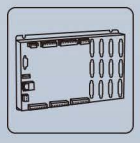
Zmotion®
正运动技术

做更好用的运动控制，智造美好生活
Better Motion Control, Smarter Life

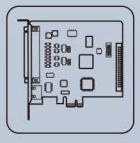
Teach Pendant HMI

ZHD400X

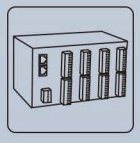
Vision Motion Controller



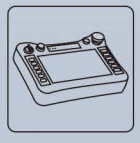
Motion Controller



Motion Control Card



IO Expansion Module



HMI

Content

Statement

Thank you for choosing our Zmotion products. Please be sure to read this manual carefully before use so that you can use this product correctly and safely. Zmotion is not responsible for any direct or indirect losses caused by the use of this product.

The information in this manual is for reference only. Due to design improvements and other reasons, Zmotion reserves the right of final interpretation of this information! Contents are subject to change without prior notice!

➢ Notes

In order to prevent possible harm and damage caused by incorrect use of this product, the following instructions are given on matters that must be observed.

■ Danger

Do not use it in places with water, corrosive or flammable gases, or near flammable substances.	May cause electric shock, fire, damage, etc.
When installing or disassembling, make sure the product is powered off.	
Cables should be connected securely, and exposed parts that are energized must be insulated by insulators.	
Wiring work must be performed by professionals.	

■ Notes

It should be installed within the specified environmental range.	May cause damage, mis-operation, etc.
Make sure there are no foreign objects on the product hardware circuit board.	
After installation, the product and the mounting bracket should be tight and firm.	
After installation, at least 2-3cm should be left between the product and surrounding components for ventilation and replacement.	
Never disassemble, modify, or repair it by yourself.	

Chapter I Production Information

1.1. What is ZHD400X

ZHD400X is one touch screen teach pendant that can show by network. Please note it must be used together with the controller that support ZHMI function.

Teach pendant has DC24V power supply, and it is with 800*480 resolution true color displayer, also there are 18 keys, one emergency stop.

- Programmable teach pendant, it can show all kinds of interfaces through script programs.
- Support drawing: Chinese & English characters, line, arc, image.
- With emergency stop button.
- There are 18 key buttons, key functions can be customized.
- Support RJ45 crystal head (for standard model, it has 3m connecting line), U disk interface.
- Support HMI configuration protocol.
- It can control all kinds of manipulator control
- Support touch screen, key buttons are used together with touch screen.
- Resolution: 800*480

ZHD HMI is a kind of open programmable teach pendant that is with touch screen. It develops interface program by RTBasic, RTHmi, RTHmi languages in RTSys. And it can debug online.

