AcraDyne®
A Division of AIMCO

Phoenix II/Phoenix III Torque Wrench User Manual

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1. General Power Tool Safety Warnings

WARNING

Read all safety warnings, instructions, illustrations, and specifications provided with this power tool. Failure to follow all instructions listed below may result in electric shock, fire, and/or serious injury. Save all warnings and instructions for future reference.

1.1 Battery and Charger

- **Use only the official charger and battery.** Do not use any other chargers or batteries not designated in this manual.
- **Use the correct charger rated to the power source.** Failure to do so may damage the charger and equipment and cause abnormal heat generation, which may result in fire.
- **Do not use the charger with a damaged plug or damaged cable.** Doing so may cause an electric shock, short-circuit, and/or a fire.
- **Do not charge the battery in conditions outside of the –1 to 42 °C (30 to 107 °F) temperature range.**
- **Do not wrap the charger or battery with a cloth, etc.** This may hinder heat dissipation and, in an extreme case, may cause a fire.
- **When it is not in use, remove the plug from the power source.** This will prevent damage in cases such as if the line voltage swings outside the accepted values.
- **Do not use the charger or store the battery in the rain or other wet conditions. Do not use a charger or battery that was exposed to water.** This will damage the products and may lead to electrical shock.
- **Do not use or charge the product in an area near flammable liquid or gas.**
- **Do not throw the battery into a fire.** It will explode and may generate hazardous gases.
- **Do not handle the charger cable roughly.** Do not carry the tool by the charging cable. When pulling out the plug, handle it by the connector and not by the cable.
- **Carefully choose the charging location so that the cable is not subject to any external damage.** A damaged cable may cause an electric shock and/or fire.
- **Keep the charge cable away from heat, oil, and sharp corners.** Avoid physical damage to the cable.
- **When charging via USB, use the cable supplied with the product or one from a reliable source that complies with the USB standard.** Certify that the USB port also complies with the USB industry standard.
- **Immediately replace damaged cables.** Check the cable of the charger periodically. Working with a damaged cable may cause an electric shock and/or a fire.
- **When using an extension cord, conduct a periodic check and change with a new one if there is any damage.**

1.2 Accessories

- **Use only authorized accessories and optional equipment.** Do not use any accessories or optional equipment other than those designated in this manual or advised by the manufacturer. Doing so may decrease the safety of the product and reduce its performance, life, or cause product failure.
- **To change accessories, follow the instruction manual.**
- **Do not disassemble or modify the product or accessories.** Doing so will decrease the safety of the product and reduce its performance, life, or cause product failure.

1.3 Tool Usage and Workplace Conditions

- **Use a natural and steady posture when using the tool.**
- **Keep your feet firnly on the ground and maintain your balance.** Pay attention to the condition of your workplace.
- **Keep the workplace brightly lit.** Working in a a poorly lit place may lead to an accident.
- **Always keep the workplace clean and uncluttered.** An untidy workplace may lead to accidents.
- **Keep the tool and its handle dry and clean.** Oil and grease may make a handle slippery and cause accidents and injury.
- **Choose the correct tool for the required operation.**
- **Before use, check the case and other parts to make sure they are functioning properly.** Check everything that may affect ordinary operation.
- **For best measurement accuracy, hold the center of the handle length and apply force at a right angle in relation to the wrench length.**
- **Connect the torque wrench and the interchangeable head firmly.**
- **When working in a high place, take appropriate measures to prevent the product and its accessories from falling.** Falling tools or sockets may cause accidents, injuries and/or product failures.
- **Keep other people away from the workplace.** A crowded workplace may lead to accidents.
- **Make sure the ratchet lever is completely switched to the direction your application requires.** Failure to do so may cause accident and/or injuries.
- **Do not extend the handle of the torque wrench with a pipe, etc.** This will cause an accuracy error and may damage the equipment and cause an accident.
- **Keep tool away from small children.** They don't know how to use wrenches.
- **When not in use, store tool properly, keep it dry, and lock it so unauthorized persons cannot use it.**
- **Do not allow the operating temperature of the tool to rise as high as 60 °C (140 °F).** Doing so may damage the battery, hinder product performance, and cause smoke and/or fire.
- **Do not use the product beyond its capacity.** In order to use the product safely, effectively, and to extend its life, use it always within its capacity. Using the product beyond its capacity may cause accidents or product failure.
- **Do not use the product for purposes other than intended.** Use it only for what is specifically designated in this manual. Doing otherwise so may cause an accident.
- **Take good care of all tools.**

2. Product Description

The Phoenix II/Phoenix III torque wrench is a world class design tailored for industrial applications. It offers in a single product, a variety of tightening strategies for use in production environments and a set of methods and software features for evaluating the residual torque for quality control and joint analysis.

No additional software licenses or hardware keys are required. All software features are standard.

Also included is TWConfig, configuration software which, among others features, can be used to configure the wrench, manage tightening programs, view and export results and tightening traces, and create quality control routes.

3 Specifications

3.1 Wrench

3.1.1 General Specification

Torque measuring range	1.5 Nm to 1,500 Nm
Torque accuracy	According to ISO 6789
Overload capacity	120% of wrench nominal capacity
Maximum angular speed	250 °/s
Minimum angular speed	5 °/s
Angle measurement accuracy	±1° over 360°
Tightening results capacity	1,000,000 results (including a copy of the program used)
Tightening traces capacity	1,000,000 traces
Haptic feedback	Built-in vibration motor
Sound feedback	Built-in speaker 1.5W (94dB peak)
Visual feedback	9 RGB LEDs (4 in each side + 1 frontal)

3.1.2 USB Interface

Micro-B

Version	USB 2.0
Data rate	480 Mbit/s
Connector	Micro B receptacle
USB charge current	1A Maximum - Compatible to USB Battery Charger Spec (BC1.2)

3.1.3 Wi-fi Module

Wi-Fi Standards	802.11 b/g/n
Frequency Range	2.4 GHz - 2.5 GHz (2400 MHz – 2483.5 MHz)
Tx Power	802.11 b +20 dBm 802.11 g: +17 dBm 802.11 n: +14 dBm
Rx Sensitivity	802.11 b: -91 dBm (11 Mbps) 802.11 g: -75 dBm (54 Mbps) 802.11 n: -72 dBm (MCS7)
Security	WPA/WPA2
Encryption	WEP/TKIP/AES

3.1.4 Barcode Reader

Illumination	Red LED 625±10 nm
Symbologies	
2D	PDF 417, Data Matrix (ECC200, ECC000,050,080,100,140), QR Code
1D	Code 128, EAN-13, EAN-8, Code 39, UPC-A, UPC-E, Codabar, Interleaved 2 of 5, ITF-6, ITF-14, ISBN, Code 93, UCC/ EAN-128, GS1 Databar, Matrix 2 of 5, Code 11, Industrial 2 of 5, Standard 2 of 5, Plessey, MSI-Plessey.
Reading Precision	≥ 5mil
Depth of Field*	
EAN13 (13mil)	55mm – 185mm
Code 39 (5mil)	55mm – 100mm
PDF 417 (6.67mil)	40mm – 130mm
Data Matrix (10mil)	40mm – 135mm
QR Code (15mil)	40mm – 160mm
Symbol Contrast	≥ 30% reflectance difference
Scan Angle**	Roll: 360°, Pitch: ±55°, Skew: ±55°
Field of View	Horizontal 36°; Vertical 23°

* Test conditions: T = 23 °C, Illumination = 300 LUX

** Test conditions: Code 39, 3 Bytes; Resolution = 10mil; W:N = 3:1; PCS = 0.8; Barcode Height = 11 mm; Scan Distance = 120 mm, T = 23°C, Illumination = 300 LUX V1.0.0

3.1.5 Dimension and Weight

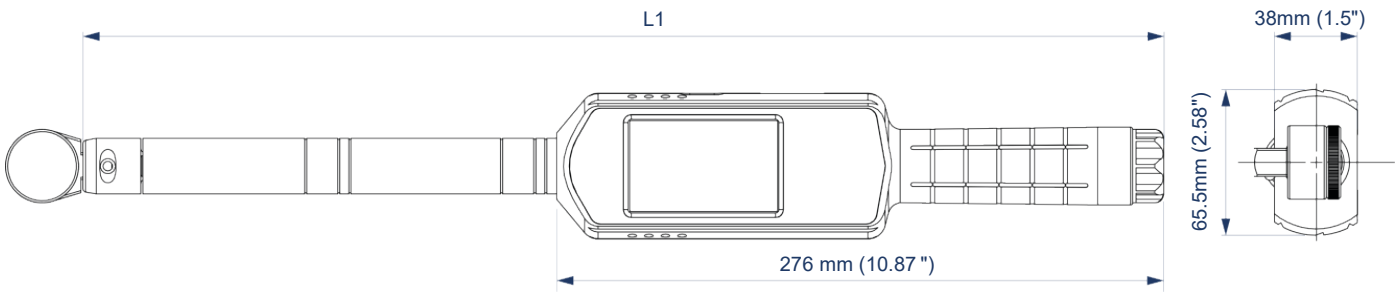


Figure 1 - Wrench Drawing

	Capacity	Drive Connector	L1		Weight (without end fitting)	
Model	**Nm**	**mm**	**mm**	**in**	**kg**	**lb**
PHOENIX III 15	15	9 x 12	426	16.8	0.95	2.09
PHOENIX III 30	30	9 x 12	426	16.8	0.96	2.11
PHOENIX III 70	70	9 x 12	488	19.2	1.0	2.2
PHOENIX III 100	100	9 x 12	488	19.2	1.03	2.27
PHOENIX III 200	200	14 x 18	615	24.2	1.57	3.46
PHOENIX III 300	300	14 x 18	765	30.1	1.69	3.73
PHOENIX III 400	400	14 x 18	866	34.1	1.89	4.17
PHOENIX III 600	600	14 x 18	1050	41.3	2.02	4.45
PHOENIX III 800	800	Ø 20	1200	47.2	3.06	6.75
PHOENIX III 1000	1,000	Ø 20	1250	49.2	3.3	7.28
PHOENIX III 1200	1,200	Ø 27	1345	53.0	3.42	7.54

3.1.6 Environmental Conditions for Operation

• Internal use only	• Ambient temperature: –1 to 42 °C
• IP grade according to EN IEC 60529: IP50	• Atmospheric humidity: 95%, non-condensing
• NEMA enclosure type: 1	• Altitude: Up to 2,100 m

3.2 Battery

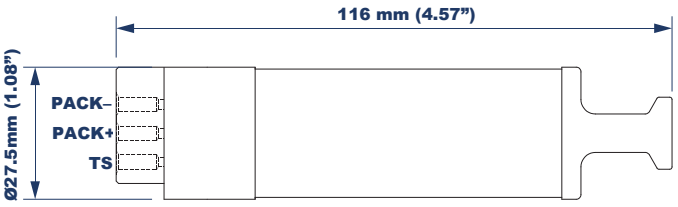


Figure 2 - Battery Drawing

Chemistry Lithium-ion (Li-ion)
Endurance 9 hours (with Wi-fi enabled)
Nominal voltage 3.60V
Capacity 3500mAh

Charging time
7 h directly in the wrench connected in standard USB port

4.5 h directly in the wrench connected in a high-powered USB port or wall adapter

2.5 h in the dedicated charger model MSH-36A1

Relative capacity x temperature 100% at 23°C, 50% at –1°C

Capacity after 450 cycles 60% of Standard Capacity

3.3 Battery Charger Model PHX II BATT CGR

Figure 3 - Battery Charger Model PHX II BATT CGR

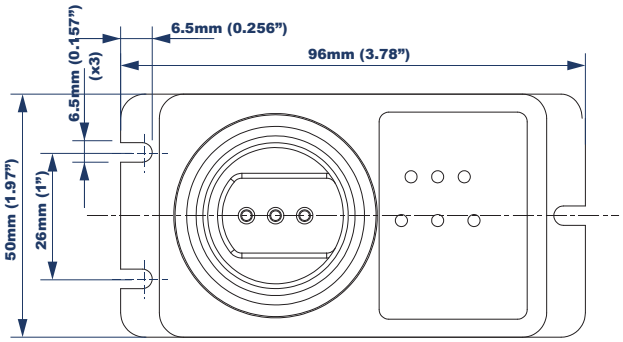


Figure 4 - Battery Charger Drawing

Input voltage	5V, 2A
Input power	Max. 10W
Protection	Thermal regulation, thermal shutdown and safety timer
DC Jack mating plug	Barrel type 3.5 mm OD, 1.35 mm ID
AC adapter	
Input voltage	100 – 260 VAC, 47– 63 Hz
Input current at full load	< 350mA, with 110 VAC
Input protection	Varistor associated with NTC and inductive filters

3.4 Companion Software TWConfig

The wrench companion software TWConfig runs on a Windows® environment, operating system version Windows XP or newer. It has been tested and works on Windows 7, Vista, 8, and 10.

