

# CONTROLLER MANUAL

VE2.8



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# 1 Main Interface Functions

## 1.1 Main interface

The main interface mainly displays the tightening results and tightening curves sent by the tightening machine, scanning information, program, transmission rate or group information.

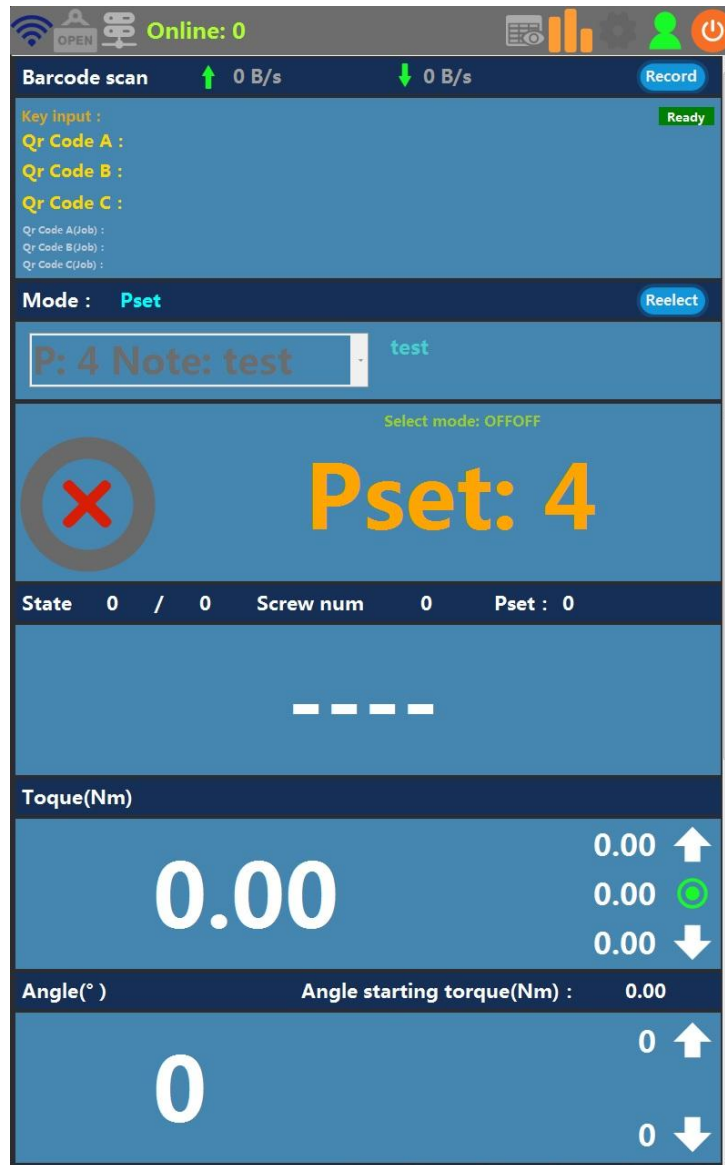


Figure 1-1 Main Interface

**Record:** Used to record the function of work number when multiple identifiers are used to select the program. Recorded identifiers do not participate in program selection, the number of recorded identifiers is set in the Work Mode menu - Sweep Policy Setting.

**Reselect:** Used when the group is not completed, an error has occurred and the group needs to be reselected with this button.

**Note: 1. Before using this controller, you need to plug the antennas before powering it on, otherwise it will cause damage to the internal circuit!**

**2. After powering up the controller and the main power switch is illuminated, please wait for two to three minutes before pressing the on/off button.**

## 1.2 Main interface menu bar introduction

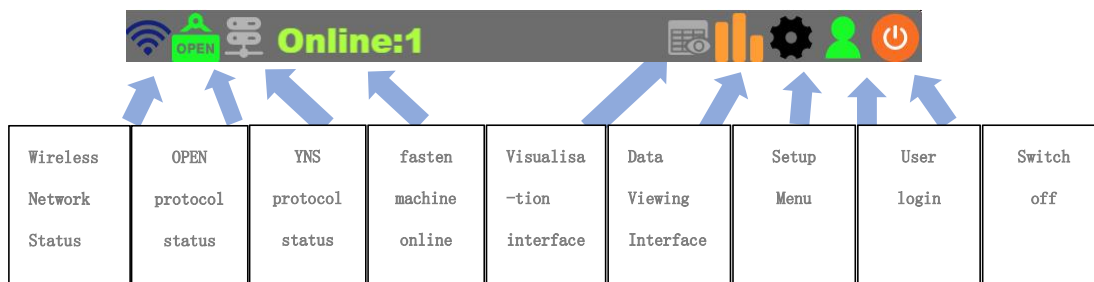


Figure 1-2 Main interface menu bar

### ① Visualization

The user can access the visualization interface through the visualization display button. This interface is graphically based on the serial number of the screw position, making it easier for the user to observe the tightening results and status. This function is only available in group mode.

### ② Current device online

This displays the number of devices that are currently online. You can click this control to bring up the details of the online devices, as shown in Figure 1-3.

The screenshot shows a window titled 'Current online equipment information' with a close button (X) in the top right corner. The window contains a table with three columns: Site, Tool ID, and State.

| Site | Tool ID  | State |
|------|----------|-------|
| 1    | 22C14012 | --    |
| 3    | SP14J240 | --    |
| 4    | TEST2005 | --    |
| 5    | TEST0003 | --    |
| 6    | 22G30508 | --    |
| 7    | TEST2001 | --    |
| 8    | TEST2004 | --    |

Figure 1-3 Current online equipment information

### ③ OPEN protocol status

This icon is automatically lit if the device's Open Protocol service is up and running properly, otherwise it is greyed out. Grey means that Open Protocol is not working properly.

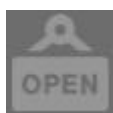


Figure 1-4 closed open protocol service



Figure 1-5 correct open protocol service

#### ④ Controller Wireless Signal Status

Represents the wireless link status of the controller. If the wireless signal status is grey, it means that there is a problem with the wireless link and the tightener cannot communicate with the controller.



**Figure 1-6** Unusual controller wireless signals



**Figure 1-7** Unusual controller wireless signals

#### ⑤ Data viewing

The main function of the Data View button is to query historical data and export data. Data View requires a simple password to be entered in order to use this function.

#### ⑥ YNS protocol status

The YNS protocol is our customized protocol used to output the tightening data. Gray color means disconnected from the server receiving the data, otherwise it means the connection is normal.



**Figure 1-8** Unusual YNS protocol



**Figure 1-9** usual YNS protocol

#### ⑦ Setting

The Setup button is primarily for setting up the tightener and controller. This button is normally grayed out and will only be effective when the user is logged in. (After 30 minutes after the user has logged in, the button will automatically become invalid and will need to be logged in again to take effect.)

#### ⑧ User login

User login will pop up the interface as shown in Figure 1-10, if the user enters the password correctly it will change the setup button to the valid status. (Valid status is 30 minutes)

The system provides three accounts by default:

Account 1: admin      password: admin123。

Account 2: root      password: root123。

Account 3: user      password: user123。



**Figure 1-10** User login interface



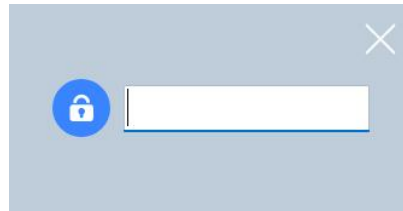
**Figure 1-11** Shutdown interface

### ⑨ Turn off

This button is used to shut down or restart the server, and its interface is shown in Figure 1-11.

### ⑩ Simple Password Interface

The simple password screen is used to enter the password required for “program reselection and data viewing”, which can be set in the operating mode.



**Figure 1-12** simple password interface

## 1.3 Curve Viewing

Tightening curves can be viewed from the main screen by dragging the scroll bar on the main screen to the bottom to see the curve display area.



**Figure 1-13** Tightening curve display

## 2 Settings

### 2.1 Setting menu main screen

Settings include Tool config, Tool setup, Tool bar code, Tool network , Working pattern, identifier, Position arm, Net out config, Register users, Bounding tool, Set group, Set Job, IO config, Comout format, Bus setup, Tool upgrade, log view, Led setting, Device info, Time set , soft update and Tool log.

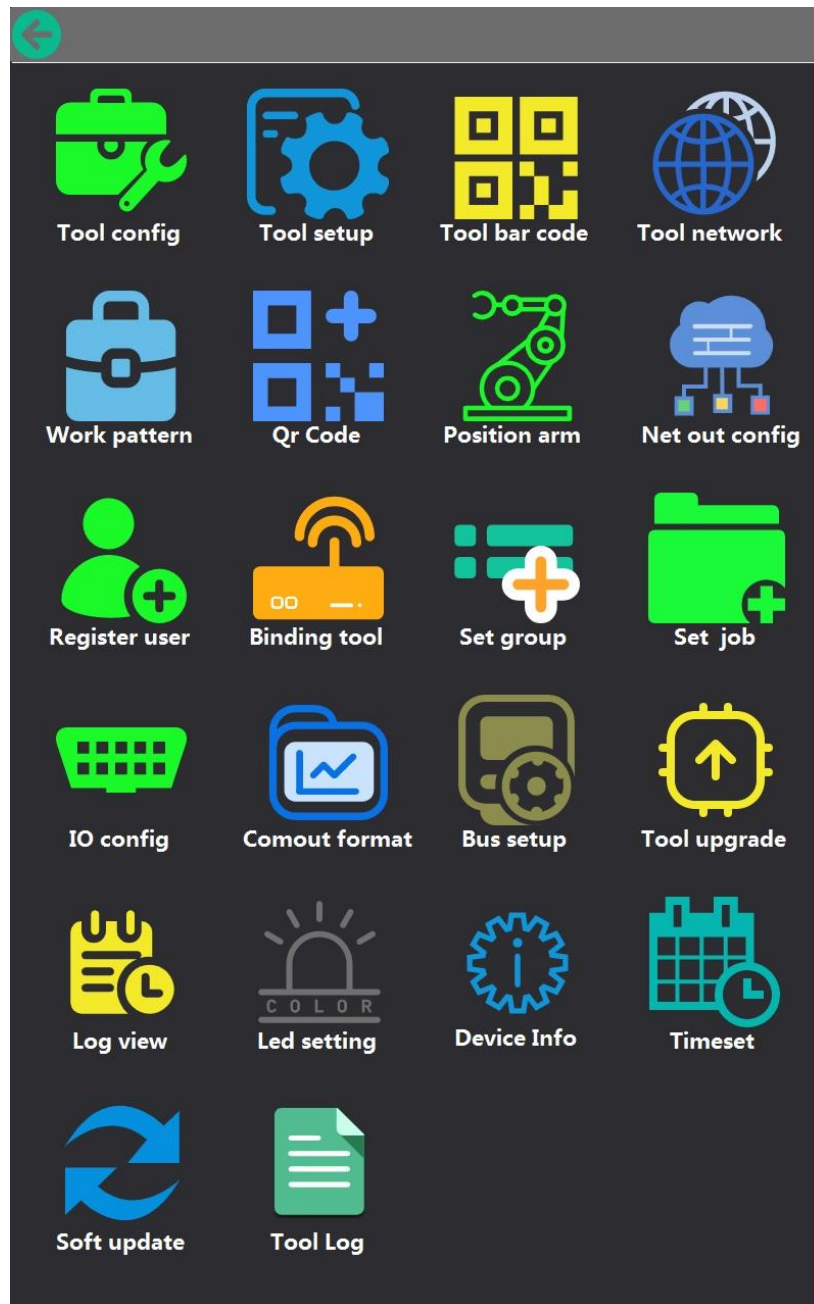


Figure 2-1 Settings main menu

## 2.2 Tool config

Tightening machine setting is to set the working parameters of each tightening machine, you need to connect the controller and the tightening machine through USB cable or wireless network, and then select USB in the drop-down box, then the original configuration information in the tightening machine will be read automatically. After the setting is finished, you can download it to the tightening machine through the download button on the right side of the drop-down box. (Click the left arrow in the upper left corner to return to the previous interface).

Figure 2-2 Tightening machine settings

### **(1) Tool ID**

Tightening machine ID is a positive integer in the range 0-999999999, which is a number given to the tightener on behalf of the user, not a serial number. The user can define this ID at will, where each tightening result contains this ID.

### **(2) Sleep Timeout(sec)**

This function is to set the standby time for the tightening machine to automatically hibernate, if the set time is reached without operating the tightening machine, the tightening machine will automatically hibernate. The maximum is 999 seconds.

### **(3) Data storage capacity**

This function is to set the maximum number of tightening data that can be stored in the tightening machine, and the specific number of data stored can be judged according to the tightening machine model.

### **(4) Curve storage capacity**

This function is to set the maximum number of tightening curves that can be stored in the tightening machine, and the specific number of stored curves can be judged according to the tightening machine model.

### **(5) Pset start num**

The program start number is the minimum program number for which the user can select a program. The program start number cannot be greater than the program end number, nor can it be zero.

### **(6) Pset end num**

The end-of-program number is the maximum program number for which the user can select a program. The end-of-program number cannot be less than the start-of-program number, nor can it be zero.

### **(7) Tool passwd**

The password is a four-digit code used for authentication when accessing the setup screen from the tightener. The values range from 0000 to FFFF.

### **(8) Pset selection mode**

The program switching mode consists of three modes:

- **Tool Selection:** Set to this mode, the user can switch program numbers manually by

tightening machine.

- **Wi-Fi Selection:** Set to this mode, the user needs to switch the program through Open protocol or other forms.
- **QR Code Selection:** Set to this mode, the user can switch the program number by scanning the identifier and barcode, provided that some characters of this information are stored in the tightener (usually the first 8 characters). How to store the identifier information is described in the following section.

#### **(9) Ext Enable**

If the external enable is set to ON, the tightening machine must be enabled by Open protocol or other forms, otherwise the tightening machine will not operate normally. If you do not want to enable the screwing machine externally, please set it to OFF.

#### **(10) Data overflow stop**

Due to the limited storage capacity of the tightening machine (at most, it can only store the maximum number of data set by the user, refer to the data storage capacity setting), if the user sets it to ON, the tightening machine can not continue to be used when it is full of data, and it must be cleared by the computer software before it can be continued to be used. If the setting is OFF, then the tightening machine will work all the time, when the data is full, the later data will overwrite the previous data.

#### **(11) Data transfer wait**

Data transmission wait If set to ON and the wireless function is turned on, the tightening machine must transmit the resultant data to the controller in order to continue working, otherwise the data will be sent until it is successful and the tightening machine cannot continue to be used. Setting it to OFF will also transmit the data to the controller, but due to the characteristics of the wireless network, the data may be lost, but it will be stored in the tightening machine. If you do not require high data storage, you can set it to OFF.

#### **(12) Curve transfer wait**

"Curve transmission wait" is an extension of data transmission wait, but instead of merely waiting for result data, it involves waiting for the entire curve to be received before the tightening machine can continue to operate.

#### **(13) Enable wireless**

Enable Wireless If set to ON the wireless connection function of the tightening machine is turned on, OFF the wireless connection function is turned off.

#### **(14) Identifier on-off**

Identifier Scanning if set to ON the tightening machine identifier scanning function is turned on, and OFF the identifier scanning function is turned off.

#### **(15) Process result out**

It is a multi-step situation where the tightening machine does not complete the last step. Just send the result of the last step of the intermediate step to the controller.

#### **(16) Group finish reset**

It means that the tightening machine itself uses the group and can automatically reset the group when it is finished. (In the case of not using the controller group).

#### **(17) Scanning module type**

There are four scanning module types, A, B, C and D, which can be configured automatically according to the type of your scanning head.

#### **(18) Scanning module light**

Scanning module light brightness is with 10 levels, where 0 is off light. Not all scanning heads support light adjustment, please set it according to your scanning head type.

#### **(19) NOK confirm**

If the result is confirmed as unqualified, after opening this function, manual confirmation is required before the tightening machine can continue to be used for the current screw that was tightened but found unqualified. Typically, this confirmation is done by pressing the "Confirm" button or "Toggle Forward/Reverse" on the tightening machine (with the function to confirm unqualified results by reversing enabled).

#### **(20) NOK reverse confirm**

Only when this function is turned on, the tightening machine can confirm whether to continue working or not by “switching forward and reverse” when the tightening fails. Otherwise, it can only be confirmed by pressing the “confirmation key”.

#### **(21) OK disable reversal**

If this function is turned on, the tightening machine will not be allowed to rotate in the reverse direction after the tightening result is passed.

## (22) Curve full stop

Shutdown when curve data is full reference shutdown on when data is full description, except that here the judgment is curve.

## (23) NOK cumulative number

The result failure confirmation function is turned on, so that if the number of times the tightening machine generates a result that needs to be confirmed is too high, the controller is required to confirm the result in order to avoid misoperation. The maximum number of confirmations allowed for the tightening machine is set here, and once the number is exceeded, confirmation is required from the controller. If you do not need to use the controller to confirm the function, then set 0 here.

## (24) Reducer reduction ratio

This setting is the amplification of the torque amplifier used by the tightening machine. It must be set to 1 if no amplifier is used, otherwise the result display will be affected.

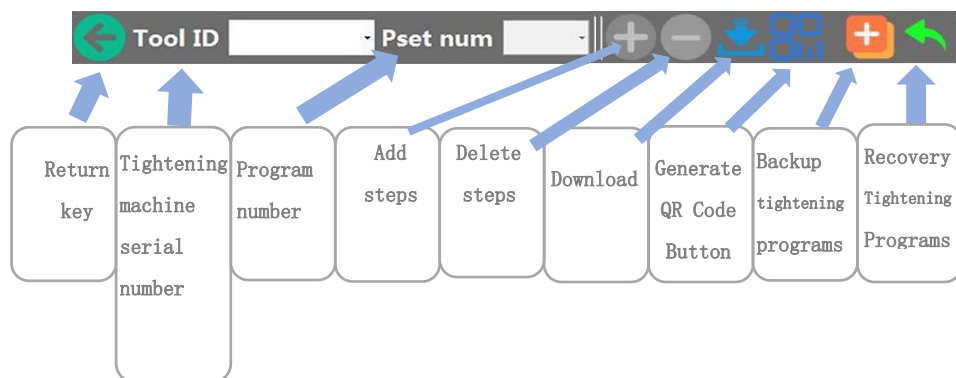
## (25) Reducer efficiency

This setting is the amplification efficiency of the tightening machine using the torque amplifier, without using the amplifier must be set to 1, otherwise it will affect the result display.

