

IQWrench2 *Opta*

Digital Torque Wrench

Operator's Manual

Manual 1181: Issue 2a

Crane Electronics Ltd



ATTENTION - BATTERY CHARGING

- The IQWrench2 Opta is powered by a Lithium Polymer battery. This battery must be charged by placing the wrench into its cradle.

PLACING TOOL IN SERVICE

- Always operate, inspect and maintain this unit in accordance with all regulations (local, state, federal and country) that may apply.
- Do not remove any labels.

USING THE TOOL

- Always use Personal Protective Equipment appropriate to the tool used and material worked.
- Keep body stance balanced and firm. Do not overreach when operating this tool. Anticipate and be alert for sudden changes in motion, reaction torque, or forces during the operation.
- Ensure work pieces are secure. Use clamps or vices to hold work piece whenever possible.
- Never use a damaged or malfunctioning tool or accessory.
- Maintain unit with care. Keep unit clean for better and safer performance. Follow instructions for changing accessories.
- Do not operate this product in explosive atmospheres, such as in the presence of flammable liquids, gases or dust.
- Do not modify this product for purposes other than those recommended.

NOTICE

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CE MARKING

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Declares that this product has been assessed and complies with the requirements of the relevant CE Directives



Caution: Changes or modifications to the IQWrench2 Opta not expressly approved by Crane Electronics Ltd could void the user's authority to operate the equipment.

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HOW TO USE THIS MANUAL

This manual is split into sections describing the steps to be taken to configure the IQWrench2 Opta for use in measuring and recording torque values.


Section 1 is an introduction to the IQWrench2 Opta.

Section 2 describes the controls and features.

Section 3 describes how to configure and use the IQWrench2 Opta .

Section 4 gives additional information on certain features.

The following conventions are adopted throughout this manual:

Keys to be pressed will be shown as the key legend - *for example*  Enter
Information displayed on the LCD screen will be shown in italics contained within quotation marks i.e. *'Select Fault'* or displayed as an actual screenshot.

PACKING LIST

The following items are supplied with the Basic and Production IQWrench2 Opta units.

1x IQWrench2 Opta Digital Torque Wrench

1x Charging Cradle unit

1x PSU

1x Mains cable

1x Opta Comms software (+ USB driver)

Additional items supplied with Advanced IQWrench2 Opta

1x Programming Cradle (instead of a Charging Cradle)

1x USB cable

CARE & STORAGE

This unit is designed for indoor use only

Operating temperature range 5-40 degrees C

Storage temperature range 0-50 degrees C

The membrane keypad may be wiped clean with a soft damp cloth.

THIS UNIT CONTAINS NO USER SERVICEABLE PARTS. ONLY QUALIFIED SERVICE PERSONNEL SHOULD REPLACE OR FIT PARTS.

OVERVIEW

IQWrench2 Opta combines all the features of a high specification digital torque and angle wrench with a data collection system in one ergonomic package.

The IQWrench2 Opta is a powerful, smart torque tool which is essential in both the Quality Audit and Assembly environments. This rugged, but light tool can be used on a stand alone basis or as part of a sophisticated production control system.

Depending on customer needs, the IQWrench2 Opta can be configured as either a basic tool or an advanced data collection system. Flexibility is enhanced as the software in the IQWrench2 Opta can be upgraded almost as soon as a change is required.

The IQWrench2 Opta features the following four measurement modes, Track, Peak, Audit and Yield. All of the above modes, other than Track, when the options are enabled, have the facility to set specification and control limits. This enables the wrench to give the user information as to the status of the torque cycle. This information is displayed in 4 ways:

- On screen

- As multi colour LEDs (on the top and underside of the wrench)

- As a buzzer

- As a vibrating handle

These indicate a HI, LO or OK fastener status and are known as the “**Fastener Status Indicators**”.

Track

This is the display of real time torque and it is typically used when calibrating the IQWrench2.

Peak

In this mode the wrench can be used to audit the residual values of a pre-tightened fixing or used as a tightening tool for low volume tightening applications. The wrench can be set-up and used in 4 different ways:

Peak only

In this mode the wrench displays torque and the fastener status indicators are activated when the control and specification parameters are reached.

Peak with Torque control

In this mode the wrench displays torque and angle, however, the fastener status indicators are still activated on the **Torque** control and specification parameters being reached. The wrench also uses a second parameter which is angle; this angle information is used to monitor an angle window, giving greater security to the tightened fixing.

Peak with Angle Control

In this mode the wrench displays torque and angle, and now uses the second parameter of angle as the controlling parameter. The fastener status indicators are now activated when the **Angle** control and specification parameters are reached. The wrench is now operating as a production tool that is tightening to a “pre” torque and final angle window.

Yield

In this mode, the wrench uses **Torque** and **Angle** to detect when the joint being tightened is going to yield. The torque and angle values at this point are displayed and stored. The yield point is where the torque vs angle curve gradient reduces to half its maximum value.

Audit

In this mode the wrench is purely used for auditing a pre-tightened fixing. This is a special software algorithm that senses the break away point of the tightened fixing and displays the torque value after a defined number of degrees is reached. In this mode the wrench displays torque and the fastener status indicators show if the correct angle has been pulled. The wrench will also display the final peak torque - achieved once the cycle is complete.

The IQWrench2 Opta is designed to be point of load insensitive, which means that the operator can be assured of correct measurement, however the wrench is held and torque is applied - particularly useful in limited access situations.

The IQWrench2 Opta can read the ID of special adaptors. It can use the ID and check its value in a table loaded into the wrench to compensate for different length adaptors. The wrench software can force a specific adaptor ID to be used for a specific job, and to choose a specific job that uses that specific adaptor.

The IQWrench2 Opta is supplied with DIN standard interchangeable head fittings, giving a wide range of head attachments to meet the assembly requirements, or a fixed square head – dependent on torque range. There is an adaptor that will convert the DIN heads to Dovetail (Sturtevant Richmond) which allows dovetail attachments to be used.

When used in Jobs mode, the IQWrench2 Opta has the ability to store a large amount of date and time stamped readings for each of the fasteners audited. This data can be uploaded and stored on the PC with the use of the Opta Comms or OMS platform.

Data from the IQWrench2 Opta can be uploaded to a PC using a USB cable. The IQWrench2 Opta has to be on a programming cradle to communicate to a PC via a cable.

BATTERIES

IQWrench2 Opta uses a 3.7V Li Polymer battery (battery life - 14 hours of typical use). It is recommended that the battery is replaced after 2 years of normal (single shift) use, or 1 year of heavy (double shift) use during calibration / service.

Battery Disposal

To be disposed of in an environmentally sound manner and in accordance with local legislation.

Do not incinerate.

Do not disassemble.

Do not short the terminals or expose to high temperatures.

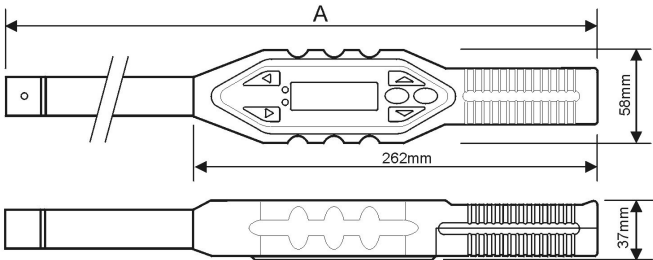
Where the customer has issues disposing of batteries - please return to Crane Electronics.

It is an offence to throw portable batteries out with domestic refuse.



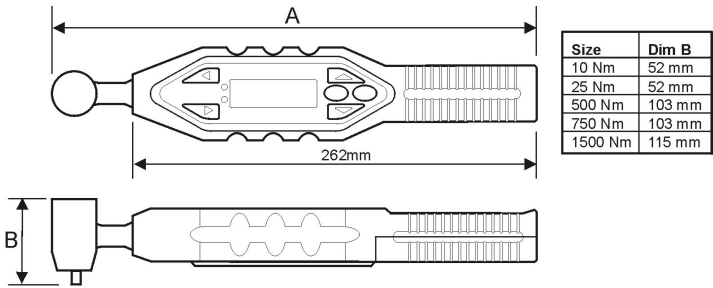
DIMENSIONS

Wrench Dimensions - DIN Version (25 to 340 Nm)

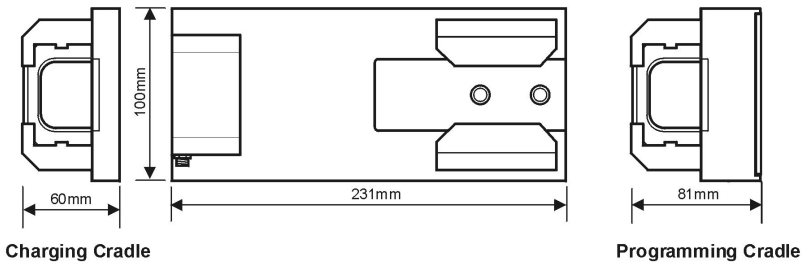


Wrench Size	Dim A	Weight
10 Nm & 25 Nm Fixed Head	313 mm	890 gms
10 Nm & 25 Nm	368 mm	960 gms
75 Nm	382 mm	1030 gms
180 Nm	600 mm	1546 gms
340 Nm	775 mm	2012 gms
500 Nm Fixed Head	1025 mm	4700 gms
600 Nm	1117 mm	3550 gms
750 Nm Fixed Head	1165 mm	5600 gms
1500 Nm Fixed Head	1908 mm	10900 gms

Wrench Dimensions - Square Head Version (10 to 1500 Nm)



Cradle Dimensions



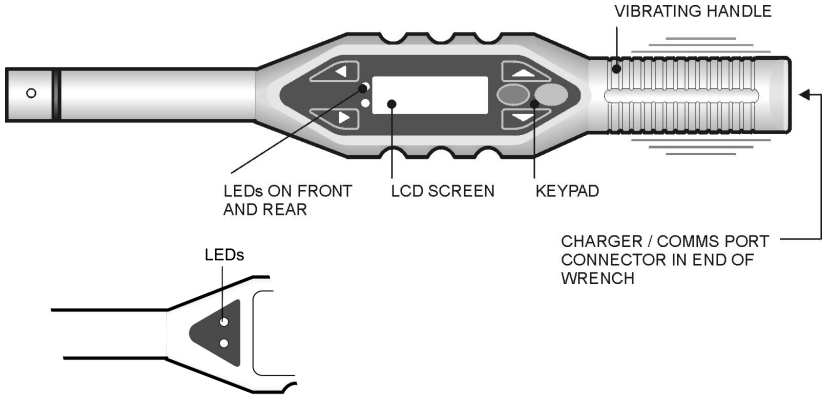
SPECIFICATIONS

Power:	One Li Polymer 3.7V battery - 2000 mAh capacity
Accuracy:	± 0.5% of rated maximum wrench capacity.
Overload Capacity:	125% of stated maximum wrench capacity.
Zero Drift:	<0.1% of rated maximum wrench capacity.
Operating Temperature Range:	+5 to +40 degrees Celsius
Temperature Stability:	± 0.1% per degree Celsius.
Sealing:	IP40.
Humidity:	5% to 75% non condensing.
Calibration:	Issued with calibration certificate traceable to national and international standards. 12 months typical recalibration interval.
Warranty:	12 months parts and labour.
Servicing:	Crane Electronics Ltd offer a repair facility and calibration to UKAS and international standards. Crane Electronics Inc. operates a calibration laboratory with a Certificate of Accreditation to ISO/IEC 17025, and a certificate of compliance to ISO 9001. Reference standards are traceable to N.I.S.T. standards.