1.2. ZHD400X Specification Parameters

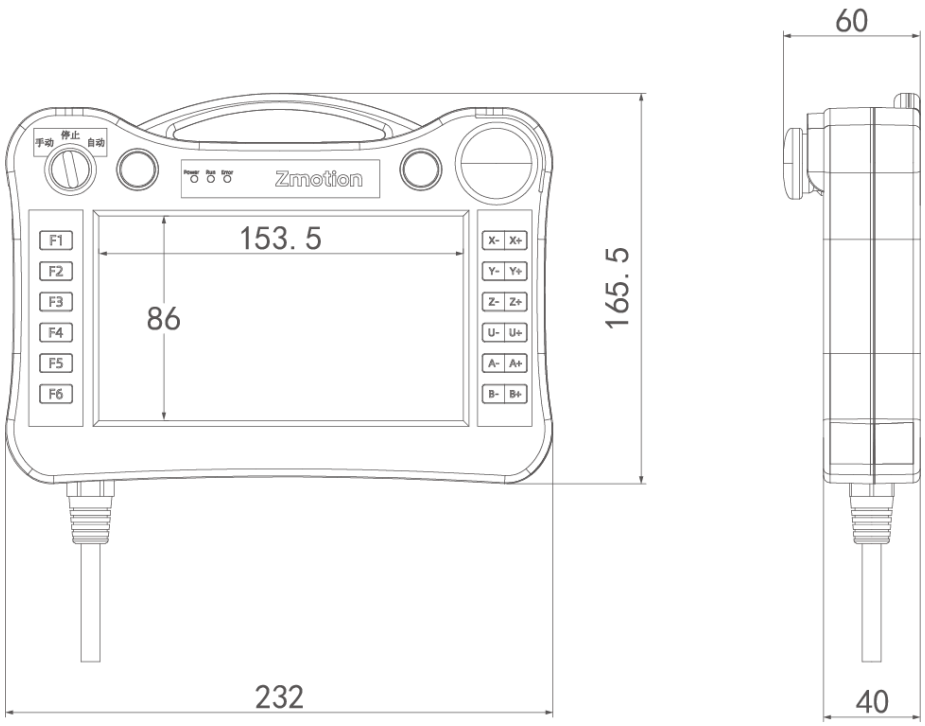
--Product Parameters--

Item	Description
Resolution	800*480
Touch Screen Size	7" TFT LCD
Brightness	320 cd/m^2
Color	24-bit
Touch Screen	Resistive touch screen
EtherNET	100 Base-T

--Other Parameters--

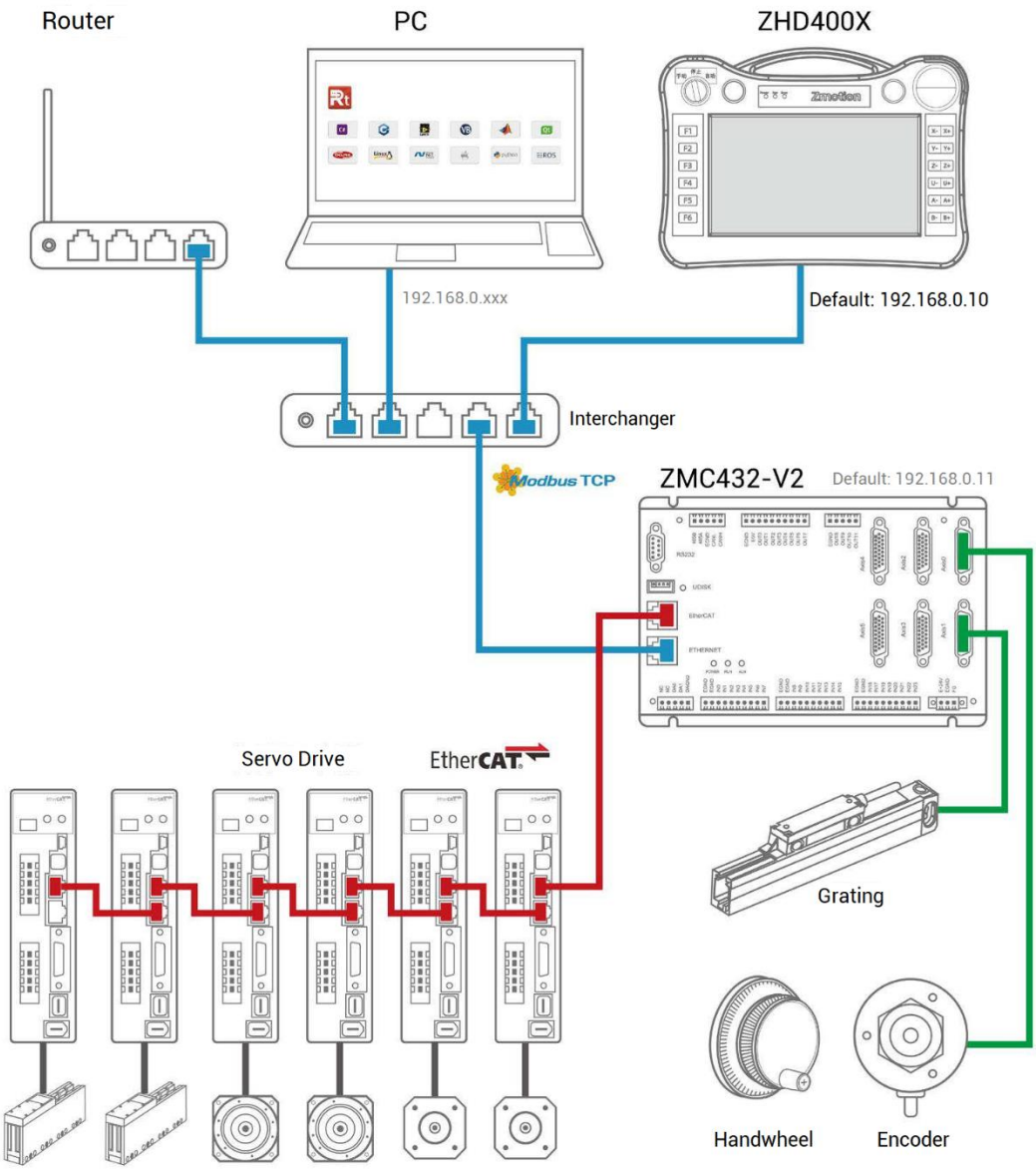
Item	Description
Power Supply	DC24V
Max Power Consumption	1.3W
Size	232mm*165.5mm*60mm
Weight	936.5g
Work Temperature	0 to 50°C
Storage Temperature	-20 to 60°C