## 2.3 Tool setup

Program setting is to add different programs for the tightening machine to facilitate the user to apply different tightening data in different environments. Figure 2-3 shows the program setting interface control menu.

### 2.3.1 Program settings menu bar



**Figure2-3** Function description of the control menu

**Tightening machine selection box:** The tightening machine can be selected for configuration via USB or serial number. (The displayed serial number of the tightening machine represents wireless transmission, while USB represents a device connected via cable.) (Note: Only one USB cable can be connected at the same time.)

**Program Selection Box:** The Program Selection Box is used for selecting programs, and each tightening machine supports up to 32 programs.

**Download button:** Download the edited programs into the tightening machine.

**Add steps:** Add steps in programs, the maximum steps can be added is 8 per program.

**Delete the steps:** Delete the last step in program.

**Backup tightening programs:** All programs within the tightening machine can be backed up into a single file.

**Recovery Tightening Programs :** The backed-up programs can be downloaded back into the tightening machine.

### 2.3.2 Main interface for program settings

Tool ID TE240918 Pset num 1

Name Max torque 12 Nm

Remarks test

Common Settings

Step 1

Reverse setting

**Figure 2-4** Main interface for program settings

**Program Name:** The Program Name can be up to 3 characters long and serves as an identifier for the current program.

**Program Remarks:** The Program remarks section can support program description information up to 100 characters long.

**Maximum Torque:** Displays the maximum torque supported by the current tightening machine.

### 2.3.3 Program setting attributes

#### (1) Common settings

The various options for general settings are illustrated in Figure 2-5.

The screenshot shows a software window titled "Common Settings" with a blue header bar. The window contains a list of settings on the left and their corresponding values on the right. The settings are: Unit (Nm), Group counting (5), Cycle delay (sec) (0), Autoincrement (0), TR Linear coefficient (1.00), TR deviation ratio (0.00), Fastening Time High Limit (sec) (60), Fastening Time Low Limit (sec) (0), Free Run Angle High Limit (°) (32000), Free Run Angle Low Limit (°) (0), ETS (0), and Joints (Hard). Below these is a "Curve setting" section with a sub-header "Curve setting". It contains two toggle switches: "Enable curve" (ON) and "Wait Ful" (ON). Below these are two radio button groups: "Curve mode" with "Torque" and "Angle and torque" (selected), and "Periodic curves" with "All periods" and "Failed only period" (selected). At the bottom of the curve settings are three more settings: "Curve sampling rate" (6), "Curve sampling point" (1000), and "Curve starting torque" (12.00).

| Setting                         | Value              |
|---------------------------------|--------------------|
| Unit                            | Nm                 |
| Group counting                  | 5                  |
| Cycle delay (sec)               | 0                  |
| Autoincrement                   | 0                  |
| TR Linear coefficient           | 1.00               |
| TR deviation ratio              | 0.00               |
| Fastening Time High Limit (sec) | 60                 |
| Fastening Time Low Limit (sec)  | 0                  |
| Free Run Angle High Limit (°)   | 32000              |
| Free Run Angle Low Limit (°)    | 0                  |
| ETS                             | 0                  |
| Joints                          | Hard               |
| <b>Curve setting</b>            |                    |
| Enable curve                    | ON                 |
| Wait Ful                        | ON                 |
| Curve mode                      | Angle and torque   |
| Periodic curves                 | Failed only period |
| Curve sampling rate             | 6                  |
| Curve sampling point            | 1000               |
| Curve starting torque           | 12.00              |

Figure 2-5 General setting

#### ① Unit

The unit selection can be Nm, In-lbs, Ft-lbs, and dNm. Currently, the tightening machine defaults to using Nm (Newton-meters) as the unit, with the others not in use.

#### ② Group Counting

Group Counting is a parameter that needs to be set when the tightening machine uses its own group feature. The maximum supported value is 255. When using a controller group, this should be set to 0.

#### ③ Cycle delay(sec)

Cycle Delay represents the amount of time that needs to be waited after tightening one screw

before proceeding to tighten the next screw.

④ **Auto increment(Currently not in use)**

⑤ **TR Linear Coefficient**

TR Linear Compensation is used to calculate the error between the calibrated set torque and the actual tightening torque, with a default value of 1. Users should not arbitrarily set this value to avoid introducing errors in the output torque.

⑥ **TR deviation ratio**

TR Offset Compensation is used to calculate the discrepancy between the calibrated set torque and the actual tightening torque, with a default value of 0. Users should refrain from adjusting this value arbitrarily to prevent errors in the output torque.

⑦ **Fastening Time high limit (sec)**

The upper limit of tightening time refers to the maximum time restriction that can be achieved during the tightening process.

⑧ **Fastening Time low limit (sec)**

The minimum time restriction that can be achieved during the tightening process.

⑨ **Free run angle high limit(°)**

The maximum angle restriction that can be achieved during the tightening process.

⑩ **Free run angle low limit(°)**

The minimum angle limitation that can be achieved during the tightening process.

⑪ **ETS**

Pulse mode 0 turns the mode off, while 1, 2, and 3 turn it on with different levels.

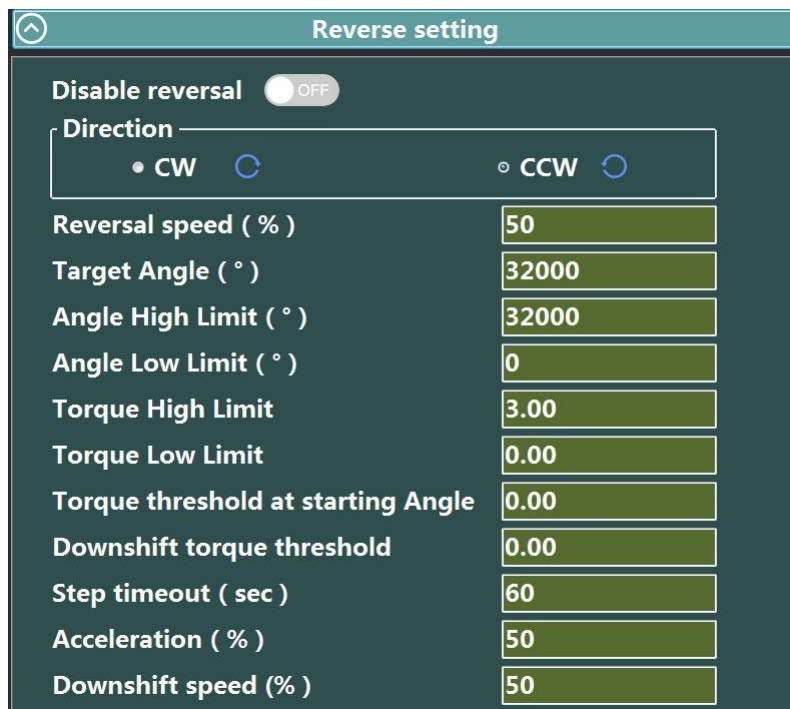
⑫ **Curve setting**

When the "Enable Curve" setting is set to ON, it indicates that the curve recording for the program is activated, allowing you to view the tightening curve on the main interface. The curve comes in two modes: 1. Torque vs. Time; 2. Torque vs. Angle. (You can select according to your needs.)

Curve Output Rules:

1. All cycles (a curve will be output for each screw).
2. Only failed cycles (a curve will only be output for screws that fail the tightening criteria).

**(2) Reverse Setting**



| Reverse setting                     |                              |
|-------------------------------------|------------------------------|
| Disable reversal                    | <input type="checkbox"/> OFF |
| Direction                           |                              |
| <input checked="" type="radio"/> CW | <input type="radio"/> CCW    |
| Reversal speed ( % )                | 50                           |
| Target Angle ( ° )                  | 32000                        |
| Angle High Limit ( ° )              | 32000                        |
| Angle Low Limit ( ° )               | 0                            |
| Torque High Limit                   | 3.00                         |
| Torque Low Limit                    | 0.00                         |
| Torque threshold at starting Angle  | 0.00                         |
| Downshift torque threshold          | 0.00                         |
| Step timeout ( sec )                | 60                           |
| Acceleration ( % )                  | 50                           |
| Downshift speed ( % )               | 50                           |

**Figure 2-6** Reverse Setting

### ① Disable reversal

If this bit is in the ON state, the reversal function is prohibited; if it is in the OFF state, the reversal function is enabled.

### ② Direction

The tightening machine can be set to rotate counterclockwise or clockwise through the direction setting.

### ③ Reverse speed

Reverse speed is a percentage parameter that adjusts the speed based on the maximum rotational speed.

### ④ Target angle

Since reversal is primarily set based on an angle parameter, the user needs to set a target angle.

The reversal will stop when it reaches this target angle.

### ⑤ Angle high limit

It represents the maximum angle value that the tightening machine is allowed to reach.

### ⑥ Angle Low limit

It represents the minimum angle value that the tightening machine is allowed to reach.

### ⑦ Torque high limit

The upper torque limit refers to the maximum torque that can be achieved during the operation of the tightening machine. The upper torque limit cannot exceed the maximum torque capacity of the tightening machine.

**⑧ Torque low limit**

The torque lower limit refers to the minimum torque that can be reached during the operation of the tightening machine.

**⑨ Torque threshold at counted angle**

The torque threshold for counted angle is a decimal number, indicating that angle calculation will only begin once this threshold is reached.

**⑩ Downshifting torque threshold**

The torque threshold for downshifting is a decimal number, indicating that once this threshold is reached, the tightening machine will start to reduce its rotational speed.

**⑪ Step timeout**

Step timeout represents the maximum time limit that should not be exceeded when executing a particular step.

**⑫ Acceleration**

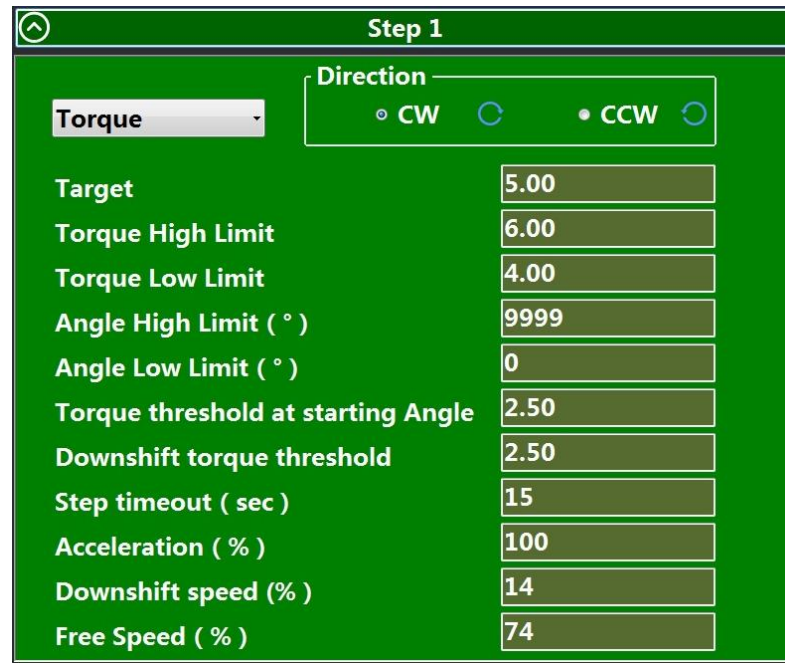
Acceleration, though not strictly a percentage parameter, refers to the rate of speed increase achievable by a tightening machine when raising its rotational speed. The greater the acceleration, the shorter the time it takes to reach the target speed.

**⑬ Downshift speed**

The downshift speed, expressed as a percentage parameter, refers to the speed threshold or range that a tightening machine can achieve when initiating the downshifting process, prior to coming to a complete stop.

### (3) Step Settings

The steps refer to the specific parameters executed by the tightening machine during the tightening process. They can be divided into multi-step programs and single-step programs (with a maximum of 8 steps supported). The settings for these steps are basically the same as those for reverse settings.



| Step 1                             |                                                               |
|------------------------------------|---------------------------------------------------------------|
| Torque                             | Direction                                                     |
|                                    | <input type="radio"/> CW <input checked="" type="radio"/> CCW |
| Target                             | 5.00                                                          |
| Torque High Limit                  | 6.00                                                          |
| Torque Low Limit                   | 4.00                                                          |
| Angle High Limit ( ° )             | 9999                                                          |
| Angle Low Limit ( ° )              | 0                                                             |
| Torque threshold at starting Angle | 2.50                                                          |
| Downshift torque threshold         | 2.50                                                          |
| Step timeout ( sec )               | 15                                                            |
| Acceleration ( % )                 | 100                                                           |
| Downshift speed ( % )              | 14                                                            |
| Free Speed ( % )                   | 74                                                            |

Figure 2-7 Step setting

#### ① Torque and Angle

Users can choose whether the tightening mode is primarily based on angle or torque. If angle-based, the target value to be set is the target angle; if torque-based, the target value to be set is the target torque.

#### ② Free Speed

Refers to the maximum speed that can be achieved by the tightening machine when it is idling, expressed as a percentage value.

#### (4) Primary torque

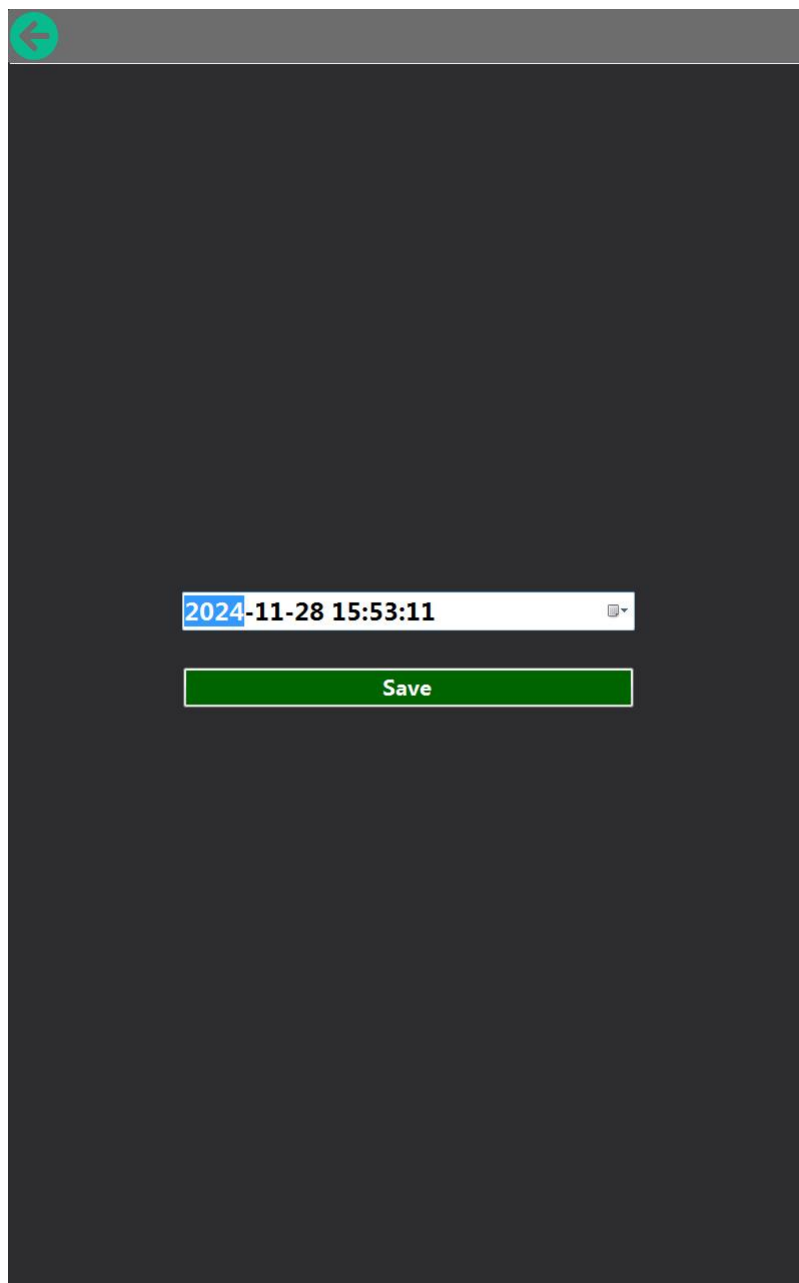
On the Step 1 settings interface, you can see a primary torque setting in the left dropdown menu. In the primary torque mode, users can set relevant parameters such as the target cut-in angle, primary range settings, and final torque settings. After setting the required parameters, the controller will automatically generate a tightening program based on the settings to facilitate quick program setup for complex tightening operations for users. (For specific parameter adjustment settings, please contact professionals.)



**Figure 2-8** Primary Torque settings

## 2.4 Time set

Time setting refers to configuring the local runtime of the controller. The operation is relatively simple, and once the settings are completed, they can be saved.



**Figure 2-9** Time setting

## 2.5 Tool network

Network settings primarily involve configuring the wireless parameters of the tightening machine. The configured wireless parameters can be downloaded to the tightening machine via the download button. (The default setting is static IP, and DHCP is not used.)



Tool ID TE240918

Static IP • DHCP

WIFI Name CM0201244701

WIFI Password siguo\_037

Server IP 192.168.1.2

Server port 9096

IP address 0.0.0.0

Subnet mask 255.255.255.0

Gateway 192.168.1.1

Port 9098



Figure 2-10 Network setting interface

### ① Wi-Fi name

The Wi-Fi name refers to the SSID of the wireless network that the tightening machine needs to connect to. By default, the Wi-Fi name is set to the serial number of the controller.

## ② **Wi-Fi password**

The Wi-Fi password refers to the security key required for the tightening machine to connect to the wireless network. The Wi-Fi password is fixed as: siguo\_037.

## ③ **Server IP Address**

The server IP address refers to the IP address of the controller within the wireless network, which is fixed at 192.168.1.2.

## ④ **Server port**

The server port number refers to the default port of the controller's service program. It is fixed at 9096.

