Electrica Actuators HKM.2

User Manual

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Scope of use: HITORK second generation multi - turn series electric actuator.

All actuators must be checked and set up to meet the requirements of field operation and process control system before being put into use. Please ensure that you read and understand this manual completely.

As our products are constantly developing and improving, the design of HITORK actuator is subject to change without notice. Please contact us for the latest technical information.

CONTENTS

1. Operator interface

The operator interface of HITORK electric actuator is composed of hand-wheel, Clutch switch knob, display interface, on-off knob, and Local-remote knob, remote control as shown in figure 1

1. Display
2. On-off knob
3. Local-remote knob
4. Clutch switch knob
5. Hand-wheel
6. Remote control

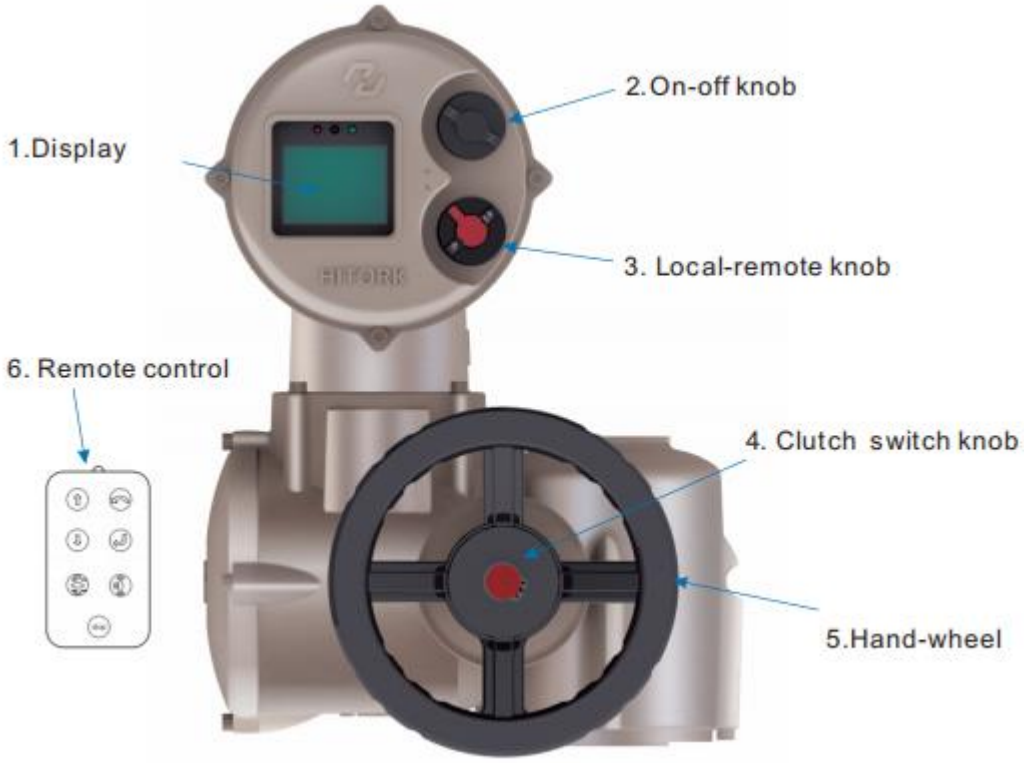


Figure 1 The operator interface

2. Manual operation

Press the clutch switch knob at the center of the hand wheel to make the clutch and the hand wheel buckle together. At this time, the spindle can be driven by rotating the hand wheel until the actuator is electrically operated and the clutch automatically disengages and returns to the motor driven state.

Electric operation is not allowed when using hand wheel.To prevent personnel and equipment damage caused by wrong operation, turn the Local-remote knob (red knob) to stop state before rotating the handwheel operation.

In general, the default direction of turning the hand wheel clockwise is the direction of closing the valve, while the default direction of turning the hand wheel counterclockwise is the direction of opening the valve.

3. Electric operation

 Warning

Power Supply： Check the power supply voltage, make sure it is consistent with the voltage on the actuator nameplate, and then turn on the power.

Local-remote knob (red knob): local/remote/stop three states. The stop function remains active when the knob is locked in the local or remote state. When the knob is locked in the stop state, it can prevent local or remote operations from being performed

The local control: turn the red knob to the local state, rotate the black knob next to it to on or off state, then conduct the local electric operation.

Remote control: change the red knob to remote state, at this time the local switch is failed, The actuator can be controlled by remote on-off signal or analog signal.

4.Display

The composition of the HITORK actuator display interface is shown in figure 2:

(1) Red -- Valve closing indicator

(2) IR sensor

(3) Blue -- Bluetooth connection status indicator

(4) green -- Valve opening indicator

(5) LCD colorful display

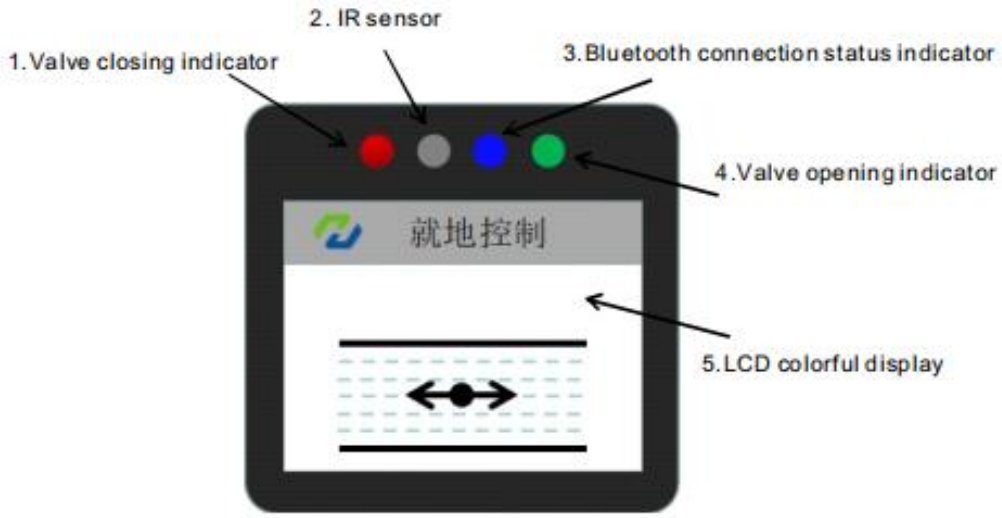


Figure 2

The corresponding status of LED indicator:

1) Opening process: the green indicator light flash

2) Closing process: the red indicator light flash

3) Fully open state: the green light is normally lighting

4) Fully closed state: red indicator light is normally lighting

5) Alarm Status: red light and green light flash simultaneously.