1.3. ZHD400X Size



Unit: mm

1.4. System Configuration



1.5. Order Information

Item	Model	Specification Description
Teach Pendant	ZHD400X	3-meter connecting line (standard)
Teach Pendant	ZHD400X-L50	5-meter connecting line (special)
Teach Pendant	ZHD400X-L100	10-meter connecting line (special)

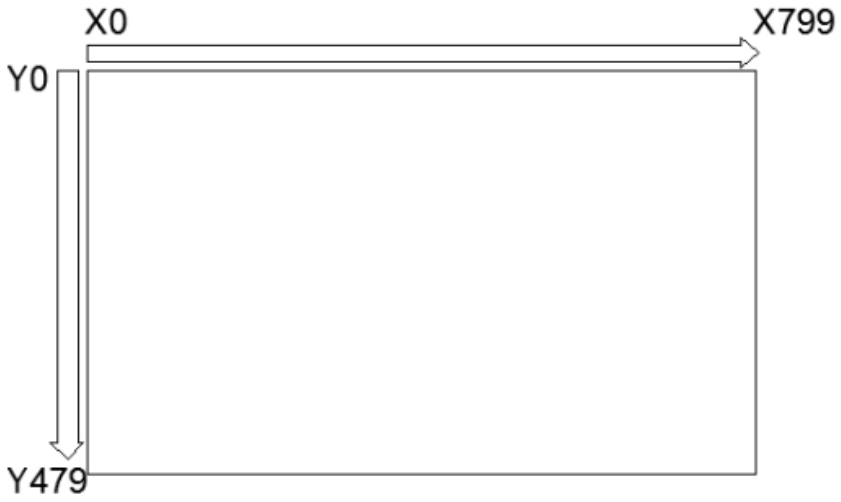
Chapter II ZHD400X Appearance

2.1. Whole Layout

No.	Interface	Description
①	Mode selection	Manually switch “manual” / “stop” / “auto”.
②	ON button	Press “ON” to run program
③	Pause button	Press “Pause” to pause the program
④	Emergency stop button	Press it, axis will stop, if you want to cancel “emergency stop” state, rotate the button clockwise.
⑤	State Led	Power Led: it is ON when power is conducted normally. Run Led: it is ON when the program runs normally Error Led: it is ON when the program runs abnormally.
⑥	Function button	Used together with physical key encodes.
⑦	Axis motion button	Used together with physical key encodes.
⑧	Display screen (touch screen)	Touch screen of 800*480 resolution.
⑨	U disk	Reserved

2.2. Touch Screen Points Coordinates

It is 800*480, the coordinate origin is at upper left corner.

