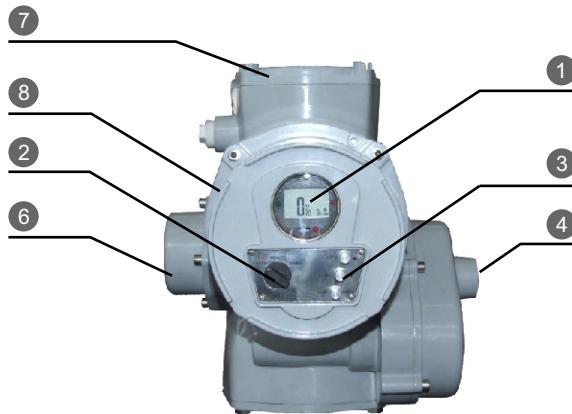
Replace the terminal cover after connections, insure good “O” ring seal and transverse plane, and hard tighten screws.

3.Operating Tefulong Actuator

3.1 Each Parts Names of the Actuator



- 1. Display Screen
- 2. Local Operating Button
- 3. Local, Remote, and Menu knob
- 4. Handwheel or Rocking handle(install when using)
- 5. Manual/ Electrical Switch Handle



- 6. Motor
- 7. Connection Terminal Cover
- 8. Electric Control Box
- 9. Protective Sleeve for Hollow Shaft

3.2 Manual Operation

Use a hand and depress the Hand/Auto lever into “Hand” status. Turn the handwheel to check whether it has engaged the clutch. When the valve value on the LCD changes while turning, the lever can now be released and it will automatically return to its original position. The handwheel will remain engaged until the actuator is operated electrically

If the lever can't be depressed into “hand” status for the first time, turn the handwheel by 30° and depress the lever again into “hand” status.

When the actuator is operated electrically, its “Hand” status will automatically switch to “electrical” status.

Notice: Please do not depress the lever when the actuator is operating electrically.

If required, the Hand/Auto lever can be locked in status using a padlock with a 6.5mm hasp.

3.3 Electrical Operation

When the actuator connections are finished, it should be checked that power supply voltage agrees with rated voltage stamped on the actuator nameplate before input electricity. It is not necessary to check phase rotation for Tefulong actuator.

If the actuator is mounted on the valve for the first time, the position limit should be carried out before electrical operation (refer to primary setting), so that its travel range can be made suitably.

It is strongly recommended that set position limit by manual. Fully open the valve by handwheel and set open limit position, then fully close the valve by handwheel and set closed limit position, at last set torque protection value and open-closed action (refer to primary setting)

Local Electrical Operation

There is a black knob on the actuator for Local, Remote and Menu. When it needs electrical operation, select “Local” and press Open or Close button at right side. The actuator will open or close accordingly. Pressing Stop, the actuator will stop.

Remote Control

Selecting Remote, the actuator will receive an order from the control room and take actions of opening, closing and stopping. Remote control can't be operated unless the external control cable is connected according to the wiring diagram from tefulong.

4.Function Commissioning for Tefulong Actuator

4.1 The Setting Tool

Specification

Enclosure: Ip67

Certification: EEx ia IIC
T4(intrinsically safe)

INT SAFE, Class I &II, DIV 1
GROUPS A B C D E F G

Power Supply: 9V Battery
(supplied)

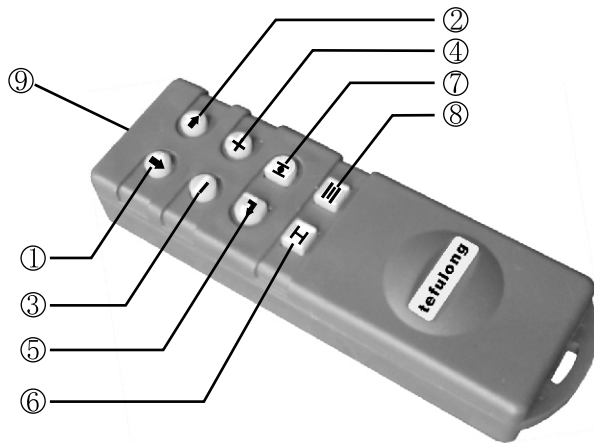
Operating Range: 0.75mm (should
be exactly in front of the display
window)



Key-press Instruction

1. Display next menu down
 2. Display next menu across
 3. Decrease/change displayed function's value or option setting
 4. Increase/change displayed function's value or option setting
 5. Enter/Stop
- #### Infra-red Local Operation
6. Stop actuator
 7. Open actuator
 8. Close actuator
 9. Infra-red transmission window

When a button is depressed, the Setting Tool transmits the relevant instruction to the actuator by infra-red, therefore, the Setting Tool must be in front of the display screen directly. Then the actuator will carry out relevant functions or actions. When the actuator receives the infra-red instruction, the red indicator lamp under LCD and a communication icon in the top right corner of LCD will flash.



Setting Tool Battery Replacement

Battery status can be checked conveniently by looking at whether the Setting Tool can transmit infra-red or not. A flashing red indicator should be seen while depressing

any Setting Tool button. To replace the battery remove the six hexagon sockets head cap screws in the back of the Setting Tool. Remove the back cover to expose the battery. Battery replacement must be carried out in a safe area.

4.2 LCD of the Actuator

4.2.1 The Components of Display:

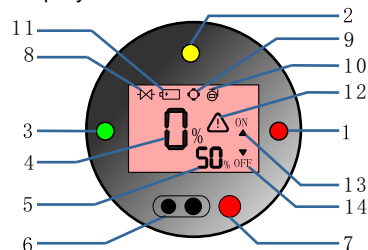


Fig. 4.2.1

1. Red fully open indicator lamp
2. Yellow Mid travel indicator lamp
3. Green fully closed indicator lamp
4. opening range of valve position
5. Torque value
6. Infrared communicator
7. Communication indicator lamp
8. Valve alarm
9. Control alarm
10. Actuator alarm
11. Battery alarm

12. Alarm indication (It appears having any of the alarm conditions)

13. Upward arrowhead means opening, and “ON” means fully open

14. Downward arrowhead means closing and “OFF” means fully closed.

On power up the actuator's liquid crystal display screen is back-lit with a “soft amber” light and one of the position indicator lamps will be on. The display screen will show opening range of valve position, torque value of the actuator, and others. With the power supply cut off, the liquid crystal display keeps displaying by a back-up battery. The screen back light and position indicator lamps will be cut off for saving electricity.

Fully Open

When the valve is fully open, the display screen will show 100% valve position, upward arrowhead, and “ON” with a lighted red indicator lamp.

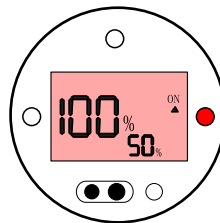


Fig. 4.2.2

Fully Close

When the valve is fully closed, the display screen will show 0% valve position, downward arrowhead, and “OFF” with a lighted green indicator lamp.

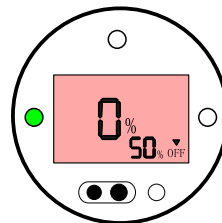


Fig. 4.2.3

4.2.2 Display- Alarm Display

The top portion of the display incorporates valve, control, actuator, and battery alarm indications. Each icon represents certain alarm conditions. Help Menu are also available to assist in determining the actuator operational and alarm status.

⊗ Valve Alarm

When the valve alarm appears and the configured torque value being developed, it will cause the actuator to trip off.

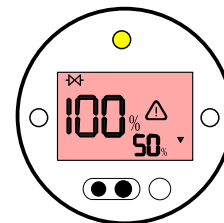


Fig. 4.2.4

The possible causes are:

- Valve blocked.
- Valve process conditions changed (increase in pressure, flow etc.)