A screen resolution of 1024 x 768 or higher is required.

A minimum of 30 MB of disk is needed for installation.

A portable version is available that does not need to be installed or administration rights to work, and can be run from a USB drive.

TWConfig is a lightweight application that does not have a minimum computer requirement. If a given computer hardware runs a supported operating system version, then the application will run without issues.

To export results in XLS/XLSX format Microsoft Excel® must be installed.

4 User Interface

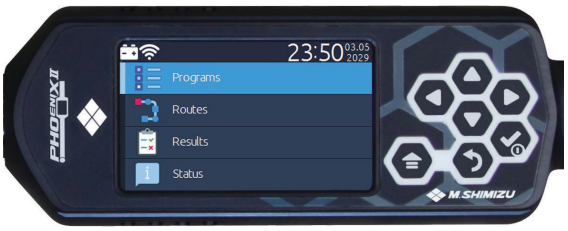


Figure 5 - Wrench User Interface

4.1 Touch Screen

For easy access, the wrench is equipped with a resistive touch screen interface that can be operated with or without gloves. Almost all functions can be accessed by touching the option or holding down and moving up and down to scroll.

4.2 Operation Keys

All wrench navigation and operation can also be done via keyboard, if accidental damage to the touch screen is a concern. The screen can be protected without diminishing the tool usability.

4.2.1 Wrench Key Functions

- Enter/On-Off
- Go back
- Shift/Activate barcode (on tightening screen)
- Left navigation key
- Right navigation key
- Up navigation key
- Down navigation key

4.3 Status Bar

The status bar is at the top of the screen and offers the user quick information about the wrench operation state. On the left side of the status bar, the battery level, Wi-fi status, and other information are shown with intuitive icons. On the right-hand side of the status bar, the current date and time are shown. The date and time format can be changed via configuration software or via settings P0.10 and P0.11.

4.3.1 Status Bar Icons

Wi-Fi

The Wi-fi icon shows the signal strength and connection state. If this icon is not present, the Wi-Fi hardware is not enabled. It can be enabled via the configuration software.

	Full strength, good Wi-fi signal
	Medium strength, acceptable signal level
	Low signal level
	Marginal signal. May not be suitable for operation if the wrench is controlled via Wi-Fi
	Not connected to the Wi-Fi network
	Wi-Fi hardware error. Device may need to be serviced

Battery

The wrench is equipped with a fuel-gauge battery monitoring chip. The battery icon shows the battery level and charge status

	Wrench connected via USB or wall adapter. The battery is being charged
	Wrench connected via USB or wall adapter. Battery charging finished
	Battery level: The icon white color diminishes as the battery level decreases. Examples: 
	Battery level very low. Wrench may turn off automatically at any time
	Battery fuel-gauge error. This icon may appear if the battery is not inserted and the power is supplied via USB port

Tool Lock

This is icon indicates that the wrench was locked via a protocol interface. If this icon is not present the wrench is free to perform tightenings.

	Wrench is locked. Tightening cannot be performed

5 Wrench Operation

5.1 Main Menu

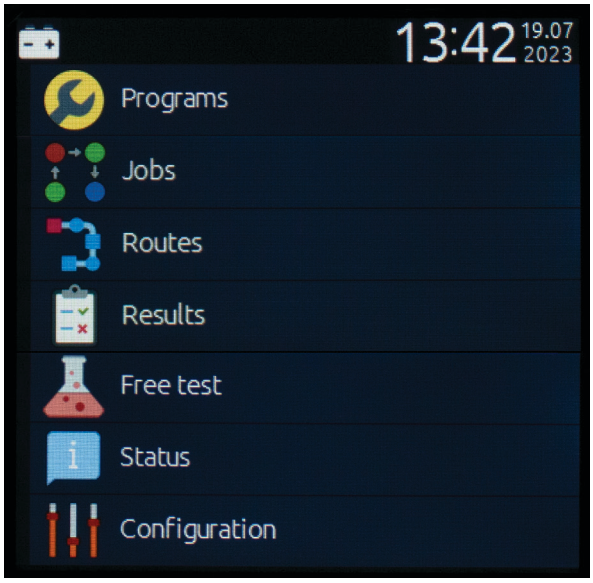


Figure 6 - Main Menu

The main menu is the first screen shown upon turning on the wrench. From this list it is possible to access the main wrench features. The user can navigate the list and access the options via keyboard or touch- screen. Holding down and moving the finger closer to the bottom or upper edge of the menu will scroll the list.

Pressing the *Go-back* key  at any time will show the tightening screen. Pressing go-back again will return to this main menu screen.

5.2 Tightening Screen

The picture below shows a typical tightening screen for a torque only program. On the left side, an analog gauge that follows the applied force gives a more natural feel of the torque needed to reach the target.

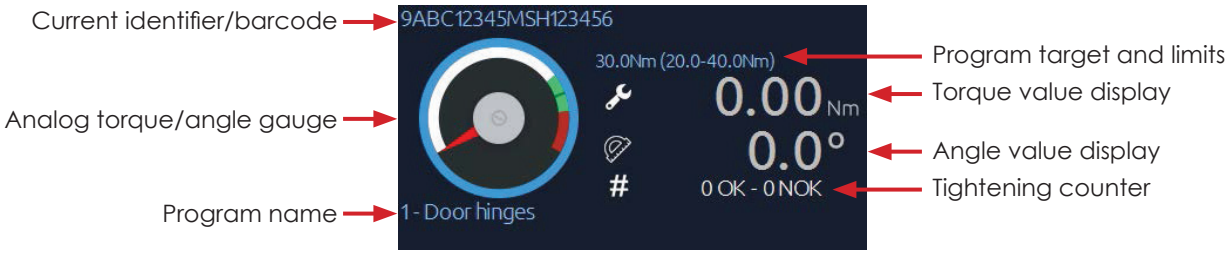


Figure 7 - Typical Tightening Screen

The actual values shown in the torque value display and angle value display change according to current program strategy. For example, for a torque-only program, the torque shown is the peak torque (unlike the analog gauge which will track the current torque applied). That is, it will not go back to zero if the torque is released. It will retain the maximum value achieved, which will be the tightening torque result.

The torque and angle text color change according to the result classification: green when it's within the limits, red when it's above the high limit, or yellow if it's below the low limit.

The tightening screen changes slightly according to the current strategy. Those changes are listed within each strategy description.

Pressing the *Right* key in the tightening screen shows the tightening trace of the last tightening. See section "5.6.1 Tightening Trace Screen" on page 10 for more information on how to navigate in this screen.

Pressing the *Down* key shows the tightening program details. See "Figure 11 - Program details screen" on page 9.

5.2.1 Activating the Barcode Scanner/Identifier Input

An identifier can be associated with a tightening cycle and stored with its result by reading a barcode or by entering it manually.

Pressing *Shift* key in the tightening screen will activate the barcode scanner and display a popup that allows the user to enter an identifier manually via an on-screen keyboard.

Figure 8 - Identifier Input Popup

This popup will close, and the barcode scanner turn off automatically after a few seconds or upon a successful reading. The user can hold down the *Shift* key to keep the barcode on for a longer period. Touching the cancel button or pressing the *Go-back* key closes the popup and turns the barcode scanner off.

Choose *Manual input* to open an on-screen keyboard that allows the user to manually enter the identifier.

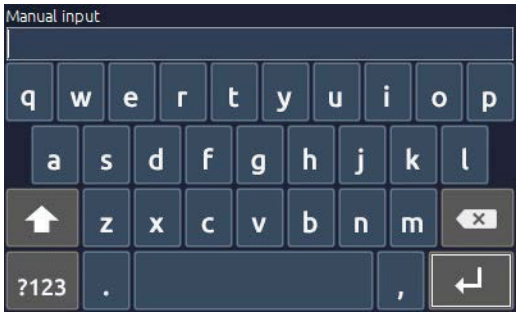


Figure 9 - On-screen Keyboard

In this screen, the user can use the touch-screen or the navigation keys to type in the identifier. The input can be canceled at any time by pressing *Go-back* .

The input can be erased by using the *Backspace* virtual button or by holding the *Shift* key and pressing *Go-back*.

The behavior of the *Enter* key changes whether the user chooses to use the touch-screen or the navigation keys as follows:

Upon entering the on-screen keyboard, the *Enter* key, when pressed, will activate the highlighted button (the button with a white rectangle around it). In order to finish the input, the user must hold down the *Shift* key and press *Enter*, or navigate to the return button (highlighted in Figure 9) and press *Enter*.

When the user uses the touch-screen for the first time in the session, the *Enter* key will change behavior and, when pressed, will accept the input directly and close the popup (same function as the return button or using +).

Upper case, numbers and symbols can be entered by changing the keyboard layout using the shift button and symbols button ?123 .

In the firmware version covered by this manual, it is not possible to select a program via identifier. The identifier is only used tin association with the tightening result.

5.3 Program Selection

Programs

Select *Programs* in the main menu to display a list of existing programs. This screen shows the number, name, and strategy of the program. In this list (and all other lists) it's possible to quickly navigate one page at time instead of one item at time by holding *Shift* key and using *Up* or *Down* keys .

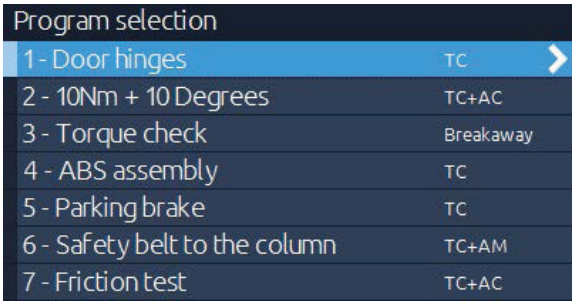


Figure 10 - Program Selection Screen

The strategy name is abbreviated:

TC	Torque control (torque only strategy)
TC+AM	Torque control with angle monitoring
TC+AC	Torque and angle control
Breakaway	Breakaway/Residual detection strategy
Drag	Drag torque detection strategy

Select the program and press *Enter* to load the program and display the tightening screen. The wrench is now ready to perform tightenings.

Manual program selection can be disabled via configuration parameter P0.16

As shown by an arrow in the right-hand of the selected item, the *Right* key can be pressed to display the details of the program. This screen will show details like the last time the program was changed, the revision, name, limits, and other information relevant to the program strategy. Those parameters will be discussed further in the program creation section.

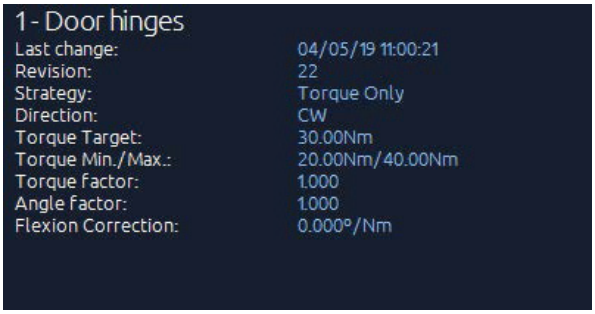


Figure 11 - Program Details Screen

5.4 Jobs

Jobs

Click the jobs icon in the main screen to open the list of existing jobs.

A job is sequential program that is executed in a series of steps. After each step is performed a set number of times (assigned by the user), the wrench automatically proceeds to the next program in the tightening sequence.

For more information, see "6.9 Jobs" on page 27.

5.5 Routes

Select *Routes* in the main menu to display the route selection screen. The route is built in a hierarchical fashion, like file and folders in a computer. Tasks appear in the root folder (the main folder that contains all items and is the first shown upon entering the route screen) and other folders that contain more tasks.

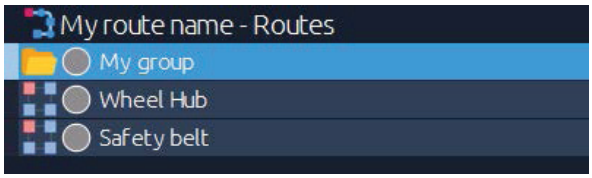


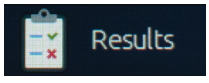
Figure 12 - Route Screen

Navigating the route follows the same principle of the program list. Select a folder icon (as in "My group" of Figure 12) and press *Enter* (or touch it directly) to list the folder contents, which can contain more folders and tasks.