6) blue tooth connection state: blue light flashes.

LCD display: the power on of the HITORK actuator is turned on. After the system is initialized and loaded, the default display contents of the LCD display screen are shown in figure 3.

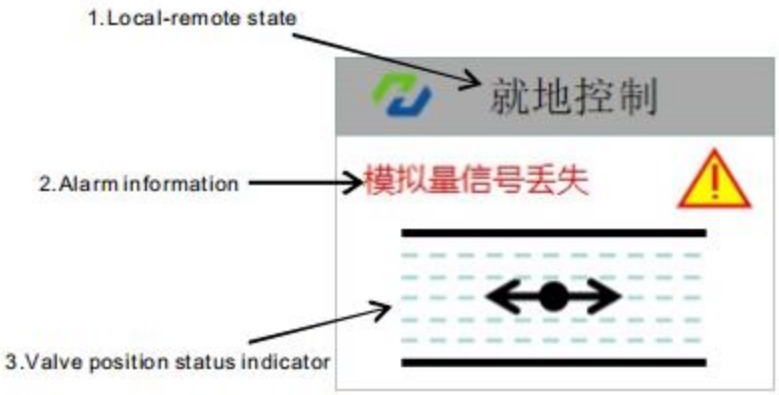


Figure 3

Display body is:

1. Local-remote state (text)

2.Alarm information (if there is an alarm, the corresponding error information will be displayed)

3. Valve position status indicator (fully open valve position; fully closed valve position; Display the percentage of valve position in the middle of travel)

LCD status display interface figure legends：

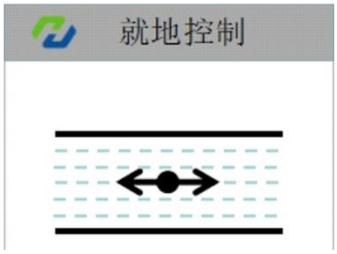


Figure 4: Fully open

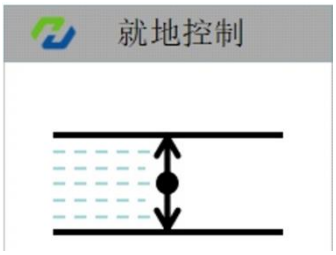


Figure 5: Fully closed

Figure 6: the middle of travel

Figure 7: error indication
(phase failure, torque, travel, overheating, signal loss, etc.)

5. The remote control

Description(Figure 8):
1. Up: used for menu selection to move up
2. Down: used for menu selection to move down
3. Undo/fallback: used to undo Settings or the menu function fallback.
4. Enter/confirm: menu entry; Menu selection confirmation; Parameter setting confirmation.
5. Open: used for local remote control to open the valve
6. Close: used for local remote shutoff of valves
7. Stop: the actuator stop to open or close valves
8. Infrared signal transmitter

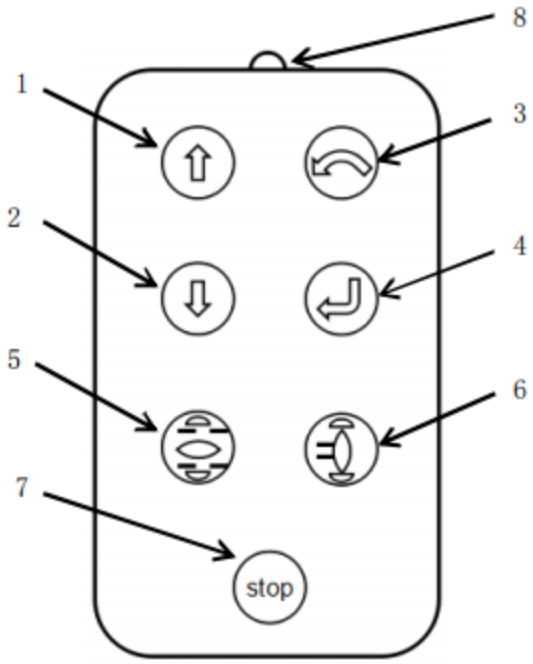


Figure 8 the remote control

Use of remote control:

When use the remote control to set up and operate the actuator, turn the local-remote knob to be locked at the local state, choose the knobs on the remote control for setup and open-stop-close operation, in order to better remote control effect, aim the infrared signal transmitter at the display interface during operation..

Note: simple configuration (-s) actuator setting instructions

Simple configuration actuator, default factory configuration is without remote control, remote control as an optional accessory, only to achieve open, close, stopfunctions, do not support parameter setting. Setting parameters depends on the knob of the actuator .Keep the local-remote knob (red knob) on the stop position, ON-OFF knob (black knob) on the on position, hold for more than 3 seconds, then enter the parameter setting mode.

In the parameter setting mode, the knob combination action can correspond to the key setting function of the remote control:

The local-remote knob from the stop position to the local position corresponding to the enter/confirm function of the remote control

The local-remote knob from the stop position to the remote position corresponding to the function of undo/fallback function of the remote control

The local-remote knob is in the stop state,ON-OFF knob inching for On is to move downwards,corresponding to the function of remote control ON-OFF knob inching for Off is to move upwards,corresponding to the function of remote control

6. System program

The system program of HITORK second generation actuator includes four functional modules: parameter setting, system status, data recording and resource management.