ACCESSORIES

ITEM	PART No.
RS232 Cable	090184
USB cable	090260
Programming Cradle	IQW2S-0000-CRCPUX
Charging Cradle	IQW2S-0000-CRCCXX
PSU for cradle	080154
Adapter heads with ID	Contact Crane

CONTROLS



Rear of Wrench

REMOVING AND ATTACHING THE DRIVE ADAPTORS

DIN Standard Head

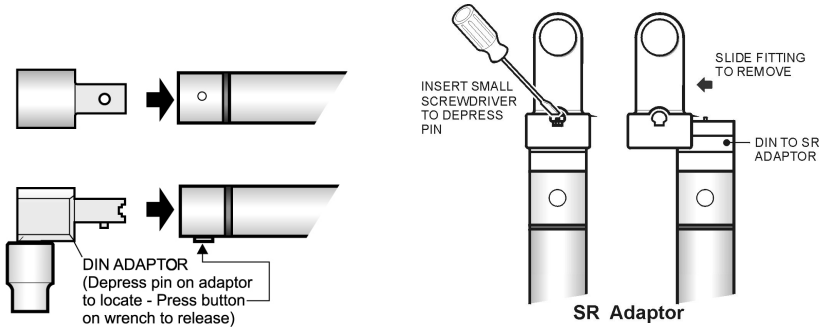
The DIN adaptors simply push into the rectangular slot at the end of the head as shown. Press the locking pin to allow the adaptor to click into position.

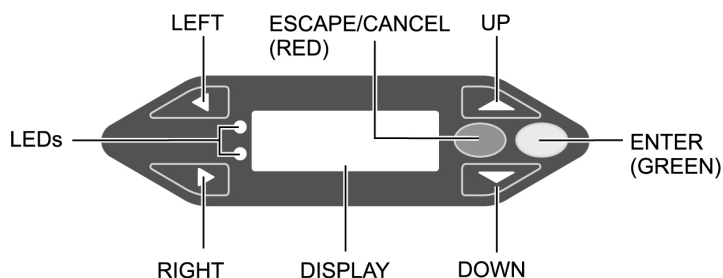
Press the release button on the underside of the wrench shaft and pull the adaptor to remove.

SR (Sturtevant Richmond) Head (attached to DIN to SR adaptor)

To remove a SR head, insert a small screwdriver into the access hole as shown, depress the small locking pin and slide the adaptor to the side - see below.

To attach a drive adaptor, depress the locking pin and slide the adaptor into place until it locates with a click.



CONTROL PANEL**ENTER KEY (green)**

Used for confirming a selection or accepting an option etc. Similar to the Return key on a computer.

**ESCAPE KEY (red)**

Used for cancelling an option.

**UP/DOWN ARROW KEYS**

Used to toggle between screens and options (small arrows on right of screen show direction(s) available).

**LEFT RIGHT ARROW KEYS**

Used to select different fields or options.


All the functionality of the wrench is accessed through a simple menu structure with the aid of the 4 arrow keys, the ENTER Key (Green) and the ESCAPE Key (Red).


A short single press is sufficient to operate the keys.


A click will be felt when the keys are operated.



keys are used to navigate through the menus on the same level.

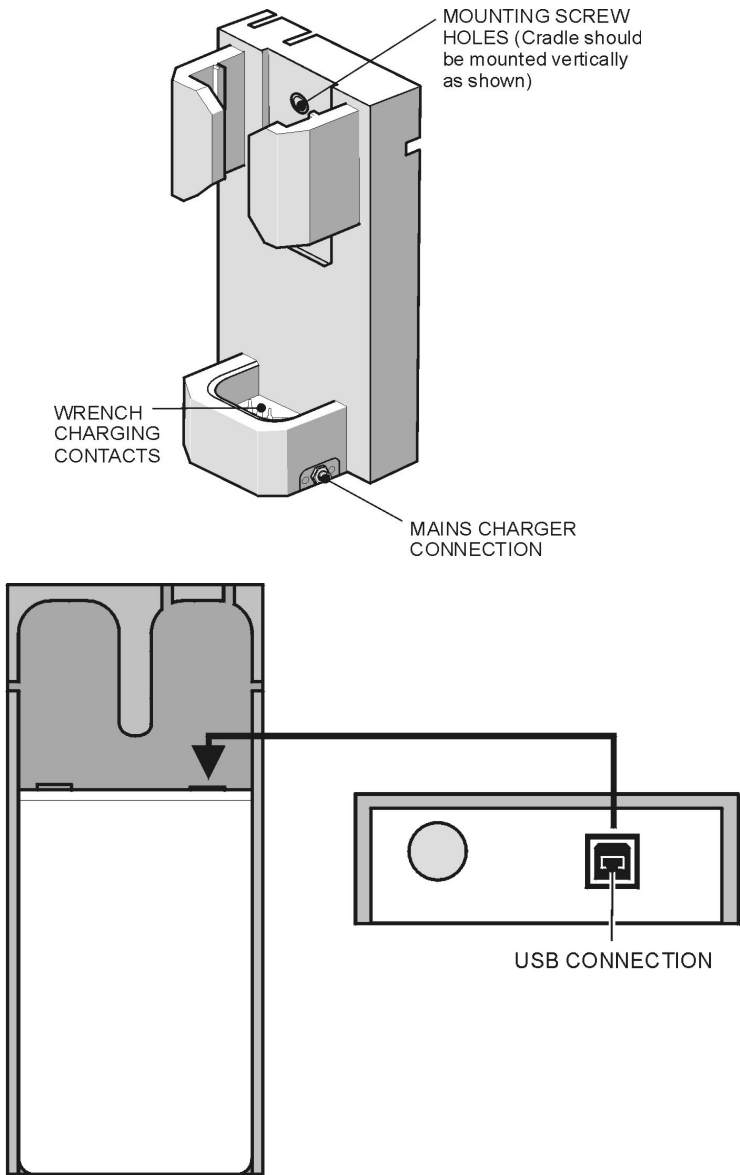
Pressing  ENTER on a displayed menu function will take you into the relevant menus for that function.

Pressing  ESCAPE will take you up a level back towards the main menu (except when in the 'ABOUT' screen).

If you keep pressing the  keys you will go through all the menus on that level and will return to where you started. When you choose a menu item, the IQWrench2 Opta will remember which sub-menu item you chose last time.

CHARGING/PROGRAMMING CRADLE

Cradle Connections (example shown is a programming cradle)

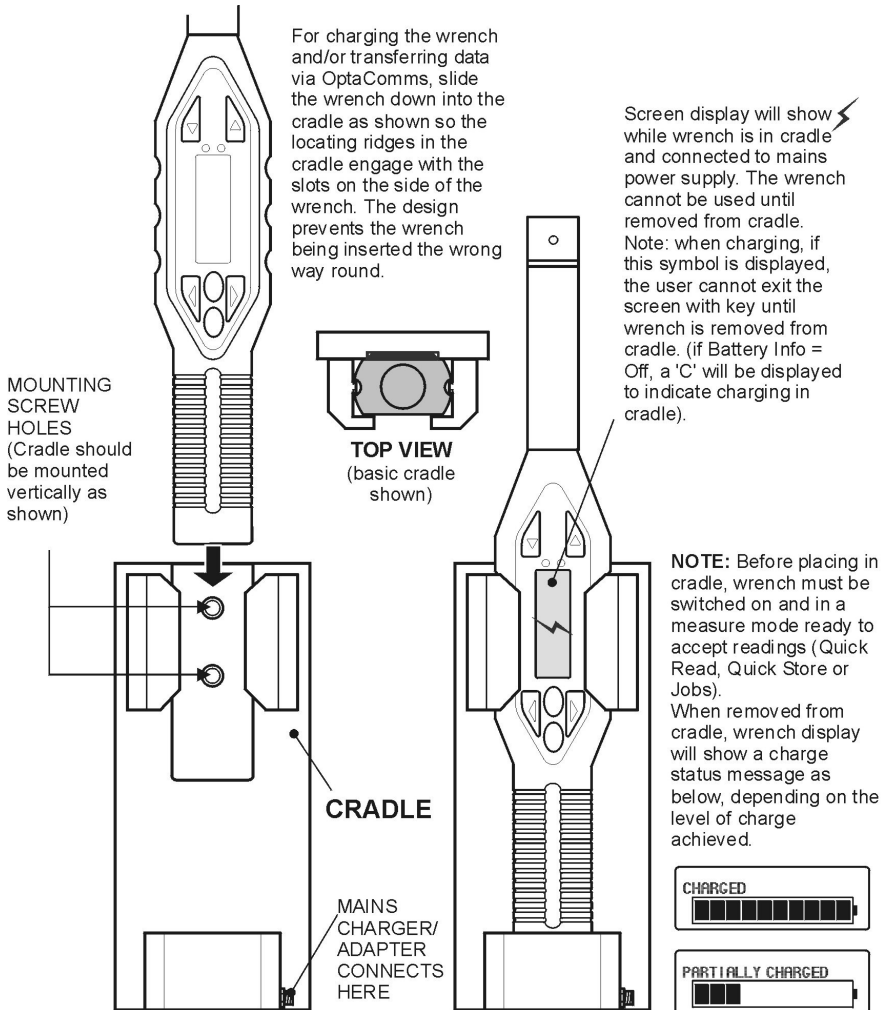


CHARGING THE WRENCH

Charging

The following information assumes battery info is set to 'ON' in Setup

NOTE: Before placing in the cradle, wrench must be switched on and in a measure mode ready to accept readings .



Replacing Battery

It is recommended that the battery is replaced after 500 uses/1 year of heavy use, or after 2 years of light use during service / calibration.

POWERING ON

To switch on the IQWrench2 Opta, press any arrow key.

If the wrench is switched on after it has powered down, it will return to the menu/screen it was in before power was removed, or to the User Menu if power was lost in a Jobs/Rounds menu. You will see 'Initialising...' and 'Wait...' messages as the unit powers up.



HARDWARE RESET

To perform a hardware reset, press the ► (RIGHT) and ▲ (UP) keys together.

Note: Performing a Hardware Reset resets the IQWrench2 Opta but does not erase any settings or Job information. See Power in Section 4 for more information.

AUTO POWER OFF FUNCTION

As an energy saving feature, the IQWrench2 Opta is programmed to power down automatically if it has received no user input for a predefined period (10 mins is the default setting, but can be set to 1 minute as a minimum, through to constant power on). Pressing any key will restore the unit to the last display prior to powering off. This is to avoid the possibility of loss of data due to an interruption to the operator's activities while using the IQWrench2 Opta.

To Switch off without waiting for the Auto Power Off, go into Main Menu, scroll down to the Power Off Icon (showing the  symbol) and press  ENTER.

ATTACHING A PC

Data from the IQWrench2 Opta can be downloaded to a PC by placing the wrench in its programming cradle and connecting the cradle to the PC using the USB or RS232 cable (see page 12).

BASIC OPERATING PRINCIPLES

MAIN MENU

This menu allows the user to choose between the following items:

Quick Read - Enter the Quick Read mode

Quick Store - Enter the Quick Store mode

Jobs (advanced model only) - Needs jobs loaded from Opta Comms

Rounds (advanced model only) - Needs Rounds loaded from Opta Comms

Comms (advanced model only) - Communications via cradle


Remote Setup (advanced model only) - Through wireless or serial port

Setup - Enter the Setup menu (see below)

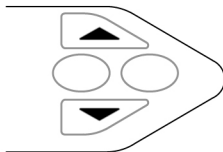
Logout (advanced model only) - Logout manually as user (see Jobs)

Power Off - Switch off manually

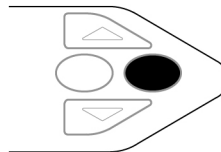
Zero Gyro - Wrench sets zero angular velocity

The screen shows only one menu item at a time. To navigate the menu, use the cursor keys to scroll, and then press  ENTER to select as shown below:

1



2



SET UP MENU

This menu allows the setup of following parameters:

Date & Time - Setup the date & time and their formats.

Regional Settings - Change the language and the decimal point.

Power Settings - View battery status, change the power setting parameters and switch off.

Buzzer- Set the audible buzzer, vibrator and targetting functions.

LED Setup- Set what LEDs do at beginning, during and at end of measurement cycle.

Printer Setup - Set the column width, specialist Jobs functions and Autoprint enhance.

Auto Print Setup - Lets you change format of what values are printed.

Display Setup - Sets the full Job Name to be displayed or not, adaptor ID warnings & functionality, and flash LEDs on errors.

Sequence Setup - set Comment, Barcode, Preload and Gyro, speed.

Trace - Set the trace duration, storage of multiple trace and real-time trace to PC.

Comms Setup (Wireless feature enabled) - Select between cable, bluetooth and RF for external communications, Protocol Setup and RF Comms.