## ⑤ **IP address**

The IP address refers to the IP address of the tightening machine within the wireless network. In the same network, the IP address of each tightening machine must be unique.

## ⑥ **Subnet Mask**

The subnet mask for the wireless network is fixed at 255.255.255.0.

## ⑦ **Gateway**

The IP address of the wireless network router is fixed at 192.168.1.1.

## ⑧ **Port**

It refers to the port number of the tightening machine itself, which defaults to 9096. The value range is from 2048 to 65535.

## ⑨ **Identifier**

The new version of the tightening machine (V2.x.x) allows for wireless parameter configuration by scanning the identifier on the controller.

## 2.6 Tightening machine identifier

If the user selects the identifier scanning switch program on the tightening machine, they first need to set the relevant string for the identifier here. Due to limited storage capacity of the tightening machine, each program can only correspond to 8 characters. The user can input 8 or more consecutive characters from the identifier into the corresponding program number. In this way, when the user scans the identifier, it will automatically switch to this program. After completing the settings, the user needs to download them to the tightening machine using the download button.

Tool ID

Pset 1~8 corresponding Qr Code

|       |                      |
|-------|----------------------|
| Pset1 | <input type="text"/> |
| Pset2 | <input type="text"/> |
| Pset3 | <input type="text"/> |
| Pset4 | <input type="text"/> |
| Pset5 | <input type="text"/> |
| Pset6 | <input type="text"/> |
| Pset7 | <input type="text"/> |
| Pset8 | <input type="text"/> |

Pset 9~16 corresponding Qr Code

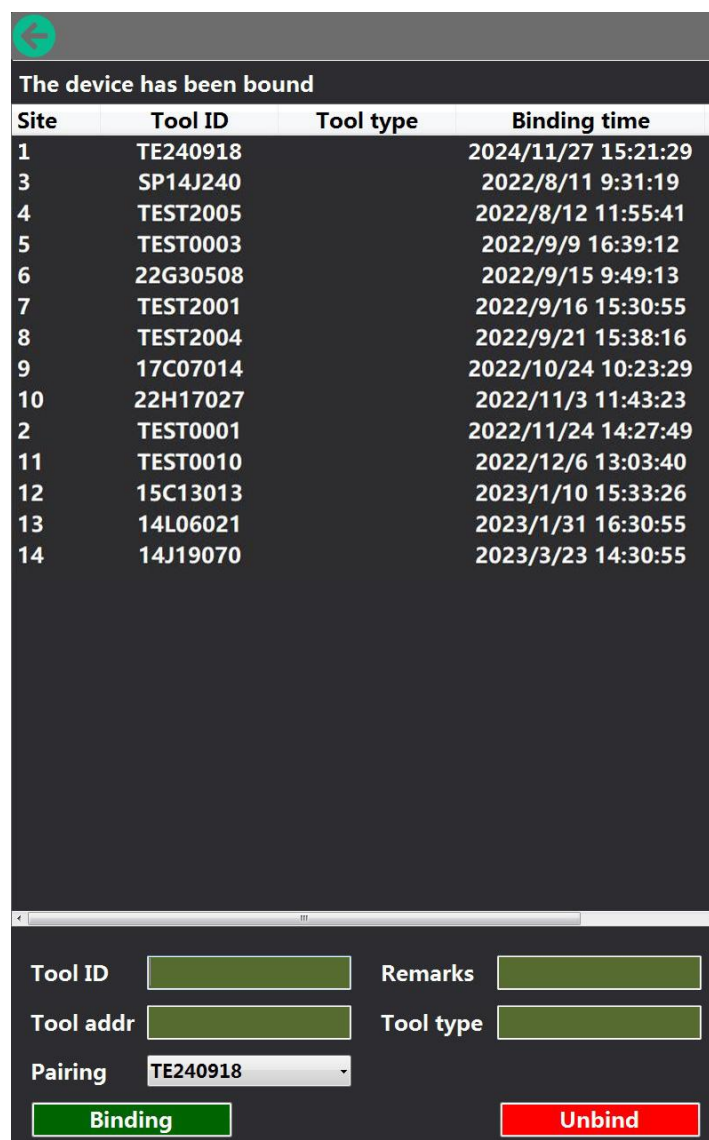
Pset 17~24 corresponding Qr Code

Pset 25~32 corresponding Qr Code

**Figure 2-11** Interface for Scanning Information

## 2.7 Binding Tool

Binding the tightening machine refers to the process of associating the tightening machine with a controller. If the tightening machine is not bound to a controller, then the controller will not be able to communicate with the tightening machine properly.



The device has been bound

| Site | Tool ID  | Tool type | Binding time        |
|------|----------|-----------|---------------------|
| 1    | TE240918 |           | 2024/11/27 15:21:29 |
| 3    | SP14J240 |           | 2022/8/11 9:31:19   |
| 4    | TEST2005 |           | 2022/8/12 11:55:41  |
| 5    | TEST0003 |           | 2022/9/9 16:39:12   |
| 6    | 22G30508 |           | 2022/9/15 9:49:13   |
| 7    | TEST2001 |           | 2022/9/16 15:30:55  |
| 8    | TEST2004 |           | 2022/9/21 15:38:16  |
| 9    | 17C07014 |           | 2022/10/24 10:23:29 |
| 10   | 22H17027 |           | 2022/11/3 11:43:23  |
| 2    | TEST0001 |           | 2022/11/24 14:27:49 |
| 11   | TEST0010 |           | 2022/12/6 13:03:40  |
| 12   | 15C13013 |           | 2023/1/10 15:33:26  |
| 13   | 14L06021 |           | 2023/1/31 16:30:55  |
| 14   | 14J19070 |           | 2023/3/23 14:30:55  |

Tool ID  Remarks

Tool addr  Tool type

Pairing

**Figure 2-12** Tightening Machine Binding Interface

To bind a tightening machine, you need the serial number of the tightening machine, which can be viewed on the machine itself. The address is used for communication with the tightening machine using the Open protocol, and the address range is 0-99. Each tightening machine under a controller must be bound to a unique address; otherwise, the binding will not be successful. For CM0201 model controllers, each controller can bind multiple tightening machines, but only one can be used at a time. Users need to select the serial number of the tightening machine they intend to use from the

dropdown menu for pairing.

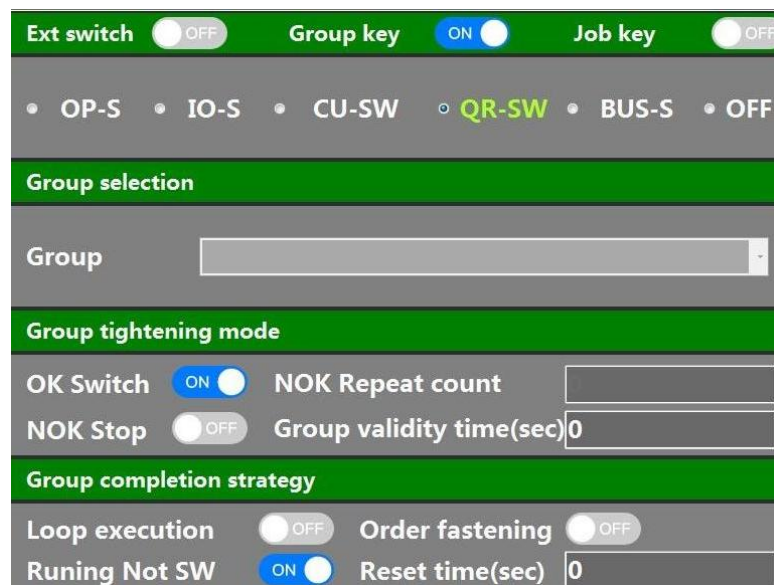
To unbind a tightening machine, you only need to enter its serial number.

## 2.8 Work Pattern

The working mode sets the operational state of the controller. The working modes are divided into Group Mode, Job Mode, and Default Mode. To use Group Mode, the tightening machine must be set to WiFi selection. If the tightening machine is set to Tightening Machine Selection or QR Selection mode, Group Mode needs to be turned off and set to OFF mode. To use Job Mode, Group Mode must be enabled.

### 2.8.1 Group mode

Group Mode represents that the smallest working unit of the controller is based on groups, which can contain one or multiple programs.



The screenshot displays a configuration interface for the Group working mode. At the top, there are three toggle switches: 'Ext switch' (OFF), 'Group key' (ON), and 'Job key' (OFF). Below these, a row of mode selection buttons includes 'OP-S', 'IO-S', 'CU-SW', 'QR-SW' (highlighted in green), 'BUS-S', and 'OFF'. A green header bar labeled 'Group selection' is followed by a 'Group' dropdown menu. Another green header bar, 'Group tightening mode', precedes two rows of controls: 'OK Switch' (ON) and 'NOK Repeat count' (input field), and 'NOK Stop' (OFF) and 'Group validity time(sec)' (input field with '0'). A final green header bar, 'Group completion strategy', is followed by 'Loop execution' (OFF), 'Order fastening' (OFF), 'Runing Not SW' (ON), and 'Reset time(sec)' (input field with '0').

Figure 2-13 Group working mode

#### (1) Group switching mode

When the Group Function is set to ON, the Group Mode is enabled. The Group Mode includes five switching modes: OP Selection, IO Selection, Controller Selection, Bus Selection, and QR Selection. (For the method of adding groups, see Section 2.11)

**OP-S:** Switches groups via the Open protocol. If the controller is set to this mode, group switching can only be done through the Open protocol.

**IO-S:** Switches groups based on external IO signals.

**Cu-SW:** Also known as manual selection, allows the user to choose the desired group to switch

to via a dropdown menu.

**QR-SW:** Switches groups by scanning a QR code on the tightening machine. (For binding identifiers to groups, see Section 2.10)

For the above modes, the tightening machine needs to be set to Wi-Fi program selection.

**Bus-S:** Allows the controller to communicate with a PLC via protocols such as Profinet or CC-Link. (Requires corresponding modules)

**OFF:** Turns off controller program or group selection and only receives data.

## (2) Group tightening mode

**OK switch:** means that only when all screws within the group are qualified can the next screw be processed.

**NOK repeat count:** refers to the number of retries set when "Qualified Switching" is OFF. If a screw fails to meet the criteria after this number of attempts, the system will proceed to the next screw.

**NOK stop:** means that if any screw within the group fails to qualify, the entire group will be reset and started from the beginning.

**Group validity time(sec):** refers to the time limit within which the group must complete its task; otherwise, the group will be deemed unqualified. (Set to 0 if not used.)

## (3) Group Completion Strategy

Completion Strategy ,It refers to the operations executed after a group completes its tasks.

**Loop execution:** When ON is selected, the controller will automatically reset the group based on the subsequent reset time to proceed to the next group. If OFF is selected, manual reset by the user is required after the group execution is completed, including OP selection, identifier selection, controller selection, bus selection, and IO selection.

**Running not SW:** When ON is selected, switching groups is not allowed when the current group is not completed. If a group reselection is absolutely necessary, the user can click the reselection button to choose a different group.

**Reset Time:** Refer to the description of Group Cyclic Execution.

**Order fastening:** The specified group must be tightened in the set sequence. This feature is primarily used in conjunction with robotic arms. If robotic arms are not used, set it to OFF.

### 2.8.2 Default Mode

Default mode and group mode are basically similar, but with one key distinction: while group mode involves switching between groups, default mode involves switching between programs. (Programs and groups have an inclusive relationship, meaning that a group can contain one or more programs.)



Figure 2-14 Default working mode

### 2.8.3 Job mode

The "Job Mode" is another management level above the group level, primarily designed to address the unified management of workpieces required for complex tightening processes. (The Job Mode necessitates the use of QR selection.)

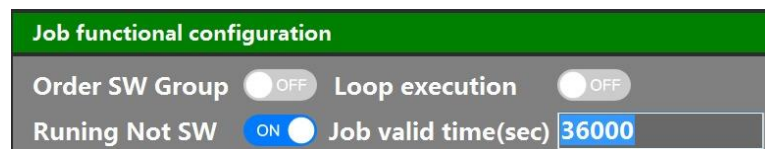


Figure 2-15 Job function setting

To use the Job Mode, you must first set up the corresponding groups and ensure that the group function is enabled. The primary function of Job Mode is to unify multiple groups into a single module.

**Order SW Group:** If enabled, the groups within a Job must be executed in the order they were set when the Job was added.

**Job Loop Execution:** This refers to whether a Job resets and starts over after it has been completed.

**Running not SW:** This determines whether a new Job can be selected while the current Job is still in progress.

**Job Validity Time(sec):** The Job must be completed within the specified time frame; otherwise, it will be considered unqualified. To disable this feature, set the time to 0.

## 2.8.4 Scanning Code Strategy(retrieval)

Scanning supports up to three identifiers for selecting a program. This update introduces a Record Mode, which means that if users choose a program using one or two codes, they can additionally record one or two more identifiers, with a maximum of three identifiers. Record Mode settings: 0 represents turning off recording; 1 represents recording one identifier; 2 represents recording two identifiers.

To select a group or program using a certain number of identifiers, simply check the corresponding number of identifiers. Here, identifiers A, B, and C correspond to the three codes (A, B, C) used when binding the identifiers to groups or programs.

Users can choose which code to use for selecting a program based on their needs.

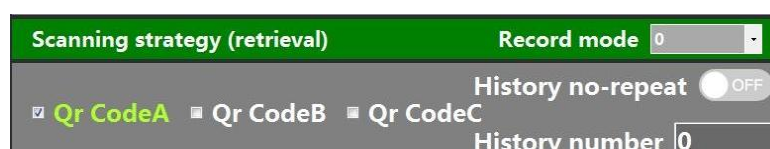


Figure 2-16 Scanning Code Strategy options

**History no-repeat:** This function searches for identical serial numbers among multiple workpieces. If a duplicate serial number is found within the specified search range, a prompt will be displayed. The search range can be set between 1 and 10 according to user needs. If users do not need to check for duplicate serial numbers in historical workpieces, please disable this function.

**Keyboard input:** The controller supports external USB barcode scanners or keyboard input for identifiers. If external devices are not required, you can ignore this setting. If you need to connect an external keyboard for input, make sure to set this option to ON. For external USB barcode scanners, set it to OFF. When inputting via keyboard, the time between entering any two characters should not exceed 10 seconds, otherwise the system will automatically consider the input as complete.

## 2.8.5 Data output mode

**Serial Port Output:** Users can receive result data through the RX1 and TX1 ports of the controller's serial interface. Please refer to Chapter 8 for hardware port illustrations, and Chapter 2.12 for the output data format.

**Bus Output:** The Profinet module and CC-Link are optional and require the configuration of corresponding modules.

**Status indicator light Output:** External tower lights are used to output pass and fail signals.

**Network Output Protocol:** Data is sent to the server through designated network ports. Due to

variations in MES protocol interfaces among most clients, the specific protocols used are not listed here. If users require information on the protocols, please contact our company.

**Figure 2-17** Data Output Mode

### 2.8.6 Setting password

The password set here is used for group and job reselection, clearing alarms, and viewing data. The password will only be required in the corresponding interfaces when the simple password setting is ON.

Login Password: When set to ON, login is required to access the settings; otherwise, no login password is needed.

**Figure 2-18** Password settings

### 2.8.7 Other settings

Battery Low Warning for the Tightening Machine: When set to ON, if the battery level of the tightening machine falls below the set warning threshold parameter, a warning interface will pop up.

**Figure2-19** Other settings

### 2.8.8 Alarm prompt Settings

The pop-up warning prompt can be set to automatically exit based on the configured time. If you need to keep it displayed, simply disable the automatic exit feature.



Figure 2-20 Waring alarm settings

### 2.8.9 Sleeve Setting

If users need to confirm whether the program selected on the controller is correct using a socket selector, they should enable this function. Then, in the IO settings interface, select the corresponding socket input point and connect it sequentially to the output wires of the socket selector.

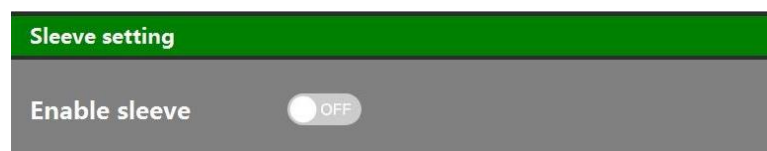


Figure 2-21 Socket settings

### 2.8.10 QR code input mode

The setting enables the input of identifiers into the controller through multiple methods, including (but not limited to) a tightening machine, bus system, barcode scanner, keyboard, and Open protocol. Users have the option to select more than one method for inputting identifiers.

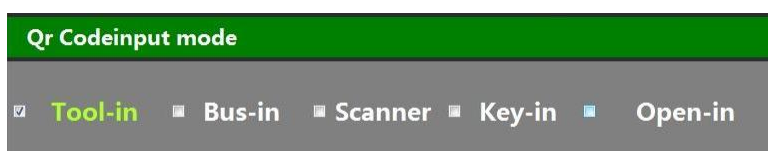


Figure 2-22 Identifier Input Method

### 2.8.11 Language setting

Users can choose multiple languages to display interface information. Currently, only Chinese and English are supported.



Figure 2-23 Language options

## 2.9 Identifiers (for binding groups, Jobs, and programs)

The identifier information is stored in the controller and is different from the tightening machine identifier. This identifier serves as the basis for the controller to select groups, Jobs, or programs. (It supports 1-64 characters and does not support Chinese characters.)