The valve status now should be inspected. It can't be operated electrically until the valve problem is surely resolved.

Once the actuator has tripped off on torque, electrical operation in the same direction is inhibited. The icon will remain displayed until movement in the opposite direction takes place.

The valve alarm icon will not be displayed when the actuator move the end of travel, which is preset.

Control Alarm

It displays when the remote control system maintains an active ESD or interlock signal (the interlock function or conditional control having been enabled.) Local and Remote operation will be inhibited at this time. (Refer to Advanced setting [A1] ESD, [A8] External

Interlocks and [A9] Conditional Control) Please confirm the remote control method of the actuator.

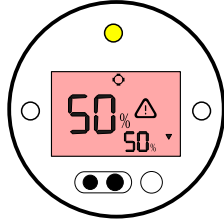


Fig. 4. 2. 5

Actuator Alarm

The actuator alarm icon is displayed when CPU detects a problem from the inner or outer actuator. Electrical operation will be inhibited while it alarms (except 24V alarm).

The possible causes are:

- Transformer thermostat tripped
- 24V internal power supply alarm
- Power supply fault
- Torque inspection system alarm

Please refer to help menu to identify the specific causes of the alarm.

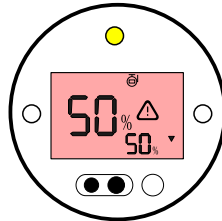


Fig. 4. 2. 6

Battery Alarm

The battery alarm icon is displayed when CPU detects its battery as being low, discharged.

When the secondary setting [OS] menu is set "on", both the battery and actuator alarm icons will be displayed. When the battery is low, the function [OS] is inhibited to operate.

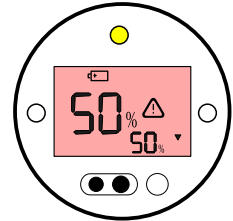


Fig. 4. 2. 7

When the battery alarm icon is displayed, the battery should be replaced immediately.

Most of the AVA range batteries are located on the connections terminal cover, which are tightened by a steel cover and opened by an internal hexagonal wrench. For some of the AVA range and AVAT range, the battery is installed in the electric control box, so it is necessary to open the control box when replacing the battery.

Battery replacement must be carried out in a safe area, or make sure there is no explosive gas or moist air nearby.

4.3 Instruction of the Setting Procedure

Tefulong adopts non-intrusive design for the operation and setting of the actuator. The user can use the setting tool to set torque, position limit and other functions without opening electric control box, which ensures the security of the internal electronic and electric device. The setting tool is certified Intrinsically

safe to allow use in explosion-proof areas.

All the actuator's setting values are stored in its EEPROM memory in the actuator, so the data will not lose even if power losing. Users can look over the actuator's functions and setting values with setting tool. The setting value can be changed under requirements.

When setting, press downward key of the setting tool to enter the next menu, press rightward key to enter right side menu(refer to Picture 4.3.1); press +or - key to change spare optional value and then press"enter"key to confirm. When the setting is effective, the crossband in the top of the screen will flash.

The menu of the setting procedure is circular, namely, as long as press downward or rightward key all the time, it'll return to its original menu.

The setting procedure has two steps: primary setting and advanced setting. There is an additional help

menu for users to diagnose all kinds of failures.

Entering Setting Procedure

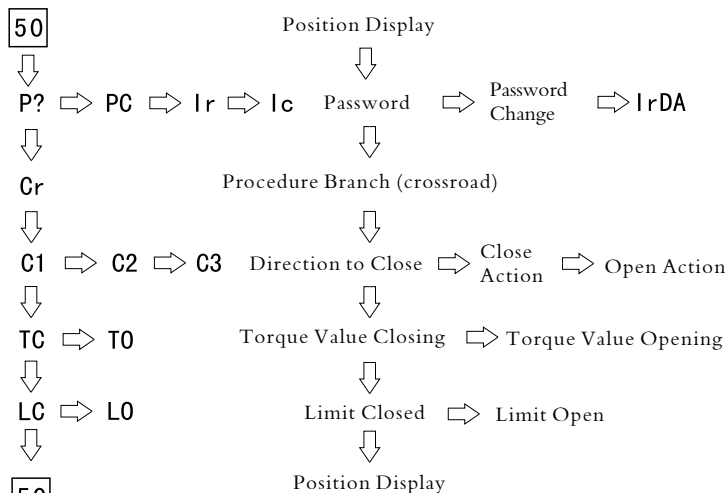


Fig. 4. 3. 1

Turn the knob (local/ remote/ menu) to local or remote, put the setting directly in front of the actuator's screen and press downward key, and then the password protection menu will be displayed (refer to picture 4.3.2). For changing the set value, Tefulong actuator must be entered correct password. The factory's default password is 33. If the password is not changed, press **enter** key directly, and password 33 will flash. Meanwhile, a crossband will appears in the top of the screen (refer to picture 4.3.4). Now you can enter the next menu and operate. If there is no crossband, it can only be looked through all the function options and can't be changed the set value.

Tefulong actuator's Password can be scrolled through from 00-99. Use + or - key to lookup set password, and press "enter" key.

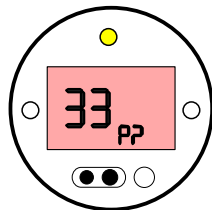


Fig. 4. 3. 2

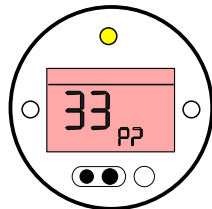


Fig. 4. 3. 3

Changing Password

After finishing password confirmation (refer to picture 4.3.3), press rightward key to enter password changing menu (refer to picture 4.3.4), find a password you want by using + or - key, and press "enter" key. Likewise, the figure you selected will flash, which means new password has been effective. If you want to enter menu setting next time, you should use new password. Users must make a record after new password setting to avoid troubles when using.

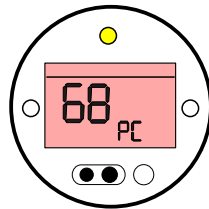


Fig. 4. 3. 4

4.4 Primary Setting

Primary setting is mainly for valve opening actions, valve opening direction, torque protection value, position limit and so on.

When the actuator has been installed on the valve and electrified correct power supply, position limit setting is the most important thing. Usually, it can be operated electrically as long as the actuator has had position limit. "usually" here means that valve opening direction is clockwise, and the actuator matching is correct.

After entering the procedure and input a correct password, press enter key. (See 4.3 Entering setting procedure)

Press downward key to enter the next menu [Cr] which is a procedure branch. Press rightward key to enter advanced setting. If you press downward key, it will enter [C1]. (Refer to picture 4.4.1)

4.4.1 Direction of Valve Opening and Actions of Valve Opening & Closing

Valve Closing Direction [C1]

This function is for adjusting valve opening direction. According to industry custom, the clockwise usually is the closing direction.

Valve closing direction has option [A] and option [C]. Option [A] is anti-clockwise closing, and option [C] is clockwise closing.

Select correct valve closing direction with + or - key, and press "enter" key. (refer to picture 4.4.1 and 4.4.2, default is [C])

Valve Closing Action [C2]

The actuator's optional valve closing action has [CL] (close on limit) and [Ct] (close on torque), It is suggested to close on limit, which is default.