Restore App. Data - Perform a software reset . This should normally be used after hardware reset. **Note:** Allows restore of Jobs / Rounds / Users / ID Table.

Flash Program - Flash download to update software

About - Displays the product name,software version number, span, serial number and calibration due date

Features - Displays the list of enabled features and gives the operator the option to enter an upgrade activation code if purchased from Crane.

Verification and Adjustment - Verification and Adjustment of calibration (password required from Crane Electronics). User can set up own calibration date.

Display Contrast - Alters the colour contrast of the screen LCD (default = 128)

User Type - Set Limited/Normal user access (use with specialist job function).

Trigger - Enable/disable trigger (only in Quick Read).

Bolt Overtighten - RFU.

Retry Function - Set number of attempts to get OK reading in Jobs.

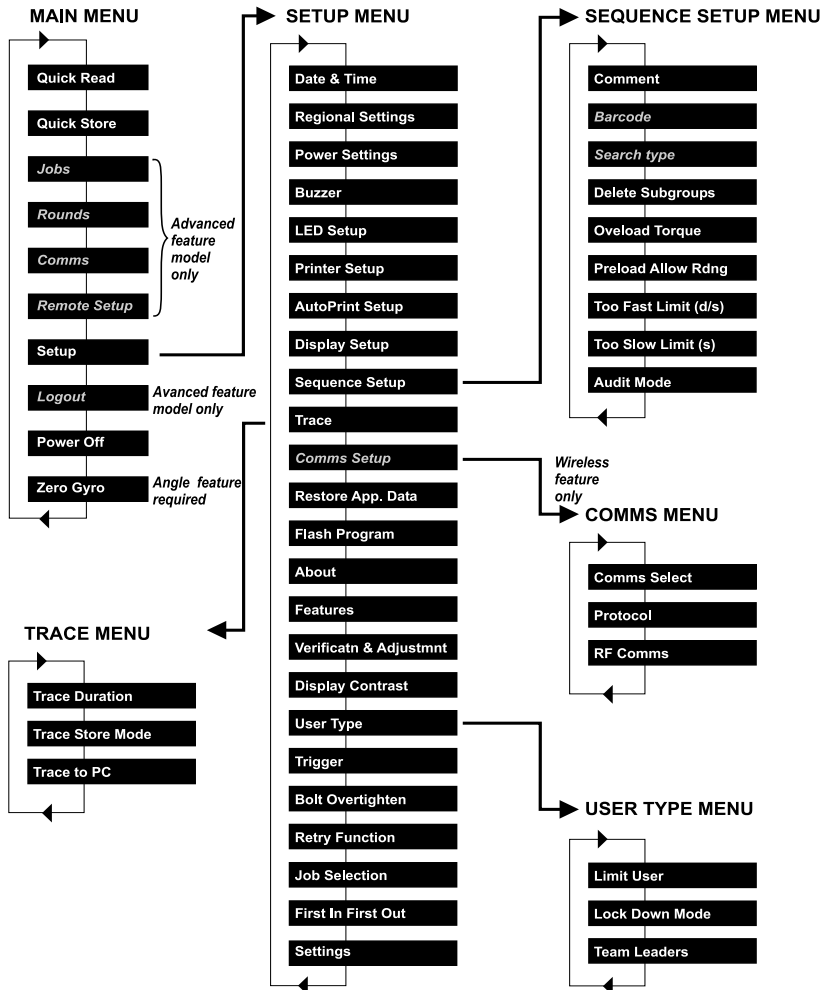
Job Selection - Allows adaptor ID to select job and how long loaded job is valid.

First In - First Out - No limit on number of readings taken. Remembers last N readings.

Settings - Allow wrench settings to be read and written.

BASIC MENU STRUCTURE

The diagram below shows the basic menu structure of the IQWrench2 Opta.









Use the  keys until the required screen is displayed and press  ENTER.

Note: There is a short beep when wrapping round from end of menu to beginning or vice versa.

Note: items shown in *italics* will be greyed out and inaccessible if those features have not been enabled - contact Crane for more details.

GETTING STARTED - USING FOR THE FIRST TIME**Setting the Time and Date**

The Time and Date is set in Main Setup Menu / Time and Date. Use the  keys to scroll to the Time screen and press  Enter. Use the  keys to change the hour digits above the cursor and the   keys to advance along to the minutes and then the seconds. When the time is correct, press  Enter.


Press ESCAPE  to return to the main Setup Menu.


The Real time clock and memory have their own battery backup supply so will not lose data if the main battery is removed.

Repeat the process for the Date screen changing the digits in the same way until the correct date is showing.

Changing the Date or Time Format

The format of how Date and Time is to be displayed can be selected.



From the Date and Time Menu, Select Date Format or Time Format and use the  keys to select the required format and press Enter.


Press ESCAPE  to return to the main Setup Menu.

Changing the Language

IQWrench2 Opta can display one of several different languages.

These are found in the Main Menu / Main Setup Menu / Regional Settings / Language.

Use the  keys to select between: English, Deutsch, Francais, Espanol, Italiano, Swedish, Czech, (Flemish), (Portugues) or Turkce and press  Enter to select.


Press ESCAPE  to return to the main Setup Menu.

The language can also be changed temporarily during Start up using the 'Language at Start' setting.






Changing the Decimal Point style


There is also an option to change the decimal point in displayed numbers from a '.' (period) to a ',' (comma), to suit local conventions.

This is found in the Main Menu / Setup Menu / Regional Settings / Decimal Point.

Press ESCAPE  to return to the main Setup Menu.


Turning the audible signal (Buzzer) On, Off or Targeting

From the Main Setup Menu, use the  keys to scroll to Buzzer menu and press  ENTER. Press  and use the  keys to select the required setting (On, Off or Targeting), and press  to accept.

Press ESCAPE  to return to the main Setup Menu.

See Section 4 - Buzzer for more information.

GETTING STARTED - TAKING A READING

From the main menu, select the required measure mode. The screen shows just one item from the menu. Use the Up and Down arrow keys to navigate between screens and press  ENTER to access the required mode. Shown below are the screens for the 2 measure modes - Quick Read and Quick Store.



Note: Any Items shown greyed out on any of the menus are unavailable at present and cannot be selected. This is either due to certain features not being activated for this particular user, or the user has not logged in.

QUICK READ MODE


Quick Read Menu

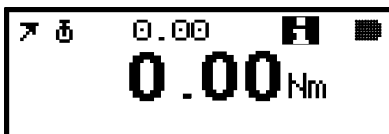
The following options are available in Quick Read Mode:

Track

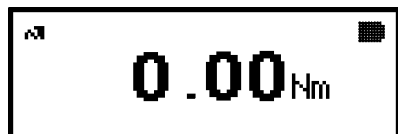
Peak

Audit Control (greyed out if wrench does not have angle capability)

Use the keys to scroll between Peak, Track or Audit measurement modes and press  ENTER. **Note:** Track mode shows a continuous real-time torque read-out, Peak shows only the peak torque achieved and Audit shows the torque value after a defined angle of rotation.



QUICK READ SCREEN - PEAK



QUICK READ SCREEN - TRACK

With a suitable drive adaptor and socket in place, connect to the required fastener and apply torque. Check the read-out in the display.

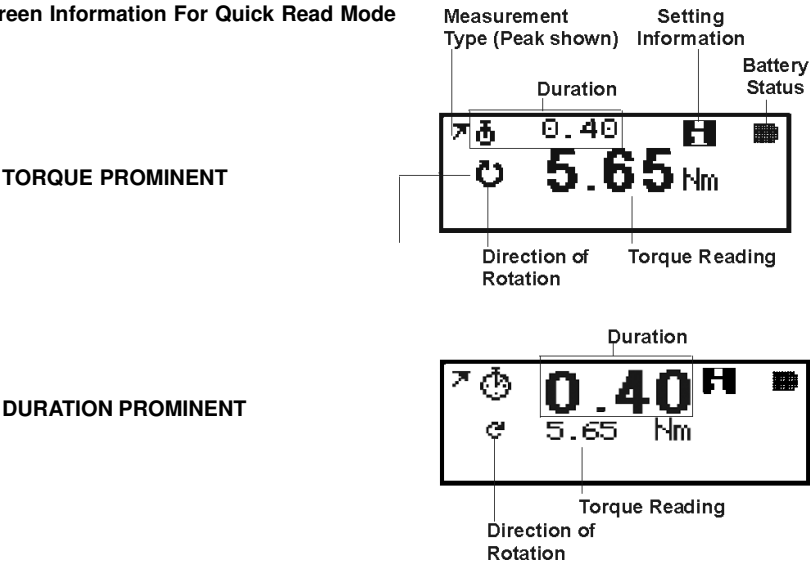
To change the following parameters:


- Memory Used %
- Units of Torque Measurement
- Direction of Rotation
- Cycle End Time
- Torque Threshold
- 2nd Parameter (angle or none)
- Angle Torque Threshold (only if Angle set as 2nd param.)
- Auto Print
- Inhibit Trace To store Trace Inhibit = No
To not store Trace Inhibit = Yes
- Adaptor Length (for ID fitted if ID table loaded or a manual editable length)

Use the ◀ ▶ keys to highlight the  Setup Icon and press  ENTER to access the Quick Read Setup Menu. See page 28.

To View the selected options, select the  icon and hold down  ENTER. For more details, see Quick Read Setup menu info on page 28.

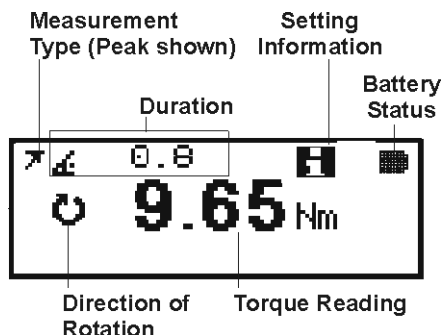
Screen Information For Quick Read Mode



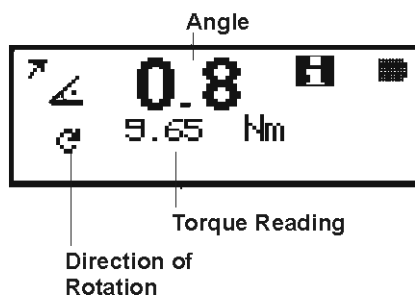
The above pictures show the alternative screen display formats - press the  key to toggle between screens.

Screen Information when Angle set for 2nd parameter

TORQUE PROMINENT



ANGLE PROMINENT



The LCD is backlit to aid viewing in poor light conditions. The backlight can be set to turn off after a certain time to conserve power (see power settings - Page 33). When the backlight turns off, it will come back on by pressing any key. The keys can be now be used for their normal functionality again.

Note: the duration time may continue for a short time after the reading is taken. It will stop and correct itself when the Cycle End Time has been reached. The Cycle End Time can be altered in Setup - see glossary for definition.

QUICK STORE MODE

Quick Store Menu

The following options are available in Quick Store Mode:

Peak



Audit Control (greyed out if wrench does not have Angle capability)

Yield Control (greyed out if wrench does not have Angle or Advanced Features capability)

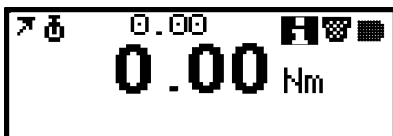
View All

Print All

Clear All

Use the  keys to scroll between Peak, Audit Control or Yield Control measurement modes and press  ENTER.