Parameter setting: including common Settings, advanced Settings and factory Settings, mainly to check and set the operating parameters and factory parameters of the actuator.

System status (advanced customization function) reflects the current system status in real time, and provides predictive maintenance and Suggestions through self-diagnosis and intelligent analysis and calculation of historical records.

Data record (advanced customization function.) : set and view data records of various parameters during the operation of the actuator, and visualize historical data.

Resource management (advanced customization function) : system level application, joint control and intelligent

Figure 9 System Program

management of network equipment resources.

Steps to enter the system program:

Actuator power on, after system initialization finished, enter the interface of the status of the valve position, turn the local-remote knob (red knob) to the local position, press ⏎ on the remote control, enter the valve position and torque display interface, press the key ⏎ again, enter the system menu interface, according to the need press ⏎ to enter into the different function menu, perform specific operations such as actuator parameter setting or data viewing..

Parameter Settings

Parameter setting is the basic standard function of the actuator, which is divided into three parts: common setting, advanced setting and factory setting.

[Common setting] common setting is the basic parameter setting for the actuator application. Before normal use of the actuator, it is necessary to set and adjust parameters, including the opening and closing of valve, local self-hold, positioning accuracy setting, torque protection towards opening direction and closing direction.

[Advanced setting] is the system parameter setting of the actuator, including remote control source setting, control dead zone setting, signal delay, signal-loss operation mode, contact setting, valve closing direction, valve opening and closing mode, ESD setting, alarm bypass setting, on-off and analog signal using setting etc.

[Factory setting] is generally used for testing and debugging by the manufacturer of the actuator or customization of specific functions. The equipment is normally used by the customer,no need to do settings.

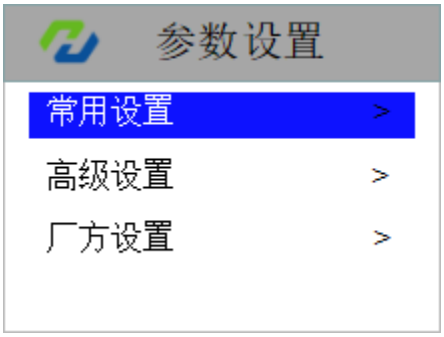
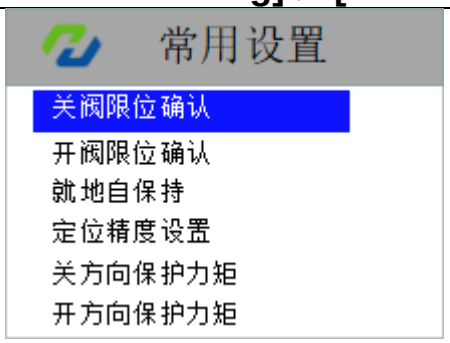
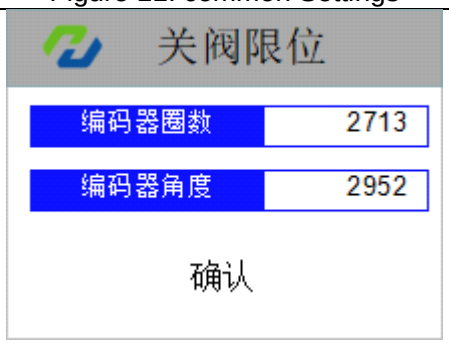
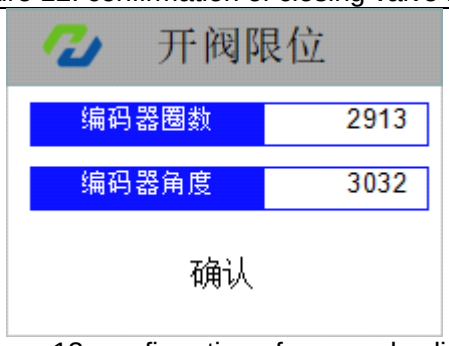
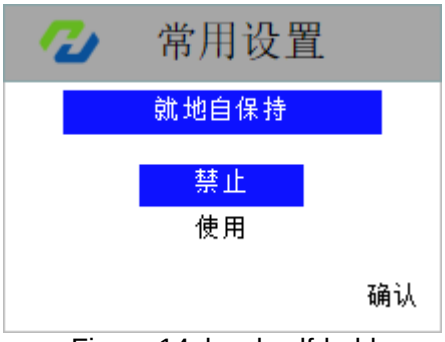
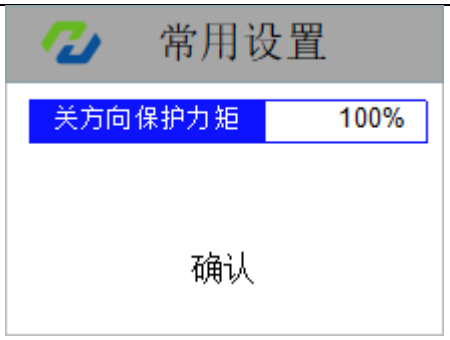
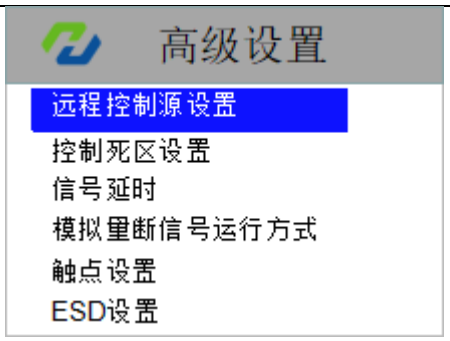
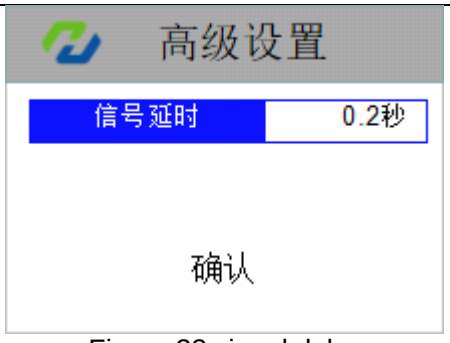