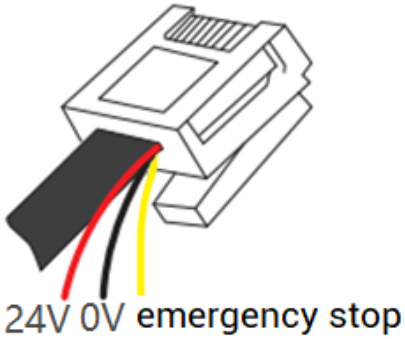


2.3. Hardware Interfaces

--Power Interface--

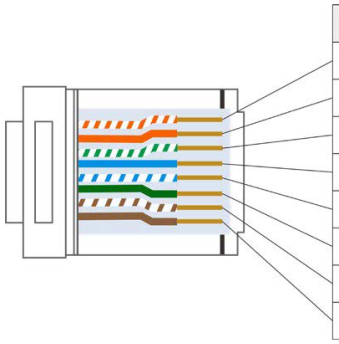
ZHD400X uses 24V DC power.

There are 3 cables on the network crystal head, HMI power cable, and emergency stop signal cable. Red one is 24V power +, black one is 24V power -, yellow is the emergency stop cable.



--RJ45 Crystal Head--

A. Specification

<table>
<tr><th>PIN Definition</th><th>Item</th><th>Description</th></tr>
<tr><td rowspan="5"> 
<table>
<tr><th>PIN</th><th>Signal</th><th>Description</th></tr>
<tr><td>1</td><td>RT+</td><td>Receive Signal (+)</td></tr>
<tr><td>2</td><td>RX-</td><td>Receive Signal (-)</td></tr>
<tr><td>3</td><td>TX+</td><td>Send Signal (+)</td></tr>
<tr><td>4</td><td>NC</td><td>Reserved</td></tr>
<tr><td>5</td><td>NC</td><td>Reserved</td></tr>
<tr><td>6</td><td>TX-</td><td>Send Signal (-)</td></tr>
<tr><td>7</td><td>NC</td><td>Reserved</td></tr>
<tr><td>8</td><td>NC</td><td>Reserved</td></tr>
</table></td><td>Communication protocol</td><td>MODBUS_TCP</td></tr>
<tr><td>Communication velocity</td><td>100Mbps</td></tr>
<tr><td>Default IP</td><td>192.168.0.10</td></tr>
<tr><td>Communication cable</td><td>Category 5e STP</td></tr>
<tr><td>Cable length</td><td>Best <10m</td></tr>
</table>

B. How to do Wiring

- HMI can be connected to controller (point to point) by one category 5e STP (shielded twist-pair) cable.
- HMI also can be connected to interchanger. That is, expand ethernet channels to connect to other devices by interchanger, then achieve one-multiple connection.

C. How to Use

1) After wiring and power on, connect HMI to controller / RTSys through ethernet.
2) Check HMI IP. HMI IP, controller IP, and PC IP should in same network segment, you can modify it through IP_ADDRESS command.
3) Details of above command and other commands, please refer to Basic Programming Manual.

--U Disk Interface--

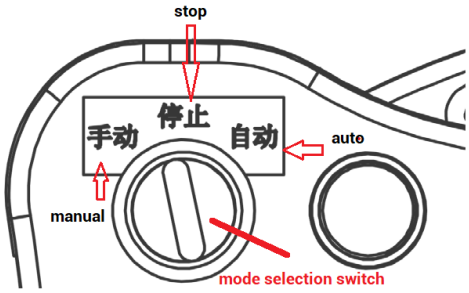
This interface's function is reserved.

2.4. Physical Key Buttons

ZHD400X has 18 buttons, which are used together with physical button encoded. And functions can be customized. You can view “Chapter III” or HMI Programming manual.

--Mode Selection Switch--

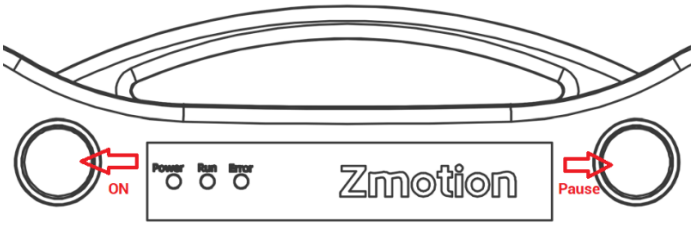
You can rotate the button to switch the mode, it locates in upper left. Modes are manual, stop, auto.