Typical Quick Store Screen (Peak Mode shown - Angle not set)



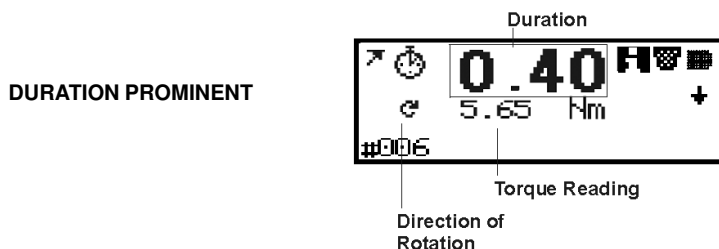
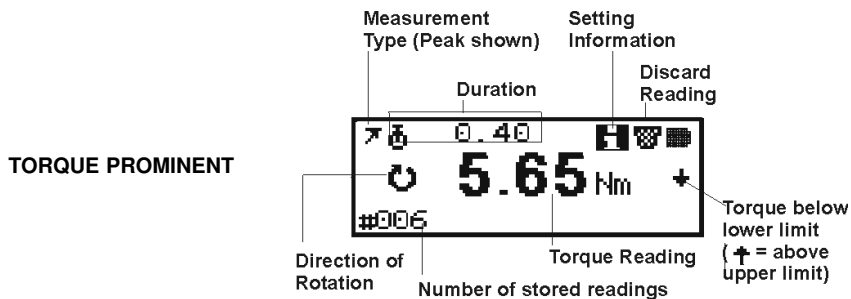
With a suitable drive adaptor and socket in place, connect to the required fastener and apply torque. Check the reading in the display.

Subsequent readings are taken in the same way.

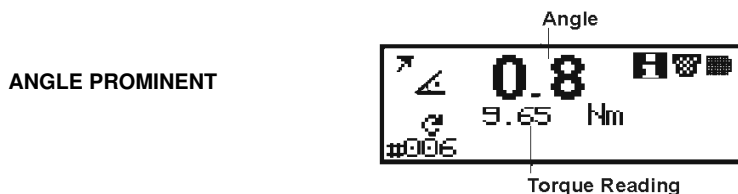
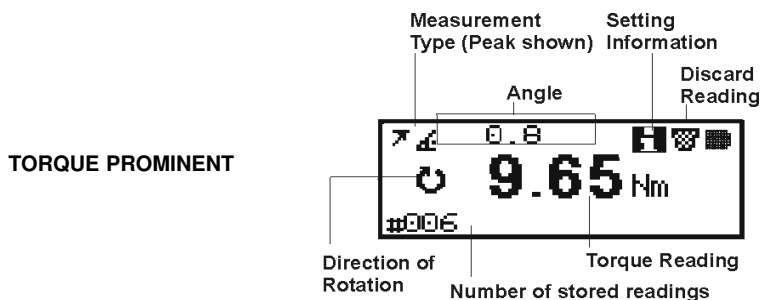
The wrench can store up to 200 readings in this mode. The screen shows the current reading, the direction of rotation, the time taken and the number of stored readings taken (this is shown following the # sign in the bottom left corner of the display).


Note: Pressing the  key will enable the user to toggle through the different screens (see following page). Pressing the  arrow will display the various statistics for the current reading. These are; \bar{X} , Cp, Cm, σ , Cpk and Cmk. Press  to return to previous screen.

Screen Information for the Quick Store Mode



Screen Information when Angle set for 2nd parameter



The above pictures show the alternative screen display formats - press the  key to toggle between screens.

The LEDs will light to show the status of the reading:

SPECIFICATION LIMITS ONLY

AMBER - Measurement below preset minimum torque setting. An arrow pointing down will appear on the screen to confirm - IQWrench2 Opta will give a single beep.

GREEN - Measurement OK (within specified torque range) - IQWrench2 Opta will give 2 beeps.

RED - Measurement above preset maximum setting. An arrow pointing up will appear in the display - IQWrench2 Opta will give 3 beeps.

	DISPLAY	LED	SOUND	PRINTED STATUS
USL	↑	RED	3 BEEPS	HI
		GREEN	2 BEEPS	OK
LSL	↓	AMBER	1 BEEP	LO

When setting USL and LSL, the user should input sensible values to avoid getting an error message.

SPECIFICATION AND CONTROL LIMITS

AMBER - Measurement between LSL LCL or between UCL and USL. 1 arrow pointing up or down will appear on the screen to confirm - IQWrench2 Opta will give 1 beep.

GREEN - Measurement OK (within specified torque range) - IQWrench2 Opta will give 2 beeps.

RED - Measurement below LSL or above USL. 2 arrows pointing up or down will appear on the screen to confirm - IQWrench2 Opta will give 3 beeps

	DISPLAY	LED	SOUND	PRINTED STATUS
USL	↑↑	RED	3 BEEPS	HS
	↑	AMBER	1 BEEP	HC
UCL		GREEN	2 BEEPS	OK
LCL		AMBER	1 BEEP	LC
LSL	↓↓	RED	3 BEEPS	LS

NOTE: If the Auto Fault Prompt has been set to yes in the Quick Store Setup menu, the following prompt will appear on the screen: 'Select fault'

Options are:

No Fault	
Stripped Thread	
Double Hit	
Blind Hole	
Crossed Thread	
Other Cause	
Operator Error	

Select an option. This option enables user to mark a particular reading to be ignored for the purpose of analysis.

The actions to be taken are:

Do Quality Check	
Replace Bolt	
Report	
Investigate	
Other Action	

Torque Status Bar

The torque status bar can be displayed on the Quick Store screen by selecting ON from the Quick Store Setup Menu - see page 29.

The first (left) Vertical line represents the Lower Specification Limit (LSL)

The second vertical line represents the Target Torque

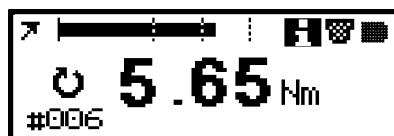
The third vertical line represents the Upper Specification Limit (USL)

The Torque Status Bar is linear and will start displaying (according to the following formula: $LSL - (USL - LSL)$).

The bar will stop at USL.

If control limits are selected, 2 additional lines either side of target will correspond to LCL and UCL. If 'Peak Only' is selected, the right hand vertical line represents the target and the left hand line equals 0Nm.

If Angle Control selected, the status bar represents angle.



Cancelling a reading



To cancel or delete an incorrect reading, use the ◀ ▶ keys to highlight the Cancel Icon and press ENTER. Press ENTER again to confirm when prompted 'Cancel reading?'

Changing the Quick Store parameters

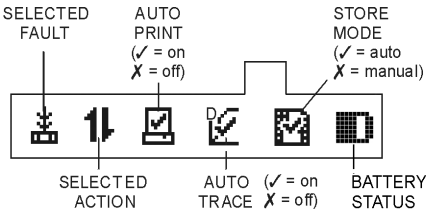
To change the following parameters:

- Units of torque measurement
 - Direction (Auto not available if angle selected)
 - Cycle End Time
 - Control Limits
 - Torque Threshold
 - Torque Limits
 - Torque LSL
 - Target
 - Torque USL
 - 2nd Parameter
 - Angle Threshold
 - Secondary Limits
 - Angle LSL
 - Angle Target
 - Angle USL
 - Control
 - Auto Print
 - Inhibit Trace
 - Storage Mode
 - Status Bar
 - Auto Fault Prompt
 - Current Fault
 - Adapter Length
 - Memory Used
- If 2nd parameter set to angle.


Use the ◀ ▶ keys to highlight the  Setup Icon and press  ENTER to access the Setup Menu.

To View the selected options, select the  icon and hold down  ENTER.



The info screen appears to show the options currently selected.




To View all readings in Quick Store mode.


Press the  ESCAPE key to return to the Quick Store menu.



Use the  keys to access the View All screen then press  ENTER.

The screen will show the latest reading and its number. To view the other readings, use the  keys to move between screens. The user can move from latest to first reading by using the  key. **Note:** Up to 200 readings can be stored.



Selecting the  icon will show faults and actions selected for stored readings.

To Delete all readings in Quick Store mode.




Press the  ESCAPE key to return to the Quick Store menu.

Use the  keys to access the Clear All screen then press  ENTER.



The screen will prompt *"Erase All Readings?"*

Press  ENTER to DELETE all saved readings or  ESCAPE to abort.

To Print all readings in Quick Store mode.

Press the  ESCAPE key to return to the Quick Store Menu. Use the  keys to access the Print All screen then press  ENTER.

The screen will prompt *"Print All Readings?"*

Press  ENTER to Print all saved readings or  ESCAPE to abort.

The readings will be sent to the serial port or wireless, depending on the Comms setup.

QUICK READ SETUP MENU**PEAK**

The following settings are available to change in Peak mode:

Units of Torque Measurement (Nm, kgfcm, kgfm, lbin, lbft, Ncm)

Direction (Right, Left, (Auto if torque only))

Cycle End Time (0.1s to 10s) + 2 min cycle time (see Section 4)

Torque Threshold (1% of span or greater)

2nd Parameter (Angle or none)

Angle Threshold (If Angle set as 2nd param.) (Angle Threshold >= Torque Threshold)

Auto Print (on or off)

Inhibit Trace (on or off) **Note:** there is only 1 trace stored at a time. When a trace needs to be saved, turn on the Inhibit Trace function and no further traces will be stored, therefore the saved trace will not be overwritten. To view the trace, download to Opta Comms. (This requires advanced feature to be activated on wrench)

Adaptor Length (Length in mm & adaptor ID)

Memory Used (memory used affected by data stored in Jobs & number of traces stored)

AUDIT CONTROL

The following settings are available to change in Audit Control mode:

Units of torque measurement

Direction (Right, Left)

Cycle End Time

Torque Threshold

Angle Target (2° to 20°)

Auto Print (on or off)

Inhibit Trace (on or off)

Adaptor Length (mm)

Memory Used

TRACK

The following settings are available to change in Track mode:

Units of torque measurement



Adaptor Length







Memory Used


To Change the settings


Use the ◀ ▶ keys to highlight the  Setup Icon and press  ENTER to

access the Setup Menu.

Use the  keys to scroll through the menu options (displayed 1 per screen), and press  to edit.

Menu options are edited by using the  keys to scroll through the options and then pressing , or in the case of numeric fields such as *Torque Threshold*, use the   keys to move between characters and use the  keys change the digit above the cursor. When the required figure is displayed, press .

To exit without changing, press  ESCAPE.

To exit from any screen, press  ESCAPE.

For more information of these settings, refer to the Glossary section.

QUICK STORE SETUP MENU

PEAK

The following settings are available to change in Peak mode:

Units of torque measurement

Direction

Cycle End Time

Control Limits

Torque Threshold

Torque Limits

Torque LSL (Lower Specification Limit)

Torque LCL (If Control Limits = Yes)

Target (target torque)

Torque UCL (If Control Limits = Yes)

Torque USL (Upper Specification Limit)

2nd Parameter (Angle or none)

Angle Threshold

Secondary limits

Angle LSL

Angle LCL

Angle Target

Angle UCL

Angle USL

Control

Auto Print (on or off)

Inhibit Trace (on or off)

Storage Mode (auto/manual)

(If 2nd Parameter = Yes)

Status Bar (Off, With Limits, Target only)

Auto Fault Prompt

Current Fault

Adapter Length (mm)

Memory Used

AUDIT CONTROL

The following settings are available to change in Audit Control mode:

Units of torque measurement

Direction

Cycle End Time

Control Limits

Torque Threshold

Torque LSL (Lower Specification Limit)

Torque LCL (Lower Control Limit) (If Control Limits = Yes)

Torque UCL (Lower Control Limit) (If Control Limits = Yes)

Torque USL (Upper Specification Limit)

Angle Target

Auto Print (on or off)

Inhibit Trace (on or off)

Storage Mode (auto/manual)

Auto Fault Prompt

Current Fault

Adapter Length (mm)

Memory Used

YIELD CONTROL

Units of torque measurement

Direction of Rotation

Cycle End Time

Control Limits

Torque Threshold

Torque Limits

Torque LSL (Lower Specification Limit)

Torque USL (Upper Specification Limit)

Secondary Limits

Angle LSL (Lower Specification Limit)

Angle Tgt (Angle Target)


Target (target torque)
Angle USL (Upper Specification Limit)
Joint Type (Soft, Hard or Medium)
Auto Print (on or off)
Inhibit Trace (on or off)
Storage Mode (auto/manual)
Auto Fault Prompt
Current Fault
Adapter Length (mm)
Memory Used



Note: If Yield is not achieved, there will be a slow flash and amber LEDs shown every 2 seconds.


A fast flash shows Yield has been achieved.


To Change the settings

Use the ◀ ▶ keys to highlight the  Setup Icon and press  ENTER to access the Setup Menu.

Use the ◀ ▶ keys to scroll through the menu options (displayed 1 per screen), and press  to edit.