Figure 10 Parameter setting

[Parameter setting] ▶ [Common setting]	
 Figure 11: common Settings	**[common setting]** common setting is the basic parameter setting for the actuator application. Before normal use of the actuator, it is necessary to set and adjust parameters, including the opening and closing of valve, local self-hold, positioning accuracy setting, torque protection towards opening direction and closing direction.
 Figure 12: confirmation of closing valve limit	**[confirmation of closing valve limit]** set the encoder parameter value when the actuator corresponds to the full closing valve position
 Figure 13: confirmation of open valve limit	**[confirmation of opening valve limit]** set the encoder parameter value when the actuator corresponds to the full valve opening position.
 Figure 14: local self-hold	**[Local self-hold]** Set the working mode of black on-off knob. This setting has two options: forbidden and use. Forbidden: forbid the function of local self-hold, that is, local inching operation. When the black knob is operated, keep it in the on or off position continuously. The knob is reset, and the motor will stop running. Use: enable the local self-hold function, turn the black knob to the position of on or off and trigger the operation of "on" or "off", even if the knob is reset, the motor keeps running until the valve is fully open or closed.After the knob triggers on and off operation, if you want to stop the motor

	operation in the middle, you need to hit the red knob to stop or use the stop button of the remote control.
 Figure 15: positioning accuracy setting	**[setting of positioning accuracy]** when the valve position signal is given by the analog signal, the positioning accuracy of the actuator's actual travel is expressed as the percentage of the full travel, which is set as 1.0% by default. Accuracy setting range is 0.1% ~ 9.9% (default setting is 1.0%). Note： Positioning accuracy setting cannot be less than the setting value of control dead zone (figure 21)
 Figure 16: protection torque of turn-off direction	**[protection torque of turn-off direction]**The protection torque of the turn-off direction is expressed as a percentage of the rated torque. When the torque value of the actuator in the process of turn-off direction exceeds the set protection torque value, it will automatically shut down and display the alarm information.Setting range of protection torque of turn-off direction is: 40%~120% (default: 100%)
 Figure 17:protection torque of turn-on direction	**[protection torque of turn-on direction]**The protection torque of the turn-on direction is expressed as a percentage of the rated torque. When the torque value of the actuator in the process of turn-on direction exceeds the set protection torque value, it will automatically shut down and display the alarm information.Setting range of protection torque of turn-on direction is: 40%~120% (default: 100%)
[Parameter setting] ▶ [Advanced setting]	
 Figure 18: password entry	To enter **[advanced Settings]**, you need to input the password. Default: 2018. presses the up and down key on the remote control, selecting the number, press enter key to enter the setting interface.

 Figure 19: advanced Settings	**[advanced setting]** systematic parameter setting of the actuator, including remote control source setting, control dead zone setting, signal delay, operation mode of signal-loss, contact setting, valve closing direction, valve open-close mode, ESD setting, alarm bypass setting, on-off quantity and analog signal using setting, etc.
 Figure 20: remote control source Settings	**[remote control source setting]** Setting actuator control signal type: remote on/off signal, analog signal, fieldbus signal. Combined with terminals 4,5,33,34,35 and 36, remote on-off control can be realized. This setting should be "remote on-off signal".The remote analog control can be realized by combining the terminal 26 and 27 t, which should be set as "remote analog signal'".The actuator fieldbus control can be realized by combining the terminals of 45,46,47, which needs to be set as " fieldbus signal".
 Figure 21: control dead zone Settings	**[control dead zone setting]** The so-called control dead zone refers to certain travel positioning errors which is inevitably caused by the inertia of motor rotation when the actuator is controlled by remote analog signal. This unavoidable positioning error is called control dead zone.In order to prevent the actuator from repeatedly oscillating back and forth and entering the dead cycle due to the control dead zone problem, a reasonable control dead zone range should be set to cover the inevitable travel positioning error.Control dead zone setting range of 0.1% ~ 9.9%.(default is 1.0%)
 Figure 22 signal delay	**[signal delay]** set the response delay of the actuator to the remote control signal

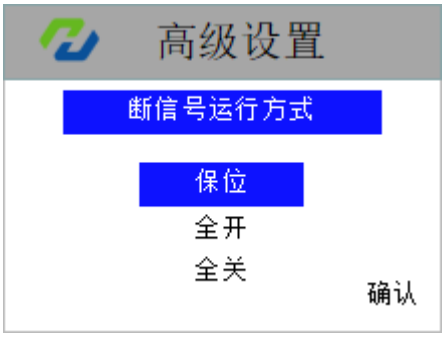


Figure 23: operation mode when analog signal lost

[operation mode of analog signal loss] set the valve operation to be performed by the actuator in remote analog control mode when remote analog signal is lost.
This setting has three options: keep in place, open and close.

Keep in place: when the actuator loses a given signal, it maintains the current valve position and does not perform any operation.

Full open: when the actuator loses a given signal, it automatically runs to the full open position.

Full off: when the actuator is lost at the given signal, it automatically runs to the full off position.