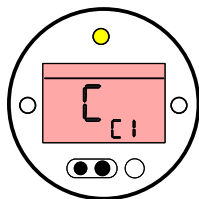
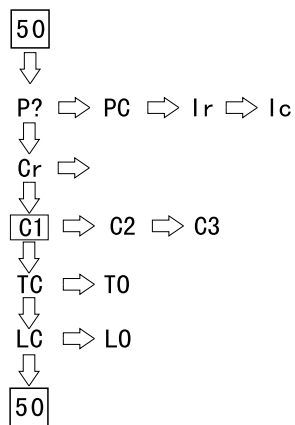


Fig. 4.4.1

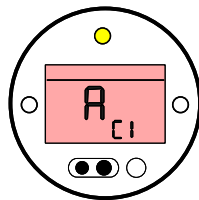


Fig. 4.4.2

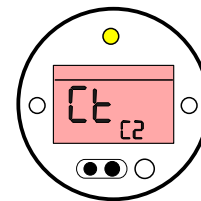
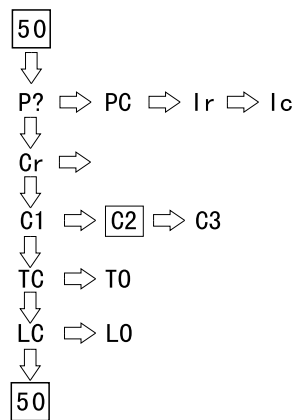


Fig. 4.4.3

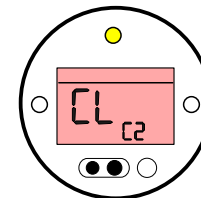


Fig. 4.4.4

Select correct valve closing action with + or - key, and press “enter” key. (refer to picture 4.4.3 and 4.4.4)

Close on limit is an action that utilizes the elements of Hall Sensor, and stocks the whole travel data of the valve into the memorizer. When it is selected close on limit, the actuator will monitor the valve data ever and again while working. When it is in the end of the valve, the actuator will stop automatically.

Close on torque is an action to utilize torque sensor of the actuator. When the valve torque exceeds the set torque value of the actuator, the actuator will trip off automatically. When it is close on torque, the torque value should not exceed 80%. See next point for details, which is torque value of valve closing and opening.

Valve Opening Method [C3]

The actuator's optional valve open action has [OL] (open on limit) and [Ot] (open on torque). It is suggested to open on limit, which is default.

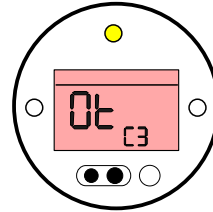
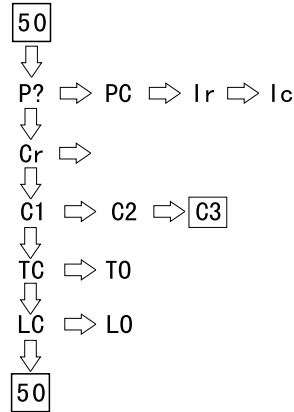


Fig. 4. 4. 5

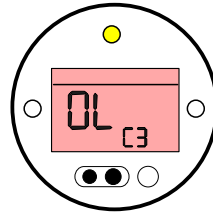


Fig. 4. 4. 6

Opening on limit is an action to utilize the elements of hall sensor, and stocks the whole travel data of the valve into the memorizer. When it is selected to open on limit, the actuator will monitor the valve data ever and again while working. When it is in the end of the valve, the actuator will stop automatically.

Opening on torque is an action to utilize torque sensor of the actuator. When the valve torque exceeds the set torque value of the actuator, the actuator will trip off automatically. When it is selected to open on torque, the torque value should not exceed 80%. See next point for details, which is torque value of valve closing and opening.

Select correct valve opening action with + or - key, and press “enter” key. (refer to picture 4.4.5 and 4.4.6)

4.4.2 Torque setting of the Valve Opening and Closing

Torque Value Closing [tC]

Tefulong actuator utilizes torque sensor to make real-time measure for the torque value in the on/off procedure. When the measured torque value is larger than the set value, the actuator will trip off immediately, and appear a torque alarm (refer to 4.2.4). It is generally used for the protection action.

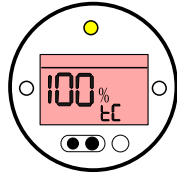
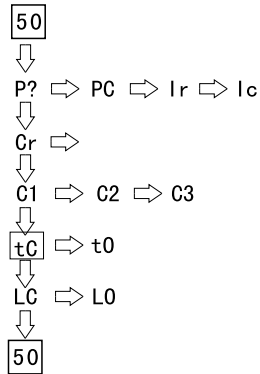


Fig. 4.4.7

Options for torque value closing are 40%-100%, and in 1% increments. The value is equal to the percent multiplied by rating torque. Select appropriate value with + or - key, and press "enter" key. (refer to picture 4.4.7)



Torque Value Opening [tO]

Tefulong actuator utilizes torque sensor to make real-time measure for the torque value in the on/off procedure. When the measured torque value is larger than the set value, the actuator will trip off immediately, and appear a torque alarm (refer to 4.2.4). It is generally used for the protection action.

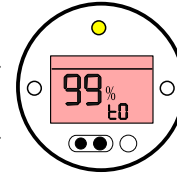


Fig. 4.4.8

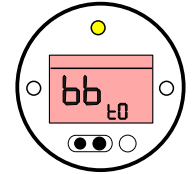
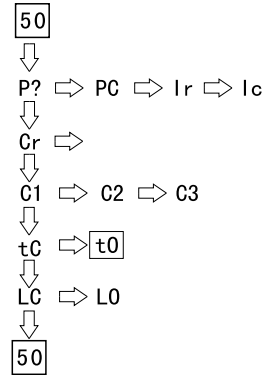


Fig. 4.4.9

Options for torque value opening are 40%-100%, and in 1% increments. The value is equal to the percent multiplied by rating torque. Select appropriate value with + or - key, and press "enter" key. (refer to picture 4.4.8)

Within a small range of valve opening (valve position is 0%-5%), intensified torque [bb] can be Selected. Intensified torque is 1.4 times of the rating torque.(refer to picture 4.4.9)



4.4.3 Setting the Function of Frequency Conversion

For Tefulong actuator, only frequency conversion range has this kind of function setting. The actuator works in the way of two segments speed. Namely, start at low speed of invariableness, run at high speed and then stop at low speed.

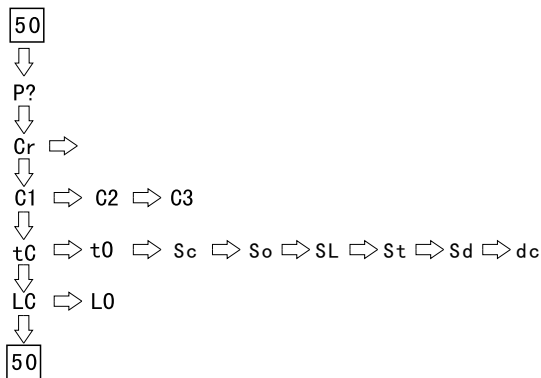


Fig. 4. 4. 10

Setting Valve Closing Speed [SC]

Frequency conversion range can be set eight different kinds of valve close speed in the direction of valve closing. There are 0-7 grades for selecting. Grade 0 is the lowest speed, and grade 7 is the highest speed. Corresponding rotate speed of the number relates to the detailed model. Select appropriate speed value with + or - key, and press “enter” key. (refer to picture 4.4.11)

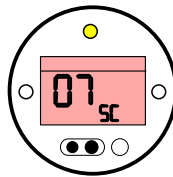


Fig. 4. 4. 11

Setting Valve Opening Speed [SO]

Frequency conversion range can be set eight different kinds of valve open speed in the direction of valve closing. There are 0-7 grades for selecting. Grade 0 is the lowest speed, and grade 7 is the highest speed. Corresponding rotate speed of the number relates to the detailed model. Select appropriate speed value with + or - key, and press “enter” key. (refer to picture 4.4.12)