Menu options are edited by using the ◀ ▶ keys to scroll through the options and then pressing , or in the case of numeric fields such as *Torque Threshold*, use the ◀ ▶ keys to move between characters and use the ◀ ▶ keys change the digit above the cursor. When the required figure is displayed, press .

To exit without changing, press  ESCAPE.

To exit from any screen, press  ESCAPE.

MAIN SETUP MENU

Use the Main Setup Menu to change the following:

Date and Time (Beep)

Regional Settings (language, decimal point style & language at start)


Power Settings (battery charge status, power auto off time, Backlight auto off time & wireless auto off (if feature enabled)).

Buzzer (Disable, Enabled, Targeting, Vibrator, Buzzer & Vibrator)

LED Setup (Torque LED, Start Colour, Cycle End Status)

Printer Setup (80 or 40 column width, CMP-10, or Tx & Del)

AutoPrint Setup (Format; Date; Time; 2nd Parameter; Direction; Duration; Spec, Limits, Control Limits, Job Name, Round Name)

Display Setup (Job Name (full job name displayed in  icon - on or off)+ Adaptor warning)

Comment (Number entry, Remember Comment, and Before Subgroup - on or off)

Trace Duration (length of trace duration - 20, 40, 80, 120, 160, 200 or 240 secs) (see page 40)

Trace Store Mode (None, Manual, Auto)

Comms Setup (see page 41) (Cable, Bluetooth, RF)

Software Reset (see page 41)

Flash Program (see page 41)

About (shows title screen followed by the software revision)

Features - features list and activation code (see page 35)

Verification and Adjustment (see page 44)

Display Contrast (128 - mid range, higher = darker, lower = lighter)



User Type (Normal, Limited)



Trigger


Bolt Overtighten (RFU)

Retry Function (Never, 1 to 5 retries, Always)

Job Selection (Manual, Auto)





Use the  keys to scroll through the menu options (displayed 1 per screen), and press  to edit.

Menu options are edited by using the  keys to scroll through the options and then pressing  ENTER.

To exit without changing, press  ESCAPE.

POWER SETTINGS MENU



Press  ENTER to show the first menu item and use the  keys to scroll to the required item and press  ENTER to change or  ESCAPE to return.

Use the Power Settings menu to change the following:

Power Auto Off

(1, 2, 5, 10,20, 30, 40 mins, 1 hour, 2 hours, 4 hours, 8 hours or Never Off)

Backlight Auto Off

(1, 2, 5, 10,20, 30, 40 minutes, 1 hour, 2 hours, 4 hours, 8 hours, Never Off or Always Off)

Wireless Auto Off (if available)


(1, 2, 5, 10,20, 30, 40 mins, 1 hour, 2 hours, 4 hours, 8 hours or Never Off)

Note: When RF is on, an 'R' will flash on and off in the bottom left hand corner of the display.

Note: When the backlight or Wireless are turned off, pressing a key or pulling a torque will turn them back on. Pressing keys, taking a torque measurement or communicating with the PC will reset the power auto-off timer.

Note: When the battery low symbol appears, backlight and Wireless will be turned off to conserve power.

The display will show 'C' when charging or in cradle.





The display will show  when charging or in cradle and Battery Info is ON.

BATTERY CHARGE INDICATOR

The Battery Charge Indicator is situated on the top right of the screen as shown.

**Battery Charge Symbols**

The following symbols indicates in 4 stages how much battery life is remaining:

-  Full battery (75 - 100%)
-  Partially full battery (50 - 75%)
-  Low Battery (25 - 50%)
-  Battery empty (0-25%) - time to recharge


FEATURES




Activation Code

The IQWrench2 Opta is presently available as Basic or Advanced version, with or without Angle.

The basic wrench can be upgraded by the user via a 16 digit code supplied by Crane Electronics which is entered in the Features Menu. This is found in the Main Menu/ Setup Menu/Features Menu.




To enter the supplied code, select 'Activation Code' from the Features Menu and press  ENTER.

Enter the supplied number using the  keys to increment/decrement the digits in the displayed number and using the  keys to advanced along the row of digits. Repeat until all the 16 digits are correct. Press  ENTER. 4 beeps indicates it is accepted.

To obtain an upgrade code - contact Crane.

Features List

This shows the features enable on the IQWrench2 Opta. The screen will only show 1 item at a time - scroll to reveal the rest. Features which are enabled, are marked with a tick .

Features available

Advanced

Angle

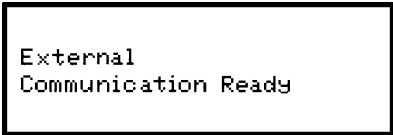
Wireless (Bluetooth or RF)

Trace

Audit (Only if advanced not ticked. Gives peak (only) and audit in basic wrench).

USING IQWRENCH2 OPTA WITH OPTA COMMS OR OMS

First connect the IQWrench2 Opta to the PC with the cradle - see page 12.
From the IQWrench2 Main Menu, select the Comms function and enter the Communications screen.



```
External  
Communication Ready
```

Open the Opta Comms or OMS program on the PC and use the Test Link function in the Communications menu to check the connection. Opta Comms will show '*Link working*' if the connection is OK. If not, check the correct comms port is selected in Opta Comms and the cable is connected correctly. When the link is established, use the Download function to download selected Jobs , Rounds and User IDs to the IQWrench2 Opta. For more information, please refer to the Opta Comms or OMS manuals.

JOBS**Logging in**

The IQWrench2 Opta has two levels of password protection, Superuser and User. This is designed to give greater security to the job/round set-up and data when on the shop floor.




Superuser login– A Superuser has total access to all enabled features of the IQWrench2 Opta.

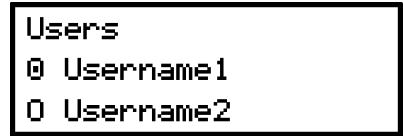
User login – A User has a limited access to IQWrench2 features. The user can take torque readings and store the data, but no editing can be performed.





See Section 4 - Users for more information.

NOTE: All Set-up Menu features are available until a Superuser/User has been activated for the first time. After this the operation will be as above.

NOTE: A user must be logged in before any Job or Round can be performed. The user's details must be created in and downloaded from the User ID table in the Opta Comms program. The screen shows a maximum of 2 users per screen - scroll to reveal any which are not displayed

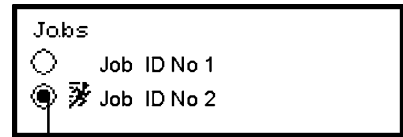
Select the required user from the list by using the  keys to highlight the required radio button  and press  ENTER.




Enter the user password (created in Opta Comms) by using the  keys to increment/decrement the character above the cursor and using the   keys to move across the character spaces. Press  ENTER when the correct password is showing. **Note:** Up to 14 Users can be downloaded from Opta Comms but only 1 Superuser .





The display will now show the list of jobs which have been downloaded from Opta Comms. **Note:** if job names are long, they will occupy 2 lines.






The following icons appearing next to Jobs in the list indicate the following:


Indicates this job is highlighted - press  Enter to select.

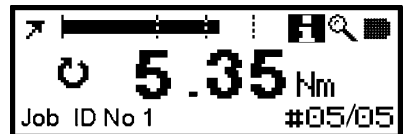
 = job in progress.

 = job has been completed.

Note: If the  key is selected, the job description for that job will be displayed.

Use the  arrow keys to scroll and press  ENTER to select required job.

Note: If the user scrolls up above the top of list, a search screen will appear. Enter the search string and press the Green Enter  key. The job list will then display only the jobs with that sequence of characters in their name. To get the whole job list, clear the search string.



Select a Job. The Perform Job screen will now appear ready to accept a series of readings. This is similar to the Quick Store screen with the addition of the Job name, the subgroup number, and an additional option for adding a comment to jobs and subgroups, or deleting/viewing readings.

If the  icon is selected using the  ENTER key, the following options are available:

Print All (print all the readings for that job)



Clear Last (delete the last reading for that job)

Clear All (delete all the readings for that subgroup - cannot delete previous)

View All (view all the readings for that job)

Scroll between these options using the  keys and press  ENTER to accept.

As the readings are taken, the number of readings will be counted until the target figure is reached. The number of subgroups within the job will also be counted. IQWrench2 Opta gives a long beep at the end of each Subgroup. The numbers in the bottom right corner of the screen show the status of the countdown. When counting readings for instance, '#01/05' shows 1 reading completed in subgroup of 5. When counting subgroups, '#02/03' means currently taking readings in subgroup 2.






There are 3 types of screen display for the jobs mode. Toggle between them using the  key. The  key shows statistics for the gathered readings.



Data can now be uploaded to the PC via the PC Comms upload function for analysis in Excel etc.

After the job(s) are complete, press Escape to exit.



Job Name


The Job Name can be set to be displayed or not.

From the Main Setup Menu, use the  keys to scroll to Setup/Display Setup/Job Name and press  ENTER. Press  and use the  keys to select the required setting (Yes for Job Name displayed or No) and press  to accept.

In the Jobs screen, press Green  ENTER key while  icon is highlighted to get full job name.

JOBS SETUP

To change the Jobs settings, from the Jobs Measurement screen use the ◀ ▶ keys to highlight the  Setup icon and press  Enter.

The following parameters can be amended or viewed by using the ◀ ▶ keys to display the various items and press  Enter to amend.

Subgroup Comment (add/amend an optional comment for the subgroup)

Subgroup Ref. (add/amend an optional reference for the subgroup)

Job Comment (add/amend an optional comment for the Job)

Auto Print (Auto print On or Off)

Inhibit Trace (prevent new traces being taken)





Storage Mode (Auto or manual)

Status Bar (Torque Status Bar Display - off, with limits, target only)

Auto Fault Prompt (Automatic prompt if a fault detected - On/Off)

Current Fault (Current fault options)

Memory Used



Menu options are edited by using the  keys to scroll through the options and then pressing  , or in the case of numeric fields such as *Subgroup Comment*, use the ◀ ▶ keys to move between characters and use the  keys change the digit above the cursor. When the required figure is displayed, press  .
See below:

Job Comment




The Job Comment can be set to accept numerical entry. From the Main Setup menu, select Sequence/Comment/Number Entry and set to On or Off.

NOTE: Subgroup Comment, Subgroup Ref. and Job Comment fields can only be added/amended if the number of characters has been specified in the job.

Press  Enter to log the current user out or press  Escape to continue as the signed in user.

Note: The comment fields will automatically appear if prompt has been linked to the field in Opta Comms or OMS.

Press ESCAPE  to return to the Setup Menu.comment field.

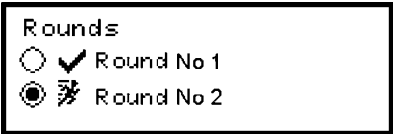
ROUNDS

NOTE: A user must be logged in before any Round can be performed (see page 36). The user's details must be created in and downloaded from the User ID table in the Opta Comms/OMS program.

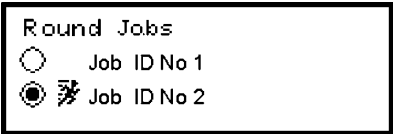
A round is a series of Jobs to be performed together as a group. Each round must contain at least 2 Jobs.

Select the Rounds Screen from the Main Menu. The screen will show a list of the user's available (see page 35 for logging in details).

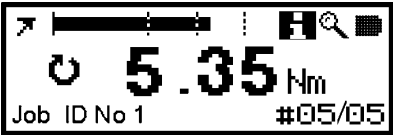
Select the required Round from the list.




Select the required Job from the list.





The Perform Job screen will now appear ready to accept a series of readings for the first Job in the Round. This is the same screen as in the Jobs mode.



As the user takes readings, IQWrench2 Opta will count down each Job subgroup showing the name of the Job (see Jobs Mode) until all of the Jobs in the Round are complete. The Opta screen will now display 'DONE'. Press Escape to exit to Round Jobs List.

Select another Round to action or press  Escape return to the Other Modes Menu.

Data can now be uploaded to the PC via the PC Comms upload function for analysis in Excel etc.

After the job(s) are complete, press Escape to exit. Screen will prompt 'Log Out?' Press  Enter to log the current user out or press  Escape to continue as the signed in user.