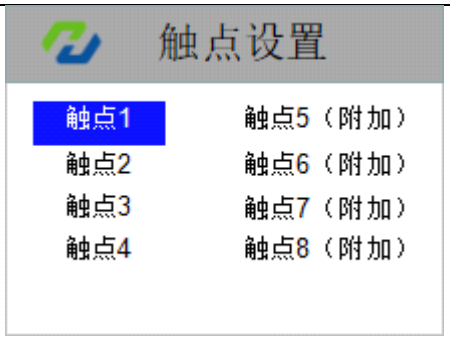


Figure 24: contact Settings

[contact setting] The actuator program has a total of 8 groups of contacts by default, with the standard configuration of contact 1~ 4 and optional additional configuration of contact 5~ 8. According to the configuration of actual parameters of the actuator, select specific contact and enter the sub-menu to customize the function of contact and the normality of contact

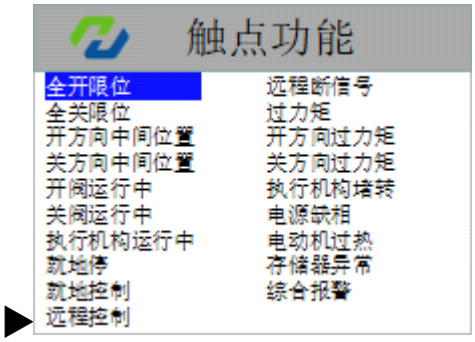


Figure 25: Selection of contact functions

[Selection of contact functions]Contact function can be set to: full-open limit, full-close limit, open direction middle position，close direction middle position, valve opening, valve closing, actuator running, local stop, local control, remote control, remote signal lost, over-torque, over-torque on the direction of opening, over-torque on the direction of closing, actuator stall, power shortage, motor overheating, abnormal storage, comprehensive alarm. This setting selects specific functions to bind to the contacts being set.

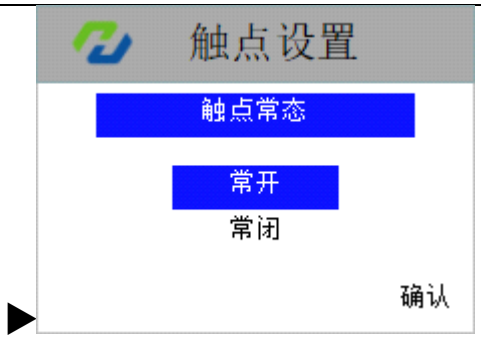
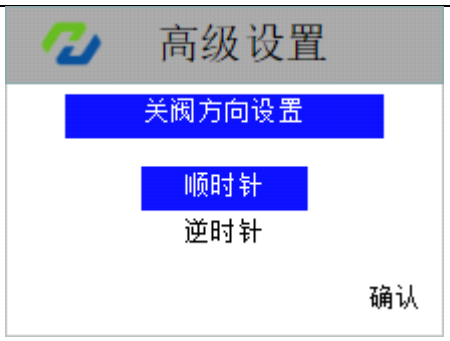
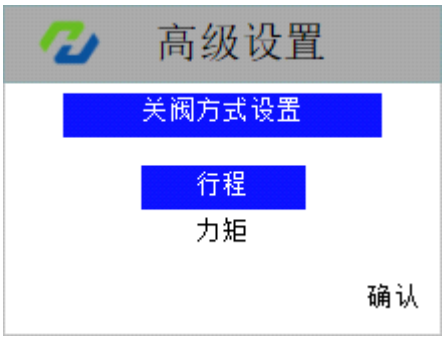
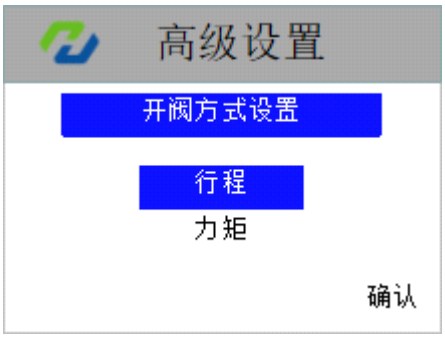
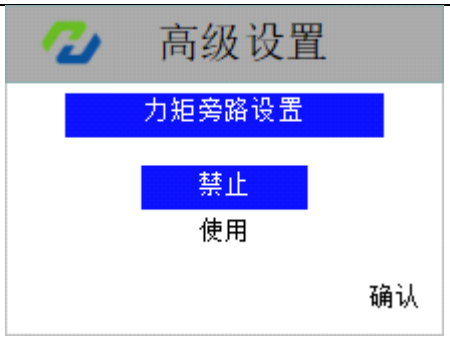
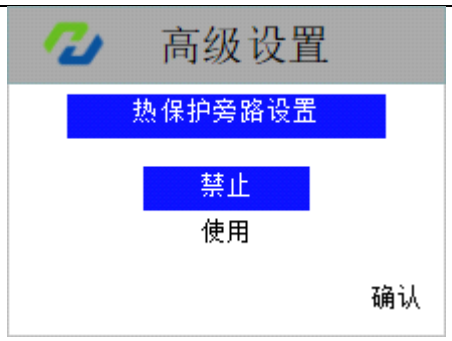
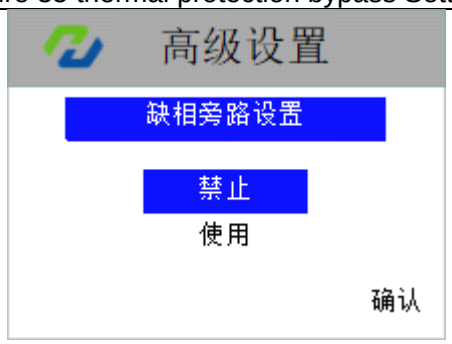


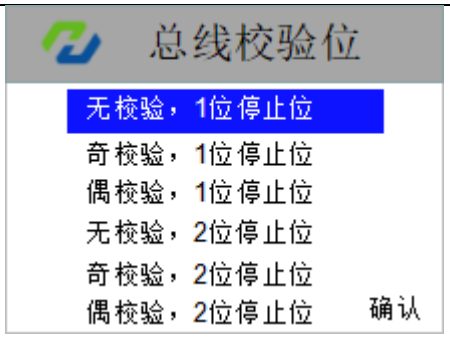
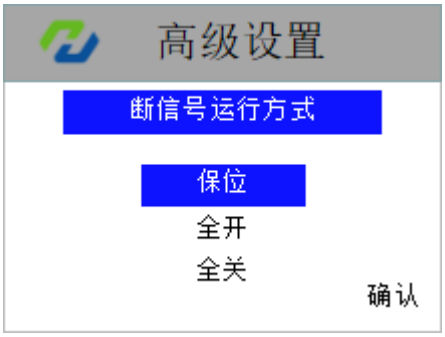
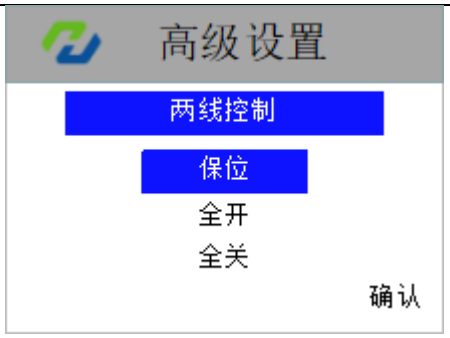
Figure 26: contact normality