The screenshot displays a software interface for managing identifiers. At the top, there is a green back arrow icon. Below it, the title "An existing bar code" is centered. A table lists existing identifiers with columns for Number, Use type, and Qr Code A. Qr Code B is also listed but empty for all entries. Below the table, there are three input fields for Qr Code A, B, and C. Qr Code A is pre-filled with "M376". Below these fields, there is a "Number" dropdown menu set to "3" and a "Use type" section with three radio buttons: "Job", "Group" (which is selected), and "Pset". At the bottom, there are two buttons: "Binding" (green) and "Unbind" (red).

| Number | Use type | Qr Code A | Qr Code B |
|--------|----------|-----------|-----------|
| 1      | Job      | M127      |           |
| 1      | Group    | M206      |           |
| 1      | Pset     | M977      |           |
| 2      | Job      | M901      |           |
| 3      | Job      | M302      |           |
| 2      | Group    | M145      |           |
| 3      | Group    | M376      |           |

Qr Code A:

Qr Code B:

Qr Code C:

Number:  Use type : ☐ Job ☒ Group ☐ Pset

**Figure 2-24** The identifier information stored in the controller

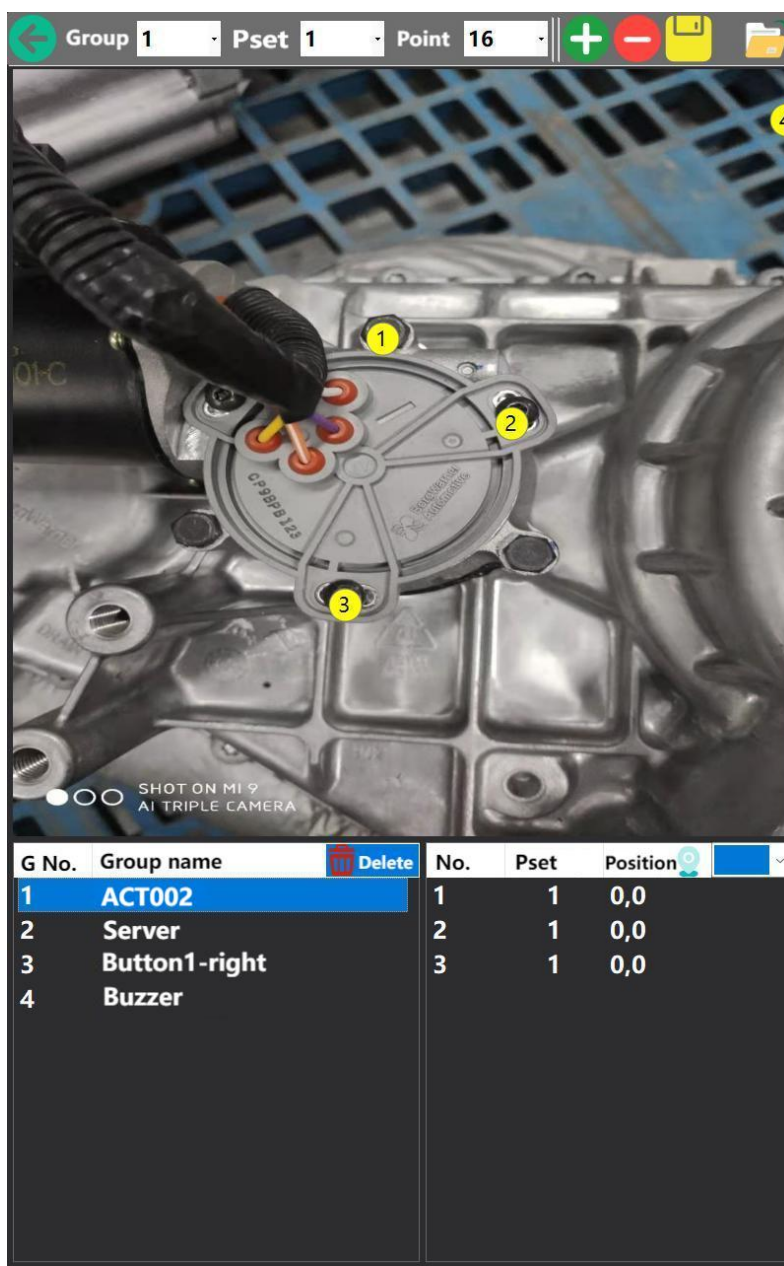
Each number can correspond to a maximum of three identifiers. When binding an identifier, the user must specify whether the binding is for selecting a Job, a group, or a program. To unbind an identifier, simply select the identifier information from the bound list and click on the unbind option.

**Identification Number:** When selecting a program, it corresponds to the program number; when selecting a group, it corresponds to the group number; and when selecting a Job, it corresponds to the Job number.

## 2.10 Add group

When the controller is in group mode, there must be selectable groups, and the addition and deletion of groups are both done on this interface.

### 2.10.1 Main Interface for Adding Groups



**Figure 2-25** Main Interface for Group Settings

### 2.10.2 Introduction to the Menu Bar

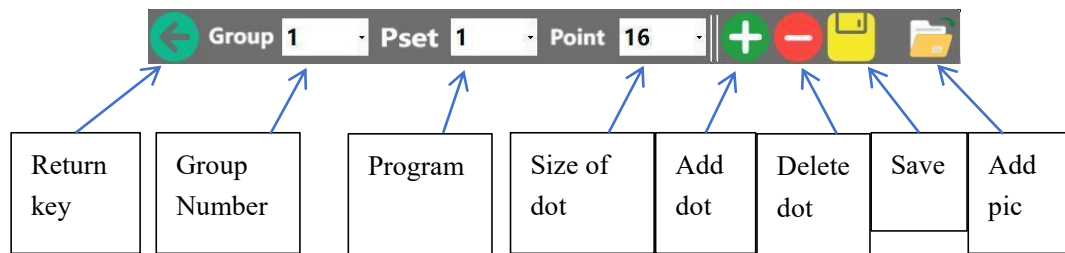


Figure 2-26 Group Menu Bar

### 2.10.3 Steps to add a group

(1) Prepare a USB flash drive with the renamed image saved on it and insert it into the controller's USB port. (Before adding a group, you need to add an image first, and the name of the image will be the name of the group after it is saved.)

(2) Click the "Add" button, and a dialog box will pop up. Locate the image you want to add from the USB flash drive and click "Open". As shown in the figure below: (The supported image formats are BMP, JPG, and PNG. Adding an image is mandatory when adding a group.)

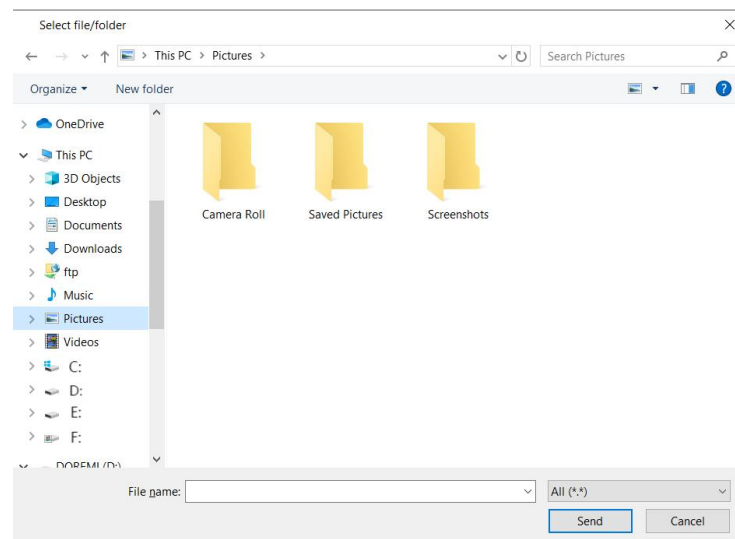


Figure 2-27 Insert image dialog box

(3) After adding the image, we will see the added image on the interface. At this point, we can select a group number through the group number dropdown box. Note that group numbers cannot be reused, and already used group numbers can be viewed in the saved group area.

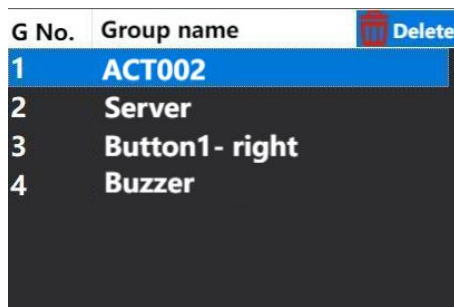
(4) Next, we can select a program through the program number dropdown box. After selecting, click the "Add Program" button, and then click on the screw hole location where you want to place the program. If a yellow dot with a serial number appears, it means that a program has been successfully added. To add multiple programs, repeat this step. The size of the dot can be changed

through the "Dot Size" dropdown box (please change the size before adding the dot).

(5) Remember to save after adding the programs.

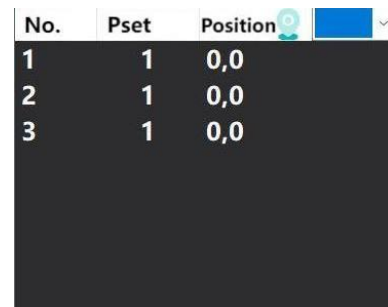
#### 2.10.4 Delete a group

To delete a group, first select the group name and press the delete button to remove the group.



| G No. | Group name     | Delete |
|-------|----------------|--------|
| 1     | ACT002         |        |
| 2     | Server         |        |
| 3     | Button1- right |        |
| 4     | Buzzer         |        |

Figure 2-28 Delete the group



| No. | Pset | Position |
|-----|------|----------|
| 1   | 1    | 0,0      |
| 2   | 1    | 0,0      |
| 3   | 1    | 0,0      |

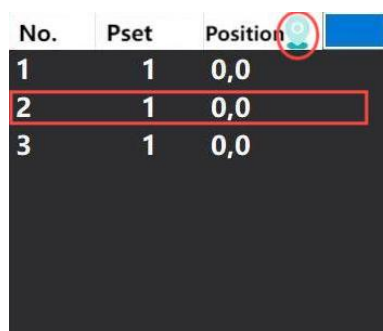
Figure 2-29 Modify the program number

#### 2.10.5 Modify the programs within a group

First, select the program you want to change, and then use the dropdown box in the top right corner to select the new program you want to replace it with. As shown in Figure 2-29.

#### 2.10.6 Add Position (Use Position Arm)

If you need to use the position arm, the parameters of the position arm will be automatically read for each group added. Therefore, please move the position arm to the corresponding position before adding a point. If you want to change the position value, select the position you want to change and then click the "Read Position" icon.



| No. | Pset | Position |
|-----|------|----------|
| 1   | 1    | 0,0      |
| 2   | 1    | 0,0      |
| 3   | 1    | 0,0      |

Figure 2-30 Modify position

## 2.11 Serial port output data format

If the serial port output is enabled, the data format for serial port output needs to be defined here. By default, the data output through the serial port is in ASCII format, and the serial port output rate is set to 9600 by default.

The serial port output format is shown in Figure 2-29. If a checkbox is ticked, the corresponding item will be output; if not, it will not be output.

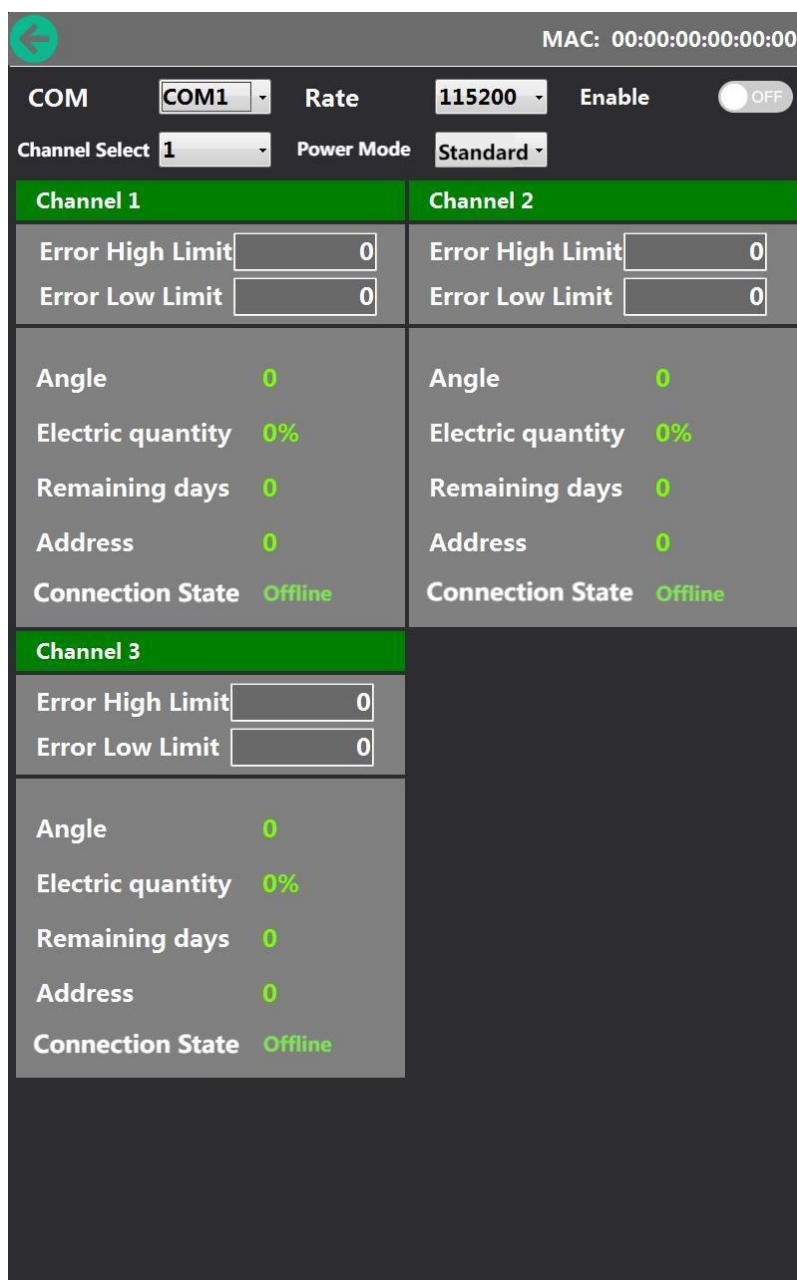
|                                     |                    |
|-------------------------------------|--------------------|
| <input checked="" type="checkbox"/> | Pset num           |
| <input checked="" type="checkbox"/> | Tool serial number |
| <input checked="" type="checkbox"/> | Screw num          |
| <input checked="" type="checkbox"/> | Final angle        |
| <input checked="" type="checkbox"/> | Final torque       |
| <input checked="" type="checkbox"/> | Final result       |
| <input checked="" type="checkbox"/> | Angle result       |
| <input checked="" type="checkbox"/> | Torque result      |
| <input checked="" type="checkbox"/> | Pset type          |
| <input checked="" type="checkbox"/> | Target             |
| <input checked="" type="checkbox"/> | Torque High Limit  |
| <input checked="" type="checkbox"/> | Torque Low Limit   |
| <input checked="" type="checkbox"/> | Angle High Limit   |
| <input checked="" type="checkbox"/> | Angle Low Limit    |
| <input checked="" type="checkbox"/> | Group counting     |
| <input checked="" type="checkbox"/> | Groups total       |
| <input checked="" type="checkbox"/> | Qr CodeA           |
| <input checked="" type="checkbox"/> | Qr CodeB           |
| <input checked="" type="checkbox"/> | Qr CodeC           |
| <input type="checkbox"/>            |                    |
| <input type="checkbox"/>            |                    |
| <input type="checkbox"/>            |                    |
| <input type="checkbox"/>            |                    |
| <input type="checkbox"/>            |                    |
| <input type="checkbox"/>            |                    |
| <input type="checkbox"/>            |                    |
| <input type="checkbox"/>            |                    |
| <input type="checkbox"/>            |                    |
| <input type="checkbox"/>            |                    |

**Figure 2-31** Definition of Serial Port Output Format

## 2.12 Position Arm Settings

The position arm mainly sets the port, baud rate, and switch. Users can optimize position recognition by setting the allowable error limits, with specific parameters adjusted according to the actual workpiece.

Generally, the coordinates of a position need to be located through two parameters from Channel 1 and Channel 2.



The interface shows a configuration screen for a position arm. At the top, there is a back arrow and a MAC address: 00:00:00:00:00:00. Below this, there are settings for COM (COM1), Rate (115200), and an Enable toggle (OFF). There are also Channel Select (1) and Power Mode (Standard) dropdowns. The main area is divided into three sections: Channel 1, Channel 2, and Channel 3. Each section has input fields for Error High Limit and Error Low Limit, both set to 0. Below these, there are status indicators for Angle (0), Electric quantity (0%), Remaining days (0), Address (0), and Connection State (Offline).

| Channel 1         |         | Channel 2         |         |
|-------------------|---------|-------------------|---------|
| Error High Limit  | 0       | Error High Limit  | 0       |
| Error Low Limit   | 0       | Error Low Limit   | 0       |
| Angle             | 0       | Angle             | 0       |
| Electric quantity | 0%      | Electric quantity | 0%      |
| Remaining days    | 0       | Remaining days    | 0       |
| Address           | 0       | Address           | 0       |
| Connection State  | Offline | Connection State  | Offline |

| Channel 3         |         |
|-------------------|---------|
| Error High Limit  | 0       |
| Error Low Limit   | 0       |
| Angle             | 0       |
| Electric quantity | 0%      |
| Remaining days    | 0       |
| Address           | 0       |
| Connection State  | Offline |

Figure 2-32 Position Arm Configuration Interface

## 2.13 Add Job

1. Select a Job number. Do not select a Job number that has already been added.

2. Set a Job name and click the "Add" button behind it.

3. Add a Group: Select a Group number, which determines the order of the Group within the Job.

Then, select a Group number and click the "Add" button. Repeat this step to complete the group addition. (Note: The Group number must be unique.)

4. Bind the settings.

5. If you need to unbind, select a Job above and click "Unbind".

The screenshot displays the 'Job setting interface'. At the top, there is a table with the following data:

| No. | Job | Job name | Inclusion group     |
|-----|-----|----------|---------------------|
| 1   | 1   | job1     | 1,1 2,2 3,3         |
| 2   | 2   | job2     | 1,1 2,2 3,3 4,1 5,1 |

Below the table, there are several interactive elements:

- Delete job**: A blue text label with a yellow arrow pointing to the red minus button in the 'Add job' section.
- Add job**: A blue text label with a yellow arrow pointing to the green plus button in the 'Add job' section.
- Add Group**: A blue text label with a yellow arrow pointing to the green plus button in the 'Add Group' section.
- Delete Group**: A blue text label with a yellow arrow pointing to the red minus button in the 'Add Group' section.
- Binding**: A green button.
- Unbind**: A red button.

The form at the bottom includes input fields for 'Job ID' (set to 1), 'Job name' (empty), 'Group ID' (set to 1), and 'Group' (empty). There are also green plus and red minus buttons for adding and deleting jobs and groups.