Touching the title portion of the screen ("My route name – Routes" in Figure 12) has the same effect as pressing *Go-back* on the keyboard: it goes back one level. That is, if the user is inside a folder, it will go back to the parent folder (which may be another folder or the root folder). If the user is already in the root folder, then it will go back to the main menu.

The concept and operation of Tasks and Tests will be discussed fully in "6.10 Routes" on page 27.

5.6 Results



Select *Results* in the main menu to display the results list. This list shows the previous tightenings with the most recent at the top. Navigate down the list to show older results. To navigate an entire page of results at a time instead of a line at time, hold the *Shift* key and press *Up* or *Down* keys .

Date/Time	Identifier	Tq. Nm	Angle	
04/06/19 14:35:09	12345678999	29.96	8.0	0/0
04/06/19 14:34:56	12345678999	24.67	45.1	0/0
04/06/19 14:34:48	12345678999	20.67	12.6	0/0
04/06/19 14:34:05		20.67	12.5	0/0
04/06/19 14:21:11	9SVE123456789	20.67	12.6	0/0
04/06/19 14:14:30	9SVE123456789	20.67	12.6	0/0
04/06/19 14:14:27	9SVE123456789	20.67	12.6	0/0
04/06/19 14:14:23	9SVE123456789	20.67	12.6	0/0
04/06/19 14:14:20	9SVE123456789	20.67	12.6	0/0
04/06/19 14:14:17	9SVE123456789	20.67	12.6	0/0
04/06/19 14:14:12	9SVE123456789	20.67	12.6	0/0
04/06/19 14:13:56	9SVE123456789	20.13	16.4	0/0

Figure 13 - Result List

Pressing *Right* shows the details of the program used to perform the highlighted tightening. This information is not the current program stored in the wrench, but a copy stored with the result when the tightening was performed. Every result in the wrench stores the tightening data, the program, and the tightening trace. This way it is possible to verify the program parameters even after it has been changed or delete from the wrench.

It's not possible to erase results from the wrench.

Press *Enter* to show the tightening trace of the result.

5.6.1 Tightening Trace Screen

The tightening trace screen shows the Torque x Angle, Torque x Time, or Angle x time trace of the tightening.

Figure 14 - Tightening Trace

The current trace type and units is shown at the top of the trace area. By default, the Torque x Angle trace is presented first. Pressing *Enter* cycles through the other trace types. In the bottom right, the torque and angle (or Torque and time or Angle and time) of the selected point is shown. The tightening result point is highlighted by default. The cursor is shown in green if the tightening final status is OK and red if it is NOK.

The toolbar at the bottom left shows the tool selected. The tool can be changed by pressing *Shift*. Those tools are, from left to right: Zoom, Pan, and Track. Each tool changes the behavior of the keyboard arrow keys as follows:

Zoom

Up zooms in and *Down* zooms out. *Left* and *Right* are not used.

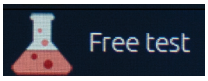
Pan

Up and *Down* pans the trace vertically and *Left* and *Right* pans the trace horizontally.

Track

Left and *Right* moves the cursor point by point. *Up* and *Down* moves the cursor 10 points at time. Each time the cursor is moved, the value displayed in the bottom right is updated.

5.7 Free Test



The free test option allows the user to use the wrench freely while reading the torque and angle applied. No tightening result will be generated.

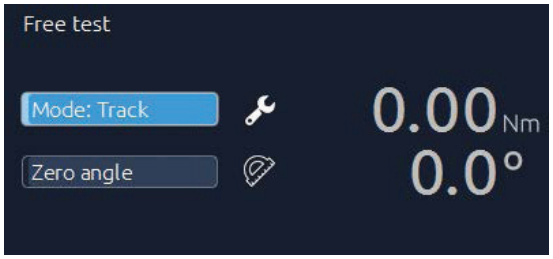
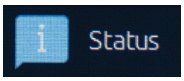


Figure 15 - Free Test Screen

The torque display has two modes, Track and Peak, that can be alternated by pressing the *Mode* screen. The track mode shows the current torque value applied, while the peak mode holds the maximum torque applied in this session. To zero the peak value, switch to Track mode and back to Peak again.

The angle can be zeroed using the screen button Zero angle.

5.8 Status



The status screen shows some basic information about the wrench and network connection.

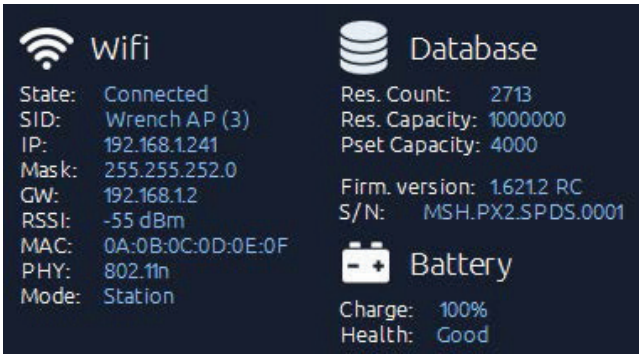


Figure 16 - Status Screen

5.8.1 Wi-Fi Status

The Wi-Fi section shows the state of the connection, the access point SID (with the current channel in brackets), and address information along with the wrench MAC address and signal strength in dBm.

5.8.2 Database

This section shows the amount of results stored and the result and program capacity. When the result count reaches the capacity, the oldest tightening will be overwritten.

The wrench firmware version and serial number are also shown.

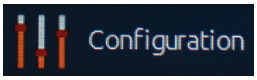
5.8.3 Battery

The battery charge percentage and health are shown is this section. The wrench is equipped with a specialized circuit that tracks the battery impedance and calculates its health.

The possible health status is listed below:

Very good	The battery is new or has a small number of cycles
Good	Battery is used but it's in good condition
Fair	Battery is usable but may hold less than 60% of its rated capacity
Poor	Battery is near the end of its life. Plan to replace it
Bad	Replace the battery as soon as possible

5.9 Configuration



5.9.1 Add/Edit Programs

Programs can be edited using the wrench interface or TWConfig software. On the main menu of the wrench interface, click Configuration → Add/Edit to input program parameters. For more information, see "6.4 Programs" on page 17.

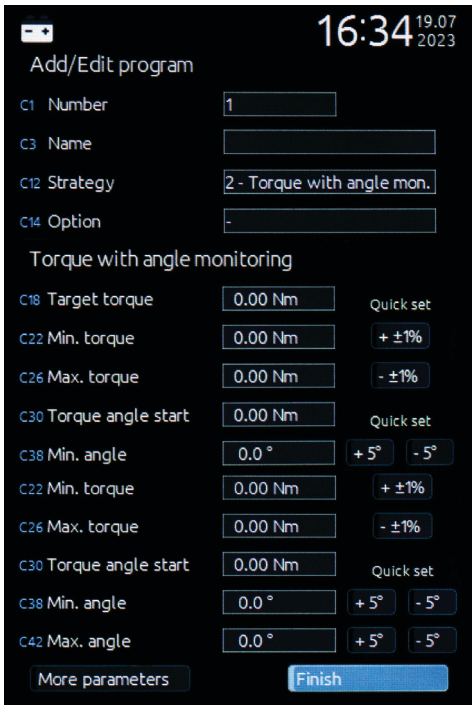


Figure 17 - Add/Edit Program Screen

Click *More parameters* to enter the *Additional parameters* screen.

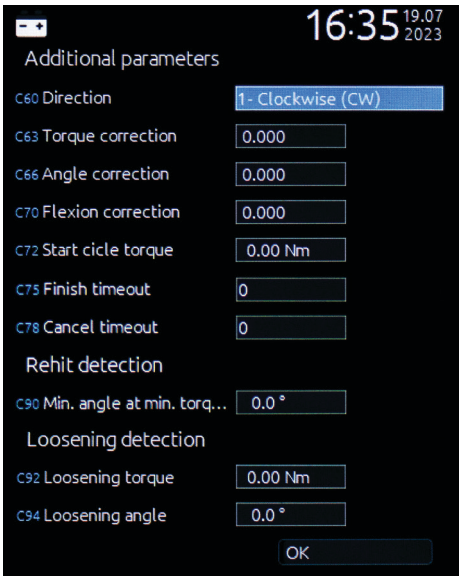


Figure 18 - Add/Edit Program, Additional Parameters Screen

5.9.2 Calibrate Touch Screen

Because of use and other factors, it may be necessary to recalibrate the touch screen in order to maintain accuracy.

To calibrate the touch screen, touch in the center of the crosshair shown. A stylus pen can be used to aid the procedure. Do not use sharp objects. After touching the first point, the crosshair will move to the next location. This will continue for each corner. After touching the needed points, the wrench will show a message confirming that the procedure was finished successfully. The touch screen can then be tested by touching random points on the screen and checking the position of the green crosshair drawn. Press *Enter* to save the calibration data in the wrench memory and complete the procedure. *Go-back* can be pressed at any time to cancel the procedure and discard the collected calibration data.

If an error message appears after the procedure is completed, the touch hardware may be damaged.

6 Wrench Management Software TWConfig

TWConfig is a windows-based software package developed to manage the Phoenix II/Phoenix III torque wrench. It's lightweight and offers an intuitive and easy-to-use interface for managing the wrench via a USB cable or Wi-Fi connection.

Among other features, it's possible to create and edit programs, configure wrench settings, create and upload routes, save and restore wrench backup, and visualize and export results and tightening traces.

TWConfig software is distributed in two forms. Both are the same software. The only difference is the way it's installed in the target computer:

- ***Setup version:*** It's installed on the computer like other standard Windows applications and runs from the start menu. It may need administration rights to install.
- ***Portable version:*** Does not need to be installed on the computer (and as such doesn't need administration rights). It can be run from a USB stick or can be simply copied to the target computer and executed directly.

6.1 Licensing

The software is free of charge for Phoenix II/Phoenix III torque wrench owners. Use of the software with third-party products is not allowed.

Please read the end user license agreement that's available with the software.

6.2 Basic Operation

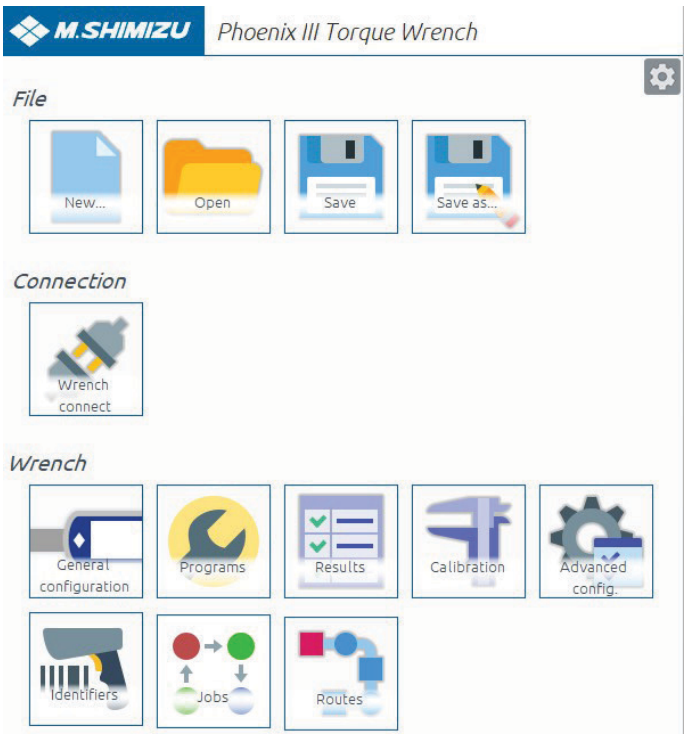
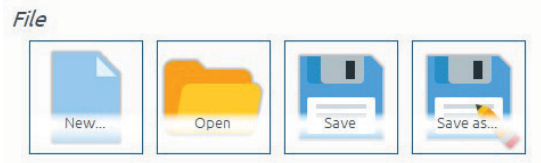


Figure 19 - TWConfig Main Interface

6.2.1 File Management



The TWConfig software works, like other Windows applications, storing and loading data from files. The behavior of file operation changes wherever the wrench is currently connected. It's possible to create programs and routes while offline and upload the configuration to the wrench later.

The action of each option under the file section:

New

- ***Disconnected:*** Unload any loaded file and start with an empty template.
- ***Connected:*** No action.

Open

- ***Disconnected:*** Open a file for viewing and editing. Previous saved results and traces can be viewed and exported. Program and configurations can be edited.

- ***Connected:*** Opening a file with the wrench connected imports the contents of the file into the wrench. This can be used to restore the wrench configuration with the contents of a file (e.g. restore a previous backup). The results present in the wrench are not changed.