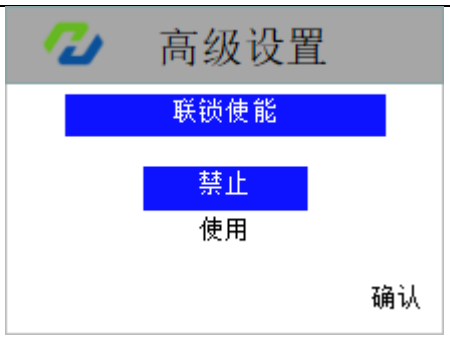
[contact normality]Contact state can be set to normally open or normally closed.

 Figure 27: ESD setting	**[ESD setting]**ESD setting includes ESD surpass, ESD contact and ESD protection. Please refer to the sub-menu for detailed Settings
 Figure 28: ESD surpass	**[ESD surpass]**Surpass setting options for ESD event signals include: ESD interlock surpass, ESD interrupt surpass, ESD local surpass, ESD protection surpass and ESD thermal protection surpass. The default Settings are all forbidded. After the setting is used, the ESD signal can surpass the original protection and alarm Settings of the device, thus giving priority to the ESD protection operation.
 Figure 29: ESD contact Settings	**[ESD contact]** ESD contact state can be set as normally open or normally closed, and the default setting is normally open.
 Figure 30: ESD protection	**[ESD protection]** sets the ESD protection action to be performed by the actuator when the ESD event is triggered: keep in place(default), full open or full closed.

 Figure 31: valve closing direction setting	**[valve closing direction setting]** The actuator can be set to close the valve clockwise or counterclockwise. Manually operate the actuator and valve to confirm the correct closing direction. The default closing direction of the actuator is clockwise.
 Figure 32: valve closing mode setting	**[valve closing mode setting]** Set the specific reference signal type of the actuator when closing the valve. The signal type can be divided into two types: travel and torque (set as travel by default). Travel: when the system detects that the travel reaches full close, the actuator will stop running; Torque: when the system detects that the torque signal reaches the set protection torque value in the closed direction, the actuator stops running. If not for special condition, it is not recommended to use torque valve closing mode.
 Figure 33: Valve opening mode setting	**[valve opening mode setting]** Set the specific reference signal type of the actuator when opening the valve. The signal type can be divided into two types: travel and torque (set as travel by default). Travel: when the system detects that the travel reaches full open, the actuator will stop running; Torque: when the system detects that the torque signal reaches the set protection torque value in the opening direction, the actuator stops running. If not for special condition, it is not recommended to use torque valve closing mode.
 Figure 34: torque bypass setting	**[torque by-pass setting]** can be set as forbidden or usable, and the default setting is forbidden. When set to usable, the actuator output torque exceeds the set protection torque, it will automatically ignore the torque alarm and continue to operate normally.

 Figure 35 thermal protection bypass Settings	**[thermal protection by-pass setting]** can be set to forbidden or usable, and the default setting is forbidden. When set to usable, the actuator motor thermal protection will automatically ignore the thermal protection alarm and continue normal operation.
 Figure 36: truncated bypass setup	**[phase-loss by-pass setting]** can be set to forbidden or usable, and the default setting is to forbidden. When set to use, the actuator power supply will automatically ignore the phase-loss alarm and continue normal operation.
 Figure 37: Fieldbus address	**[Fieldbus address]** set the actuator fieldbus address . When the actuator field fieldbus is configured, the address in the same fieldbus cannot be repeated.
 Figure 38: FIELDBUS baud rate	**[FIELDBUS baud rate]** set the communication rate of the actuator FIELDBUS (when the actuator is connected to the FIELDBUS , it shall be configured in accordance with the communication parameters of the FIELDBUS).

 Figure 39: FIELDBUS check bit	**[FIELDBUS check bit]** set the check mode of actuator FIELDBUS communication (when the actuator is connected to the field FIELDBUS, it shall be configured and the configuration shall conform to the communication parameters of the field FIELDBUS.
 Figure 40 Fieldbus signal lost operation mode	**[FIELDBUS signal loss operation mode]** The valve operation that needs to be performed when the fieldfieldbus signal is lost when the remote control source of the actuator is fieldfieldbus mode. This item has three options: Keep in place, Full open and Full close. Keep in place : when the actuator fieldfieldbus signal is lost, the current valve position is maintained and no operation is performed. Full open: when the actuator fieldfieldbus signal is lost, it will automatically run to the full open position of the valve. Full close when the actuator fieldfieldbus signal is lost, it will automatically run to the full close position of the valve.
 Figure 41: two-line control setting	**[two-line control setting]** Set priority operation when connecting two lines. Use the two-line control diagram for configuration.

 Figure 42: interlock control Settings	**[interlock control setting]** setting enable or disable external wiring interlock.
 Figure 43 calibration input 4mA	**[calibration input 4mA]** calibrates the current signal at the full close position (calibrate 4mA given signal). On the current setting interface, when 4mA is set by signal generator, press the remote control key to save it. It will not be modified by defaultt. It needs to be adjusted when the 4mA given signal is biased.
 Figure 44: calibration input 20mA	**[calibration input 20mA]** calibrates the current signal at the full open position (calibrate 20mA given signal). On the current setting interface, when 20mA is set by signal generator, press the remote control key to save it. It will not be modified by default. It needs to be adjusted when the 20mA given signal is biased.
 Figure 45: calibration output 4mA	**[calibration output 4mA]** calibrates the feedback signal at the full close position (calibrate 4mA given feedback signal). When the actuator is at the full close valve position, use the remote control or key to modify the current value until the feedback is 4mA. Press the key to confirm and save. It will not be modified by default It needs to be adjusted when the 4mA given signal is biased.