Figure 2-33 Job setting interface

### 3 Data viewing

#### 3.1 Data viewing main interface



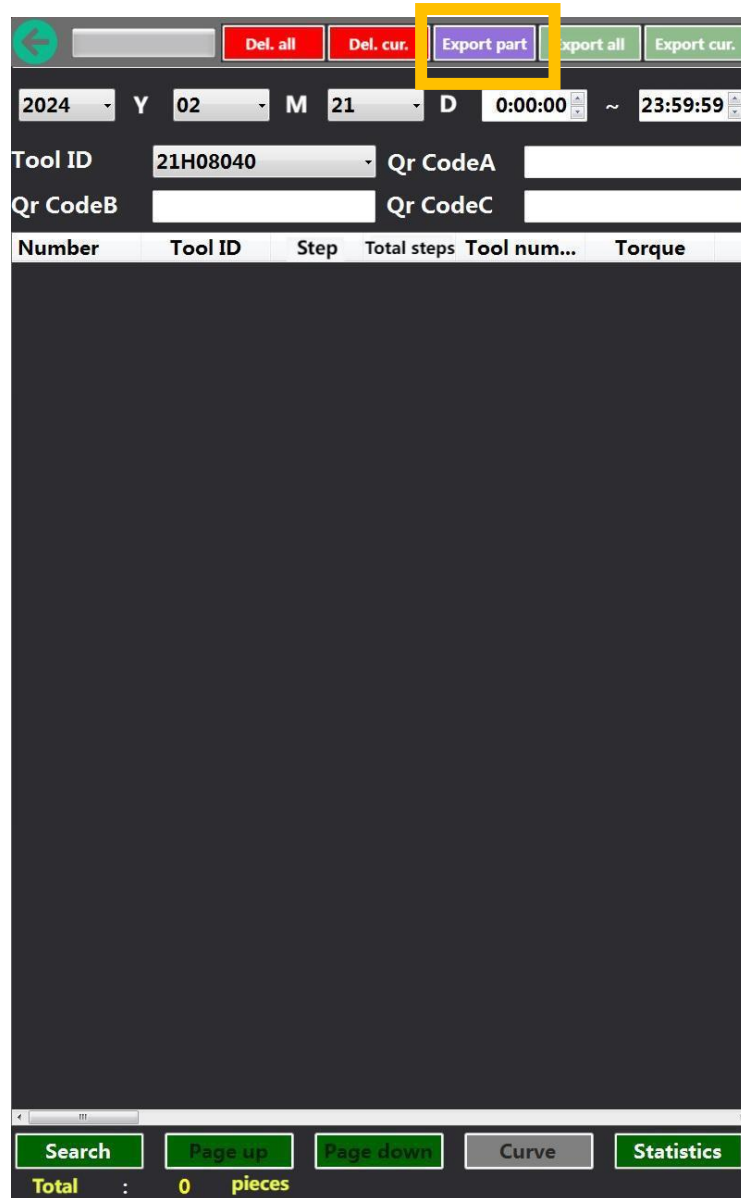
Figure 3-1 Data viewing interface

##### (1) Retrieve specific operation steps

- ① Select the desired tightening machine serial number from the corresponding date dropdown list and the tightening machine serial number dropdown list.
- ② Click "Retrieve" to view the data. You can navigate through pages using the "Previous" and "Next" buttons.
- ③ To export data, you must first insert a USB flash drive, select the corresponding tightening machine serial number, and then choose the data you wish to export. "Export Part" indicates exporting a portion of the data, "Export All" indicates exporting all the data, and "Export Current" indicates exporting the currently selected data.

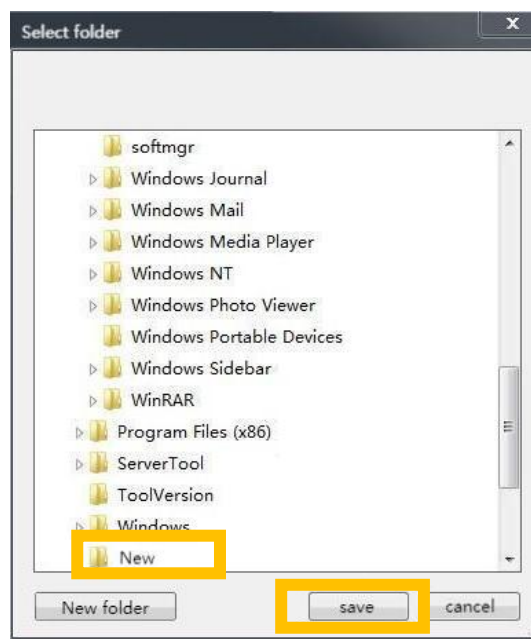
Using "Export Part" as an example, the export process is as follows:

After inserting the USB flash drive, select "Export Part". A dialog box will pop up, where you should select the corresponding USB flash drive.



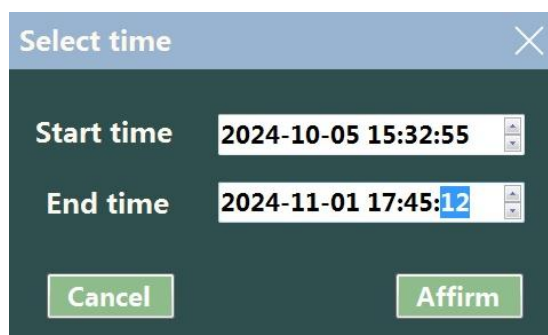
**Figure 3-2** Export data operation

Select the folder on the USB flash drive where you want to export the data, and click "OK".



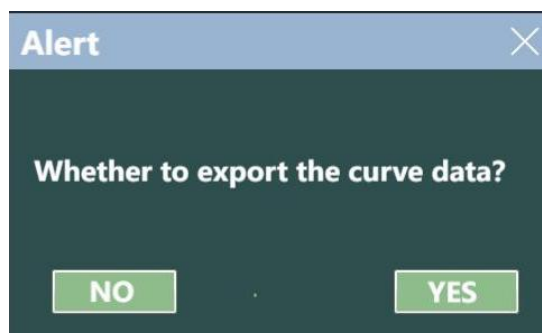
**Figure 3-3** Export data operation

Select the time range for which you want to export data and click "Confirm".



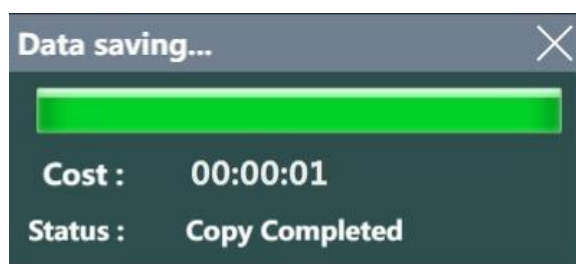
**Figure 3-4** Time Range Selection Dialog

A dialog box will pop up asking whether to export the curves. Make your selection as needed.



**Figure 3-5** Export Curves Dialog

The following dialog box will pop up, indicating that the data export is complete.



**Figure 3-6** Export data complete

④ You need to login before delete the data

Login default accounts:

Account1: admin      Password: admin123。

Account2: root      Password: root123。

Account3: user      Password: user123。

"Delete All" will delete all data, so use this function with caution. "Delete Current" will delete the currently selected data.



**Figure 3-7** Login interface

## (2) Curve viewing function

If a selected data entry contains a curve, the "Curve" button will be illuminated. Clicking the "Curve" button will display the curve for that data entry. As shown in Figure 3-3.

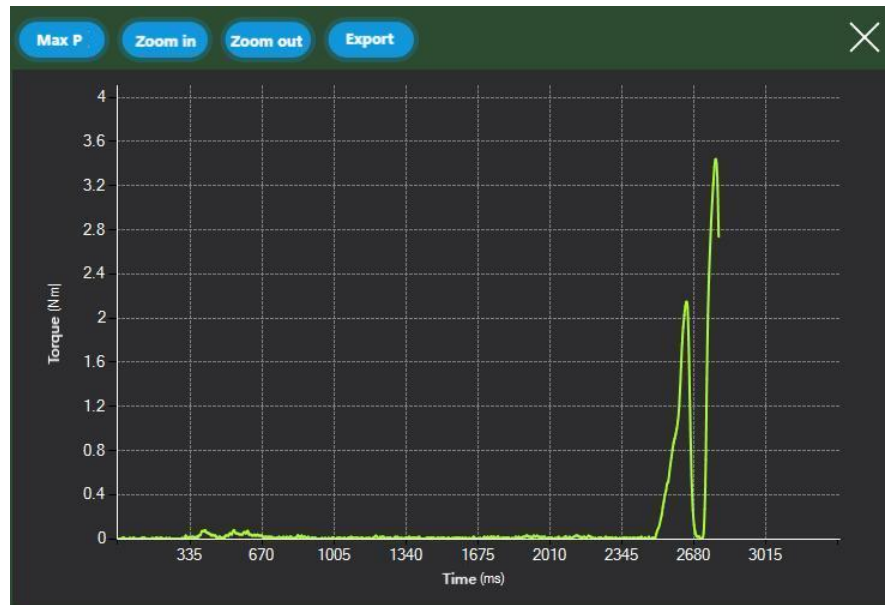


Figure 3-8 Curve viewing

If a USB flash drive is inserted, clicking the "Export" button will export the curve data to the USB flash drive.

## 3.2 Statistics

The statistics function allows for the analysis of tightening data. You can view the results of data analysis through three visualization methods: bar charts, range charts, and average charts.

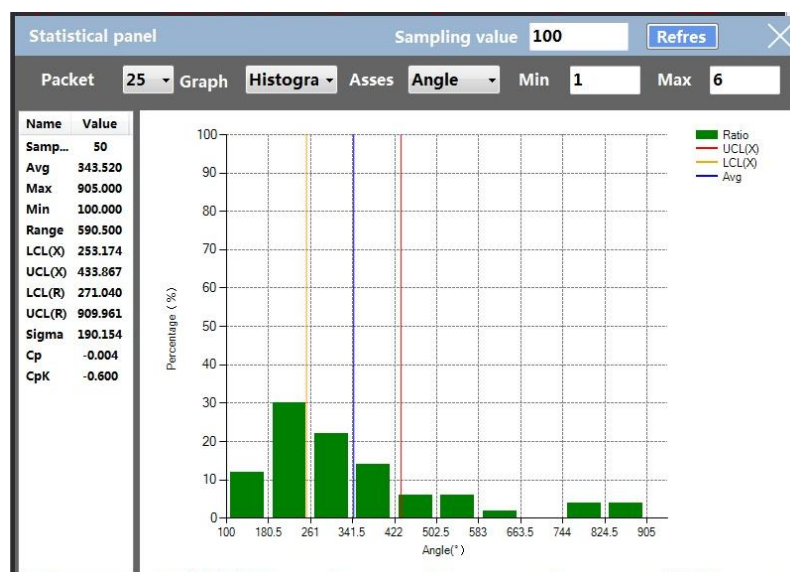


Figure 3-9 Statistics Interface

### 3.2.1 Acquisition of Data Samples

You can determine the scope of the data to be analyzed by setting the content parameters in Figure 3-5. The maximum number of data samples is 5000. The data with the most recent end time is used as the basis for analysis. For details, see Table 3-1.

Figure 3-10 Retrieval conditions

Table 3-1 Definition of data range

| Title                 | Description                                                         |
|-----------------------|---------------------------------------------------------------------|
| Time interval         | Measurement data from start time to end time.                       |
| Data sample size      | Up to 5000 times.<br>Use the most recent data.                      |
| Result state          | Pass and fail results.                                              |
| Tightening machine ID | Limited to the same tightening machine                              |
| Identifier A/B/C      | <b>Barcodes that are limited to a particular type of workpiece.</b> |

### 3.2.2 Setting of Statistical Parameters

Table 3-2 Definition of statistical parameters

| Title                 | Description                                                                                                                                                                       |
|-----------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Group Size            | An integer between 2 and 25.<br>Used to determine the lower and upper control limits.<br>Divide the sample data into N groups (the maximum data sample for a single group is 25). |
| Graphs                | Histograms, polar plots, and mean plots.                                                                                                                                          |
| Setting Maximum Value | Enter the value used to calculate the upper limit USL.                                                                                                                            |
| Set Minimum Value     | Enter the value used to calculate the lower LSL limit.                                                                                                                            |
| evaluate              | Select the main parameter for analysis (torque or angle).                                                                                                                         |
| Reload                | If you set new retrieval conditions or sampling values, you need to manually reload.                                                                                              |
| Sampling value        | The maximum is 5000 times and the minimum is 25 times.                                                                                                                            |

|                                                   |                                                                                                                                                                                                                                                                                                                                                                                                                                 |
|---------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Number of Values</b>                           | Used to calculate the number of arrays of visualized data. Presented as an integer multiple of the grouping. For example, if the grouping is 10 and the sampled value has 105 data, only 100 of those data will be used.                                                                                                                                                                                                        |
| <b>Average value(<math>\bar{x}</math>)</b>        | The average value of the sample data adopted is also the average value of all groups.                                                                                                                                                                                                                                                                                                                                           |
| <b>Minimum</b>                                    | The minimum value of the adopted sample data.                                                                                                                                                                                                                                                                                                                                                                                   |
| <b>Maximum</b>                                    | The maximum value of the adopted sample data.                                                                                                                                                                                                                                                                                                                                                                                   |
| <b>LCL</b>                                        | <p>In quality control, the Lower Control Limit (LCL) is the lower boundary for data points below the control (average) line on a control chart. For histogram and mean charts, the LCL is calculated using the following formula:</p> $LCL_{\bar{x}} = \bar{x} - (A_2 \times \bar{R})$ <p>For the range chart, calculate the LCL using the following formula:</p> $LCL_{\bar{R}} = D_3 \times \bar{R}$                          |
| <b>range value R</b>                              | The range value R = the maximum value within a group - the minimum value within a group. There are as many R - values as there are groups.                                                                                                                                                                                                                                                                                      |
| <b>Average range value (<math>\bar{R}</math>)</b> | Average range value: $\bar{R} = \frac{\sum_{i=1}^n R_1 + R_2 + \dots + R_n}{n}$                                                                                                                                                                                                                                                                                                                                                 |
| <b>UCL</b>                                        | <p>In quality control, the Upper Control Limit (UCL) is the upper bound of data points that are above the control (average) line in a control chart. For histograms and mean charts, calculate the UCL using the following formula.</p> $UCL_{\bar{x}} = \bar{x} + (A_2 \times \bar{R})$ <p>For the range chart, use the following formula to calculate the UCL (Upper Control Limit):</p> $UCL_{\bar{R}} = D_4 \times \bar{R}$ |
| $\sigma$                                          | Standard deviation: $S = \sqrt{\frac{\sum_{i=1}^n (X_i - \bar{x})^2}{n-1}}$                                                                                                                                                                                                                                                                                                                                                     |
| <b>Cp</b>                                         | <p>The Cp index is an indicator for measuring process capability. It is the ratio of the process tolerance (defined by the control limits) to six - standard deviations:</p> $Cp = \frac{USL - LSL}{6 \times S}$                                                                                                                                                                                                                |
| <b>Cpk</b>                                        | The Cpk index comprehensively considers process potential and is an indicator that measures the difference between the process mean and the specification mean. If the process mean is centered on the target (nominal) specification value, then Cpk                                                                                                                                                                           |

|  |                                                                                                                                                                                                                                                                                                                                                         |
|--|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|  | <p>equals Cp. If Cpk is negative, it indicates that the process mean exceeds the specification limit. If Cpk is between 0 and 1, the 6σ distribution exceeds the specification range. If Cpk is greater than 1, the 6σ distribution is completely within the specification range.</p> $C_{PK} = \frac{\min (\bar{x} - LSL, USL - \bar{x})}{3 \times S}$ |
|--|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|

**Table 3-3** Control Limit Coefficient

| Group Size | $A_2$ | $D_3$ | $D_4$ |
|------------|-------|-------|-------|
| 2          | 1.880 | 0.000 | 3.267 |
| 3          | 1.023 | 0.000 | 2.574 |
| 4          | 0.729 | 0.000 | 2.282 |
| 5          | 0.577 | 0.000 | 2.114 |
| 6          | 0.483 | 0.000 | 2.004 |
| 7          | 0.419 | 0.076 | 1.924 |
| 8          | 0.373 | 0.136 | 1.864 |
| 9          | 0.337 | 0.184 | 1.816 |
| 10         | 0.308 | 0.223 | 1.777 |
| 11         | 0.285 | 0.256 | 1.744 |
| 12         | 0.266 | 0.283 | 1.717 |
| 13         | 0.249 | 0.307 | 1.693 |
| 14         | 0.235 | 0.328 | 1.672 |
| 15         | 0.223 | 0.347 | 1.653 |
| 16         | 0.212 | 0.363 | 1.637 |
| 17         | 0.203 | 0.378 | 1.622 |
| 18         | 0.194 | 0.391 | 1.608 |
| 19         | 0.187 | 0.403 | 1.597 |
| 20         | 0.180 | 0.415 | 1.585 |
| 21         | 0.173 | 0.425 | 1.575 |
| 22         | 0.167 | 0.434 | 1.566 |
| 23         | 0.162 | 0.443 | 1.557 |
| 24         | 0.157 | 0.451 | 1.548 |
| 25         | 0.153 | 0.459 | 1.541 |