REMOTE SETUP

Protocol is available from Crane Electronics and allows jobs to be fed by a PC to the wrench (via cradle or wireless), one at a time. (contact Crane Electronics for more information).

COMMS SETUP

This menu is only enabled if the Wireless feature has been activated. It chooses the path for serial data communications as either through the RS232 port or via a Wireless Link. **Note:** for RF to work, the antenna in the backplate of the wrench must be present.

As soon as Wireless is selected it is turned on and initialised. Its timer is used to control when it will turn off. A flashing 'R' will be displayed.

FLASH PROGRAM

For use only by Crane authorised personnel.



SOFTWARE TYPE

The wrenches contain a Mark II main PCB. This requires a different software type so all versions will start with 151-. The original Mark I PCB required type114- software. The software version can be observed either on switch on when the wrench goes through a series of splash screens or by going to Setup / About.

RESTORE APP. DATA

To return the device to its factory settings, use the Software Reset function. Accessed via the Main Setup Menu - see page 32.

Screen will warn: '**ATTENTION, ALL DATA AND SETTINGS WILL BE LOST!**'

Press  ENTER to reset or  ESCAPE to abort.

Normally this function would only be used after an abnormal restart where it is recommended to save data and perform a software reset.

RESTORE JOBS FROM FLASH MEMORY

The IQWrench2 Opta still contains jobs, users and ID table information in volatile RAM but it now also backs up this information to a non-volatile flash memory on the

wrench. This means if a software reset is performed, the job information can be restored without taking the wrench back to a cradle and connecting to a PC.

Restoring Jobs

The original Software Reset function in Setup has been replaced with Restore App. Data. It does the same function as Software Reset, but afterwards it allows one to restore the job information that has been erased. The sequence of screens is:

'ATTENTION ALL DATA AND SETTINGS WILL BE LOST'

'Are your sure?'

'Zeroing RAM'

'Do you want to restore jobs?'

- If OK is selected to restore jobs then will see 'Wait...'
after a few seconds.

Followed by 'Cold Reset 3'

'Restoring Jobs'

Splash Screens

This extra function means there is some extra information that will appear on screen during the operation of the wrench:

Update of new Software

After Flash Downloading new software onto the wrench the following will be displayed after pressing the green button for one second (or waiting for 3 minutes):

Flashdownload

- Communications Enabled With PC
 - Press Green key for 1s

Display will show;

'Zeroing RAM'

'Wait...'

Note: This is new and due to the backup memory being erased Existing job information stored in backup memory is always erased on loading new software, so the wrench will need to have a new set of jobs downloaded afterwards.

'Cold Reset 3'

Crane Splash Screen

Software Version Number

Wrench span

'Waiting Lock Down mode from PC'

- If asked wrench to go to specific measurement mode

'English'

- If asked wrench to display language on startup

'Zeroing Gyro Keep Wrench still'.

Press any key

- If asked gyro to zero on power up.

'Quick Read'

Updating Jobs

When OMS or Opta Comms is used to update jobs information then on exit from Comms the following will be displayed:

'External Communications Ready'

- Press red key to exit

Display will show;

'Erasing Backup'

'Backing up Pointers'

'Backing Up Jobs'

'Comms'

Progress bars will show status of the actions.

If nothing changes in the job information, then the wrench will immediately exit back to Comms in Main Setup.

Jobs Information is defined as: **job specifications, user information (name and password), and ID table.**

Switching On the wrench

The following will be displayed on power from an autpower down.

'Power up'

'Initialising'

'Wait...'

Splash screens

TRACE DURATION

The wrench can save multi-traces if Trace Save Mode is set. If set to Manual, the user will be prompted to save a trace after a reading is taken or it can happen automatically. As traces are taken, the Memory Used function in Measurement Setup will show how much of the wrench memory has been used on jobs and stored traces. Pressing the GREEN key allows stored traces to be deleted. Any memory used after deleting traces is due to jobs. Multi-traces can be uploaded from the wrench using Opta Comms or OMS. The trace will contain torque (and angle if used in measurement mode) against time. The length of the trace can be setup in the **Trace Duration** option in the Main Menu / Setup Menu. Note that the same number of data points are stored so specifying a longer trace means that a certain number of the actual measurements are ignored.

The maximum resolution is 1 reading every 2 mS and up to 10,000 readings (of torque & angle) can be stored. This would give a true length of 20 seconds. A lower resolution can be of down to 1 reading every 24mS.

VERIFICATION AND ADJUSTMENT

IMPORTANT: Before using this function, please discuss your verification process with your local Crane Distributor or the Crane Customer Support Manager.

ZERO GYRO

For the wrench to operate accurately in Angle modes, it needs to calibrate while remaining stationary. This will be required each time the wrench is switch on. Place the wrench on a flat surface so it remains stationary for 10 seconds. The wrench will display “Zeroing.. Wait 10s”. If the wrench is not perfectly still while this is taking place, the wrench will display an error message and retry the zeroing process.

Zeroing can also be applied manually by selecting Zero Gyro from the main menu.

In Gyro Setup mode the user can choose to have the Gyro automatically zero on power up or the first time the user enters a measurement mode requiring angle.

In Angle mode, if you pull the wrench ‘*too fast*’ for the angle to work accurately, the wrench will display a warning message “*Angle too fast*”.

Note: Auto direction is not possible with Angle selected. If Angle is selected, the default direction is right.

GYRO



If the wrench angle feature is ticked and it contains a Gyro, then the wrench can measure angle. To measure angle, the wrench must first establish a zero datum, i.e. a condition, where the wrench is not turning. This always needs to be performed when the wrench is turned on. It can be performed in 2 ways:

- Use the **Zero Gyro** function on Main Menu. The Red LEDs will turn on as a warning and the wrench should be kept still for 10s while the zeroing occurs, e.g. by laying the wrench on a bench. If the wrench detects that the wrench is not stable but being moved, then it will re-do the zeroing process, displaying the message *"Initialisation: Angle Not Steady"* and it will repeat the zeroing function, until it is abandoned or passes. It is a requirement that there must be a good zero result before angle measurement can occur.
- When entering a torque measurement screen that requires angle, for the first time. This will also start the same Zero Gyro process, if enabled in Gyro menu.

Once the Gyro has been zeroed, that result is remembered while the wrench remains powered.

It is also possible to repeat the zero Gyro function at any stage.

The Gyro will work down to ~ 0.5 deg/s. Below this angular velocity, the angle may not increment properly.

The Gyro will work up to ~ 300 deg/s. Above this angular velocity, the wrench will display the error message *"Pull too fast"*. It will remain until acknowledged by Red  or Green  key. The wrench will then re-zero the Gyro and initialise ready to start the torque measurement again. In Sequence / Too Fast Limit the user can change maximum gyro speed. In Too Slow Limit the user can set the time within which the pull must occur to be valid.

Angle is only measured in the direction stated. If ratchet against this direction, then the angle will not change.

CYCLE END TIME

This sets the time that the wrench waits, after the torque falls below torque threshold, before finishing torque cycle.

Cycle End Time = 2 Mins is a special case

- Applies to all measurement modes

- Applies only if torque < LSL (or torque < LCL if control limits set)
- Above LSL (LCL) torque, the cycle end time reverts to 2s, so will finish quickly as achieved at least an OK torque.
- If angle is primary parameter (e.g. Angle Control) then refers to Angle LSL (LCL)

LEDs

There are 2 independent LEDs on the front of the wrench. The 2 LEDs on the back of the wrench will show the same colour as the top front LED.

The LEDs can show 3 colours; **Amber**, **Green** and **Red**.

At the end of cycle the LEDs have the meaning as shown on page 16.


- This does not apply in Quick Read as no limits are set.
- If torque only Peak, the angle LED will be blank.

During the measurement cycle All the LEDs show the status of the primary measurement parameter.

- In Quick Read this only applies for Audit as this measurement mode has limits set for target angle.
- With just specification (not control) limits and between LSL and target will get the LEDs flashing Green to indicate are approaching target.
- The amber lights will flash while torque (or angle) is < $\frac{1}{2} \times$ LSL value and then will turn to steady Amber. This does not operate in Remote Setup.
- In Audit and Peak with angle control, the primary measurement parameter is angle.

If you leave the measurement mode and return, the LED will indicate the status of the last reading displayed.

REGIONAL SETTINGS

Set permanent language, which is remembered on start up or after a software reset. Can represent decimal point as a period (default) or as a comma, as required by country conventions. This affects the display of numbers and the printing of numbers. If language at start is enabled, then on power up at the end of the splash screen sequence, will display current permanent language and give an opportunity to temporarily change it for that “power on” period. It will give the user 10 secs to make a choice and then continue to main menu. This time can be shortened by pressing the Green  key.

BUZZER

Disabled means no buzzer or vibrator.

Enabled gives error beeps and end of cycle status

Targeting has the buzzer enabled function plus during a measurement cycle gives beeps whose frequency of repetition increases as the primary parameter (torque or angle) approaches its target value. Targeting buzzer does not operate in Quick Read.

Vibrator means there will be no buzzer and the vibrator will operate when get into OK region of primary parameter (i.e. when go above LSL if no control limits and LCL if control limits).

Buzzer & Vibrator. The wrench behaves the same as Buzzer Enabled function but each time buzzer beeps, the vibrator will also operate.

Buzz and Vib Targeting is the same as Targeting and Vibrator together

REMOTE SETUP

Can send jobs one at a time remotely to the wrench.

Can have 1 to 200 readings in a job.

Must have set torque units, direction (default is right when set angle), cycle end time in Quick Store / Peak as cannot be sent by Remote Setup protocol.

Must set 2nd parameter as Angle in Quick Store / Peak, in order to do angle jobs in Remote Setup.

Setting angle control in Quick Store / Peak allows the 2 minute timer and targeting buzzer to be affected by angle parameter in Remote Setup.

Sending Cntrl-R while the wrench is in a Main Menu function will put the wrench into Remote Setup screen with message *"Waiting for Remote Setup"*.

Sending Cntrl-R while the wrench is in a Remote Setup function will abort the current function and will put the wrench into Remote Setup screen with message *"Waiting for Remote Setup"*.

When in Remote Setup measure mode get an automatic status response from the wrench every 2s except if it has to zero gyro.

REMOTE PROTOCOL

The Jobs are preloaded on to the wrench.

The Jobs are selected by an ID sent by Remote Protocol.

When the wrench is activated, readings can be taken.

These readings are sent back one at a time and each one is acknowledged before allowing the next reading.

Please contact Crane Electronics for the Protocol.

STATUS BAR

Set in Measurement mode setup of Quick Store or Jobs.

Only shown if Peak or Peak + Angle measurement.

'Target only' setup has right hand vertical line set as primary parameter target value and left hand vertical line is set as zero.

With 'Limits' setup has LSL, Target and USL limit lines evenly spaced on right and not in proportion to their values. This means any value between two limits takes into account the difference between those limit lines and so the rate the status bar travels across the display can appear to speed up or slow down as it passes limit lines.

The left hand most limit line is given the value $LSL - (USL - LSL)$ or zero if the answer is negative. The status bar will not be displayed until it reaches this left hand limit line.

If control limits are enabled, they are placed between the other limits in proportion to their value.

The status bar will start when measurement cycle starts. This means it may suddenly appear if measuring torque as the torque threshold is between the limit lines. If angle LSL is set as zero (is permitted), then at beginning of cycle status bar will appear already at LSL.

One of the screen formats (Press  key) will make the status bar prominent.

POWER

Wrench can be powered off in 3 ways:

- Select *Power Off* in Main Menu
- Select Power Off icon in Setup / Power Settings
- If the wrench has not been used for certain time defined in Setup / Power Settings then it will turn off

If the wrench has been turned off by one of the above methods, it is in fact in a low power mode and can be woken up by pressing one of the arrow keys.

If the wrench has its power removed, either by removing the battery or allowing its battery to go to a low level, then when power is re-applied, it will require the green key to be pressed for 1s or wait 3 minutes for the wrench to turn on by itself. This is to make sure that wrench is not affected by power glitches and that it has a clean power up, with sufficient power.