Upon opening the file, a prompt allows the user to select which parts of file to upload to the wrench. This way it's possible to maintain, for example, the wrench calibration and network configuration while restoring all other configurations.

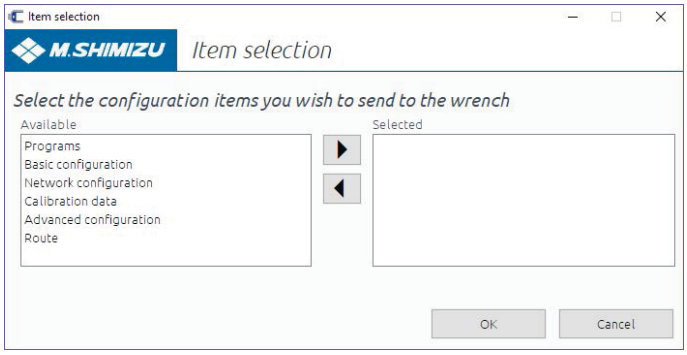


Figure 20 - Configuration Upload Prompt

Save

- ***Disconnected:*** Save the configuration to the current open file. If a file wasn't saved previously, the software will prompt you to choose a location.
- ***Connected:*** The current wrench configuration will be downloaded and saved to the current file. The downloaded results and traces are also stored. If no results have been previously loaded, then the last 10 will be downloaded. More results can be saved by loading them, prior to saving the file, using the Results option.

Save as

The *Save as…* button has the same functionality as the *Save* button except that it always prompts to save the configuration in a new file instead of using the current open file.

6.2.2 Connection

It's possible to connect to the wrench using the USB port or via Wi-Fi using a TCP/IP connection.

Click the *Wrench connect* button to open the connection prompt where it's possible to select which method to use.

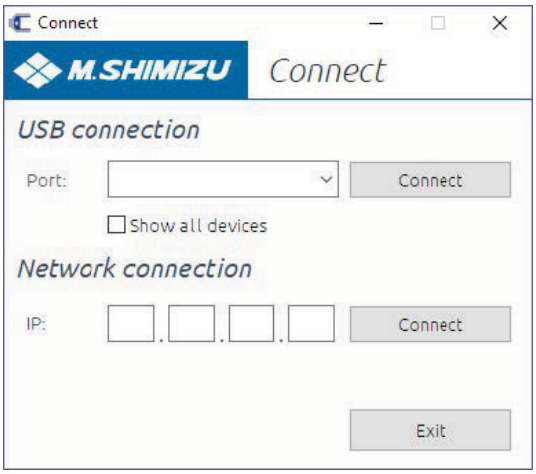


Figure 21 - Wrench Connection Prompt

6.2.2.1 *USB connection*

Upon opening the screen, a list of wrenches connected via USB port will appear in the *Port* box. Multiple wrenches can be connected to the computer at the same time, but the software can only manage one at time. After selecting the device, the connection can be made using the *Connect* button

The *Show all devices* is used in some Windows versions where the computer is unable to correctly identify that a wrench is connected. This option lists all ports available. The correct port can then be found by trial and error. It's advised to remove all other devices connected to the computer before executing this procedure.

6.2.2.2 *Network connection*

If the wrench is connected to a Wi-Fi network accessible by the computer, the connection can be done without cables using the wrench IP address.

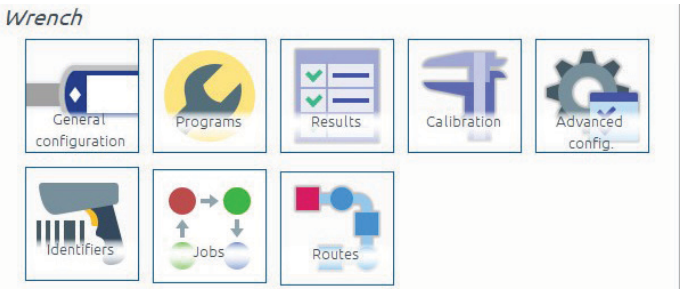
Enter the wrench IP address in the *IP* field and select the *Connect*. The previously configured wrench IP can be found directly in the wrench using the *Status* option.

Make sure that the Wi-fi network to which the wrench is connected is accessible by the computer, and that the IP address of the computer is within the same range of the device.

If an error occurs while trying to connect with the wrench, contact your IT department, providing them the error shown, the address of the wrench, and which computers are being used to connect. The error descriptions given by the software are standard Windows messages that are common to other networked devices and may help identify the root cause even if IT personnel are unfamiliar with the device.

Regardless of the connection method, the software operation is the same. The USB connection usually is faster depending of the signal quality of the wireless network.

6.2.3 Wrench Configuration



The *Wrench* section in the lower part of the main software screen shows the major options for configuring and setting up wrench parameters. Each option is briefly described below and will be discussed in detail later.

General configuration
Access to the basic wrench setup such as display language, units, date, time, and network configuration.

Programs
The program management option contains the program list and allows the user to edit or duplicate an existing program or create a new one.

Results
Lists the results of a connected wrench or open file. Has the option to view the tightening trace and export the result to formats such as .txt, .csv, or Excel®.

Calibration
Interface to calibrate the wrench torque transducer and angle gyroscope gain.

Advanced config
This options lists all the wrench configurations and allows fine control of the wrench behavior.

Identifiers
Identifiers are barcode readings or manually input text that can be saved with the results to identify the product/part/vehicle where the tightening was applied.

Jobs
A job is sequential program that is executed in a series of steps. After each step is performed a set number of times (assigned by the user), the wrench automatically proceeds to the next program in the tightening sequence.

Routes
The route functionality is used in quality control to perform a series of tests in a structured manner. Routes are comprised of tasks, which house the programs to be performed along with configurations such as how many times a program should be executed. The route program is separated from the wrench programs so both can co-exist in the same wrench.

6.3 Wrench General Configuration

Select *General configuration* From the TWConfig main interface and the following screen is displayed:

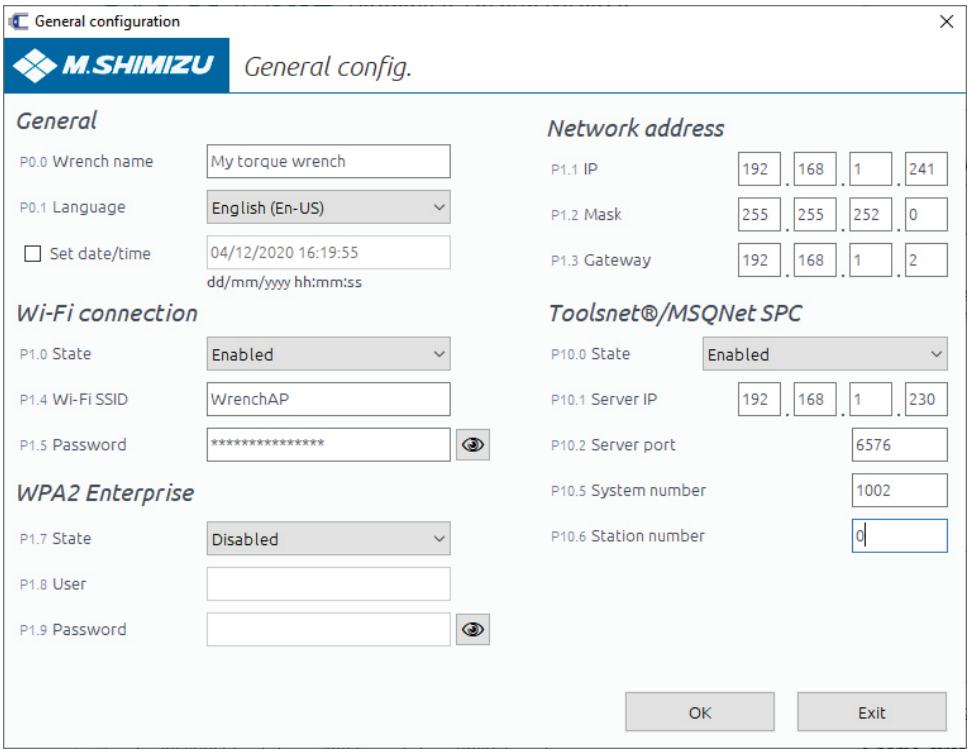


Figure 22 - General Configuration Screen

6.3.1 Interface Descriptions

Wrench name
Text that identifies the wrench. This is also used in some protocols that require a name to be returned.

Language
Selects the wrench display language. The supported languages in the wrench version covered in this manual are English and Brazilian Portuguese.

Date/Time
Ticking the *Set date/time* check box enables the user to enter a new date/time to be sent to the wrench. This new value will be sent when the OK button is pressed.

Wi-fi connection
Use this section to set up the wrench Wi-fi connection. If the wireless connection will not be used, the wrench radio can be disabled to save battery.

The information needed to connect to the Wi-fi network is the network name (SID) and password. The cryptography type is automatically detected.

WPA2 Enterprise
The wrench supports WPA2 enterprise using PEAP + MsCHAPv2 (certificate file is not supported). This type of authentication requires a username and password.

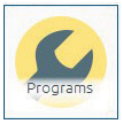
Network address
The IP address and network mask are the two basic network configurations that must be entered in order to establish a connection with the wrench. The gateway address is not always needed and can be left blank in network setups that don't use it.

Toolsnet®/MSQNet SPC
TWConfig software supports the Toolsnet v3.4 protocol to send result data and traces to a remote server. For the wrench version covered in this user manual, the PIM portion of the Toolsnet protocol is not implemented. The Server port value 6576 is the default port used when PIM is not enabled and rarely needs to be changed.

The *System number* and *Station number* are fields sent with the protocol telegram that, together with the IP address, identifies the source of the information. Consult the documentation of the protocol and the remote system for further information.

After all configuration is done, press OK to validate and send the data to the wrench.

6.4 Programs



Click the *Programs* button to open the program list. From here, you can create a new program, and edit, duplicate, or delete an existing program.

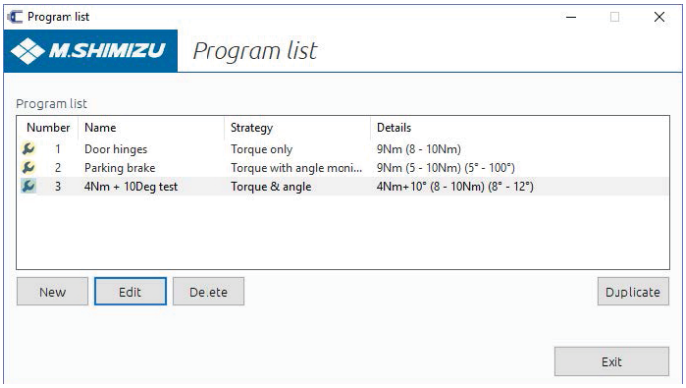


Figure 23 - Program Management Screen

The program list shows the number, name, strategy, and basic details of the existing programs. The items can be edited, deleted, or duplicated using the button in the lower part of the list. When an existing program is duplicated, the next available number is used. This number can be changed afterward to any value within the wrench range (1 to 4,000). This number is used to select the program via protocol connection and must be unique.

6.4.1 Creating and Editing a Program

The steps to create or edit an existing program are basically the same. Select a program and choose Edit or New. This opens the program editing screen.

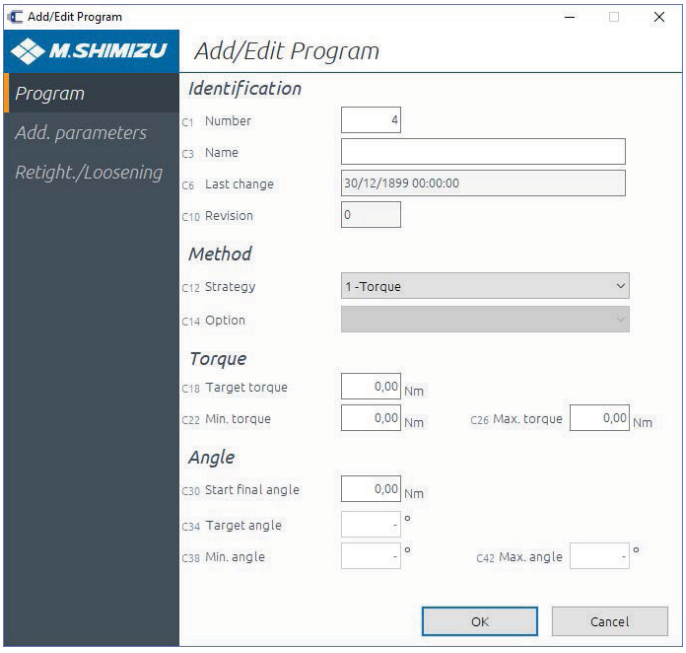


Figure 24 - Add/Edit Program Screen

6.4.1.1 Identification

The program parameters are divided into sections and each parameter has a unique code to easily identify and locate them.