### 3.2.3 Bar Chart

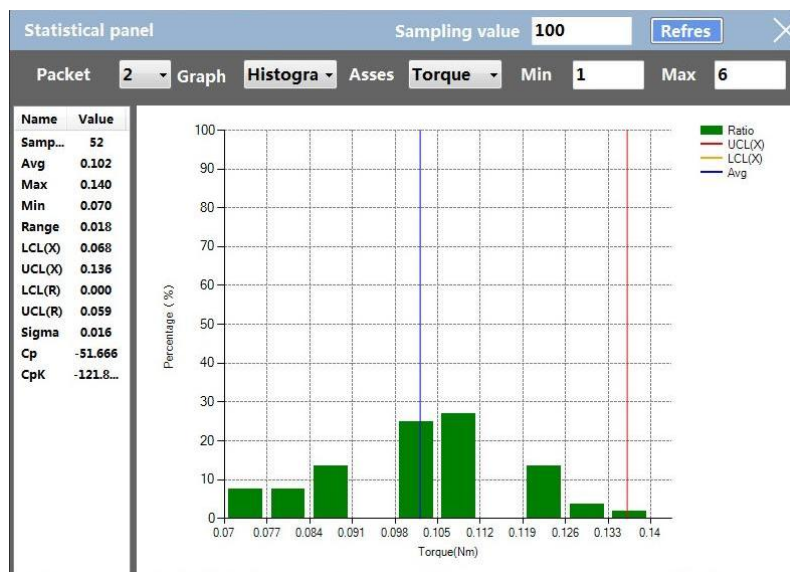


Figure 3-11 Bar graph

### 3.2.4 Range Chart

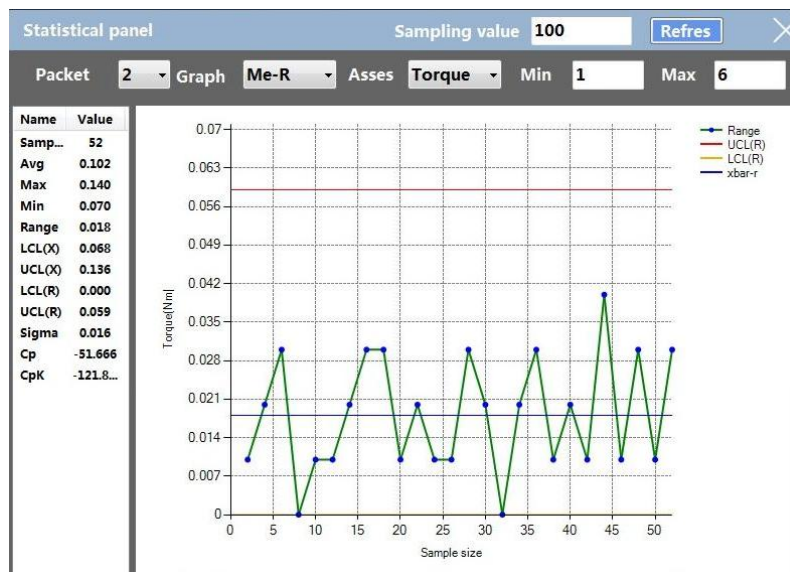


Figure 3-12 Range chart

### 3.2.5 Average Chart

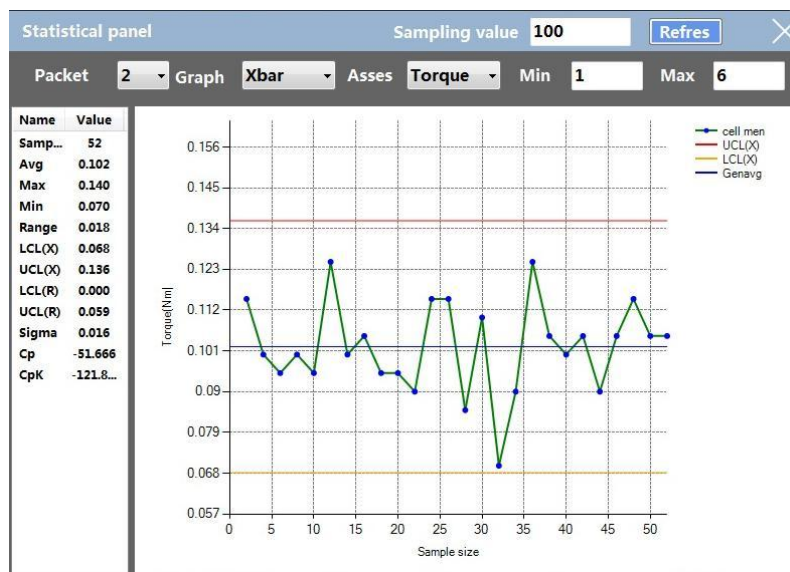
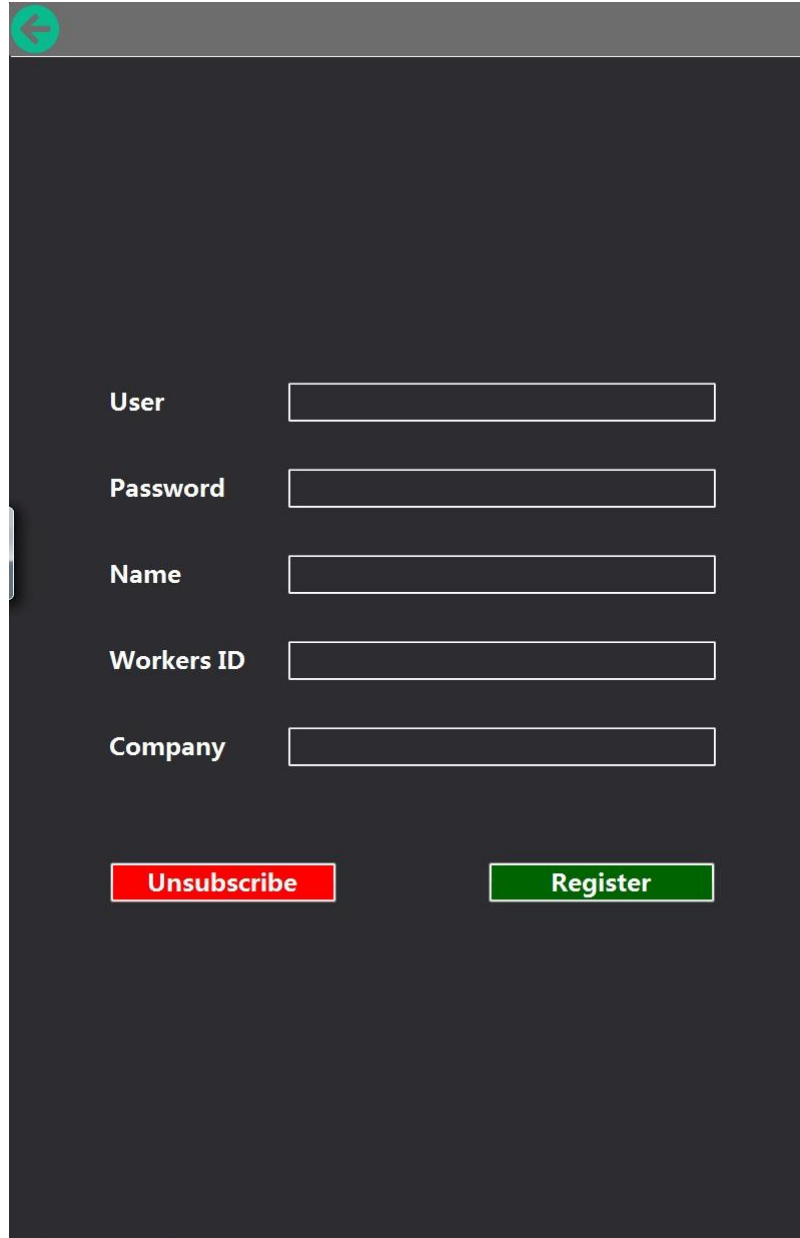


Figure 3-13 Average chart

## 4 Register user

Apart from the pre - set accounts, users can also register their own account information by themselves.

The image shows a mobile application interface for user registration. At the top, there is a dark grey header bar with a green circular button containing a white left-pointing arrow. Below the header, the background is a dark grey color. On the left side, there is a vertical white bar. The main content area contains five labels with corresponding input fields: 'User', 'Password', 'Name', 'Workers ID', and 'Company'. Each label is in white text, and each input field is a white-outlined rectangle. At the bottom of the form, there are two buttons: a red button labeled 'Unsubscribe' and a green button labeled 'Register'.

**Figure 4-1** Registered User Interface

**Table 2-1** System default accounts

|           | User name | Password | permission |
|-----------|-----------|----------|------------|
| Account 1 | admin     | admin123 | 1          |
| Account 2 | user      | User123  | 0          |
| Account 3 | root      | Root123  | 2          |

## 5 Equipment Information

The device information mainly shows the basic information of the current controller, such as current, voltage, and chassis temperature, which are displayed at the top.

| TEMP 40.7°C UPS-V 12.5V Power-V 20.2V Electricity 0.921A |                               |                   |
|----------------------------------------------------------|-------------------------------|-------------------|
| No.                                                      | Property                      | Value             |
| 1                                                        | Controller type               | CM0201W00RY00     |
| 2                                                        | Controller ID                 | CM0201244701      |
| 3                                                        | Software version              | 2.2.9.28          |
| 4                                                        | Release date                  | 2024-11-18        |
| 5                                                        | Wi-Fi server ip address       | 192.168.1.2       |
| 6                                                        | Wi-Fi server mask             | 255.255.255.0     |
| 7                                                        | Wi-Fi server gateway          | 192.168.1.1       |
| 8                                                        | Wi-Fi server port             | 9096              |
| 9                                                        | OpenProtocol server ip        | 192.168.100.100   |
| 10                                                       | OpenProtocol server mask      | 255.255.255.0     |
| 11                                                       | OpenProtocol server gateway   | 192.168.100.1     |
| 12                                                       | OpenProtocol server port      | 0                 |
| 13                                                       | Tool software version         | 3.5.1             |
| 14                                                       | Tool hardware version         | 2.0.7             |
| 15                                                       | Tool ID                       | TE240918          |
| 16                                                       | Current database version      | V2.0.0.4          |
| 17                                                       | The software database version | V2.0.0.4          |
| 18                                                       | UPS software version          | V2.0.1            |
| 19                                                       | UPS hardware version          | V2.0.0.4          |
| 20                                                       | MAC                           | 8C:C5:8C:08:3D:C1 |

**Figure 5-1** Device Information Interface

## 6 Visualization Interface Display

The visualization interface can only be accessed when the controller group mode is turned on. Before entering the visualization interface, the group must be properly set up. The visualization interface enables one to see the tightening status of the screws within the group more intuitively.

### 6.1 Visualization Interface

The pictures and the set points are displayed on the upper part, while the tightening result data are shown in the table on the lower part.



Figure 6-1 Visualization Interface

## **6.2 Several states of the points on the visualization interface**

When the color of the point is blue, it indicates the screw that is to be tightened next.

When the color of the point is yellow, it signifies the waiting status.

When the color of the point is red, it implies that the current screw is defective.

When the color of the point is green, it denotes that the current screw is acceptable.

## **6.3 The display of jobs on the visual interface.**

The status display for a Job shows the Job number and the current number of groups within the Job at the top. Below, it displays the sequence in which the groups appear within the Job, along with the group number, group name, and other information, separated by commas. The color of the icon in front indicates: gray represents unfinished; red represents unqualified; green represents qualified; and blue represents currently being executed.

## 7 IO Port Editing

The IO ports are used when selecting IO programs. Users can customize the status of IO ports and set what signals the IO ports will output respectively.

Each time a user wants to edit, they need to click the edit button to start the editing. After the editing is completed, they must click the save button; otherwise, the changes will not be saved.

Each output port can have its signal holding time set individually. If a signal needs to be held permanently, the delay time should be set within 100ms, and generally, it can be set to -1.

The screenshot displays the 'IO definition' window. At the top, a status bar shows network activity: '↓ 1.3 K/s ↑ 120 B/s'. Below this is a green header bar with the title 'IO definition'. The main area is divided into two columns: 'Input' and 'Output'.

**Input Configuration:**

| Port  | Signal  | Status |
|-------|---------|--------|
| IO. 0 | Pset 1  | OFF    |
| IO. 1 | Pset 2  | OFF    |
| IO. 2 | Pset 4  | OFF    |
| IO. 3 | Group 1 | OFF    |
| IO. 4 | Group 8 | OFF    |
| IO. 5 | Free    | OFF    |
| IO. 6 | Free    | OFF    |
| IO. 7 | Free    | OFF    |

**Output Configuration:**

| Port  | Signal       | Delay (ms) |
|-------|--------------|------------|
| QO. 0 | OK           | 1500       |
| QO. 1 | NOK          | 1500       |
| QO. 2 | OK (G)       | 2000       |
| QO. 3 | NOK (G)      | 0          |
| QO. 4 | Job Running  | 2000       |
| QO. 5 | Job overtime | 0          |
| QO. 6 | Job finish   | 2000       |
| QO. 7 | Group incom  | 0          |

Figure 7-1 IO port edit interface

The signals currently supported by the input ports are: Idle, Enable, Start, Reverse, Program 1, Program 2, Program 4, Program 8, Program 16, Group 1, Group 2, Group 4, Group 8, Group 16, Group 32, Group 64, Group 128, Reset.

The signals currently supported by the output ports are: Idle, OK, NOK, OK (Group), NOK (Group), Program 1, Program 2, Program 4, Program 8, Program 16, Torque Over Upper Limit, Torque Over Lower Limit, Angle Over Upper Limit, Angle Over Lower Limit, Running Status, Group 1, Group 2, Group 4, Group 8, Group 16, Group 32, Group 64, Group 128, Group Completed.

## 8 Controller IO Port Wiring Diagram

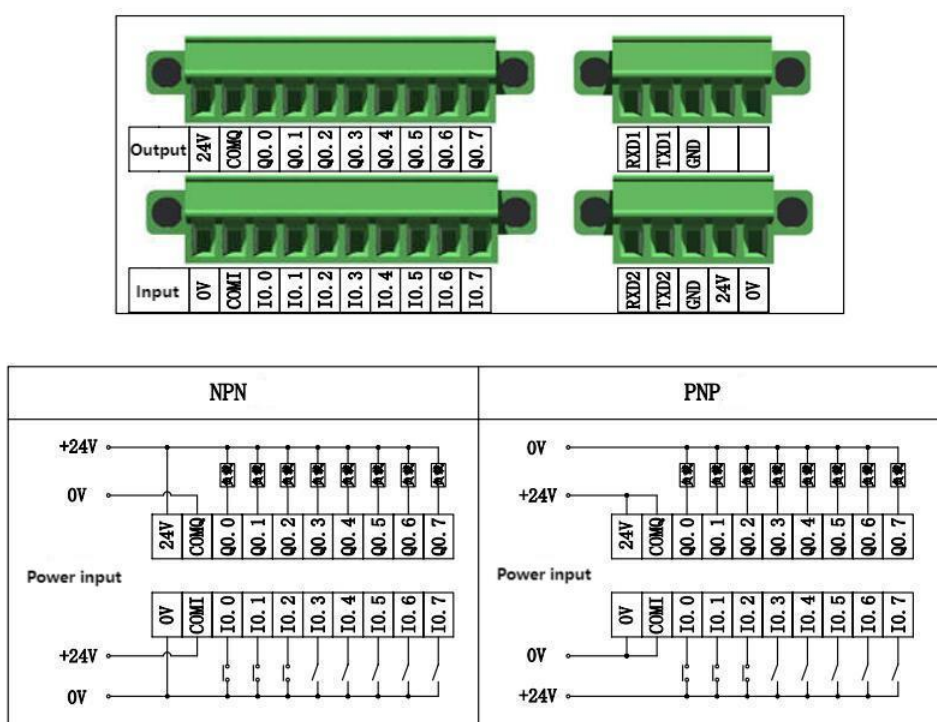


Figure 8-1 Controller IO Definitions

## 9 Bus Settings

### 9.1 Bus I/O Configuration Instructions

The bus settings are basically the same as the IO settings. The only difference is that the bus has 32 channels for input and output, while the IO only has 8 channels for input and output. The bus settings can refer to the IO settings.

The screenshot displays a configuration window for bus I/O settings. It features a top navigation bar with a back arrow, up/down arrows, and icons for a grid, edit, and save. The main area is divided into two sections: 'Output' and 'Input', both with green headers. The 'Output' section contains 32 channels, numbered 0 to 31, arranged in two columns. Each channel has a radio button, a 'Free' dropdown menu, a '0' value field, and a 'ms' unit label. The 'Input' section also contains 32 channels, numbered 0 to 27 (with the last row partially visible), arranged in two columns. Each channel has a radio button, a 'Free' dropdown menu, and a red 'OFF' button.

| Output |      |   |    |
|--------|------|---|----|
| 0      | Free | 0 | ms |
| 1      | Free | 0 | ms |
| 2      | Free | 0 | ms |
| 3      | Free | 0 | ms |
| 4      | Free | 0 | ms |
| 5      | Free | 0 | ms |
| 6      | Free | 0 | ms |
| 7      | Free | 0 | ms |
| 8      | Free | 0 | ms |
| 9      | Free | 0 | ms |
| 10     | Free | 0 | ms |
| 11     | Free | 0 | ms |
| 12     | Free | 0 | ms |
| 13     | Free | 0 | ms |
| 14     | Free | 0 | ms |
| 15     | Free | 0 | ms |
| 16     | Free | 0 | ms |
| 17     | Free | 0 | ms |
| 18     | Free | 0 | ms |
| 19     | Free | 0 | ms |
| 20     | Free | 0 | ms |
| 21     | Free | 0 | ms |
| 22     | Free | 0 | ms |
| 23     | Free | 0 | ms |
| 24     | Free | 0 | ms |
| 25     | Free | 0 | ms |
| 26     | Free | 0 | ms |
| 27     | Free | 0 | ms |
| 28     | Free | 0 | ms |
| 29     | Free | 0 | ms |
| 30     | Free | 0 | ms |
| 31     | Free | 0 | ms |

| Input |      |     |  |
|-------|------|-----|--|
| 0     | Free | OFF |  |
| 1     | Free | OFF |  |
| 2     | Free | OFF |  |
| 3     | Free | OFF |  |
| 4     | Free | OFF |  |
| 5     | Free | OFF |  |
| 6     | Free | OFF |  |
| 7     | Free | OFF |  |
| 8     | Free | OFF |  |
| 9     | Free | OFF |  |
| 10    | Free | OFF |  |
| 11    | Free | OFF |  |
| 16    | Free | OFF |  |
| 17    | Free | OFF |  |
| 18    | Free | OFF |  |
| 19    | Free | OFF |  |
| 20    | Free | OFF |  |
| 21    | Free | OFF |  |
| 22    | Free | OFF |  |
| 23    | Free | OFF |  |
| 24    | Free | OFF |  |
| 25    | Free | OFF |  |
| 26    | Free | OFF |  |
| 27    | Free | OFF |  |

Figure 9-1 input and output setting

## 9.2 WiFi Frequency Bands and Antenna Port Output Power

This Controller supports the 2.4GHz WiFi frequency band, with a specific frequency range from 2412MHz to 2462MHz. Within this band, the device can automatically or manually select different channels for wireless communication.