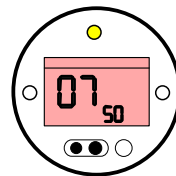


Fig. 4. 4. 12

Setting the Running Range at Low Speed for the Actuator [SL]

Within the setting range, the actuator will run at a very low speed. For example, 5% shows that, within the range of 0%-5% and 95%-100%, it will run at low speed. Select appropriate range value with + or - key, and press “enter” key. (refer to picture 4.4.13)

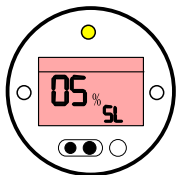


Fig. 4. 4. 13

Setting the Rising Time of the Motor [St]

The setting range is 0-10 second(s), that is, the time for the motor reaching the fastest running speed from the bottom. This option affects control precision and the length of the time for putting through the motor. Select appropriate rising time with + or - key, and press “enter” key. (refer to picture 4.4.14)

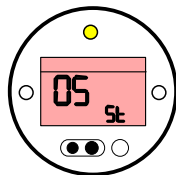


Fig. 4. 4. 14

Setting Speed for Emergency [Sd]

Valve opening and closing speed under an emergency can be set. There are 0-7 grades for selecting. Grade 0 is the lowest speed, and grade 7 is the highest speed. Select appropriate value with + or - key, and press “enter” key. (refer to picture 4.4.15)

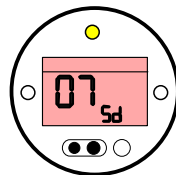


Fig. 4. 4. 15

DC Brake Value [dC]

DC brake value of current has 0-7 grades for selecting. Grade 0 is non-brake, and grade 7 is the largest current brake. This option affects temperature rising of the motor and control precision. Select appropriate value with + or - key, and press “enter” key. (refer to picture 4.4.16)

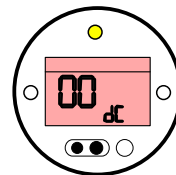


Fig. 4. 4. 16

4.4.4 Position Limit

Setting Limit Closed [LC]

Before setting limit closed, tighten the valve manually first, keep pressing the setting tool downwards until enter menu [LC] (refer to picture 4.4.17), and press enter key. Meanwhile, keep pressing, and the original value of the valve position will be changed to 0%.

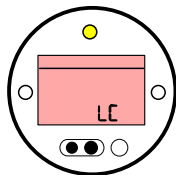


Fig. 4.4.17

Setting Limit Open [LO]

Before setting limit open, open the valve manually, and leave a certain room. Keep pressing the setting tool downwards until enter menu [LC], press rightwards to enter right menu [LC] (refer to picture 4.4.18), and press enter key. Meanwhile, there is a flashing of red indicator lump on the right of screen, and the original value of the valve position will be changed to 100%.

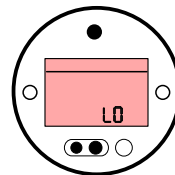
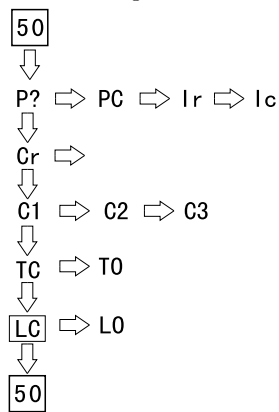
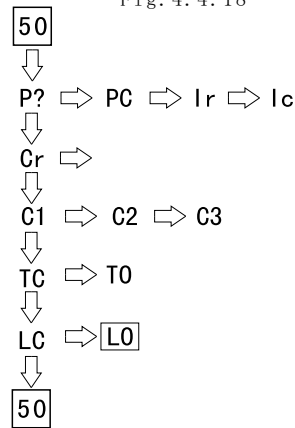


Fig. 4.4.18

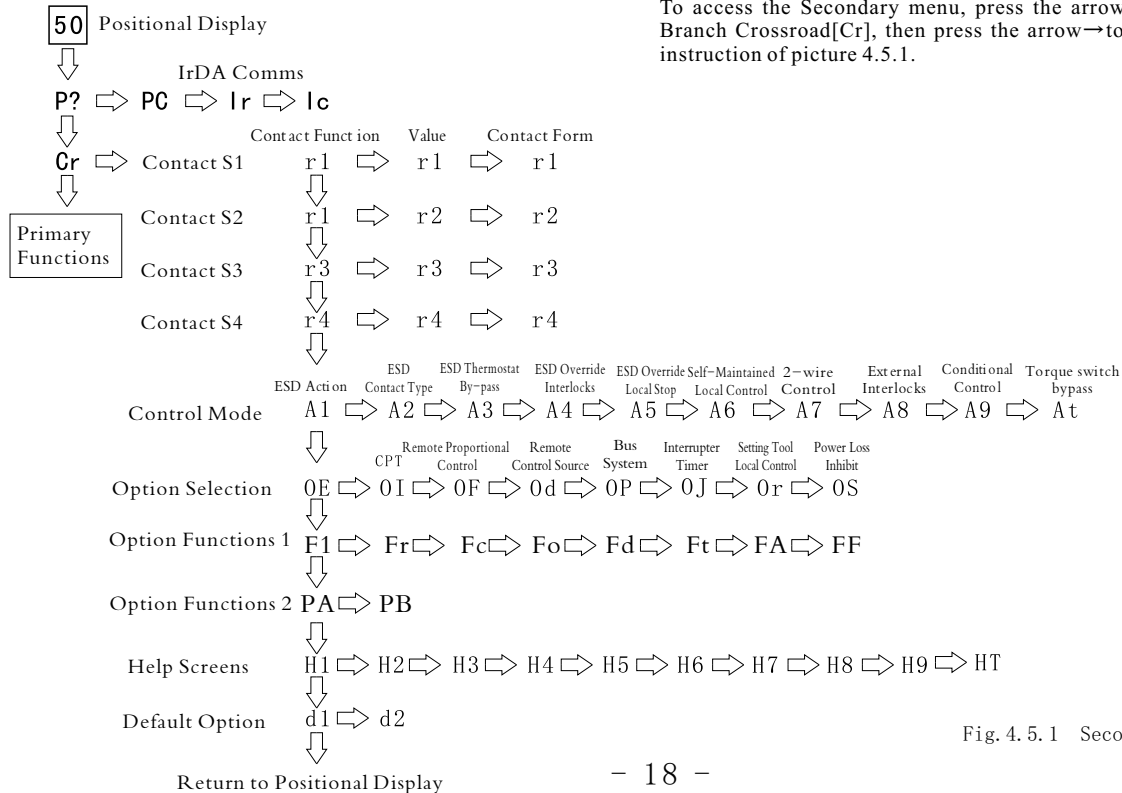


When the actuator has been installed on the valve, limit must be set prior to electrical operation. Limit setting is one of the most important commissioning works. The purpose of it is to store the set data of valve travel range into memorizer.

4.5 Advanced Setting

Settings cover the control, indication and optional device functions

Tefulong actuator is set in a default before dispatch unless alternatives have been specified with the order. Should difficulty be encountered during commissioning, the default can be found (refer to secondary setting 4.5.7) and site commissioning can then begin again.



To access the Secondary menu, press the arrow → key to find Procedure Branch Crossroad[Cr], then press the arrow→to find [r1] according to the instruction of picture 4.5.1.