- **Number:** Unique number to identify the program. This number is used to select the program remotely via a protocol interface.
- **Name:** Free text value to help the user identify the program. This name is show in the wrench screen.
- **Last change:** This field is automatically set by the program every time the program is changed.
- **Revision:** This number is automatically incremented by the system every time the program is changed and helps keep track of program versions used in production. Every time a result is saved, this value gets saved with it, so it's possible to pinpoint the program revision used in every tightening performed.
- **Method:** Sets the program strategy and strategy option to be used. In the current firmware version the following strategies are supported:

  1. **Torque:** Torque only strategy
  2. **Torque with Angle Monitoring:** Torque control with angle monitoring
  3. **Torque & Angle:** Torque and angle control. Result can be the torque at the angle peak or the peak torque
  4. **Breakaway:** Automatic residual torque detection
  5. **Drag Torque:** Measures the torque needed to turn an axle for example

Each strategy will be discussed in detail in their own section later in this manual (see "6.4.2 Program Strategies" on page 19)

The strategy selected will enable the required torque and angle parameters. Click in a parameter input box to show a description of its function on the left side of the screen.

6.4.1.2 *Additional parameters*

Select the *Add. parameters* tab to show more program settings to help fine tune the program for specific needs.

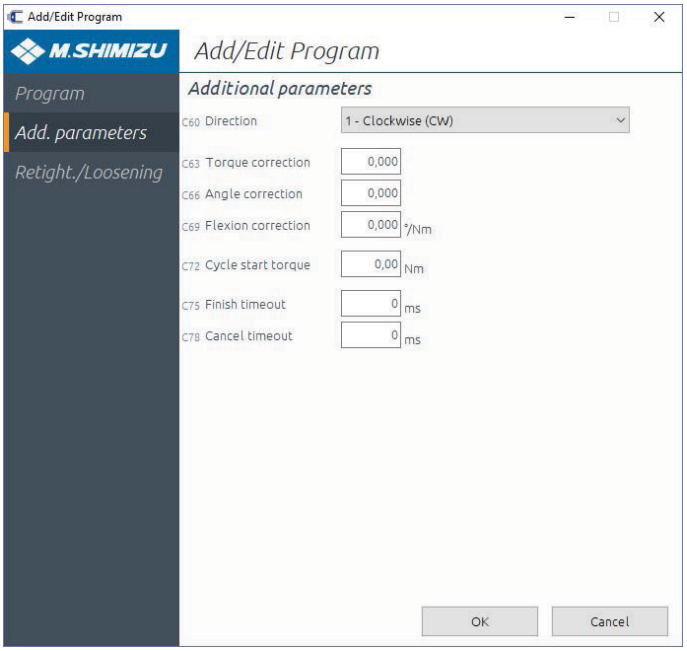


Figure 25 - Program Additional Parameters

- **Direction:** Tightening direction, clockwise or counterclockwise.
- **Torque correction:** This is a multiplication factor used to compensate for sockets or extensions that change the arm length of the wrench. If this value is zero, the global value set in P0.28 is used. If both values are zero, a default of 1 is used. This value changes the torque read in the wrench and saved with the results. The factor used to perform a tightening is saved with each result.
- **Angle correction:** Multiplication factor for the angle measurement. Although not as commonly used as the torque counterpart, this parameter is useful, for example, if a torque multiplier is utilized. If zero, the value set in P0.29 is used. This value is also saved with the results when a tightening is performed.
- **Flexion correction:** The flexion correction is measured in degrees per Newton meter. It is used to compensate for flexion in the wrench arm during the torque application (especially in larger wrenches of 200 Nm and above). Angle measurement is made indirectly by using a gyroscope in the wrench body, and flexion in the wrench arm can add a few degrees to the final result measurement. Usually this value is preset when the wrench is manufactured in the global configuration P0.6. However, as in the case of torque and angle correction, the global value can be overridden by the value set in the program.
- **Cycle start torque:** After a program is selected, the wrench shows the tightening screen and waits for the user to apply torque. This torque value must be reached in order to start the tightening cycle. Upon crossing this threshold, the internal cycle counters are incremented and the data for the tightening trace starts to be collected. A result is generated only if the torque goes beyond this value to start the cycle. If zero, the default of 1% of the wrench capacity is used.
- **Finish timeout:** This timeout value is used to finish the tightening quickly after completion, but allows some time for ratcheting the wrench during operation. This timer is triggered after at least the minimum torque is reached (or minimum angle in an angle strategy). It starts to runout only after the torque falls below the Start torque. If the torque goes up again, the time is reset. The wrench will finish the tightening only if the torque is kept below Start torque for this amount of time. If zero, the default set in P0.7 is used. Usually the default is 500 ms.
- **Cancel timeout:** This timeout value cancels the tightening when a cycle is started (Start torque is reached) and no further torque is applied. It is triggered when a cycle starts but starts to runout only after the torque falls below the Start torque again. The wrench will finish the tightening if a cycle is started and the torque is kept below Start torque for this amount of time. If zero, the default set in P0.8 is used, usually the default is 5000ms.

The tightening cycle can also be finished immediately by pressing *Enter* on the keyboard.

6.4.1.3 *Retightening and loosening detection*

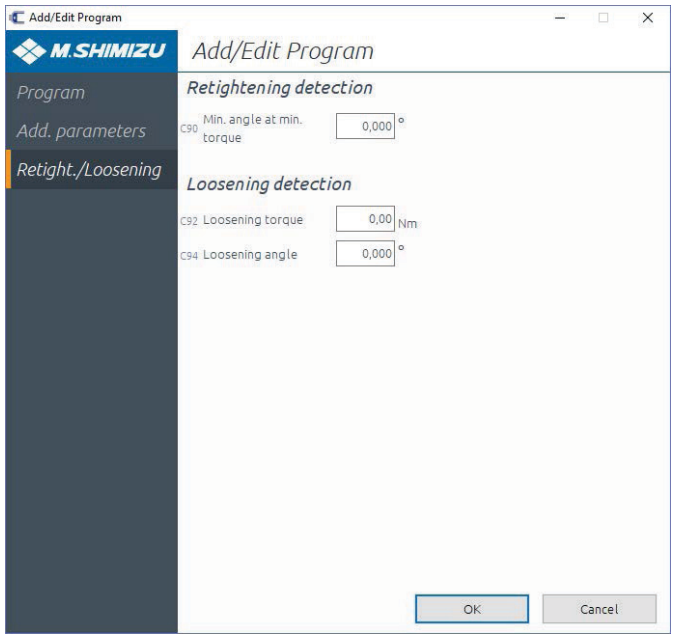


Figure 26 - Program Re-hit and Loosening Detection

- **Retightening:** The wrench can detect torque being applied on an already tightened bolt by checking the angle measured when the minimum torque value set in the program strategy is reached. When the bolt is already tightened, the angle turn to reach this torque is very low in comparison to a bolt not tightened. Even if the bolt is pre-assembled, this value can be determined empirically by testing both conditions and picking a middle ground between them.

  When the torque reaches the parameter C22 Min. torque, the angle is compared with the value set in C90 Min. angle at min. torque. If the angle is higher than this value, the cycle can continue. If the angle is lower than this value, the wrench will warn the user that a retightening condition was detected. A result will be generated with the status NOK – retightening.

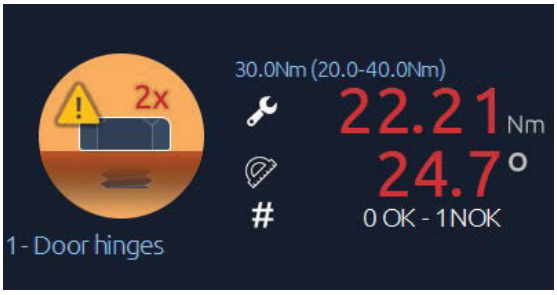


Figure 27 - Retightening Status Screen

- **Loosening detection:** The loosening of a bolt already tightened can be detected by setting the *C92 Loosening torque* and *C94 loosening angle* parameters. When the measured torque reaches *Loosening torque* in the opposite direction of the tightening (param. C60), the *Loosening angle* starts to be incremented. If the user keeps turning the wrench, and the angle value reaches the value set in *Loosening angle*, a loosening is detected. When this happens, the wrench will warn the user and save the results with the status NOK – loosening.

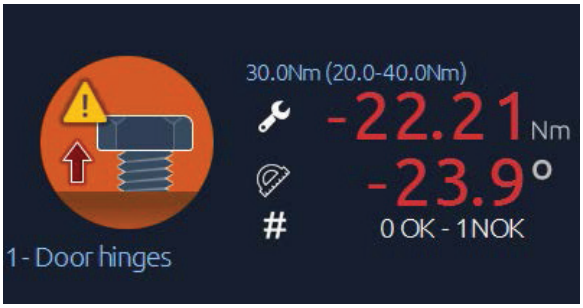


Figure 28 - Loosening Detected Screen

6.4.2 Program Strategies

6.4.2.1 *Torque*

The torque strategy measures and classifies only the torque read. The angle is still measured, but is not considered to determine the final result.

Strategy parameters:

C18 Target torque	Torque target
C22 Min. torque	Minimum torque value of the torque classification window
C23 Max. torque	Maximum torque value of the torque classification window
C30 Start final angle	Starting from this torque value, the angle will start to be measured

6.4.2.2 *Torque with angle monitoring*

This strategy is similar to the torque strategy but also classifies the angle value according to a set window.

Strategy parameters:

C18 Target torque	Torque target
C22 Min. torque	Minimum torque value of the torque classification window
C23 Max. torque	Maximum torque value of the torque classification window
C30 Start final angle	Starting from this torque value, the angle will start to be measured
C38 Min. angle	Minimum angle value of the angle classification window
C42 Max. angle	Maximum angle value of the angle classification window

6.4.2.3 *Torque & angle*

This strategy can be separated in two steps. First, an initial torque must be reached, then the wrench must be turned a set number of degrees. The final torque and angle is then classified using the set window.

This strategy has two options for which torque value is used as the final result torque.

Strategy options:

Result is torque peak	The maximum torque collected during the tightening will be used as the final torque
Result is torque at angle peak	The wrench will collect the torque value when the maximum angle is achieved

Strategy parameters:

C30 Torque 1st stage	Initial torque to be applied. The angle will start to be measured after this torque is reached
C22 Min. torque	Minimum torque value of the final torque
C23 Max. torque	Maximum torque value of the final torque
C34 Target angle	Angle to be turned after C30 is reached
C38 Min. angle	Minimum angle value of the angle classification window
C42 Max. angle	Maximum angle value of the angle classification window

6.4.2.4 *Automatic breakaway/residual torque*

The automatic breakaway strategy is used for a quality control check, and automatically detects the moment the bolt starts to move when retightened. This strategy is used to check a tightening operation already performed in order to ascertain the residual torque in the joint.

Strategy options:

When a screw is rotated further, the *torque x angle* graph can assume two forms. In the first case, there's a clean transition from the moment the bolt is static to when it starts to move. This transition is marked by a change of gradient as pictured in Figure 29 – Case 1, Clean Breakaway. In this case, the breakaway torque and the residual torque are the same.

In the second case, due to high friction in the bolt head, conical seats, and other factors, a torque peak may be present in the transition moment. This peak is the breakaway torque and is normally not considered as the residual torque. The residual torque is taken as the lower value that follows the breakaway as pictured in Figure 30 – Case 2, Breakaway with Peak.

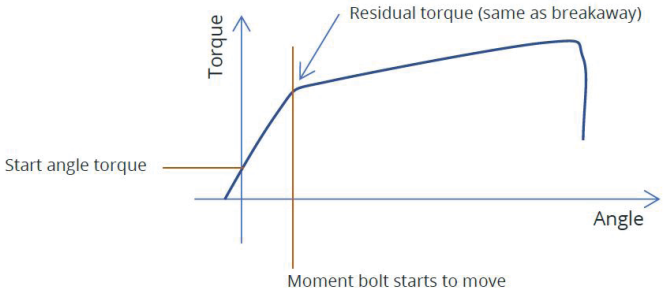


Figure 29 – Case 1, Clean Breakaway

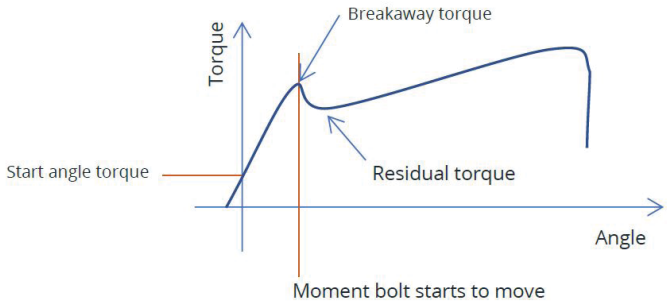


Figure 30 – Case 2, Breakaway with Peak

There are two options regarding those cases.