Mode	Description
Manual	Rotate it to left – manual mode, used for system debugging, you can manually move robot, edit the program, etc.
Stop	Rotate it to the middle – stop mode, used to stop the program and motion.
Auto	Rotate it to right – auto mode, used to run edited program automatically.

--ON / Pause--

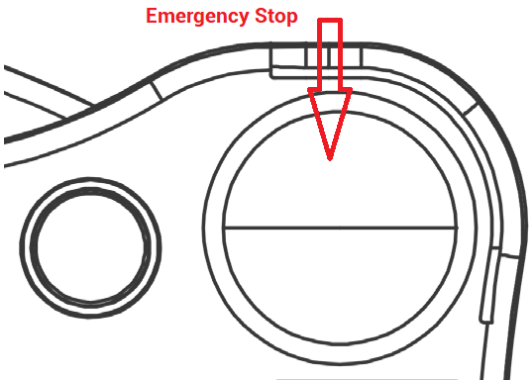
“ON” and “Pause” buttons are located at above of HMI, which are used to open and pause the program.



Mode	Description
ON	Green on – open
Pause	Orange – pause

--Emergency Stop--

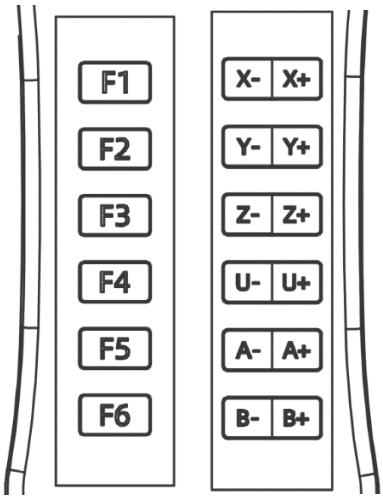
This button is located at upper right corner of HMI. When some emergency situations happen, you can press it to protect the program, axis will stop immediately. When all is normal, you can rotate the button clockwise to cancel it.



Note: please consider the "Circuit Design", which must be safe and reliable, otherwise, hard to achieve emergency stop.

--Board Buttons--

It located in two sides of HMI forward, functional keys and axis shift keys.



Buttons	Description
F1-F6	Functional Buttons
X- X+	Axis Shift (Motion) Buttons
Y- Y+	
Z- Z+	
U- U+	
A- A+	
B- B+	

Chapter III Usage & Operations

3.1. Physical Key Codes

Encodes of button consist of row and column combination.

When the button is pressed, HMI will automatically send the physical button to the controller, then controller can detect the physical button. If you need to use virtual keys, there is one Key transformation list in RTSys – HMI (RTSys / ZDevelop has standard 400X button transformation list.

Note: for customized one or others, please contact us, because different positions are with different values.

--Model Selection Switch--

Button	Button Encode
Manual	1
Stop	No fixed encode, when “manual” and “auto” buttons are released.
Auto	2

--ON / Pause / Emergency Stop--

Button	Button Encode
ON	3
Pause	4
Emergency Stop	5

--Board Buttons--

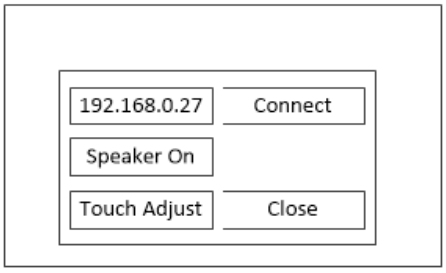
Button	Button Encode
F1-F6	Global Const key_f1 = 11 'functional key F1 Global Const key_f2 = 12 'functional key F2 Global Const key_f3 = 13 'functional key F3 Global Const key_f4 = 14 'functional key F4