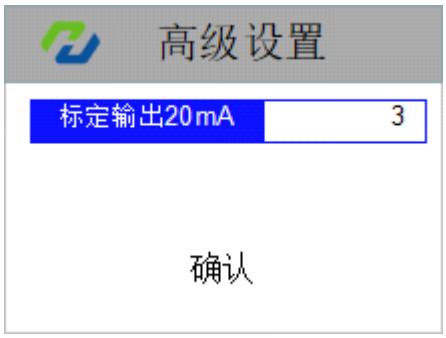
<table>
<tr>
<td> 

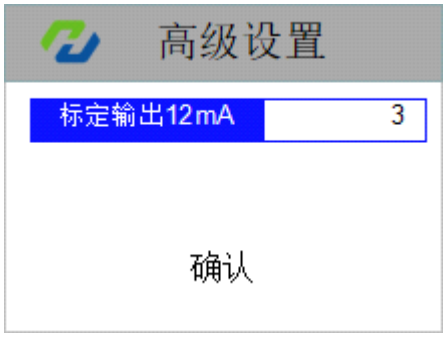
Figure 46 calibration output 20mA</td>
<td>[calibration output 20mA] alibrates the feedback signal at the full open position (calibrate 20mA given feedback signal). When the actuator is at the full open valve position, use the remote control or key to modify the current value until the feedback is 20mA. Press the key to confirm and save. It will not be modified by default
It needs to be adjusted when the 20mA given signal is biased.</td>
</tr>
<tr>
<td> 

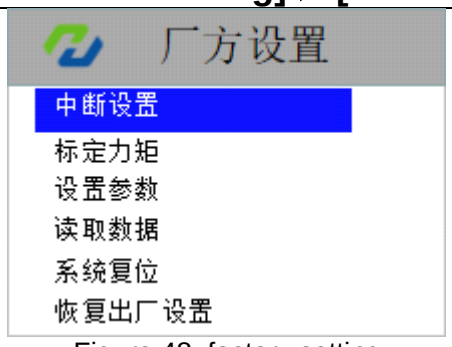
Figure 47: calibration output 12mA</td>
<td>[calibration output 12mA] Calibrate the feedback signal of the middle valve position (12mA feedback signal calibration). When the actuator is at the middle valve position, use the remote control or to modify the current value until the feedback is 12mA. Press the key to confirm and save. It will not be modified by default
It needs to be adjusted when the 20mA given signal is biased.</td>
</tr>
<tr>
<td colspan="2">[Parameter setting] ▶ [Factory setting]</td>
</tr>
<tr>
<td> 

Figure 48: factory setting</td>
<td>[factory setting] It is used when the manufacturer sets it as the actuator manufacturer's debugging setting, and the user can use it normally without setting it.</td>
</tr>
</table>

7.Equipment debugging and initial setting

The system parameters of the HITORK actuator are initially set by default according to Hankun enterprise standard. If you need to change, please specify it when you place an order.When the actuator is installed in the field, the default setting does not match the field valve position and operation condition. Therefore, the default setting should be carefully used in the field for the sake of operation safety.After the actuator is installed in the field, a series of initial Settings and debugging are required to make the actuator meet the requirements of field operation conditions and process control system before it is put into use formally.

The debugging and setting of HITORK actuator mainly involves several contents of the system program (commonly used Settings), including: valve closing limit confirmation, valve opening limit confirmation, control dead zone setting, signal lost operation mode, closing direction protection torque, opening direction protection torque, and local self-hold.

The equipment debugging in this chapter assumes that the actuator has been installed correctly and started normally with power supply, and the system program has entered the parameter setting interface.

7.1 valve closing limit setting

Following the path of the menu:

[Parameter setting] ▶ [Common setting]▶ [valve closing limit setting]

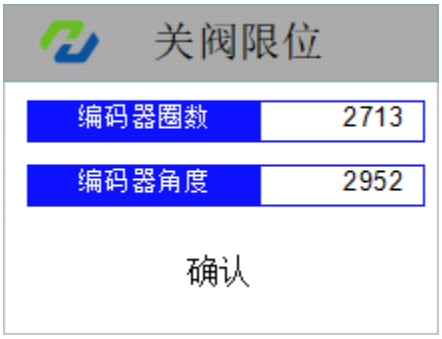


Figure 49: valve closing limit setting

Navigate to the valve closing limit interface according to the menu path,

manually turn the valve to full closing, press the remote control key to confirm and save parameters, and the system saves the travel encoder code value corresponding to the full closing position of the valve. Sometimes the manual force is too large and the valve position is over closed , or even the actuator appears torque alarm, then the hand-wheel can be properly rotated in the direction of the valve opening (generally no more than one circle), and when the torque alarm disappears, then press the remote control key to confirm and save parameters.

Then, press the remote control key to back to the status indicating interface， which display the symbol of full close valve positions (see figure 5).

7.2 valve opening limit setting

Following the path of the menu:

[Parameter setting] ▶ [Common setting]▶ [valve opening limit setting]

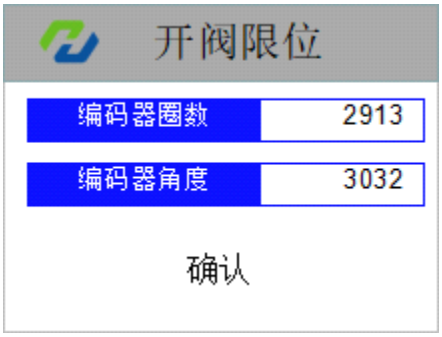


Figure 50:valve opening limit setting

Navigate to the valve opening limit interface according to the menu path, turn the manual valve to the full open position, press the remote control keyo confirm and save parameters, and the system saves the recorded travel encoder code value corresponding to the full open position of the valve. Sometimes the manual force is too large and the valve position is over open, even the actuator has a torque alarm, then the hand-wheel can be properly rotated in the direction of the valve closing (generally no more than 1 circle), when the torque alarm disappears, then press the remote control key to confirm save parameters.