Fig. 4.5.1 Secondary Functions

4.5.1 Indication Contacts [r1], [r2], [r3] and [r4]

Indication Contacts [r1], [r2], [r3] and [r4] are four relays indicating all kinds of functions. Each of them can be set one of the following functions:

[CL] closed end position

[OP] open end position

[Po] intermediate position

[TC] torque trip close

[TO] torque trip open

[TT] torque trip any position

[TI] torque trip mid travel

[DC] actuator closing

[DO] actuator opening

[D?] actuator rotating

[St] motor stalled

[BA] battery low

[HA] hand operation

[BL] blinker

[LS] local stop

[OI] open interlock

[CI] close interlock

[IL] interlock active

[ES] ESD signal

[LP] lost phase

[Lo] local selected

[RE] remote selected

[AA] actuator alarm *

[24] 24V power failure

[RR] motor running

[UA] Valve alarm *

[Ht] thermostat tripped

[CA] control alarm *

[RP] relay parity

Each relay contact form can be set normally open [NO] or normally closed [NC]. The procedures for setting up contacts [r2], [r3] and [r4] are the same as those shown for [r1].

Unless specified with order, the default settings for indication contacts are as follows:

r1 - [CL] closed, [no] contact normally open

r2 - [OP] open, [no] contact normally open

r3 - [CL] closed, [nc] contact normally closed

r4 - [OP] open, [nc] contact normally closed

Select correct indication functions with + or - key, and press "enter" key. Refer picture 4.5.2 and 4.5.4.

When the R contact function is set to [Po], the required intermediate position value must be set. No other functions require the value to be set. The valve can be set from 1% open to 99% open in 1% increments. See picture 4.5.3

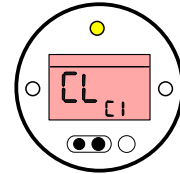


Fig. 4.5.2

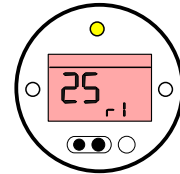


Fig. 4.5.3

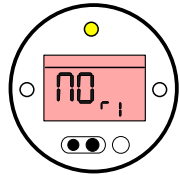


Fig. 4.5.4

4.5.2 Setting Control Mode

The control mode is used to set functions of actuator under conditions of emergency shut down, local control, remote control interlocks etc.

There are 10 control functions:

A1 ESD action (ESD)

A2 ESD contact type

A3 ESD thermostat bypass

A4 ESD override interlock control

A5 ESD override local control

A6 Maintained local control

A7 2-wire remote control

A8 External interlocks

A9 Conditional control

At Torque switch bypass

ESD Direction [A1]

ESD is a function when emergency appears. It can be set as follow:

[CL] Close on ESD,

[SP] Stay put on ESD

[OP] Open on ESD

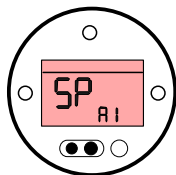


Fig. 4.5.5

ESD needs a support from the remote control wire. For the connection method, it refers to Tefulong wiring diagram. When ESD contact type [A2] is set to normally open [no], one of remote high-level signal will enable the actuator to work in [A1] set direction. When ESD contact type [A2] is set to normally closed [nc], one of remote low-level signal will enable the actuator to work in [A1] set direction. Select correct indication functions with +or - key, and press “enter” key. Refer to picture 4.5.5. The default setting is Stay Put

ESD Contact Form [A2]

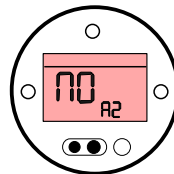


Fig. 4.5.6

There are two types: [nc] and [no]. The default setting value is [no], namely the contact is normally open.

When the contact is normally open, the actuator responds to remote high-level ESD signal.

When the contact is normally closed, the actuator responds to remote low-level ESD signal.

Select correct indication functions with +or - key, and press “enter” key. Refer to picture 4.5.6. The default setting is [no].

ESD Thermostat Bypass [A3]

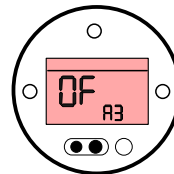


Fig. 4.5.7

The function is set when ESD signal appears, whether the actuator can be thermostat bypass. Namely, when there is temperature alarm, whether ESD signal can override temperature alarm and enable the actuator to take actions.

The function has two options:[OF], ESD can't override thermostat bypass

[ON], ESD override thermostat bypass

Select correct indication functions with +or - key, and press “enter” key. Refer to picture 4.5.7. The default setting is [OF].

Warning: actuator explosion-proof certification is invalidated while the thermostats are bypassed.

ESD Override Interlocks [A4]

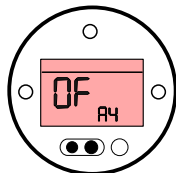


Fig. 4.5.8

The function is set when ESD signal appears, whether the actuator can override interlocks to have an action. (When the interlocks is not set, this function is no need to be set.)

The function has two options:

[OF], ESD can't override interlocks

[ON], ESD override interlocks

Select correct indication functions with +or - key, and press “enter” key. Refer to picture 4.5.8. The default setting is [OF].

ESD Override Local Stop [A5]

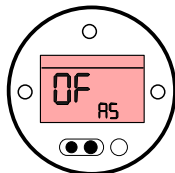


Fig. 4.5.9

The function is set when ESD signal appears, whether the actuator can override local/remote knob to have an action.

The function has two options:

[OF], ESD can't override local stop

[ON], ESD override local stop

Select correct indication functions with +or - key, and press “enter” key. Refer to picture 4.5.9. The default setting is [OF].

Maintained Local Control [A6]

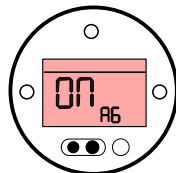


Fig. 4.5.10

Maintained control is needed when operating the local knob of the actuator, namely, set this function when the actuator is in electric control.

The function has two options:

[OF], local pointing control

[ON], maintained local control

Select correct indication functions with +or - key, and press “enter” key. Refer to picture 4.5.10. The default setting is [ON].

2-Wire Remote Control [A7]

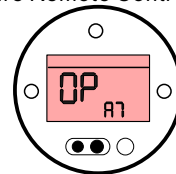


Fig. 4.5.11

The method of 2-wire control is adopting 2 wires when the actuator in remote control. One is connected with common end, the other one is connected with valve open (or valve closed). Valve closed (valve open) shortly connects with control source end. So the actuator is normally closed (normally open) without inputting control signal, while the actuator carries out the priority and advanced order. Refer to wiring diagram.

There are three options:

[OP] Open priority

[SP] Stay put

[CL] Close priority

Select correct indication functions with +or - key, and press “enter” key. Refer to picture 4.5.11. The default setting is [OP].

External Interlocks [A8]

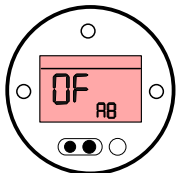


Fig. 4. 5. 12

This function is set open/closed for external interlocks of the actuator.

[OF] disuse external interlocks

[on] use external interlocks

Select correct indication functions with +or - key, and press “enter” key. Refer to picture 4.5.12. The default setting is [OF].

Note: If interlocking is only needed in one direction, it will be necessary to connect a link with short connected wire between the actuator terminals associated with the other direction.

External Conditional Control [A9]

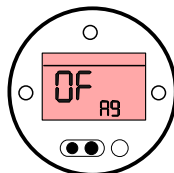


Fig. 4. 5. 13

Where a high level of safety integrity is required, Conditional Control can be set. In this mode two discreet signals are required for remote operation. Remote control will be conditional on both a control signal (open or close) and the appropriate interlock signal being applied simultaneously. Failures or a spurious signal will not cause operation.

Interlocks [A8] must be [ON]. Interlock signals are not required for local control.

[OF] disuse external conditional control

[on] use external conditional control

Select correct indication functions with +or - key, and press “enter” key. Refer to picture 4.5.13. The default setting is [OF].