	Global Const key_f5 = 15 'functional key F5 Global Const key_f6 = 16 'functional key F6
X- X+	Global Const key_X-- = 24 'axis shift key Global Const key_X+ = 25 'axis shift key
Y- Y+	Global Const key_Y-- = 34 'axis shift key Global Const key_Y+ = 35 'axis shift key
Z- Z+	Global Const key_Z-- = 44 'axis shift key Global Const key_Z+ = 45 'axis shift key
U- U+	Global Const key_U--= 54 'axis shift key Global Const key_U+= 55 'axis shift key
A- A+	Global Const key_A-- = 64 'axis shift key Global Const key_A+ = 65 'axis shift key
B- B+	Global Const key_B--= 74 'axis shift key Global Const key_B+ = 75 'axis shift key

3.2. Touch Correction

➢ **Method 1**

Click continuously in a "Z-shaped" manner (upper left, upper right, lower left, lower right, upper left, upper right, lower left, lower right) until the settings window pops up to wake up the screen. You can perform touch calibration (Touch Adjust), controller IP modification, speaker (Speaker On) operations, etc.



➢ **Method 2**

After connected RTSys/ ZDevelop, trigger correction by TOUCH_ADJUST command.

➢ **Method 3**

When RTSys / ZDevelop is not connected, press 16 (F6) key, and then press 11 (F11)

button at the same time.

Follow the English instructions on the display (Touch crosshair to calibrate), trace the "cross" icon on the screen and click on it one by one.

3.3. Operation Steps

--Connect to Power--

Please refer to above power interface, red & DC24V +, black & DC24V -.

--Touch Calibration--

Please refer to above "Touch Correction".

--Connect to Controller--

- **Method 1: connect HMI and controller directly, then HMI identifies controller IP.**

1) Connect controller and PC by serial / ethernet. And connect controller to RTSys / ZDevelop, then download the program into ROM. After that, disconnect controller and PC.

2) Use network cable to connect HMI and controller. When communicating by ethernet, please make sure HMI IP and controller IP are in same network segment. If not, you need to modify controller IP (controller default is 192.168.0.11, HMI default IP is 192.168.0.10)

3) Do touch calibration: after powering on, you can click the four corners of the screen of the teaching box in a Z-shaped order twice in a row to wake up the screen and pop up the setting window.

4) In popped window, it will automatically obtain connected controller IP address, select needed correct IP, then click "Connect".

Note: if HMI doesn't scan controller IP by method 1, please refer to method 2.

➢ **Method 2: connect HMI to PC at first, then do connection of HMI and controller.**

1) Use interchanger to connect HMI, controller, and PC (you can view "system configuration", make sure their IP addresses are in same segment.

2) Connect controller to RTSys / ZDevelop, then download the program into ROM. After that, disconnect.

3) Do touch calibration: after powering on, you can click the four corners of the screen of the teaching box in a Z-shaped order twice in a row to wake up the screen and pop up the setting window.

4) Connect HMI and RTSys / ZDevelop (HMI IP and PC IP are in same network segment).

5) In RTSys / ZDevelop "output" window, send IP_CONNECT = controller IP command. Then, HMI will show HMI interface content, which means HMI and controller are connected successfully.

6) If you want HMI program to update in real-time. After step 5, disconnect HMI with RTSys / ZDevelop, then connect controller to RTSys / ZDevelop, at this time, connect them (controller & PC & HMI) through interchanger. When the program changed, download the program into controller, in this way, real-time can be achieved.

For RTSys/ ZDevelop, it also can simulate this HMI.

3.4. How to Use Physical Encodes

By binding this component to the physical buttons of the HMI, customized physical button actions can be achieved.

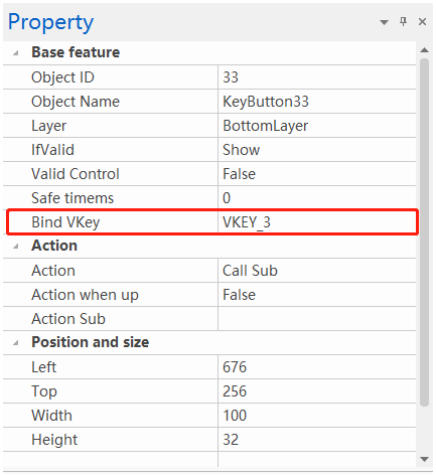
--How to Use--

Click RTSys / ZDevelop "Control Class" – "Control" – "Key button", then put this component to suitable position, open the component's property window, find "Bind PhyKey", and select needed one. Then in "action", choose needed actions. In this way, you can achieve corresponding actions by real hardware button, that is, you bind it with one button of physical key, actions selects "call sub", when you pressed the HMI button, it will call corresponding sub function.