Then, press the remote control key and return to the status indicating interface, which display the symbol of fully open valve position (see figure 4).

7.3 Local self-hold setting

Following the path of the menu:

[Parameter setting] ▶ [Common setting]▶ [Local self-hold setting]

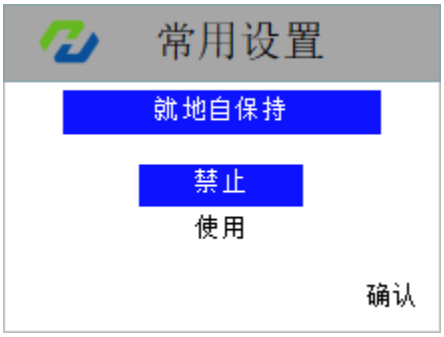


Figure 51: Local self-hold setting

Navigate to the interface of local self-hold saccording to the menu path, use the remote control ⇧ or ⇩ , choose to forbidden or usable the function of local self-hold, press the ↵ to confirm and save the parameter setting. The default setting for self-hold is forbidden. The local-remote knob and the remote control mode for valve opening and closing are the mode of inching. After using this function, the valve opening and closing in the local knob and remote control mode are self-hold.

7.4 The positioning accuracy setting

Following the path of the menu:
[Parameter setting] ▶ [Common setting]▶ [The positioning accuracy setting]

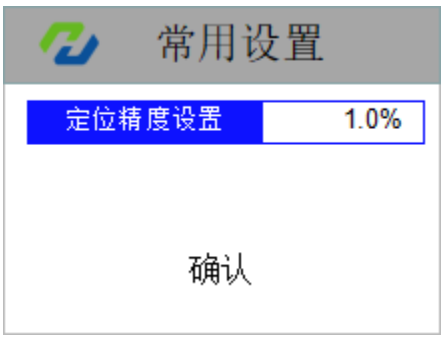


Figure 52 The positioning accuracy setting

Navigate to the positioning accuracy setting interface according to the menu path. Adjust the percentage parameters of the control dead zone by pressing the remote control ⇧ or⇩. After adjusting to the value you

want to set, press the key to confirm and save the parameters. Positioning accuracy shall not be set less than the control dead zone of the actuator.

7.5 torque protection value in closing direction setting

Following the path of the menu:
[Parameter setting] ▶ [Common setting]▶ [torque protection value in closing direction setting]

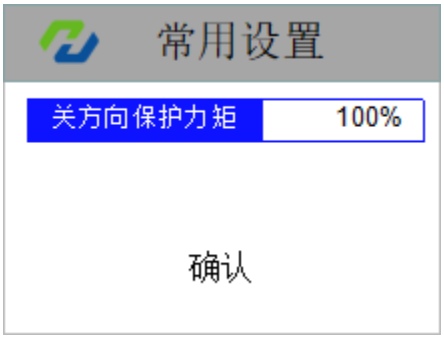


Figure. 53: torque protection value in closing direction setting

Navigate to the interface of closing direction torque protection according to the menu path, press the remote control or to adjust the value of torque protection in the closing direction (the percentage of rated torque). After the adjustment, press the to confirm and save the parameters. No special torque protection requirements, generally just follow the default Settings, no need to change.

7.6 torque protection value in opening direction setting

Following the path of the menu:
[Parameter setting] ▶ [Common setting]▶ [torque protection value in opening direction setting]

Figure.54: torque protection value in opening direction setting

Navigate to the interface of opening direction torque protection according to the menu path, press the remote control ⇧ or ⇩ to adjust the value of torque protection in the opening direction (the percentage of rated torque). After the adjustment, press the ↵ to confirm and save the parameters. No special torque protection requirements, generally just follow the default Settings, no need to change.

8. Electrical connection

8.1 The definition of terminal function

Terminal No.	The definition of terminal function	Terminal No.	The definition of terminal function
U1	Ac power supply input U phase	24	Standby, vacant
V1	Ac power supply input V phase	25	ESD
W1	Ac power supply input W phase	26	4~20mA Analog input (+)
E	GND	27	4~20mA Analog input (-)
1	Standby, vacant	28	Standby, vacant
2	Standby, vacant	29	Standby, vacant
3	Standby, vacant	30	Standby, vacant
4	Non-stable voltage 24VDC power supply negative (-)	31	ESD, open, close interlock function 24VDC common terminal

5	Non-stable voltage 24VDC power supply positive	32	Standby, vacant
6	OUT1 output replay contact 1	33	Close signal input
7	OUT1 output replay contact 2	34	Self-hold signal input
8	OUT2 output replay contact 1	35	Open signal input
9	OUT2 output replay contact 2	36	Remote control common
10	OUT3 output replay contact 1	37	Standby, vacant
11	OUT3 output replay contact 2	38	Standby, vacant
12	OUT4 output replay contact 1	39	auto-control signal input
13	OUT4 output replay contact 2	40	Standby, vacant
14	OUT5 output replay contact 1	41	Manual/automatic common
15	OUT5 output replay contact 2	42	Alarm output relay contact common terminal
16	OUT6 output replay contact 1	43	Alarm output relay contact common terminal
17	OUT6 output replay contact 2	44	Alarm output relay contact common terminal
18	OUT7 output replay contact 1	45	RS485 B
19	OUT7 output replay contact 2	46	RS485 A
20	OUT8 output replay contact 1	47	RS485 GND
21	OUT8 output replay contact 2	48	Standby, vacant
22	Valve position feedback (+)	49	Standby, vacant
23	Valve position feedback (-)	50	Standby, vacant

8.2 Common electrical connections diagram