Torque Switch Bypass [A9]

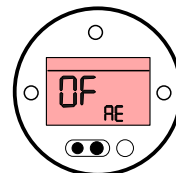


Fig. 4. 5. 14

[OF] not bypassing

[on] bypassing

If it is set [ON], the torque switch will be bypassed from position 0% to 5% when opening and from position 100% to 95% when closing. Bypassing the torque switch makes torque in excess of rated and up to actuator locked torque for opening a “sticky” valve. Outside these positions, torque setting will revert to torque set value [tC] and [tO]. Refer to primary setting.

Select correct indication functions with +or - key, and press “enter” key. Refer to picture 4.5.14. The default setting is [OF].

4.5.3 Option Selection

Extra Contact [OE]

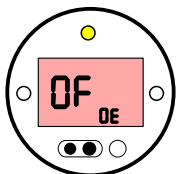


Fig. 4.5.15

If customers need extra indication contacts, Tefulong actuator can provide Option [OE] is set for turning on this function.

There are two options:

[ON] turning on extra contacts

[OF] not turning on extra contacts

The setting method of extra contacts r5, r6, r7, r8 are identical to that of r1, r2, r3.

Select correct indication functions with +or - key, and press “enter” key. Refer to picture 4.5.15. The default setting is [oF].

Position Transmitter Option [OI]

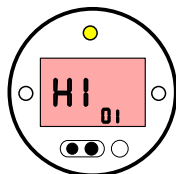


Fig. 4.5.16

The actuator has the function of position transmitter function on the range of modulating, frequency conversion and part on-off. 4-20mA current can be output to indicate position open range.

There are two options:

[HI] 20mA current corresponds to valve fully open

[LO] 20mA current corresponds to valve fully closed

Select correct indication functions with +or - key, and press “enter” key. Refer to picture 4.5.16. The default setting is [HI].

Remote Proportional Control [OF]

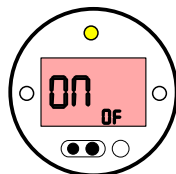


Fig. 4.5.17

Remote proportional control is a switch, which is used to control actuator, with analogue signal (usually 4-20MA)

Only the modulating actuator has this function. Moreover, only when proportional control [bO] (generally 4-20mA control) is selected and used from the menu of remote control [Od], this option will be effective.

[OF] not turning on remote proportional control

[on] turning on remote proportional control

Select correct indication functions with +or - key, and press “enter” key. Refer to picture 4.5.17. The default setting is [OF].

Remote Control Source [Od]

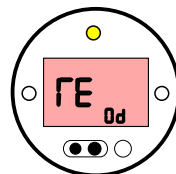


Fig. 4.5.18

The setting for remote control source depends on the option specified and fitted. If it is installed Modbus, [rE] function should be selected.

[rE] Standard hardwired remote control or optional Modbus

[bO] Optional remote proportional control

[OP] Optional Pakscan, Profibus or Foundation

[OF] All remote control ineffective (Actuator available for local control only)

Select correct indication functions with +or - key, and press “enter” key. Refer to picture 4.5.18. The default setting is [OF].

Bus System(Optional) [OP]

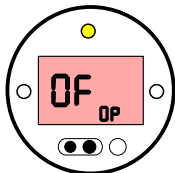


Fig. 4.5.19

This function is not provided for the moment.

Interrupter Timer [OJ]

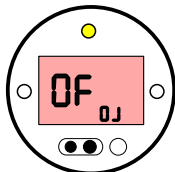


Fig. 4.5.20

This function is not provided for the moment.

Setting Tool Control [OR]

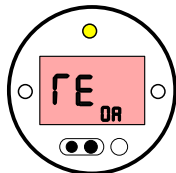


Fig. 4.5.21

This function sets the setting tool whether it can be used to local open and closed.

[on] setting tool local open/closed enabled (it is available when local/remote/menu knob is turned to local)

[oF] setting tool local open/closed disabled

[rE] Actuator is set remote operation in the software (it is especially useful when local/stop/remote knob is removed on purpose)

Select correct indication functions with +or - key, and press "enter" key. Refer to picture 4.5.21. The default setting is [OF].

Prohibit Operation with Battery Invalidation [OS]

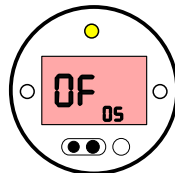


Fig. 4.5.22

If the handwheel has been operated when power loss, low battery and no display appear, the valve position data will be incorrect. At this moment, although the main power reverts, the actuator will not be allowed to operate unless old batteries are replaced.

If disuse this function, the important thing is not to operate the actuator manually during power loss and low battery. At this moment, manual/auto switch lever can be locked at auto to prevent manual operation.

[On] Prohibit operation after power loss

[OF] Allow Operation after Power Loss

Select correct indication functions with +or - key, and press "enter" key. Refer to picture 4.5.22. The default setting is [OF].

4.5.4 Control Selection of Remote Proportion

Remote proportional control uses analogue electrical signal (generally 4-20mA) to control open/closed of the actuator.

Only the modulating actuator has this function. Moreover, only when proportional control [oF] is set [on], the menu will appear.

Point Signal Type [FI]

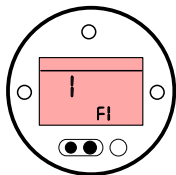


Fig. 4. 5. 23

Analogue control signal has current type and voltage type

[I] current signal control

[U] voltage signal control

Select correct indication functions with +or - key, and press “enter” key. Refer to picture 4.5.23. The default setting is [I].

Point Signal Range [Fr]

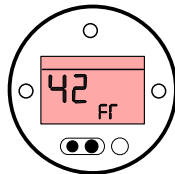


Fig. 4. 5. 24

When [FI] is selected as current control:

[01] 0-10mA analogue control

[02] 0-20mA analogue control

[42] 4-20mA analogue control

When [FI] is selected as voltage control

[05] 0-5V voltage analogue control

[10] 0-10V voltage analogue control

Select correct indication functions with +or - key, and press “enter” key. Refer to picture 4.5.24. The default setting is [42].

Time for Closing Direction Stop in Advance [FC]

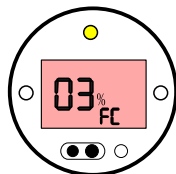


Fig. 4. 5. 25

If the actuator appears overshoot when it is in remote operation and needed to stop exactly in a certain place, namely, the actuator overrides the set position a little. Fc is a time unit for closing direction stop. overshoot will be inhibited by adjusting Fc parameter

There are five parameters:

[00] not stopping in advance

[01] stopping one time unit in advance

[02] stopping two time units in advance

[03] stopping three time units in advance

[04] stopping four time units in advance

[05] stopping five time units in advance

Select correct indication functions with +or - key, and press “enter” key. Refer to picture 4.5.25. The default setting is [00].

Time for Opening Direction Stop in Advance [FO]

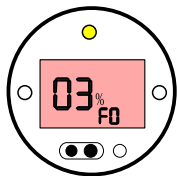


Fig. 4.5.26

If the actuator appears overshoot when it is in remote operation and needed to stop exactly in a certain place, namely, the actuator overrides the set position a little. Fo is a time unit for opening direction stop. overshooting will be inhibited by adjusting Fc parameter

There are five parameters:

[00] not stopping in advance

[01] stopping one time unit in advance

[02] stopping two time units in advance

[03] stopping three time units in advance

[04] stopping four time units in advance

[05] stopping five time units in advance

Select correct indication functions with +or - key, and press "enter" key. Refer to picture 4.5.26. The default setting is [00].