If the power is removed, while the wrench is normally operating, then when it is powered up it could display that it has had an Abnormal restart, indicating that the memory used for storing program or data could be affected. It is strongly recommended that if this happens, that data is retrieved from the wrench before any more results are taken and that a Restore App. Data is performed that will set all program and data structures back to a known state. This will erase any data and jobs stored in the wrench (unless it has been requested they are restored).

The battery is protected by a resettable fuse, in case the wrench connectors are shorted out. If this fuse is set, then this will be the equivalent to the battery being removed.

It is recommended that if the wrench battery does need replacing, that the wrench is powered off first.

On power up after a manual power off, the wrench will go through the initial screens which show; *Initialising..., Wait...,Crane splash screen, Software version, Torque span and wrench serial number, Recal date or whether calibration is due or overdue.*

These same screens can be seen when using Setup / About function. After these initial screens the wrench will then show the current selected language (if enabled) for 10s allowing it to be temporarily changed.

The wrench will then go to one of several locations depending on the circumstances:

- After a software reset or loading of new software, the wrench will power up in **Quick Read**.
- After a normal power up the wrench, if “advanced” feature ticked, will go to Comms ready to receive new jobs, otherwise **Quick Store**.
- If the wrench has received jobs, then it will go to jobs, and rounds if received rounds.
- Once wrench has received user list, it will request a user to be selected and then a password.
- If were in Jobs or Rounds when the wrench powered off, then the wrench will power back on to the password screen.
- If power into **Quick Read**, **Quick Store** or limited user, or Setup and users have been loaded on wrench, then when you exit menu, will find it is disabled so cannot re-enter until enter Superuser password.

If the wrench powered off automatically, it will come back to the same screen it was in when it powered off, except if it was in a Job. In that case it will go to the user password screen.

The latest IQWrench2 has a rotary switch recessed into its backplate. If this switch is rotated anti-clockwise, the battery is completely disconnected. This should only be done if the wrench is powered off. The battery should remain charged if the wrench is kept at or below room temperature (< 25°). NOTE: if the wrench is place in cradle in this state, it will turn on as receiving power from the cradle but the battery will not be charging.

When the user needs to use the wrench, turn the switch clockwise, press the ► (RIGHT) and ▲ (UP) keys together and then press the Green key for 1 second. The wrench will power back up.

WIRELESS

Wireless is switched on in Comms Setup by selecting RF. RF module is initialised and will get a flashing 'R' in bottom left hand corner of display while it is on.

(Note: RF must be on)

CHANGE RF ID


It is now possible to configure the wrench RFID address on the wrench itself. This will make it easier to swap a wrench over for another. To change the RFID perform the following. The change to RFID is performed in Setup so only a Superuser is allowed to perform the change:

- Ensure in Main Menu by pressing Red key (several times).
- Use down arrow key to go to Setup and select with Green key.
- Use down arrow key to go to Comms Setup and select with Green key.
- Use down arrow key to go to RF ID and select with Green key.
- The current RFID will be displayed.
- You can edit the value between 01 and FF and pressing Green key will save changes.
- At present it is necessary for the wrench to be power cycled for the new RF ID address to be used.
- Pressing Red Key 3 times will bring the user back to Main Menu.

This function is in setup so only a Superuser can perform a change.

This function is in Comms Setup as the wrench must be set in RF wireless mode ('R' flashing in bottom left corner of display).


The user can confirm this address by entering Comms Setup / RF Comms / RF Configuration

Press the Green  key to get the message 'sending GEN Mode 0'

Press down arrow to access GEN DEVICEADDR xx -> where XX is current RFID

The flashing 'R' will disappear if RF is switched off.

RF stays on for the period of the Wireless Auto Off timer set in Power Settings. This timer is reset if a torque is pulled, there is communication, or if a key is pressed.


RF function will be switched off if get a low battery warning in order to conserve power. So if a  symbol is displayed, replace wrench in to cradle to charge battery.

RETRY FUNCTION

This function is in the Setup Menu.


If set to Never, then each reading, whether bad or good will be accepted (although other functions may then change the decision).

If set to 1 to 5 Retries, then if the result is NOK, i.e. primary (and secondary if enabled) parameter are NOK, then the wrench will warn the user with the buzzer bleeping every second and displaying message *"Cancel reading?"*

The user can press Red  key to accept that bad result or can press the Green key to re-take the reading. They are allowed up to the number of retries selected in the function which is between 1 and 5.

If still get a NOK reading after the permitted retries, then the last result will be accepted.

A good result is automatically accepted.

If the function is set to always, then the Red  key is disabled. This means if get a NOK reading, then must cancel reading. This means only OK readings can be accepted.

This function only works in Jobs and Remote Setup (not in Quick Store) as these are more production orientated functions.

In Jobs, when Retry function is set to Retries or Always, if the Looking Glass icon is selected, then Clear Last (reading) and Clear All functions are disabled so that the Retry function cannot be subverted.

If in **Job Setup**, set Storage mode to Manual, then this takes precedence and user will be asked "Store Reading". Note access to setting this feature will depend on what type of user is set.

In Retry Function / Retry Message = Cancel / Accept the user can set message displayed for bad reading :-

If 'Cancel Reading' is displayed, the user must press Green to cancel

If 'Accept Reading' is displayed, the user must press Green to accept (or Red to cancel)

USERS

If the wrench is an advanced wrench, then it will be necessary to download a user list to the wrench from Opta Comms.

This user list can consist of up to 15 user names and associated passwords.

- Maximum length of user name is 20 characters but only 15 can be displayed on wrench
- Maximum length of password is 10 alpha numeric characters with letters being capitals

On power up from a manual power off, after the initial screens the user will be brought to the Users screen, where a user must be selected. Once selected, a password must be entered. If incorrect, the password can be entered again. Once a correct password is entered, that user is logged in and results in jobs will be stored against their username.

There are 2 ways for a user to log out

- Use the Logout function on the Main Menu
- Turn off or allow wrench to turn off itself

In Opta Comms or OMS you can specify if a user is a Superuser or a Normal User. There can be only one Superuser downloaded and it is the first one in the user list. The Superuser has access to all functions.



A normal user has no access to Setup functions except: Power Settings, Trace Duration, Trace Store Mode

As a superuser you can enter Setup and use function User Type to limit a Normal User to a Limited User. The Limited User in addition to the limitations for a normal user cannot access: Quick Read, Quick Store, Job Setup and in Job measurement can only clear last reading (i.e. barred from using Clear All, Print All and View All functions).

Restore App. Data removes user list and passwords and sets limited user back to normal user. The wrench will then power up in Comms screen to await job and user information.

NOTE: if restoring Jobs, this includes user list and so user will remain logged in as Superuser who initiated Restore Apps. Data.

ID ADAPTER

If head adapter ID is not in the table, the wrench will display "Head ID not recognised" and error message must be cleared with a key press. Press Green  key or arrow keys to continue and re-test. Press Red  key, to exit that screen.

If ID is recognised, then "ID = xxx, Length = yyy" will be displayed briefly if Setup / Display Setup / Adapter Warning = Yes

If adaptor length is non-zero, then an "*" will be placed next to torque unit

The IQWrench2 reads the ID of the head attached to it approximately every second. Therefore the wrench knows if you change the head between measurements.

The wrench checks that the head ID is in a table loaded onto the wrench from Opta Comms

If the Crane SR adaptor is used, it will have an ID PCB, which has ID = 087. If Display Setup /Auto ID is set to OFF, the wrench will automatically assign the length as 41mm if 25 / 75Nm IQWrench2 or smaller and 34mm if a 180 / 340Nm wrench or larger. This is so an ID table does not need to be downloaded. If an ID table is downloaded, the value assigned to ID=087 is ignored. No asterix is assigned against the torque unit as defining SR adaptor as standard length.

CALIBRATION DATE

There are 2 calibration dates that can be saved in the wrench:

- Certification date is saved in Calibration / Misc Settings when a wrench is calibrated at Crane and matches the date put on the calibration certificate.
- Validation date can be assigned by the customer for their own internal validation checks.

In Setup / Verification + Adjustment :

- Disable or Cert Date enabled will cause the Certification recal date on splash screen when wrench is switched on or when select Setup / About function. Otherwise the Val date enabled will cause the Validation date (that can be set in the same function) to be displayed.
- If the current date is within 7 days of the displayed recal date, then the message "*Calibration due in x days*" will be displayed where x is 1 to 6 days. A

key must be pressed to accept the message and to continue onto language selection in splash screen.

- If the message is on or after the displayed recal date then the message “*Calibration Overdue*”. A key must be pressed to accept the message.
- If try to enter a job when “*Calibration is overdue*”, then the wrench will display “*Calibration Overdue*”. In the case of a Superuser, they can then continue and perform the job if they wish. However if it is a user, then they will be warned and then prevented from entering the job list and entering a job
- If try and enter Quick Read or Quick Store and date is past the set calibration date, then will be warned “*Calibration Overdue*” and will then enter that function.

MEASUREMENT MODES

There are 4 groups of measurement mode:

Quick Read where there are no limits set or checked, and no results are stored and the result is displayed on the screen.

Quick Store where there are limits set and checked against. The results are stored so they can be viewed or printed at a later time. The wrench will store up to 200 results.

Jobs and Rounds are available in advanced wrenches. The Comms function is used to allow the wrench to talk with a PC running Opta Comms. The PC can download Jobs, user lists and ID table to the wrench and can upload data stored against the jobs.

Remote Setup / Remote Protocol. Contact Crane Electronics for further information.

There are different measurement modes:

Track mode shows real time torque and no angle. Torque is displayed continuously.

Peak mode shows the maximum (peak) torque that occurred while the torque was above threshold and before cycle end.



Audit mode shows the torque as the wrench passes the set audit angle. The wrench also records the peak torque seen during the process.


Yield Mode shows the point at which the fastening goes into yield.


JOB MEASUREMENT ICONS

In job measurement mode there are 3 icons at the top right of the display.

These icons are highlighted with ◀ ▶ key and selected with Green  key

The  icon (default highlight) only works if Green  key is held down.

- It will show the whole job name first if Setup / Display Setup / Job Name = Yes. This is because in certain screen modes (controlled by ▲ key) you can only see first 12 or 24 characters of job name.
- It will then give fault icons, and status of autoprint, trace, and autostorage until Green  key is released.

The  icon gives the following features:

Clear Last – Clears the last reading

Clear All – Clears all the readings in the current subgroup (not previous readings as they may have been saved under a different user)


Print All – Prints all readings


View All – Views all readings.

The screen view is the same as the one selected in Job Measurement.


The ◀ ▶ keys select readings within a subgroup.


The  arrow keys select the subgroup.


The Green  key displays the current subgroup comment (0 – 30 characters) for a short period.

The  icon allows the global features for jobs to be setup.

If User is Limited, then not allowed to select job setup as user or superuser.

If Printer Setup is Tx & Del not allowed to select  icon.

If Printer Setup is CMP-10 and User is Limited, then only allowed to select Clear Last in  icon.

If Setup / Retries = a Retry or Always, then Clear All and Clear Last are disabled in  icon features to prevent the user from inadvertently deleting good readings.

YIELD FUNCTION

It is available in Quick Store and Jobs if Advance and Angle features are enabled.

The function relies on measuring torque and angle and calculating the slope of torque versus angle. The wrench uses the definition of when this slope falls to half its maximum as the yield. This is just past the true definition of the 'yield point' which is when the joint will not elastically return to its original length.

Before performing yield, first take a trace while performing a good fastening with the bolt yielding. Then download that graph to Opta Comms and export to Excel. From that graph you can work out if the joint type is hard, medium or soft. For example, if the bolt goes into yield at about 30 degrees, then it is suggested that you set the Joint Type (in measurement setup) to Hard.

When pulling the wrench, you must watch the LEDs as these will tell you when you have reached the bolt yielding as per the algorithm above. If yield is reached then the LEDs will flash quickly with the torque and angle status at yield recorded. If yield is not reached then the LEDS will flash slowly and alternate with 2 Amber LEDs.

Once the fastening is pulled, only the yield torque and angle are recorded so they can be downloaded to Opta Comms, or Printed out or Viewed.