1. **Residual torque:** The wrench will always collect the residual torque as shown in Figure 29 and Figure 30, ignoring the breakaway peak if present.
2. **Breakaway torque:** The wrench will always collect the breakaway torque as shown in Figure 29 and Figure 30.

Strategy parameters:

C22 Min. torque	Minimum torque value of the breakaway/residual torque detected
C23 Max. torque	Maximum torque value of the breakaway/residual torque detected
C43 Start final angle	The angle will be measured starting from this torque value
C46 Stop angle	If this value is zero, the wrench automatically detects when the breakaway happens and signals the user to stop applying torque. This detection may happen a few degrees after the bolt moves (to avoid false detection). This causes more torque to be added to what's

already in the joint. The wrench can be programmed to signal early by setting the parameter to a known angle value (taken empirically) that occurs after the breakaway. The wrench will still analyze the trace and correctly detect the breakaway point

C48 Torque limit Maximum torque value allowed during the tightening process. If this value is reached, the results will always be set to NOK regardless of the value of the residual torque

C50 Angle limit Maximum angle value allowed during the tightening process. If this value is reached, the results will always be set to NOK regardless of the value of the residual torque

6.4.2.5 Drag torque

The drag torque strategy is used to measure the torque needed to turn a shaft a certain amount of degrees. This strategy is commonly used to help set the preload of bearings and bushings. If the axle turns too freely, more preload is needed. If it is too tight, the preload must be reduced. This strategy's options allow It to be used in a variety of other applications.

The angle is measured continuously after *C30 Start angle* torque is reached.

Torque is needed to overcome the static friction in order to start the rotation. Ignore this torque by setting the parameter *C38 Angle Discard*, which will discard torque measurement taken before the angle is reached.

The torque starts being measured when it exceeds the value set in *C38 Angle Discard*. The measurements are taken until *C34 Stop Angle* is reached. Once this Stop Angle is reached, the measured torque is again ignored. The total angle measurement window is C34 minus C38.

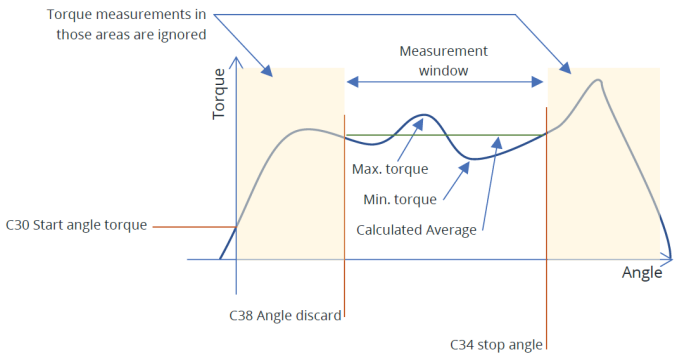


Figure 31 – TWConfig Result List

The maximum, minimum and average torque collected during the angle measurement window can be used as the final torque result. This result will then be classified using the torque limits set in the program parameters C22 and C23.

Strategy options:

Capture Maximum Torque The maximum torque collected during the angle measurement windows will be used as the torque result

Capture Minimum Torque The minimum torque collected during the angle measurement windows will be used as the torque result

Capture Average Torque An average of the torque samples collected during the angle measurement window will be used as the torque result

Strategy Parameters:

C22 Min. torque Minimum torque value of the final torque

C23 Max. torque Maximum torque value of the final torque

C30 Torque angle start The angle will be measured starting from this torque value

C38 Angle discard Discard torque measurement until this angle is reached

C34 Stop angle Stops collecting torque and finishes the cycle when this angle is reached

6.5 Results

The wrench tightening database can hold up to 1,000,000 results, along with tightening trace information and information about the program used. The TWConfig tightening screen shows, by default, the last 10 tightening results and tightening trace information. The button *Load Results* can be used to download more results to the local computer.

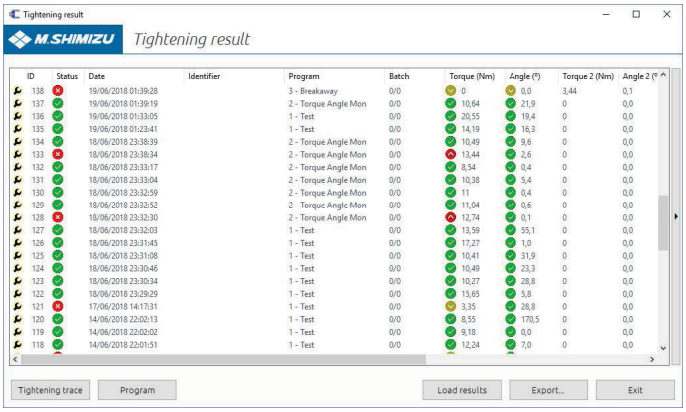


Figure 32 – TWConfig Result List

Tightening trace and program information can be viewed by selecting a result and clicking *Tightening trace* or *Program* button.

This screen is capable of showing a maximum of 100,000 tightenings. If more data is desired, the export option must be used.

6.6 Calibration

The wrench calibration can be performed by applying a known torque, comparing the torque shown by the wrench, and setting the gain or calibration factor to equalize them. The calibration procedure is regulated by local and/or international technical standards and must be performed by a certified laboratory. The following information is intended to aid the calibration technician and is not a procedure for the general user.

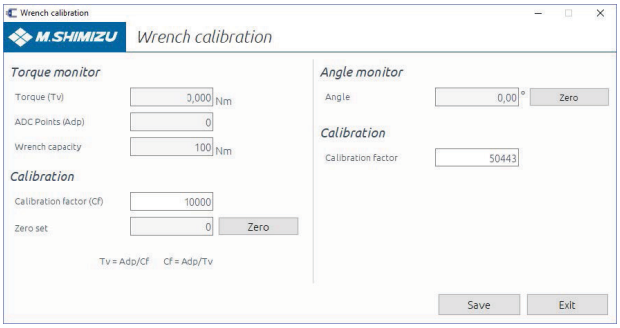


Figure 33 - Wrench Calibration

6.6.1 Torque Calibration

Before starting torque calibration, use the *Zero* button to set the wrench zero. This removes the torque offset caused by the idiosyncrasies of the strain gauge installation in the torque transducer, which varies from one device to another.

Torque (Tv) shows the current torque being applied. *ADC points (Adp)* is the internal engineering value used by the wrench. The wrench capacity shows maximum torque that may be applied.

As the formula in the lower part of the screen indicates, the wrench *Torque (Tv)* is calculated by dividing the *ADC points (Adp)* by the *calibration factor (cf)*. As soon as a new value is entered, the torque is calculated based on this new information.

The torque and angle values shown in the wrench screen are calculated using the wrench calibration data, so the values entered in this screen have no effect until they are saved.

The current calibration data in the wrench is not changed until the calibration is sent to the wrench using the *Save* button.

6.6.2 Angle Calibration

The angle calibration is somewhat simpler than the torque calibration. The zero from which it's measured is a chosen reference, not absolute. The Zero option here only resets the measurement and has no effect in the calibration value.

Internally the angle is measured using a MEMS gyroscope, which detects angular displacement and outputs the turning speed in degrees/second. This value is then integrated to obtain the final angle. The gyroscope angular zero reference is initially set when the wrench is turned on, and is tracked and adjusted internally with no need for user setup. The calibration factor set in this screen is, in fact, the integration factor used in the calculation and can be fine-tuned to attain the maximum accuracy in the angle measurement.

The angle calibration factor is a unitless value and changes from wrench to wrench due to gyroscope manufacturing. This value is usually adjusted slightly between angle tests until a satisfactory angle accuracy is achieved.

6.7 Advanced Configuration

The advanced configuration screen lists all wrench configurations. Each configuration has a unique code in the format *PX.Y*, which helps identify a particular parameter. *X* is the setting group and *Y* is the item within the group.

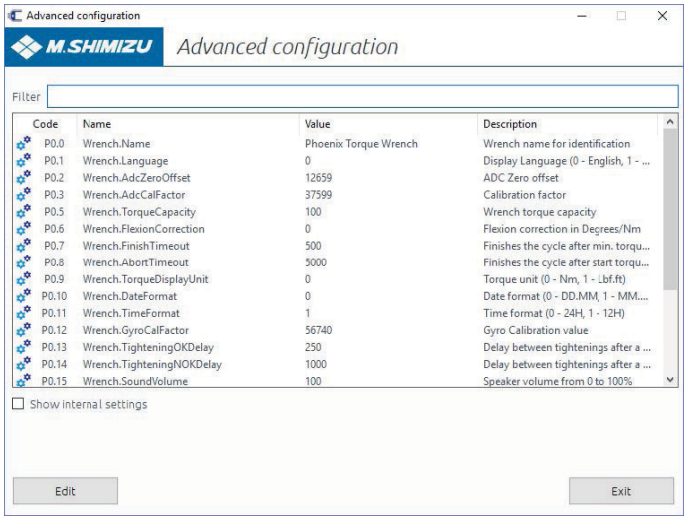


Figure 34 - Advanced Configuration

Select an item in the list to show a small description with its function. Most configurations also have a default value. When the current value differs from the default, the line is shown in bold.

Double click a list item or select it and click Edit to open a popup to edit its value. The default, minimum, and maximum limits for the configuration are shown.

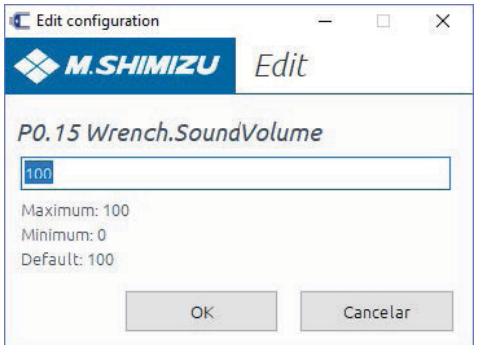


Figure 35 - Configuration Example

Tick the *Show internal settings* checkbox to show internal wrench configurations. Those configurations are not meant for end-user setup and may affect the stability and performance of the device. Only change them if instructed by the manufacturer or distributor.

6.8 Identifiers

Identifiers are barcode readings or manually input text that can be saved with the results to identify the product/part/vehicle where the tightening was applied.

As many as 8 identifiers can be read, and 7 can be stored with the result. One of those identifiers can be configured to automatically select a job or program.

6.8.1 Identifier Configuration

Click the Identifiers button in the main screen to open the main identifier configuration screen

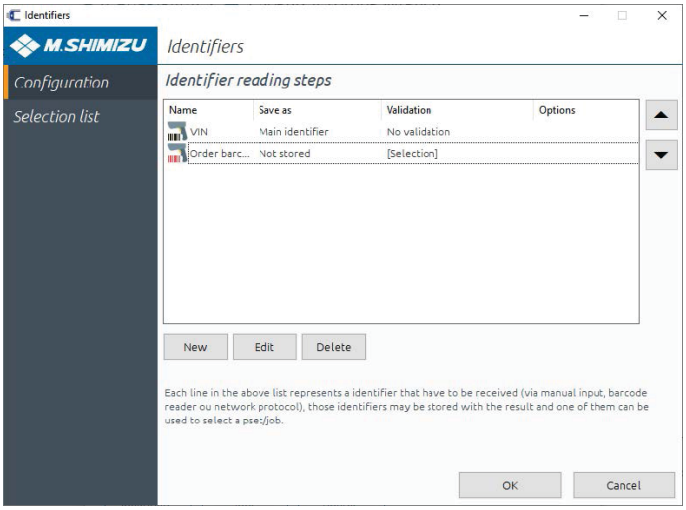


Figure 36 - Identifier Configuration Main Screen

Each line in the Identifier Reading Steps list represents an identifier that the wrench must receive in order to accept the readings, select a job/program (if set), and save the identifiers with the result.

If no step is configured, the wrench will accept a single reading and save the received value as the main identifier. No selection of job/program will be made.

As many as 8 steps can be configured, 7 of those readings can be saved with the results as follows:

One main identifier: This identifier is the main result identifier and is saved in the Identifier field of the result. A maximum of 63 characters can be used.