Under the 802.11g protocol, the Peak output power of the device's antenna port is 20.97dBm.

## 9.3 Bus Output Variable Address Table (Profinet Protocol or CC-Link Protocol, etc.)

**Table 9-1** Variable Address Table

| 0     | Program number              | BYTE                   | Current program                          |
|-------|-----------------------------|------------------------|------------------------------------------|
| 1     | Screw Identification Number | DWORD<br>(double word) | Record the number of tightened screws    |
| 2     |                             |                        |                                          |
| 3     |                             |                        |                                          |
| 4     |                             |                        |                                          |
| 5     | Mode                        | BYTE                   | 0: Torque 1: Angle                       |
| 6     | Target torque               | Real                   | Torque Value at the End of Tightening    |
| 7     |                             |                        |                                          |
| 8     |                             |                        |                                          |
| 9     |                             |                        |                                          |
| 10-13 | Target angle                | Real                   | Angle Value at the End of Tightening     |
| 14    | Tightening results          | BYTE                   | 0:NOK 1:OK                               |
| 15    | Angle results               | BYTE                   | 0:NOK 1:OK                               |
| 16    | Torque results              | BYTE                   | 0:NOK 1:OK                               |
| 17    | Torque Upper Limit          | Real                   | The set upper limit of programmed torque |
| 18    |                             |                        |                                          |
| 19    |                             |                        |                                          |
| 20    |                             |                        |                                          |
| 21    | Torque Lower Limit          | Real                   | The set lower limit of programmed torque |
| 22    |                             |                        |                                          |
| 23    |                             |                        |                                          |

|         |                                        |       |                                           |
|---------|----------------------------------------|-------|-------------------------------------------|
| 24      |                                        |       |                                           |
| 25      | Target value                           | Real  | The set target value                      |
| 26      |                                        |       |                                           |
| 27      |                                        |       |                                           |
| 28      |                                        |       |                                           |
| 29      | Angle upper<br>Limit                   | WORD  | The set upper limit of the program angle  |
| 30      |                                        |       |                                           |
| 31      | Angle Lower<br>Limit                   | WORD  | The set lower limit of the program angle. |
| 32      |                                        |       |                                           |
| 33      | Group<br>Counting                      | BYTE  |                                           |
| 34      | Total number<br>of groups.             | BYTE  |                                           |
| 35      | Group<br>number                        | BYTE  |                                           |
| 36-99   | Identifier A                           | ASCII | The maximum supported size is 64 BYTES    |
| 100-163 | Identifier B                           | ASCII | The maximum supported size is 64 BYTES    |
| 164-227 | Identifier C                           | ASCII | The maximum supported size is 64 BYTES    |
| 228-239 | Tightening<br>Machine Serial<br>Number | ASCII | The maximum supported size is 12 BYTES    |
| 240-255 | Controller<br>Serial Number            | ASCII | The maximum supported size is 16 BYTES    |

## 10 Log Viewing

Users can view the system's operational information through the log viewing interface. Currently, most log entries primarily consist of error logs. Users can export logs to a USB drive using the button in the top right corner.

| Number | Description  | Time               |
|--------|--------------|--------------------|
| 1      | 20220427.log | 2022/4/27 17:03:33 |
| 2      | 20220428.log | 2022/4/28 18:29:09 |
| 3      | 20220429.log | 2022/4/29 16:58:36 |
| 4      | 20220505.log | 2022/5/5 17:59:59  |
| 5      | 20220506.log | 2022/5/6 12:31:30  |
| 6      | 20220507.log | 2022/5/7 17:11:50  |
| 7      | 20220509.log | 2022/5/9 18:00:40  |
| 8      | 20220510.log | 2022/5/10 17:19:19 |
| 9      | 20220511.log | 2022/5/11 16:21:10 |
| 10     | 20220512.log | 2022/5/12 17:55:10 |
| 11     | 20220513.log | 2022/5/13 17:35:32 |
| 12     | 20220516.log | 2022/5/16 10:19:10 |
| 13     | 20220517.log | 2022/5/17 13:27:26 |
| 14     | 20220519.log | 2022/5/19 8:44:15  |
| 15     | 20220523.log | 2022/5/23 17:16:09 |

Figure 10-1 Log Viewing

## 11 Firmware upgrade

The firmware upgrade function is used to update the firmware of the tightening machine. Users can utilize this setting to upgrade the firmware of their tightening machines. Before proceeding with the upgrade, please consult the manufacturer to confirm whether the current tightening machine supports firmware upgrades.



**Figure 11-1** Firmware upgrade interface

## 11.1 Introduction to the Firmware Upgrade Menu

Back: Returns to the previous menu level.

Progress Bar: Used to view the progress of the firmware upgrade.

Upgrade Tightening Machine: Sends firmware upgrade to the tightening machine.

Add Firmware: Adds firmware from a USB drive to the controller's internal storage.

Delete Firmware: Deletes unnecessary firmware from the controller.

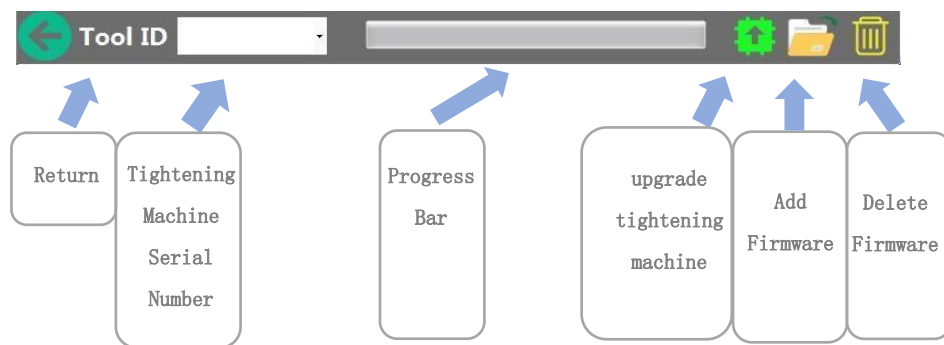


Figure 11-2 Firmware Menu

## 11.2 View Firmware

You can view the firmware description by clicking on the firmware in the list.



Figure 11-3 View Firmware

### 11.3 Firmware Selection

You can select a firmware that needs to be upgraded from the firmware selection dropdown list.

|          |                                                          |
|----------|----------------------------------------------------------|
| firmware | Firmware-LMCJ01-020100-020000-C4567A8E-0000EB78-20220111 |
| Number   | Firmware-LMCJ01-020003-020000-A11C54B4-0000DA08-20220118 |
| 1        | Firmware-LMCJ01-020100-020000-C4567A8E-0000EB78-20220118 |
|          | Firmware-LMXS00-020003-020000-A54F616D-0010B730-20220112 |

Figure 11-4 Choose firmware

### 11.4 Firmware Upgrade

After selecting the firmware, you can proceed with the firmware upgrade for the tightening machine. Simply click the "Firmware Upgrade" button to start the automatic upgrade process. Wait for the progress bar to complete, and you will be prompted with a message indicating that the upgrade has been successful.

### 11.5 Add firmware

First, copy the firmware provided by our company onto a USB flash drive, and then insert the USB flash drive into the USB port of the controller. Next, enter the firmware upgrade interface and click the "Add Firmware" button. This will bring up a firmware selection dialog box. At this point, select the firmware file from the USB flash drive and click "Open" to successfully add it. As shown in Figure 11-5.

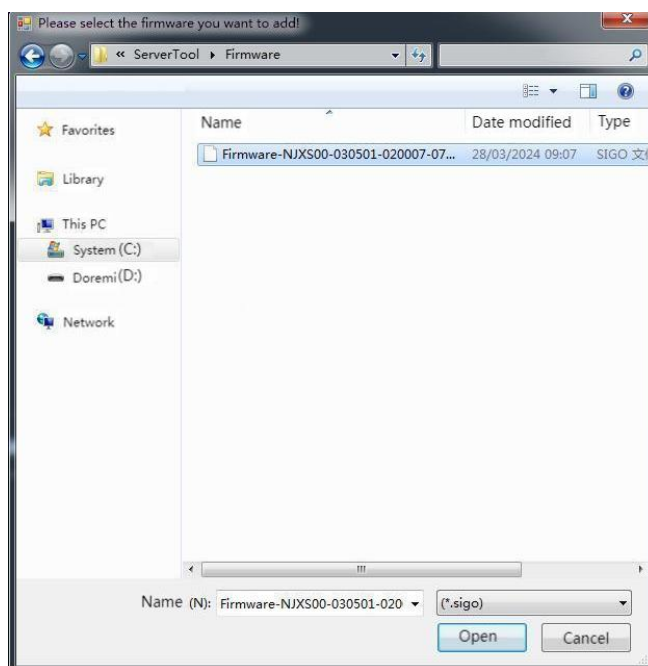
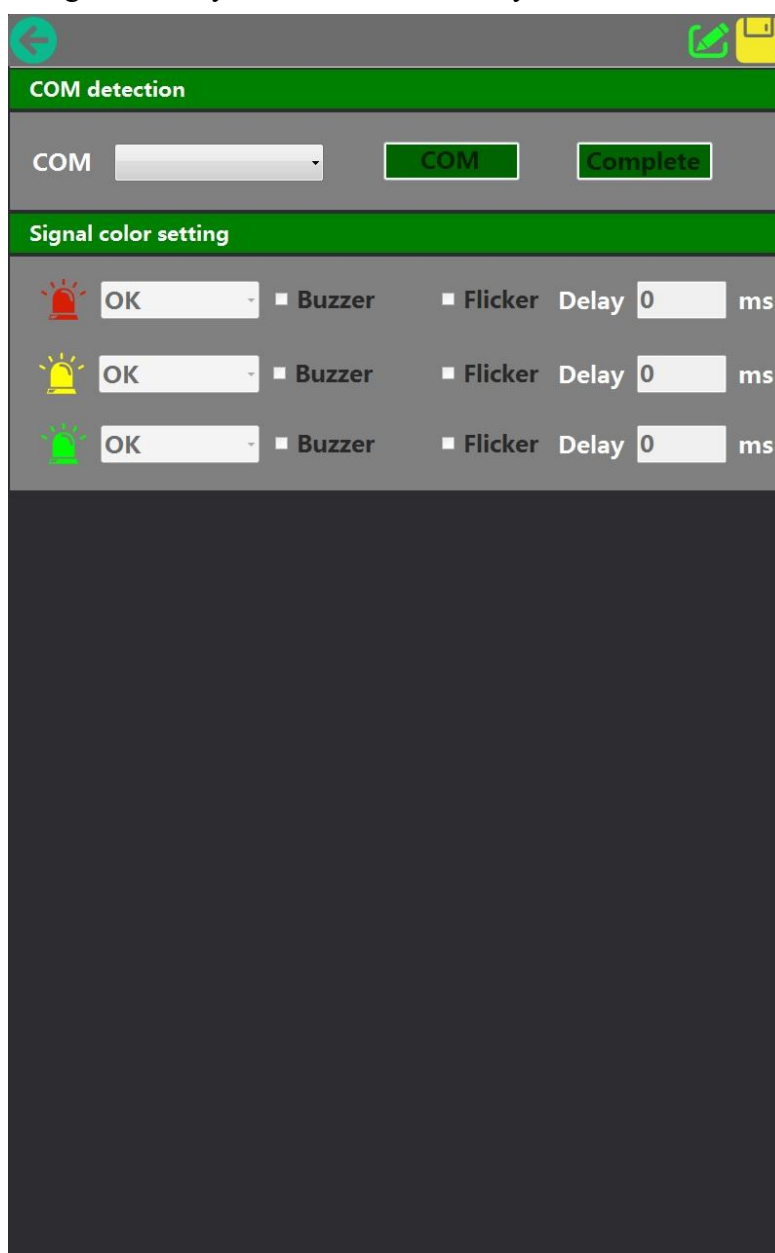


Figure 11-5 Upgrade firmware

## 12 Led Setting

### 12.1 Led instruction

The signal lamp used is a serial port signal lamp, and only the signal lamp of a fixed model can be used. You can choose what signals each color represents (qualified or unqualified signals), combine it with the buzzing of the buzzer, the flashing of the flash lamp, etc. If the delay setting is less than 100 milliseconds, the signal lamp will remain constant. If the delay setting is greater than or equal to 100 milliseconds, the signal lamp will automatically turn off according to the set time. If you want to use the flashing function, you need to set the delay to more than 2000 milliseconds.



The screenshot displays the 'Led Setting' interface. At the top, there is a green header bar with a back arrow icon on the left and a save icon on the right. Below this is a green bar labeled 'COM detection'. Underneath, there is a 'COM' dropdown menu, a green 'COM' button, and a green 'Complete' button. The next section is a green bar labeled 'Signal color setting'. Below this, there are three rows of settings for different signal colors: red, yellow, and green. Each row includes a color-coded bell icon, a dropdown menu set to 'OK', checkboxes for 'Buzzer' and 'Flicker', and a 'Delay' input field set to '0' with a 'ms' unit. The bottom half of the interface is a large, dark gray rectangular area.

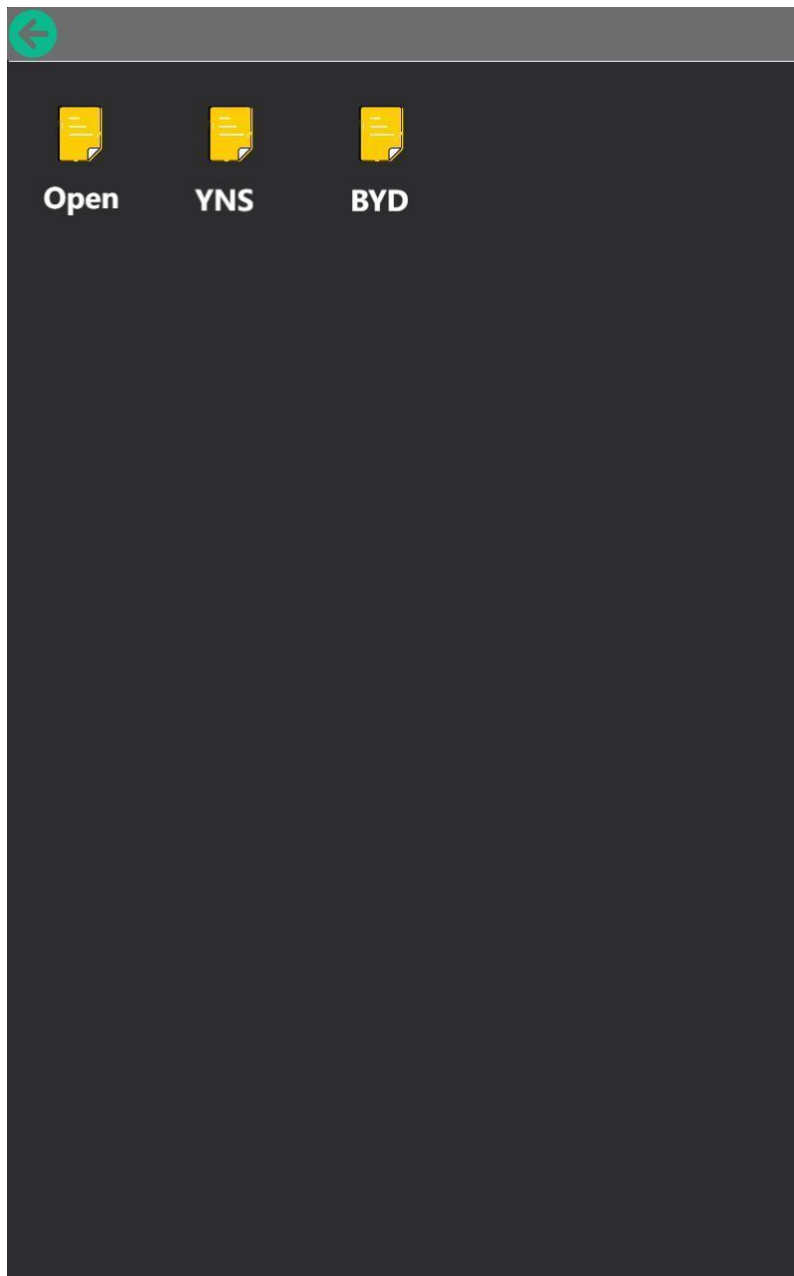
**Figure 12-1** Led Setting interface

## 12.2 Operating instructions

- ① Firstly, click the edit button (on the left side of the upper right corner).
- ② Click on the port drop-down box to select a port (above COM3).
- ③ After selecting the port, click the detection button and then check whether the signal lamp is lit.
- ④ If the signal lamp is on, click the "Detection Completed Button". If the signal lamp is not on, reselect another port and repeat steps ①②③ until there is an output from the signal lamp.
- ⑤ Just save it after the settings are completed.

## 13 Network Output Configuration

The network output is sent to the server through the specified port. Before sending, you need to set the port number and IP address of the server. Meanwhile, select a network output protocol under the working mode menu. The specific protocol may not be specified. Please contact our company to inquire about the protocol details.



**Figure 13-1** Network output settings

## 13.1 Open Protocol

The Open Protocol settings are mainly for configuring the parameters of the Open Protocol server. Once the parameters are set, click "Save" to apply the changes.