The Yield Algorithm works as follows:

- It starts once the torque has gone above torque threshold
- Trace data is stored so have a torque value against angle for each 1° increment of angle.
- A gradient of the torque vs angle graph is calculated. The size of the chord measuring the gradient is set by the user in terms of the angle difference (along the x-axis - angle)

Soft = 24°

Medium = 16°

Hard = 12°

- The maximum gradient is found and stored.

- The yield point is where the calculated gradient is now half the maximum gradient.

You cannot detect a yield point until the angle has moved the appropriate chord length after torque threshold has been exceeded. Therefore, for example, if chord length is medium (16°), then the joint must be rotated by more than 16° for the yield point to be calculated. Therefore if you had a hard joint, it would be unadvisable to specify a soft ($=24^\circ$) calculation.

For similar reasons, the point the gradient is actually measuring is approximately halfway between the 2 ends of the chord, which are used for measurement purposes. Therefore, for example, if a soft yield calculation is used and the yield is calculated as being complete at an angle of 45° , then in reality the yield occurred at $(45^\circ - 24^\circ/2 = 33^\circ)$. It also means that the wrench has moved a further 12° past the defined yield point. Therefore if you had a hard joint, it would be unadvisable to specify a soft ($=24^\circ$) calculation.

On a soft joint the gradients would be smaller and more prone to error if taken over smaller chord lengths so it would be unadvisable to use a hard joint calculation

It means on the joint that uses the soft joint type chord algorithm, the joint is turned through a greater angle, sees a greater torque, and stretches more.

You still set the normal parameters for torque threshold, LSL and USL for torque and angle so the wrench can determine if the final torque and angle achieved are within the correct range. As the yielding is the most important factor, then these parameters should be given a wide tolerance. If they are set very wide, then will always get fast green LED flashing when go into yield.

A metal to metal joint is classed as a hard joint but cylinder head with a gasket will be classed as a medium joint. The torque against angle slope will be lower on a soft joint than hard.

The operator should stop pulling the wrench as soon as he sees the LED's flashing otherwise the fastening will be taken further into yield.

This is how the LEDs work for the yield function:

- If Yield is reached, the LEDs will immediately start flashing quickly with fixed colours. These colours will indicate whether the Torque and Angle are below LSL (Amber), okay (Green), or above USL (Red).

- If Yield is not reached before cycle end time, then the LEDs will flash slowly and will alternate the Angle and Torque status with Amber.

Examples:

- Good Yield, Good Torque, Good Angle
Torque LED flash Green quickly
Angle LED flash Green quickly
- Good Yield, Torque below LSL, Angle below LSL
Torque LED flash Amber quickly
Angle LED flash Amber Quickly
- Bad Yield, Good Torque, Good Angle
Torque LED flash Green alternately with Amber slowly
Angle LED flash Green alternately with Amber slowly
- Bad Yield, Torque below LSL, Good Angle.
Torque LED flash amber slowly (actually alternating Amber with Amber)
Angle LED flash Green alternately with Amber slowly.

Therefore to recap if you see Amber LEDs and slow flashing then Yield was NOT reached. The reason for slow flashing was to distinguish between the case when Yield was Good or Bad but Torque and Angle were below LSL, which would give Amber.

If not interested in LED colours then set LSL for torque and angle as low as possible and USL as high as possible. Then when yield occurs will get fast flashing green LEDs.

Must do yield in one movement. If stop turning change in torque angle curve could be interpreted as yield

SPECIALIST JOB FUNCTION

If Printer Setup = CMP-10 then various features are invoked:

Partially filled Job

- If a job is partially filled and the wrench is on a cradle receiving power and the user exits from the job measurement mode back to the job list, then the wrench will display *"Delete Job Readings?"*
- If the green key is pressed then the message are *"Are you sure?"* will be displayed. Pressing the green key again will delete all the readings in that job's subgroup, which is the equivalent to performing a Clear All.

Completed Job

- A job is completed when all the readings are taken and it will display DONE in bottom right corner of display. No further readings can be taken.
- When the job measurement screen is exited to job list, will get *"Lock Out"* printed on the top line to indicate that no other jobs can be selected by the up / down arrow keys. It is permitted to re-enter that job or to leave jobs altogether, but each time the user returns to job list, it will be that completed job that is highlighted.
- To unlock the wrench so other jobs can be selected, the wrench must be placed in a powered cradle. The wrench will sense the cradle power and print a label to the CMP-10 printer.
- If another label is required, then the job can be re-entered and exited again or after the first label is printed, a message *"Press RED key to exit, Press GREEN key to repeat print"* is displayed. Press the Green key to print another label.
- When you press the Red key to exit the print label function, then the wrench will display *"Delete Job Readings?"* If the red key is pressed, then nothing will happen and will go back into job list which is now unlocked. If the green key is pressed then the message are *"Are you sure?"* will be displayed. Pressing the green key again will delete all the readings in that job's subgroup, which is the equivalent to performing a Clear All.

The label will have 5 lines:

The job name (should be 1 to 31 characters)

“*Samples*” followed by number of samples. This can be from 1 to 200.

“*Target*” followed by target torque and torque units

“*Status*” followed by OK if all readings are OK, otherwise print NOK

Date and Time. The date format can be changed in Setup / Date & Time.

DOWNLOADING JOBS

If Download / Modify / Delete; Jobs / Rounds / Users / ID table is on the IQWrench2 Opta, then the user exiting from Comms mode will see the following:

- Erasing Backup
- Backing up Pointers
- Backing up Jobs
- Backing up rounds
- Comms (Main Menu)

This is because all this information is backed up to a non-volatile memory. Therefore if the wrench is reset using the Reset App. Dat function, the Job information can be restored if required.

NOTE: Job readings are NOT backed up.

GLOSSARY OF TERMS

Angle threshold

This is the value that the torque must rise above to start the angle measurement.

Angle limits

The upper and lower limits for the angle application. Displayed as an actual value or a percentage of target.

Any Order

The jobs can be used in any order.

Auto Print

Automatic printing of the torque value, second parameter, and duration. Via selected comms port to serial printer or RS232 terminal emulator.

Auto Fault Prompt

Facility to indicate cause of fault and corrective action to be taken against a low or high reading.

Audit Algorithm

This is a special software algorithm that senses the break away point of the tightened fixing and displays the torque value after a defined number of degrees is reached.

Configure

The process of entering and storing the basic parameters which determine the resulting outputs of IQWrench2 Opta.

Control Limits

The upper and lower limits for the torque application either side of target indicating tool or process is out of control.

Cycle End Time

Is the time the torque must be below threshold for the reading to finish.

Timer is reset if torque goes above threshold.

Settings are 0.1; 0.2; 0.5; 1.0; 2.0; 5.0; 10 secs.

If being used with ratchet, it is best to use larger cycle end time.

Current Fault

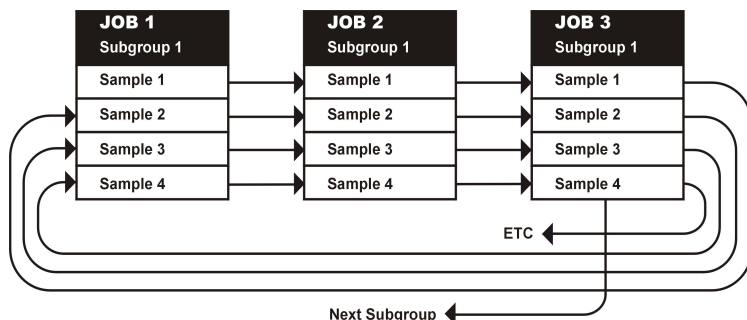
Is the last fault indicator assigned to the last low or high reading.

Direction

The direction in which the wrench is turned to apply torque - Clockwise (right) or Anticlockwise (left).

Horizontal sampling

Collection of data by round, where the first reading of the job is taken, then it automatically moves onto the next Job and so on..



Horizontal sampling with prompt

Identical to that of horizontal mode except that before stepping to next job the enter key will have to be pressed.

Inhibit Trace

Turn off automatic storage of trace data for last tightening.

Job

Specification of one particular torque value to be collected. Each Job has a name of up to 30 characters. IQWrench2 Opta can store up to 275 different Jobs at any one time.

LCL

Lower Control Limit as set in the Setup parameters (if control limits enabled).

LSL

The Lower Specification Limit as set in the setup parameters.

Max Torque Value

Upper tolerance level of any reading. This can equal but not exceed the torque rating of the transducer to be used.

Memory Used

A display of the percentage of free memory remaining.

Min Torque Value

Lower tolerance level of any reading.

No. of Subgroups

Number used to allocate memory space in IQWrench2 Opta for a particular job. May be set in the range - 1 to 200.

Peak

A type of measurement which records the highest torque applied to a wrench during an operation.

Reading

Individual sample. Can have up to 255 Jobs per Round.

Round

A sequence of Jobs to be collected either horizontally or vertically. Each Round has a name of up to 30 characters.

Sample

Individual torque reading, with allowable range of 1 to 200.

Secondary Limits

The upper and lower limits for the angle or torque application. Displayed as an actual value or percentage target.

Span

The Span is the effective operating range of the wrench. This is the range between zero and the maximum design limit of the transducer.

Standard Deviation σ

Is a measure of the variation of the samples of a statistical group.

If a group of n values has a mean of x then its standard deviation is given by;

$$\sigma = \sqrt{\frac{\sum_{i=1}^N (x_i - \bar{x})^2}{n - 1}}$$

Storage Mode

This is set to Automatic or Manual storage, in manual a key press is required to store the data.

Status Bar

Graphical on screen display of torque reading with limit applicable.

Subgroup

Grouping of samples to enable analysis, with an allowable range of 1 - 50.

Torque Threshold

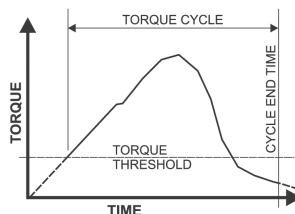
The level of torque which a signal must rise above and then fall below to be considered a valid torque cycle. In the IQWrench2 Opta, this is set at 5% of the rated span of the transducer, but is editable by the operator.

Target

The target torque figure.

Torque Cycle

A complete application of torque to a joint starting from the torque rising above the preset threshold value and finishing at the preset cycle end time.



Torque Limits

The upper and lower limits for the torque application. Displayed as an actual value or percentage of target.

Trace

A graphical representation of the torque cycle.

Track

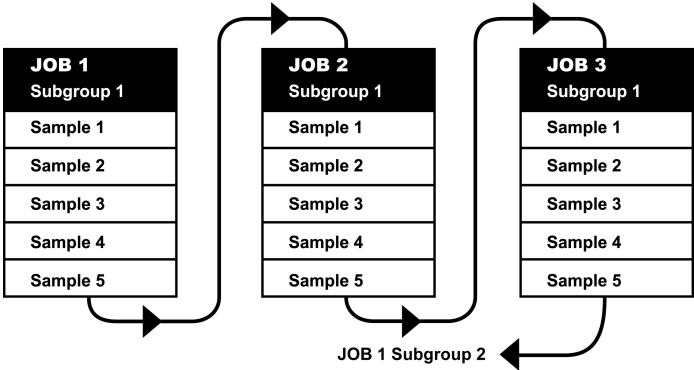
A type of measurement which follows the changing torque values imposed on a transducer as torque is applied. The display will return to zero after the torque is removed.

Vertical Sampling

Collection of data by round, where a full subgroup is collected for a Job, before stepping to the next Job.

See diagram on following page.

NOTE: If there is one reading per subgroup, the vertical round is identical to a horizontal round.



Vertical plus Prompt

Identical in procedure to that of Vertical mode except that before stepping to the next Job, IQWrench2 Opta will prompt for the rest of the job to start and will require the ENTER key to be pressed.

UCL

The Upper Control Limit as set in the Setup parameters. (if control limits enabled)

Units

It is possible with IQWrench2 Opta to measure torque, and convert internally to display and store in any of the other torque measurement units as specified.

Units available - Nm; kgfcm; kgfm; lbin; lbft; Ncm.

Will only display in units that allow torque to be displayed in 4 significant figures for that span of wrench.

USL

The Upper Specification Limit as set in the setup parameters.

2nd Parameter

A second set of values for measuring either torque or angle at the same time.