➢ **Example 1**

1) Bind “run” control with “ON” physical button. In HMI file, click “run” control, then in its property window, bind it with “3” (3 is HMI “ON” button).

   Bind “pause” control with “pause” physical button. In HMI file, click “pause” control, then in its property window, bind it with “4” (4 is HMI “pause” button).



2) Download the program again to run it. Set “custom parameter”, and after selecting the axis, you can use “ON” “pause” buttons on HMI to replace touch screen button, that is, control selected axis' motion. In touch screen “motion state” window, you can view current axis' position and speed.

➢ **Example 2**

1) Bind “+” control with “X+” physical button. Click “motion control” window “+” of manual, then in its property window, bind it with “25” (25 is HMI “X+” button).

Bind "-" control with "X-" physical button. Click "motion control" window "-" of manual, then in its property window, bind it with "24" (24 is HMI "X-" button).

2) Download the program again to run it. Set "custom parameter", and after selecting the axis, you can use "X+" "X-" buttons on HMI to replace touch screen X+ & X- buttons, that is, control selected axis' forward and reverse motion. In programming design, this movement is a triggered movement, that is, when an external force is applied (such as pressing a button), the movement will be started, and when the external force is removed (such as releasing the button), the movement will stop. In touch screen "motion state" window, you can view current axis' position and speed.

Chapter IV Maintain

The correct operation and maintenance of the device can not only guarantee and extend the life cycle of the equipment itself, but also take technical management measures according to the pre-specified plan or the corresponding technical conditions to prevent equipment performance degradation or reduce equipment failure.

4.1. Regular Inspection and Maintenance

The working environment has an impact on the device. Therefore, it is usually inspected regularly based on the inspection cycle of 6 months to 1 year. The inspection cycle of the device can be appropriately adjusted according to the surrounding environment to make it work within the specified standard environment.

Check item	Check content	Inspection standards
power supply	Check whether the voltage is rated	DC 24V (-5%~5%)
surroundings	Whether the ambient temperature is within the specified range (when installed in the cabinet, the temperature inside the cabinet is the ambient temperature)	0°C - 55°C
	Whether the ambient humidity is within the specified range (when installed in the cabinet, the humidity in the cabinet is the ambient humidity)	10%-95% non-condensing
	Is there direct sunlight	No
	With or without droplets of water, oil, chemicals, etc.	No
	Whether there is dust, salt, iron filings, dirt	No
	Whether there is corrosive gas	No
	Whether there are flammable and explosive gases or articles	No
	Whether the device is subjected to	Should be within the range of

	vibration or shock	vibration resistance and impact resistance
	Is the heat dissipation good	Keep good ventilation and heat dissipation
Installation and Wiring Status	Whether the basic unit and the expansion unit are installed firmly	The mounting screws should be tightened without loosening
	Whether the connecting cables of the basic unit and the expansion unit are fully inserted	The connection cable cannot be loosened
	Are the screws of the external wiring loose	Screws should be tightened without loosening
	Whether the cable is damaged, aged, cracked	The cable must not have any abnormal appearance

4.2. Common Problems

Problems	Suggestions
It can't show HMI interface normally.	1. Resolution is set incorrectly, please set it according to hardware requirements.
The screen is not bright, the brightness is not enough.	1. Check HMI power, it should be powered enough.
It can't communicate	1. Check the network cable.
Click one, but wrong position	1. Please do HMI calibration again.
POWER led is ON, RUN led is OFF.	1. Check whether the power of the power supply is sufficient. At this time, it is best to supply power to the HMI alone, and restart it after adjustment. 2. Check whether the ALM light flickers regularly (hardware problem).
RUN led is ON, ALM led is ON.	1. Program running error, please check RTSys / ZDevelop error code, and check application program.