**Server IP:** Refers to the IP address of the Open Protocol port on the controller.

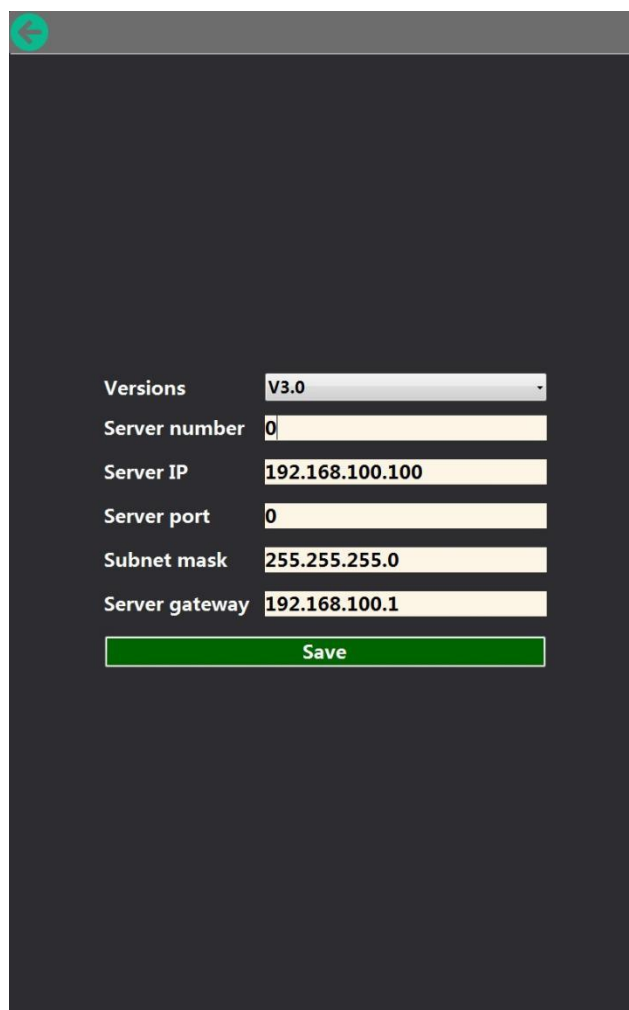
**Server Port Number:** Represents the port number of the Open Protocol.

**Subnet Mask:** An artificially assigned network address mask, typically set to 255.255.255.0.

**Server Gateway:** The network exit assigned for the internal network. If there is no specific requirement, it can be left as default.

**Version Number:** V2.6 is the standard version of the Open Protocol; V3.0 is a customized version evolved from the Open Protocol.

For the specific data format of the Open Protocol, please refer to the Open Protocol Standard Manual or the Open Protocol instructions provided by our company.



|                |                 |
|----------------|-----------------|
| Versions       | V3.0            |
| Server number  | 0               |
| Server IP      | 192.168.100.100 |
| Server port    | 0               |
| Subnet mask    | 255.255.255.0   |
| Server gateway | 192.168.100.1   |
| Save           |                 |

**Figure 13-2** Open Protocol Server Configuration Interface

## 13.2 YNS Protocol

The YNS protocol is a custom protocol of our company, which controls the sending of fixed data to a server that needs to receive data through a TCP connection. The data format is shown in Table 13-1. If users need to develop based on this protocol, please contact our company for support.

**Table 13-1** Data Format of the YNS Protocol

| Information Description                 | Byte    | Value                                                                                                                        |
|-----------------------------------------|---------|------------------------------------------------------------------------------------------------------------------------------|
| Length of Information Flow              | 0-4     | Length 00000-99999                                                                                                           |
|                                         | 5-6     | 00                                                                                                                           |
| Controller Serial Number                | 7-26    | 20 ASCII Characters                                                                                                          |
|                                         | 27-28   | 01                                                                                                                           |
| Controller Model                        | 29-48   | 20 ASCII Characters                                                                                                          |
|                                         | 49-50   | 02                                                                                                                           |
| Serial Number of the Tightening Machine | 51-70   | 20 ASCII Characters                                                                                                          |
|                                         | 71-72   | 03                                                                                                                           |
| Tightening Machine Model                | 73-92   | 20 ASCII Characters                                                                                                          |
|                                         | 93-94   | 04                                                                                                                           |
| Screw Sequence Number                   | 95-102  | 8 ASCII Characters, 00000000-99999999                                                                                        |
|                                         | 103-104 | 05                                                                                                                           |
| Tightening Result                       | 105     | 1: OK , 0: NOK                                                                                                               |
|                                         | 106-107 | 06                                                                                                                           |
| Angle Result                            | 108     | 1: OK , 0: NOK                                                                                                               |
|                                         | 109-110 | 07                                                                                                                           |
| Torque Result                           | 111     | 1: OK , 0: NOK                                                                                                               |
|                                         | 112-113 | 08                                                                                                                           |
| Torque                                  | 114-118 | 5 ASCII Characters, 00000-99999, The default is to display two decimal places. For example, for 01001, it would be 10.01 Nm. |
|                                         | 119-120 | 09                                                                                                                           |
| Upper Torque Limit                      | 121-125 | 5 ASCII Characters, 00000-99999, The default is to display two decimal places. For example, for 01001, it would be 10.01 Nm. |
|                                         | 126-127 | 10                                                                                                                           |
| Lower Torque Limit                      | 128-132 | 5 ASCII Characters, 00000-99999, The default is to display two decimal places. For example, for 01001, it would be 10.01 Nm. |
|                                         | 133-134 | 11                                                                                                                           |
| Angle                                   | 135-140 | 6 ASCII Characters, 000000-999999                                                                                            |
|                                         | 141-142 | 12                                                                                                                           |
| Upper Limit of Angle                    | 143-148 | 6 ASCII Characters, 000000-999999                                                                                            |
|                                         | 149-150 | 13                                                                                                                           |
| Lower Limit of Angle                    | 151-156 | 6 ASCII Characters, 000000-999999                                                                                            |

|                        |           |                                          |
|------------------------|-----------|------------------------------------------|
|                        | 157-158   | 14                                       |
| Program number         | 159-161   | 3 ASCII Characters, 000-999              |
|                        | 162-163   | 15                                       |
| Group number           | 164-166   | 3 ASCII Characters, 000-999              |
|                        | 167-168   | 16                                       |
| Group counting         | 169-171   | 3 ASCII Characters, 000-999              |
|                        | 172-173   | 17                                       |
| Total Number of Groups | 174-176   | 3 ASCII Characters, 000-999              |
|                        | 177-178   | 18                                       |
| Time                   | 179-197   | 19 ASCII Characters, YYYY-MM-DD:HH:MM:SS |
|                        | 198-199   | 19                                       |
| Identifier A           | 200-263   | 64 ASCII Characters                      |
|                        | 264-265   | 20                                       |
| Identifier B           | 266-329   | 64 ASCII Characters                      |
|                        | 330-331   | 21                                       |
| Identifier C           | 332-395   | 64 ASCII Characters                      |
|                        | 396-397   | 22                                       |
| Reservation            | 398-4493  | 4K Buffer Zone                           |
|                        | 4494-4495 | 23                                       |
| Reservation 2          | 4496-8591 | 4K Buffer Zone                           |

## 14 UPS Power Management Function

The integration of the controller into the UPS (Uninterruptible Power Supply) power management module is primarily to prevent irreversible damage to the working data of the controller's system software due to sudden power outages.

Controllers equipped with UPS power management modules are internally furnished with energy storage batteries, ensuring the normal operation of the controller for up to 30 minutes. Typically, the controller automatically detects the power supply voltage. If it detects a power failure in the external input power, it will save the current data within 30 seconds and automatically shut down after counting down. If power is restored within 30 seconds, the automatic shutdown will be halted. The system power supply voltage can be checked on the device information interface. The alert prompt box is shown in the figure below:



**Figure 14-1** Warning Notification

## 15 Software Update

Users can import the update file we provide to a USB flash drive, plug it into the controller, and then retrieve the new version. The detected new software version will be displayed in the list.

If you want to update the software, you can click on the version you wish to update in the list and select the update option.

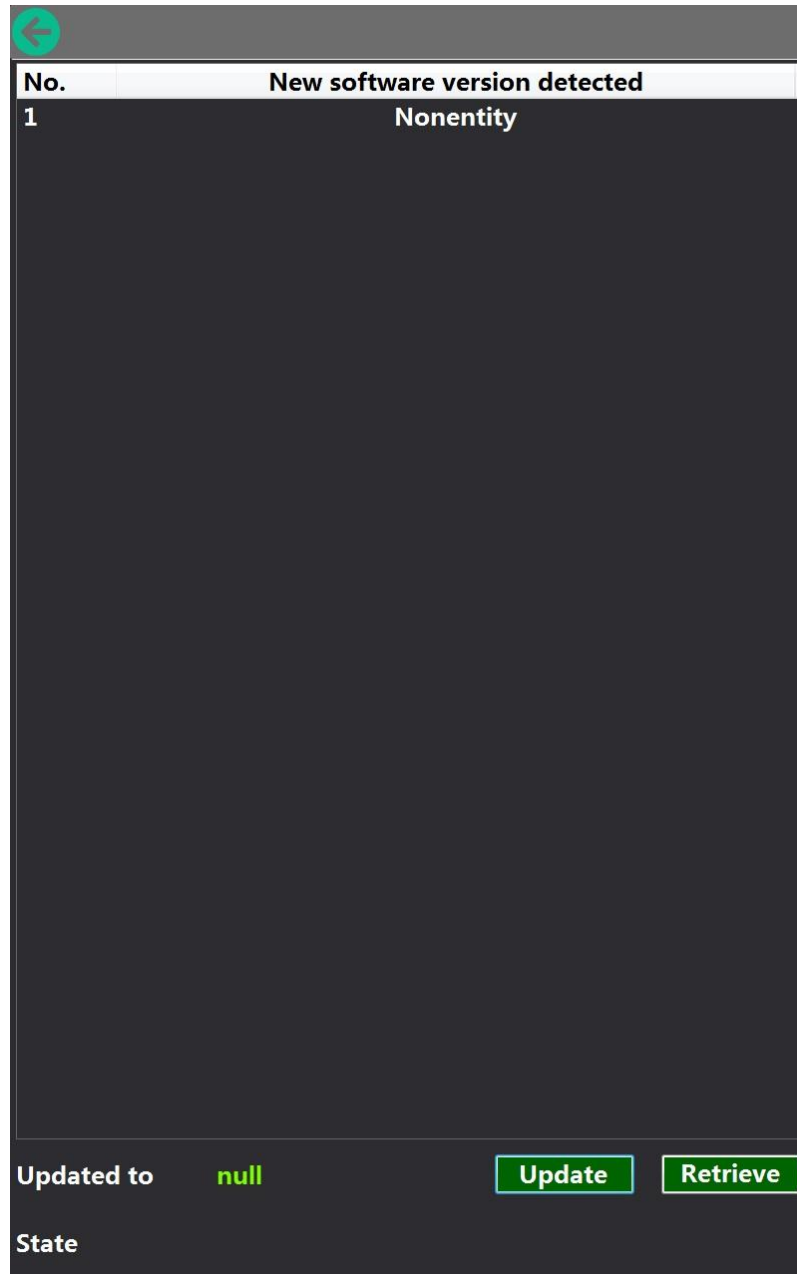
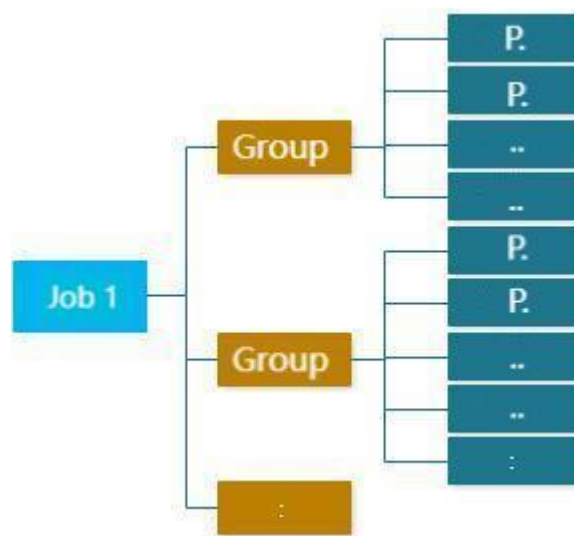


Figure 15-1 Update software

## Appendix A: Diagram of Job, Group, and Program Relationships



**Figure A-1** Diagram of Job, Group, and Program Relationships

## Appendix B: Description of IO and Bus Input/Output Signals

**Table B-1** Summary of Input Signals

| Signal             | Signal Type | Description                                                   |
|--------------------|-------------|---------------------------------------------------------------|
| Enable             | Input       | The signal to enable the tightening machine control           |
| Start              | Input       | (Unused) Signal for Controlling Tightening Machine Tightening |
| Reverse            | Input       | (Unused) Control Signal for Reversing the Tightening Machine  |
| Program 1          | Input       | If true, increment the program number by 1.                   |
| Program 2          | Input       | If true, increment the program number by 2                    |
| Program 4          | Input       | If true, increment the program number by 4                    |
| Program 8          | Input       | If true, increment the program number by 8                    |
| Program 16         | Input       | If true, increment the program number by 16                   |
| Program 32         | Input       | If true, increment the program number by 32                   |
| Program 64         | Input       | If true, increment the program number by 64                   |
| Program 128        | Input       | If true, increment the program number by 128                  |
| Group 1            | Input       | If true, increment the group number by 1.                     |
| Group 2            | Input       | If true, increment the group number by 2                      |
| Group 4            | Input       | If true, increment the group number by 4                      |
| Group 8            | Input       | If true, increment the group number by 8                      |
| Group 16           | Input       | If true, increment the group number by 16                     |
| Group 32           | Input       | If true, increment the group number by 32                     |
| Group 64           | Input       | If true, increment the group number by 64                     |
| Group 128          | Input       | If true, increment the group number by 128                    |
| Reset              | Input       | Not currently in use                                          |
| Reverse Enable     | Input       | Not currently in use                                          |
| Job_1              | Input       | If true, increment the Job number by 1.                       |
| Job_2              | Input       | If true, increment the Job number by 2                        |
| Job_4              | Input       | If true, increment the Job number by 4                        |
| Job_8              | Input       | If true, increment the Job number by 8                        |
| Job_16             | Input       | If true, increment the Job number by 16                       |
| Job_32             | Input       | If true, increment the Job number by 32                       |
| Job_64             | Input       | If true, increment the Job number by 64                       |
| Job_128            | Input       | If true, increment the Job number by 128                      |
| Sleeve Selection 1 | Input       | Input Signal for Sleeve Selector in 8421 BCD Format           |
| Sleeve Selection 2 | Input       | Input Signal for Sleeve Selector in 8421 BCD Format           |
| Sleeve Selection 4 | Input       | Input Signal for Sleeve Selector in 8421 BCD Format           |
| Sleeve Selection 8 | Input       | Input Signal for Sleeve Selector in 8421 BCD Format           |

**Table B-2** Output Signal Summary

| Signal                             | Signal Type | Description                                                    |
|------------------------------------|-------------|----------------------------------------------------------------|
| OK                                 | Output      | Program qualified                                              |
| NOK                                | Output      | Program unqualified                                            |
| OK(Group)                          | Output      | Group qualified                                                |
| NOK(Group)                         | Output      | Group unqualified                                              |
| Program 1                          | Output      | If true, increment the output program number by 1              |
| Program 2                          | Output      | If true, increment the output program number by 2              |
| Program 4                          | Output      | If true, increment the output program number by 4              |
| Program 8                          | Output      | If true, increment the output program number by 8              |
| Program 16                         | Output      | If true, increment the output program number by 16             |
| Program 32                         | Output      | If true, increment the output program number by 32             |
| Program 64                         | Output      | If true, increment the output program number by 64             |
| Program 128                        | Output      | If true, increment the output program number by 128            |
| Group 1                            | Output      | If true, increment the output group number by 1                |
| Group 2                            | Output      | If true, increment the output group number by 2                |
| Group 4                            | Output      | If true, increment the output group number by 4                |
| Group 8                            | Output      | If true, increment the output group number by 8                |
| Group 16                           | Output      | If true, increment the output group number by 16               |
| Group 32                           | Output      | If true, increment the output group number by 32               |
| Group 64                           | Output      | If true, increment the output group number by 64               |
| Group 128                          | Output      | If true, increment the output group number by 128              |
| Job_1                              | Output      | If true, increment the output Job number by 1                  |
| Job_2                              | Output      | If true, increment the output Job number by 2                  |
| Job_4                              | Output      | If true, increment the output Job number by 4                  |
| Job_8                              | Output      | If true, increment the output Job number by 8                  |
| Job_16                             | Output      | If true, increment the output Job number by 16                 |
| Job_32                             | Output      | If true, increment the output Job number by 32                 |
| Job_64                             | Output      | If true, increment the output Job number by 64                 |
| Job_128                            | Output      | If true, increment the output Job number by 128                |
| Torque exceeds the upper limit     | Output      | The resulting torque exceeds the set upper limit               |
| Torque falls below the lower limit | Output      | The resulting torque does not meet the set lower limit         |
| Angle exceeds the upper limit      | Output      | The resulting angle exceeds the set upper limit                |
| Angle falls below the lower limit  | Output      | The resulting angle does not meet the set lower limit          |
| Operation status                   | Output      | The tightening machine is in operation                         |
| Group completed                    | Output      | Group completion output                                        |
| Tightening completed               | Output      | Current tightening completed, results-based                    |
| Ready for operation                | Output      | Indicates that the controller and tightening machine are ready |

|                                         |        |                                                                          |
|-----------------------------------------|--------|--------------------------------------------------------------------------|
| Group not completed                     | Output | Indicates that the set time for the group has expired without completion |
| During the group process                | Output | Indicates that the group is currently being executed                     |
| The tightening machine's battery is low | Output | Indicates low battery level of the tightening machine                    |
| OK(Job)                                 | Output | Job qualified                                                            |
| NOK(Job)                                | Output | Job unqualified                                                          |
| During the Job process                  | Output | Indicates that the Job is currently being executed                       |
| Job completed                           | Output | Job completed                                                            |
| Job not completed                       | Output | Job not completed                                                        |
| Group timeout                           | Output | Group exceeds set time                                                   |
| Job timeout                             | Output | Job exceeds set time                                                     |

## **Appendix C: FCC Caution**

### **FCC Caution:**

Any Changes or modifications not expressly approved by the party responsible for compliance could void the user's authority to operate the equipment.

This device complies with part 15 of the FCC Rules. Operation is subject to the following two conditions: (1) This device may not cause harmful interference, and (2) this device must accept any interference received, including interference that may cause undesired operation.

### **IMPORTANT NOTE:**

Note: This equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation. This equipment generates, uses and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures:

- Reorient or relocate the receiving antenna.
- Increase the separation between the equipment and receiver.
- Connect the equipment into an outlet on a circuit different from that to which the receiver is connected.
- Consult the dealer or an experienced radio/TV technician for help.

### **FCC Radiation Exposure Statement:**

This equipment complies with FCC radiation exposure limits set forth for an uncontrolled environment. This equipment should be installed and operated with minimum distance 20cm between the radiator & your body.