Deadband set [Fd]

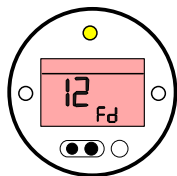


Fig. 4.5.27

If the modulating actuator can't stop at a certain place, namely, hunts or responds to certain unnecessary

signal at a certain place, the deadband parameter should be increased. If more accurate control is needed, the deadband should be decreased. Range 00-100 corresponds to 0%-10% of control point signal.

Note: Maximum deadband is 10% of valve stroke. The deadband should normally not be less than 1%.

Maximum deadband is 10% of valve stroke. The deadband should normally not be less than 1%.

Select correct indication functions with +or - key, and press "enter" key. Refer to picture 4.5.27. The default setting is [12], namely, the deadband set is 1.2% of valve stroke.

Inhibit Time [Ft]

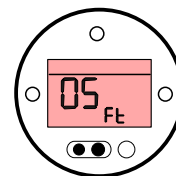


Fig. 4.5.28

In order to prevent the actuator from working frequently within much short time or for rapidly fluctuating signal, it appears an appropriate delay to prevent unnecessary movement. Inhibit time is interval time both of two actions. The parameter is set to adjust interval time both of two actions. Second is the unit, and range of it is 00-99 seconds. It generally suggested that the setting of inhibit time should not less than three seconds.

Select correct indication functions with +or - keys , and press "enter" key. Refer to picture 4.5.28. The default setting is [05].

Response on Loss of Point Signal [FA]

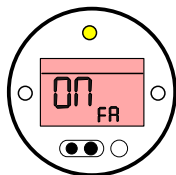


Fig. 4. 5. 29

This function is to set the actuator to respond or not when point signal loss happens. It is effective when the control signal is not zero, for instance 4-20Ma.

[On] Respond but the actuator running direction is determined by [FF]

[OF] No response

Select correct indication functions by using +or - keys , and then press “enter” key. See picture 4.5.29. The default setting is [OF].

Failsafe Action [FF]

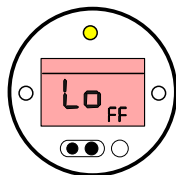


Fig. 4. 5. 30

It is necessary to set failsafe action here when point signal enable to [ON].

[LO] move valve to position corresponding to minimum point signal

[SP] stay put on loss of point signal

[HI] move valve to position corresponding to maximum point signal

Select correct indication functions with +or key, and press “enter” key. Refer to picture 4.5.30. The default setting is [SP].

4.5.5 Bus Setting

Bus control of Tefulong actuator is not standard configuration. The actuator installed bus module has this function. The bus in common use has modbus, profibus, foundation and can.

Bus Address [PA]

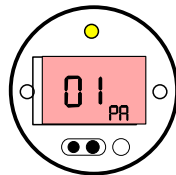


Fig. 4. 5. 31

This is for setting each actuator's physical address. Each actuator in the same station should be allocated a unique address. Address number is from 01-199.

Select correct indication functions with +or - keys , and press “enter” key. Refer to picture 4.5.31. The default setting is [01].

Communications Baud Rate [PB]

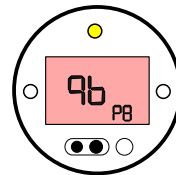


Fig. 4. 5. 32

The appropriate communications speed should be set when bus control.

Tefulong actuator communications speeds have:

- [03]=300 baud
- [06]=600 baud
- [12]=1200 baud
- [24]=2400 baud
- [48]=4.8K baud
- [96]=9.6K baud
- [19]=19.2K baud
- [38]=38.4 baud

Select correct address with +or - keys , and press “enter” key. Refer to picture 4.5.32. The default setting is [96].

4.5.6 Help Menu

Tefulong actuator has self-diagnosis function. Users can use help menu for quick troubleshooting.

Help screens instruction:

H1 Factors affecting electrical operation

H2 inspecting battery level and ESD input

H3 inspecting position limit and power supply status

H4 inspecting remote control input

H5 inspecting remote interlocks, local control input and motor thermostats

H6 inspecting torque switch status and infrared setting tool communication

H7 inspecting stroke limit and remote indication input

H8 inspecting position devices

H9 Tefulong use only

Ht software version no.

U inspecting date of control analogue

Factors Affecting Electrical Operation [H1]

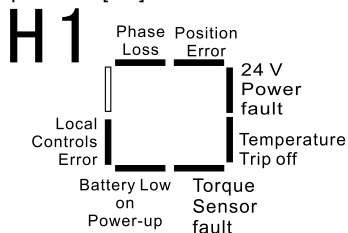


Fig. 4. 5. 33

POSITION ERROR

Bar ON = Current position error. During power up the actuator position processor compares the current position to that stored in the Eeprom. If there is a discrepancy this is shown as a current position error. Re-setting of both actuator limits should now be carried out.

24V POWER SUPPLY ALARM

Bar ON = internal 24V power supply malfunction. If the actuator don't inspect internal 24V power supply when having main power

supply, this alarm will appears, and the actuator alarm will appears in the screen at the same time. Note: internal 24V power supply is for remote control.

TEMPERATURE ALARM

Bar ON = temperature sensor tripped. When the motor temperature sensor tripped caused by overheated, this alarm will appears and the actuator alarm will appears in the screen at the same time.

TORQUE ALARM

Bar ON = torque sensor tripped or malfunction. When the actuator torque on the travel exceeds that of set, or the torque inspecting system appears malfunction, this alarm will appears and the actuator alarm will appears in the screen at the same time.

LOW BATTERY ON POWER UP

Bar ON = low battery inspected. If [OS] is selected [ON], the actuator electrical operation will be prohibited when powered up again.

Inspecting Battery Level and ESD Input [H2]

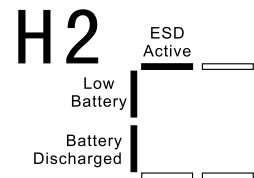


Fig. 4. 5. 34

BATTERY LEVEL DISCHARGED

Bar ON = battery level discharged. The battery should be replaced and position reset.

LOW BATTERY

Bar ON = low battery. Bar ON when the battery is low but still able to support the necessary actuator functions

Bar OFF = battery OK

ESD SIGNAL EFFECTIVE

Bar ON = ESD signal present. ESD function will be determined by the settings on control mode configuration screens [A1] to [A5]. The actuator will not respond to any local or remote control when an ESD signal is maintained.

Inspecting Position Limit and Power Supply Status [H3]

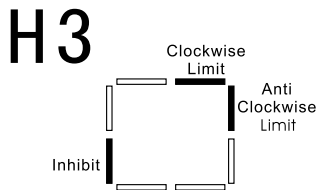


Fig. 4. 5. 35

CLOCKWISE LIMIT

Bar ON = actuator moved to clockwise limit of travel.

Anti-clockwise Limit

Bar ON = actuator moved to anti-clockwise limit of travel.