Six extra identifiers: These identifiers are saved in the Extra identifiers field of the result. These are usually used to store serial number of parts fastened in a main assembly. For example, a car VIN can be the main identifier, and serial numbers of the wheels fastened can be added as extra identifiers. This area has a size of 128 characters that are shared between all extra identifiers. Each extra identifier occupies its own size plus one control character. Therefore, the wrench can store a single extra identifier with 127 characters, or two extra identifiers with, for example, 100 and 26 characters (100 + 1 + 26 + 1 = 128) and so on up to six values. If the number of characters exceeds the available size, the wrench will accept the identifiers, but will truncate the last readings to fit the buffer.

Ascii control characters (characters with byte value from 0x00 to 0x1F hexadecimal) are not used by the wrench and are removed from the received value before any processing. If an identifier with only control characters is received, an error message will be shown.

6.8.2 Selection List

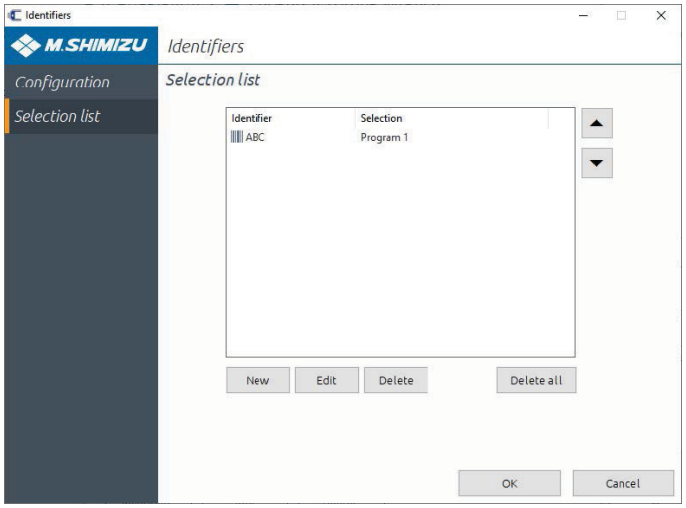


Figure 37 - Identifier Selection List

The identifier selection list contains a list of identifiers associated with a program or job. In this context, an identifier may be a full barcode or only some of its characters. This will become more clear in the following identifier step configuration section. When an identifier configured as a selection identifier is received, the wrench will scan this list to find which program/job to select.

6.8.3 Identifier Reading Step Configuration

Add a new reading step by selecting *New* in the main identifier screen. The following screen appears.

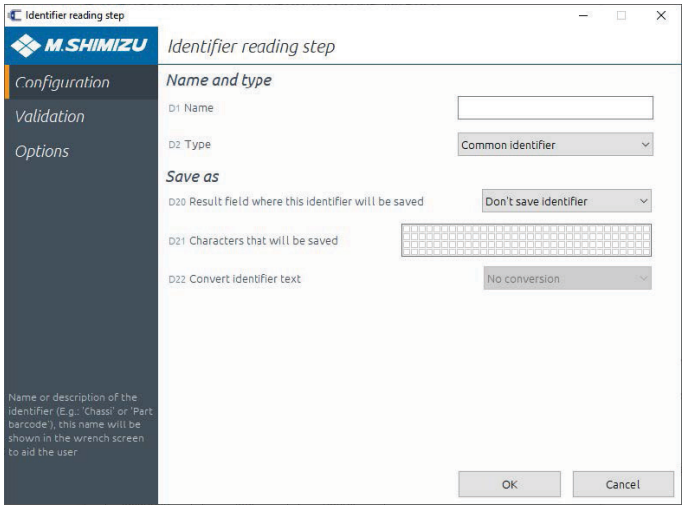


Figure 38 - Reading Step Configuration

Each step represents an identifier that must be received (either a barcode reading, manual input, or via protocol) and has two main configurations: its type and the location where it will be saved.

The *Type* specifies if the identifier will be used to select a program or job, or if it is just a common reading to save with the result. The *Save as* configuration shows the result field in which the identifier will be saved.

Other fields on this screen include:

D1 - Name
Unique name for the identifier, such as "Main code," "Red label," or "car VIN."

D2 - Type
As previously mentioned, the Type specifies the function of the identifier. It can be either a common identifier or an identifier to select a job or program. When the Type is set to "Identifier to select pset/job," the following option appears:

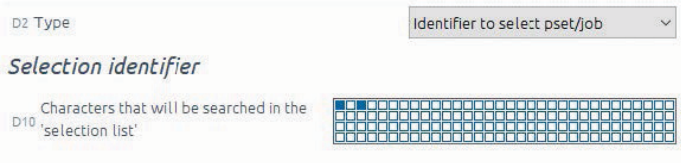


Figure 39 - Selection Identifier Options

This grid represents characters in the received identifier that will be searched in the Selection List (the first and third character are selected in the example). Click in this grid to open the configuration window:

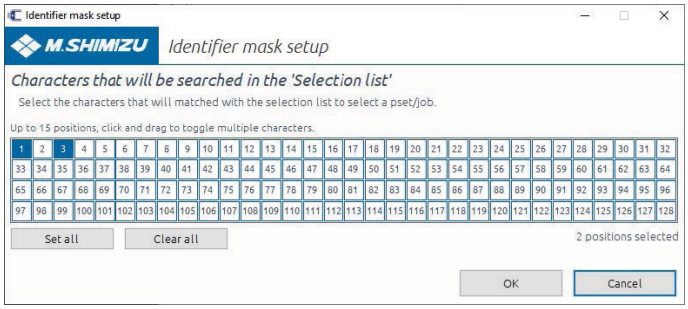


Figure 40 - Selection Identifier Mask Setup

In this window, it is possible to configure which characters will be used.

This configuration works like a mask. After the identifier is received, this mask is applied and the resulting value is searched in the selection list. As many as 15 characters of the received identifier can be used. Only 1 step of the 8 available can be set as a selection identifier.

Example:
Using the example configuration shown in Figure 40 (first and third character enabled) if an identifier with the value ABCDEF is received, the resulting value AC will be searched in the selection list. If this value is found, the job/program associated with it will be selected when all other identifier steps, if any, are completed. If the value is not found, an error message will be shown in the wrench screen and the identifier is discarded. The user then has the option to either cancel the operation and discard all the identifiers read so far, or try again.

D20 - Result field where the identifier will be saved
This configuration selects the result field in which the result identifier will be saved. As mentioned previously, the fields are the main identifier, or one of the six available extra identifiers.

D21 - Characters that will be saved
This option is a mask to define which characters will be saved. The identifier received (via a QR Code reading for example) may include up to 128 characters, but only a part of that value can be used. The maximum allowed length depends on the target fields as described earlier. This mask defines which of the characters received will be used. This option can also be used to remove unwanted characters, such as controls symbol in the beginning and end of a barcode.

D22 - Convert identifier text
A received identifier can be converted to all lowercase or all uppercase text before being saved with the results. This is useful to maintain the same letter case for identifiers received by barcode or entered by hand.

6.8.3.1 Identifier step validation

A received identifier can be validated by size or by checking a portion of its content to ensure that a read barcode, for example, is the one expected.

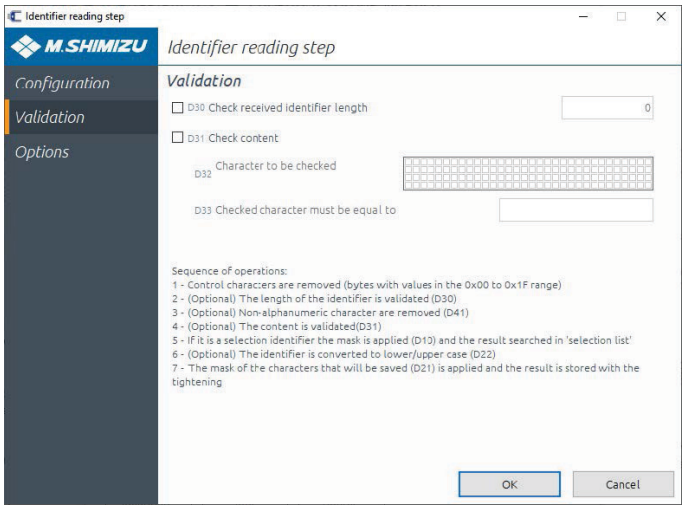


Figure 41 - Identifier Validation Options

D30 - Check received identifier length
This is a simple check that compares the length of the received identifier with the value provided. This check is done before any mask is applied but after removing control characters (characters with byte value from 0x00 to 0x1F hexadecimal) if any.

D31 - Check content
This option allows some character of the received identifier to be matched against a predetermined value. If the values are equal, the identifier is accepted.

Note that this check is case sensitive, and it is performed before conversion to lowercase/ uppercase takes place. If a case insensitive check is desired, there is an option to treat lowercase and uppercase as equal. This will be discussed in the next section.

6.8.3.2 Identifier step options

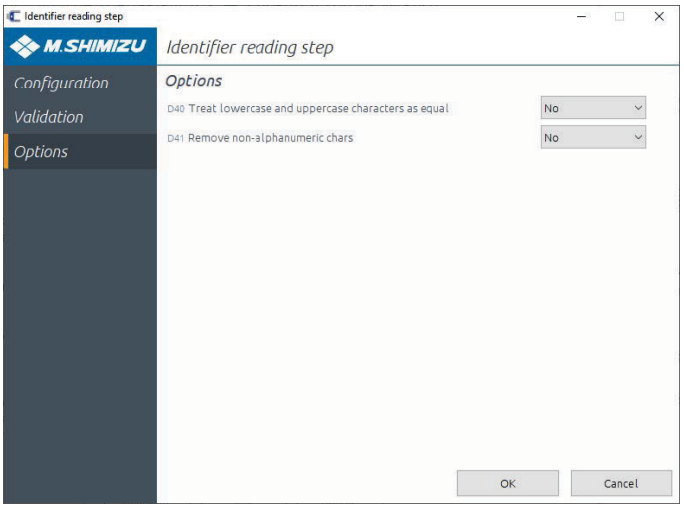


Figure 42 - Identifier Options

D40 Treat lowercase and uppercase characters as equal
When searching the selections list or validating the content of the received identifier, the character comparison is by default case sensitive (a character 'z', for example, is treated as being different than a uppercase 'Z'). If case insensitive is desired this option may be enabled.

D41 Remove non-alphanumeric chars
Removes characters other than letters (a-z, A-Z) and numbers (0-9) from the received identifier. This is done before validating the content. The next section discusses the order of operations and when each option is applied.

6.8.3.3 Identifier options processing order

Following lists the order in which each option is applied. Some features may influence others, so understanding this order is important to achieve the desired outcome.

1. **Control characters are removed:** Before any processing takes place, controls characters are removed from the received identifier. These control characters, if present, still occupy space in the 128 characters input limit.
2. **The length of the identifier is validated:** If option D30 is enabled, the length of the received identifier is checked.
3. **Non-alpha numeric chars are removed:** If option D41 is enabled, non-alpha numeric chars are removed. Note that all further processing will only see the new filtered identifier. If, after removing those characters, the identifier becomes empty it will be refused and an error message will be shown.
4. **The content is validated:** If enabled, Mask D32 is applied and the result is compared with the value set in the field D33. If they don't match, the identifier is refused. If option D40 is enabled, this comparison is case insensitive. This step does not change the content of the identifier.
5. **Selection identifier operation:** If the identifier is set as a selection identifier, the mask D10 is applied and the result searched in the Selection list. If option D40 is enabled, the comparison is case insensitive. If a match is found, the program/job will be selected when all other identifier steps are completed. This step does not change the content of the identifier.
6. **Case conversion:** If option D22 is set the identifier text is converted accordingly.
7. **Identifier is accepted:** The mask D21 is applied and the resulting value is accepted. If all other steps are completed successfully when a tightening is received, this identifier will be store in the result field selected in the option D20.

6.9 Jobs

A job is sequential program that is executed in a series of steps. After each step is performed a set number of times (assigned by the user), the wrench automatically proceeds to the next program in the tightening sequence.

6.9.1 Creating and Editing a Job

Click the job icon in the main screen to open the job list. Options are to create a new job, edit an existing job, duplicate a job, or delete a job.