Phase Losing

Bar ON = Phase losing (3 phase actuator only)

Inspecting Remote Control Input [H4]

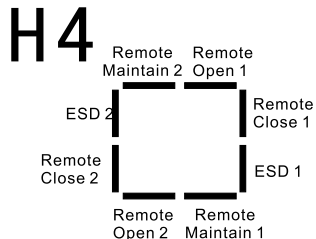


Fig. 4. 5. 36

REMOTE OPEN 1

Bar OFF = remote open signal present

REMOTE CLOSE 1

Bar OFF = remote close signal present

REMOTE OPEN 2

Bar OFF = remote open signal present from bus option bus pcb

REMOTE CLOSE 2

Bar OFF = remote close signal

present from bus option bus pcb

ESD 1

Bar OFF = ESD signal present

ESD 2

Bar OFF = ESD signal present from bus option pcb

REMOTE MAINTAIN 1

Bar OFF = remote maintain signal present

REMOTE MAINTAIN 2

Bar OFF = remote maintain signal present from bus option pcb

Inspecting Remote Interlocks, Local Control Input and Motor Thermostats [H5]

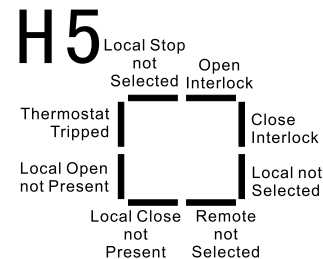


Fig. 4. 5. 37

OPEN INTERLOCK

Bar ON = open interlock effective

CLOSE INTERLOCK

Bar ON = close interlock effective

REMOTE CONTROL NOT SELECTED

Bar ON = remote control not selected

Bar OFF = remote control selected

LOCALCLOSESIGNALNOTPRESENT

Bar ON = Local close signal not present

Bar OFF = Local close signal present

LOCALOPENSIGNALNOTPRESENT

Bar ON = Local open signal not present

Bar OFF = Local open signal present

THERMOSTAT TRIPPED

Bar ON = Thermostat tripped. The actuator motor has thermostat switch. If the motor become overheated, the thermostat switch will trip and the actuator will prohibit electric operation. n cooling the thermostat will automatically reset, enabling operation.

LOCAL STOP NOT SELECTED

Bar ON = Local stop not selected
Bar OFF = Local stop select

LOCAL CONTROL NOT SELECTED

Bar ON = Local control not selected
Bar OFF = Local control selected

Inspecting Torque Switch Status and Infrared Setting Tool [H6]

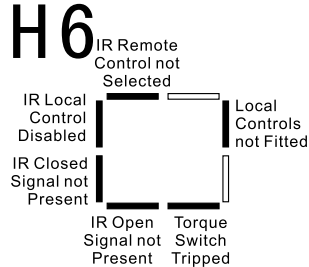


Fig. 4. 5. 38

When actuators are supplied for vandal proof applications, the local control knobs are removed to prevent unauthorized operation. The local control functions are then carried out by the Setting Tool.

LOCAL CONTROL NOT FITTED

Bar OFF = Local control fitted
Bar ON = Local control not fitted (vandal proof)

TORQUE SWITCH TRIPPED

Bar OFF = torque switch tripped

INFRARED OPEN SIGNAL NOT PRESENT

Bar OFF = torque switch tripped

INFRARED CLOSE SIGNAL NOT PRESENT

Bar OFF = torque switch tripped

INFRARED REMOTE CONTROL NOT SELECTED

Bar OFF = infrared remote control selected (Vandal proof).

When local control is not offered for vandal proof, the option selection screen [Or] must be set to [rE] for remote operation.

Inspecting Stroke Limits and Remote Indication Outputs [H7]

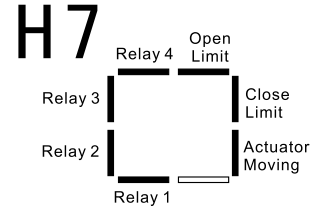


Fig. 4. 5. 39

OPEN LIMIT

Bar ON = actuator reaches fully open

CLOSE LIMIT

Bar OFF = actuator reaches fully close

ACTUATOR MOVEMENT

Bar ON = actuator moving
SWITCH CONTACTS R1, R2, R3, R4

Bar ON = r contact close

Inspecting Position Devices [H8]

H8

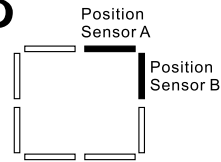


Fig. 4.5.40

Tefulong actuator adopts two hall sensors to inspect position data and actuator action direction.

POSITION SENSOR A, B

Correct operation of the sensor is bar ON (and OFF) 12 times per output revolution. When the motor is running, the time for bar ON and OFF should be equal.

To observe this function, select manual operation and turn the actuator handwheel clockwise, starting with all sensors OFF:

Turn clockwise 30 degree

Sensor A 01100

Sensor B 00110

4.5.7 Default Setting Value [d1] and [d2]

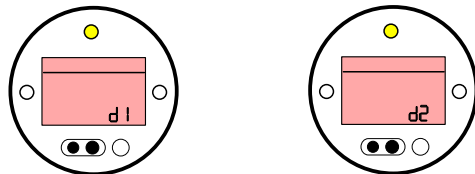


Fig. 4.5.41

Functions of all Tefulong range actuators are configured according to fault settings before being dispatched, see following sheet. It surely can be set according to pointed content when ordering.

There are two fault settings:

[d1] = all parameter initialized

[d2] = limit number of turns initialized

If [d1] is entered, all primary and advanced function except position limit will be set fault. Refer to following sheet.

If [d2] is entered, position limit will be reset. The whole travel is 25 turns and the display screen shows 50% position.

As long as find the menu by using the setting tool and then press “enter” key. See picture 4.5.39

Tefulong Standard [d1]Fault Setting

Function	[d1] fault setting
[P?] Password	Unaffected will keep setting
Primary functions	
[C1] Close Direction	[C] Clockwise
[C2] Close method	[CL] Close limit
[C3] Open method	[OL] Open limit
[tC] Torque closed	[100] 100% Rated torque
[tO] torque Open	[100] 100% Rated torque
Advance settings	
[r1] Indication r1	r1 close, normally open
[r2] Indication r2	r2 open, normally open
[r3] Indication r3	r3 close, normally closed
[r4] Indication r4	r4 open, normally closed
[A1] ESD method[SP] ESD stay up	
[A2] ESD contact type [nO] Normally open (ESD effective when closed)	
[A3] ESD thermostat bypass[OF] Thermostats effective during ESD	
[A4] ESD override interlocks[OF] Interlocks effective during ESD	
[A5] ESD override local stop[OF] Local stop effective during ESD	
[A6] Self-Maintained local control[On] self-Maintained in local control	
[A7] 2-wires control[OP] 2-wire controlling, valve open in advance	
[A8] Interlocks[OF] interlocks disused	
[A9] Conditional control[OF] function disused	

[OI] CPT[HI] 4mA correspond to close 4mA
 [OP] option remote proportional control [OF]
 [Od] remote control source [rE] see fix or not
 [Or] setting tool local control [OF] setting tool control disused
 [OS] power loss prohibit [OF]

5.Weights and Lubrication

Unless specially ordered for extreme climatic conditions, Tefulong actuators are dispatched with gearcases filled with GL-5 75W/90 lubricant suitable for ambient temperatures ranging from 22°F/30°C to 160°F/70°C.

Note: Excluding secondary gearboxes.

Weights and lubricant capacity

Part No.	N/W (Kg)	Lubricant capacity (L)
AVA01	32	0.3
AVA02	32	0.3
AVA03	32	0.3
AVA04	42	0.8
AVA05	42	0.8
AVA06	67	1.1
AVA07	193	6.5
AVA08	215	7.0
AVA09	220	7.0
AVA09.1	220	7.0
AVA10	220	7.0
AVAT01	23	1.5
AVAT02	23	1.5
AVAT03	38	1.5
AVAT04	39	1.5
AVAT05	39	1.5
AVAT06	39	1.5
AVAT07	39	1.5

With scientific designing, advanced machining and proper installing, Tefulong actuator can provide fault-free operation for many years.

If technical support or spare parts are required, contact local agents or factory directly and offer actuator part no. and range no. Tefulong can provide the best service in the whole world.

As we are continually developing our products, please forgive us that the design of Tefulong Actuators is subject to change without notice. The latest products and information are available at our website: www.greatork.com or E-mail: geatork@greatork.com.