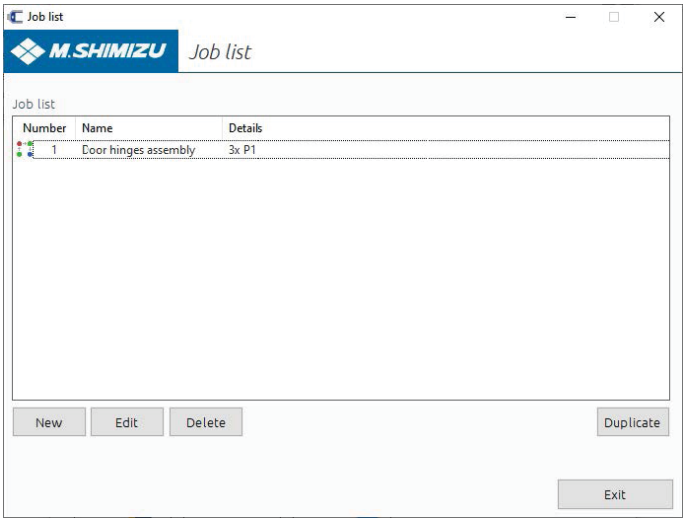


Figure 43 - Job List

Select a job and choose g Edit, or click New to open the job editing screen.

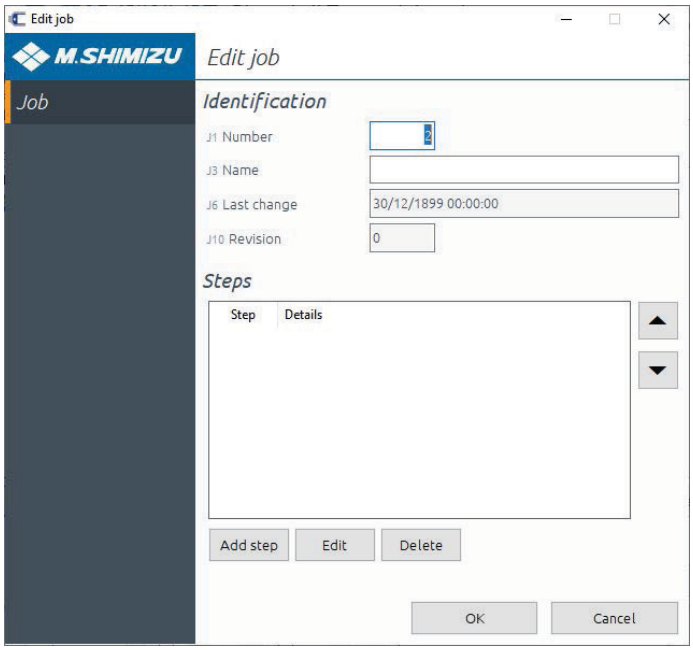


Figure 44 - Job Editing Screen

Number
Unique number to identify the job. This number is saved with the result and can be used to select the job remotely via a protocol interface.

Name
Free text value to help the user identify the job. This name is show in the wrench screen.

Last change
This field is automatically set by the program every time the job is changed.

Revision
This number is automatically incremented by the system every time the job is changed and helps keep track of job versions used in production.

Steps
This shows each step in the program and the number of times it must be performed. Only OK tightenings are counted. The steps are performed in the same order they appear in the list.

6.10 Routes

The route functionality is used in quality control to perform a series of tests in a structured manner. Routes are comprised of tasks, which house the programs to be performed along with configurations such as how many times a program should be executed. The route program is separated from the wrench programs so both can co-exist in the same wrench. Deleting a route has no effect on the wrench programs, and modifying the wrench programs has no effect on the route.

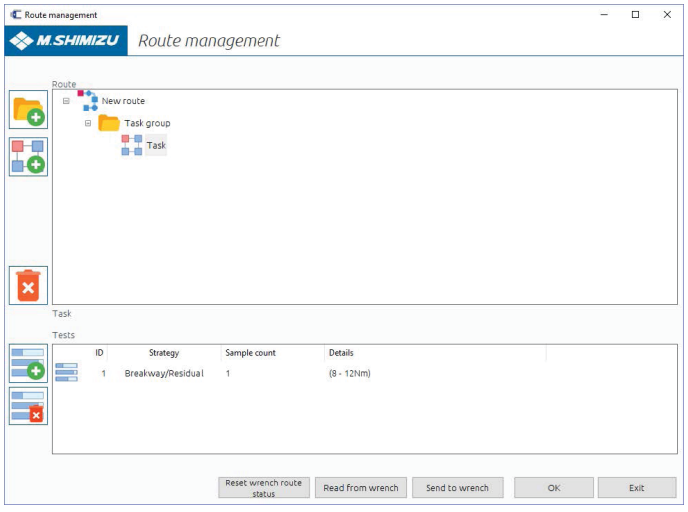


Figure 45 - Route Management Screen

For easy navigation in the wrench, the route structure is organized as a tree hierarchy just like files and folders are organized on a computer. The three main items of the route are Group, Task, and Test.

6.10.1 Groups

Groups act like a folder on a computer and can contain tasks or more groups.

6.10.2 Task

The task is the main item in the route. Each task is basically a program that can be repeated a number of times (set in Task).

Each task can hold up to 8 tests that can be performed a number of times (set in *Test*).

In the most commonly used application, a task holds just one test to be executed a number of times and the task itself is performed a number of times.

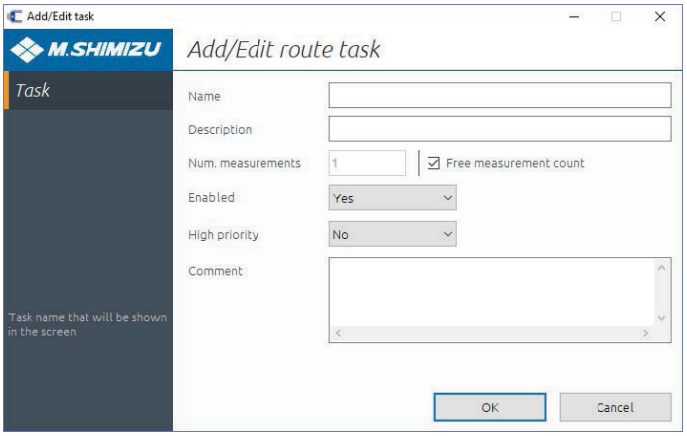


Figure 46 - Route Task

Name: The task name is visible in the wrench and is used to identify the task.

Description: Brief text containing any additional information.

Num. measurements: How many times the tests inside the task should be performed. This is not the bolt count — it's the number of times the entire task will be executed. The number of times each each test will be performed is set separately (see "6.10.3 Test" on page 28). When this count is reached, the task is completed and cannot be performed again until the results are downloaded and the wrench route reset.

Enabled: Tasks can be disabled to help remove a task from the route without the need to delete it.

High priority: When high priority is enabled, the wrench will show an icon with the task name to inform the user that this task is more critical than the others.

Comment: Free user text.

6.10.3 Test

A test is a program that is added to a Task as a step to be performed. Usually a task holds only one test, but up to 8 tests can be added to each task. Each test can be performed a set number of times (*Num measurements*).

The total tightenings that must be performed to complete a task is the Task number of measurement times the sum of the number of measurements of each test it holds.

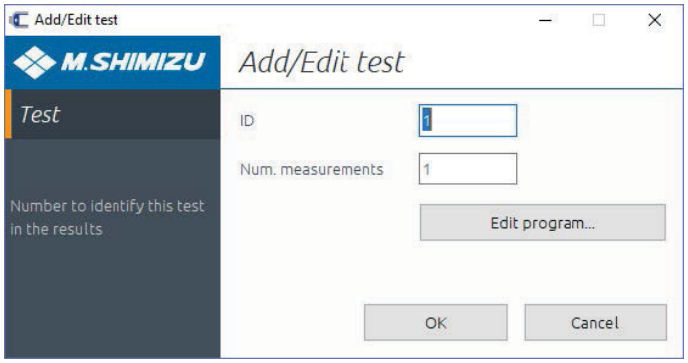


Figure 47 - Route Test

ID: The ID is a unique number used to identify the test in the result list and is saved with the results. This number is automatically assigned but can be changed by the user.

Num. measurements: Number of bolts/points that need to be measured.

Edit program: Edit the program used in this test. The programs are created in the very same way as the wrench programs "6.4 Programs" on page 17.

The task/test concept can be illustrated with the following example:

> To set up the measurement of a door hinge fastening that has 2 bolts, a task named Door Hinges is created. Inside the task, a test with the appropriate strategy is added. Because 2 bolts will be measured in each piece the *Num. measurements* in the test is set to 2. If the user desires to collect the sample of 10 door hinges then task *Num. measurements* is set to 10.

6.10.4 Route Operation in the Wrench

Select the *Route* option in the main wrench screen to show the folders and tasks previously configured.

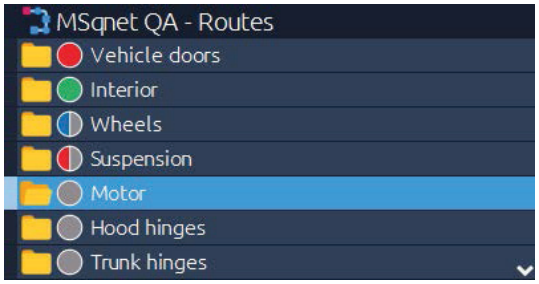


Figure 48 - Wrench Route Screen

Each folder has a circle icon that changes color depending on the status of the tasks inside it.

	Grey circle: No tasks inside the folder have been performed yet.
	Half blue: Some tasks inside the folder have been performed or are being performed. The tasks performed finished with OK status.
	Full green: All tasks inside the folder have been performed the preset number of times and all of them finished with OK status.
	Full red: All tasks inside the folder have been performed the preset number of times and at least one of them finished with NOK status.
	Half red: Some tasks inside the folder have been performed or have started to be performed and at least one of them finished NOK.

Select one of the folders to review the tasks inside

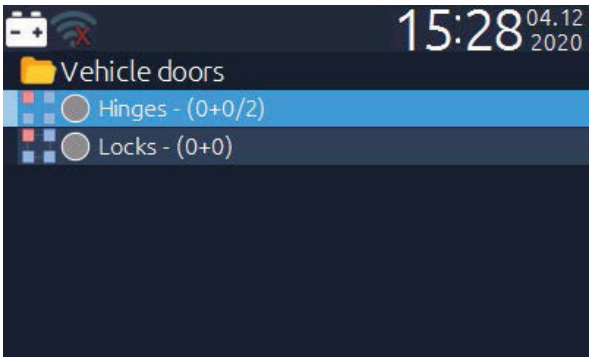


Figure 49 - Route Tasks Wrench Screen

Like the folders a circle icon shows the status of each task.

	Grey circle: Task not performed yet.
	Half blue: Some tests of the task have been performed but there are items still pending.
	Full green: All tests of the task have been performed the set number of times and all finished with OK status.
	Full red: All tests of the task have been performed the set number of times and at least one of them finished with a NOK status.
	Half red: Some tests of the task have been performed but there are items still pending. At least one item has a NOK status.

To the right of the Task name, a set of numbers shows information about the number of times the task has been executed as follows:

[Number of OK cycles] + [Number of NOK cycle] / [Number of times the task must be performed]

If the last part is not present (as in the second item of the Figure 49) the task was configured to allow it to be performed any number of times.

As the following screen shows, this same information is presented when accessing the task.

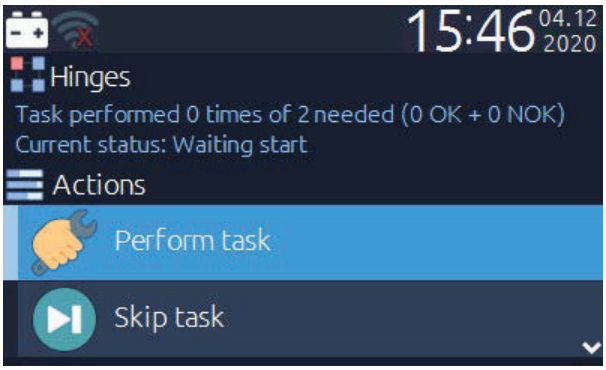


Figure 50 - Task Wrench Screen

The first line shows the number of times the task has been perform and, if set, the number of times it must be performed.

The Current status shows the status of the task as follows:

Waiting start: The tasks have not been started yet.

Incomplete: Some tests have been performed but some items are still pending.

Incomplete (1 or more NOK): Some tests have been performed but some items are still pending. At least one NOK result was received.

Finished OK: All tests have been performed and finished with OK result.

Finished NOK: All tests have been performed and at least one NOK result was received.

This wrench Task screen has four available options:

Perform task: Start executing or resume executing the tests inside this task.

Skip task/Skip remaining tests: Skip the full task or skip pending tests (depending if the task has been started or not). A prompt will ask if the skip should be considered OK or NOK and the proper counter will be incremented.

Results: Shows the tightening results performed in this task.

Test list: Shows the tests associated with this task and how many times they must be performed.

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