

Electronic torque wrenches of the RF411 series (hereinafter, wrenches) are designed for high accuracy tightening of critical threaded joints with specified torque.

1. BASIC TECHNICAL CHARACTERISTICS

Model	RF411-10	RF411-20	RF411-50
Measurement range, Nm (FtLbs)	0...10 (0...7,5)	2...20 (1,5...15)	5...50 (3,8...38)
Measurement error	1% of range		
Indication discreteness, Hm (FtLbs)	0,02	0,1	0,1
Overload margin	25% of range		
Size of attachment square (inch or mm)	1/4" or 6,3x6,3		
Weigh, kg	0,35	0,35	0,45
Dimensions	figure 1,		
Power supply	3 x LiMH 1000 mAh		
Continuous operation, hour	200		

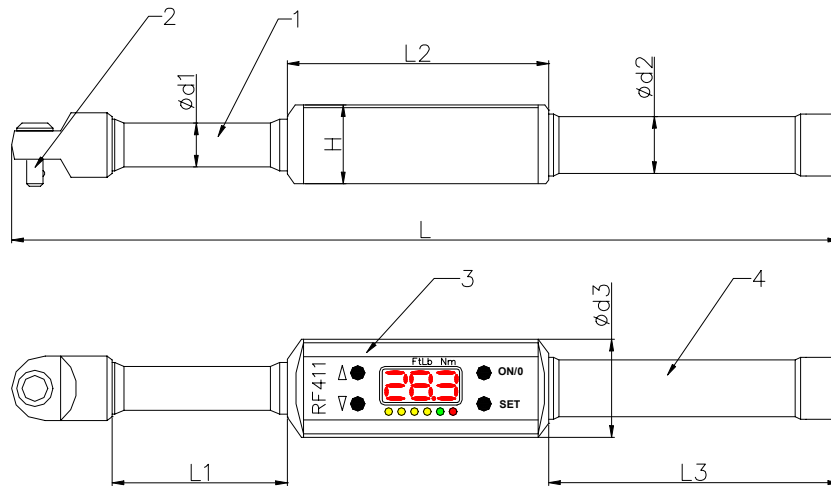
2. DELIVERY SET

Name	Quantity
Electronic torque wrenches of the RF411 series	1 piece
Charger	1 piece
Passport	1 piece
Case	1 piece

3. GENERAL

3.1 Designe

The wrench (fig.1.) consists of: resilient element 1 with tetrahedron 2, electronic module 3 of control and display, knob 4.



Model	L1	L2	L3	L	H	d1	d2	d3
RF411-10	98	102	90	329	31	17	22	38
RF411-20						18		
RF411-50			100	339		19		

3.2 Description of the front panel

On the front panel of electronic module (fig.2.) the following parts are situated:

- button 7 ("ON/-0-") to turn on the power and for the reset of the numeric display indication;
- button 8 ("SET") to set up (select) the wrench operation mode;
- button 1 (with "Δ" symbol) to increase the parameters;
- button 2 ("∇") to decrease the parameters;
- digital display 3 showing the current and preset parameters;
- four yellow signaling LEDs 4 that indicate the attainment of 20, 40, 60 and 80% of minimum allowable torquing;
- green LED 5 to signal the minimum allowable torque M_{min} ;
- red LED 6 to signal attainment of the maximum allowable torque M_{max} .

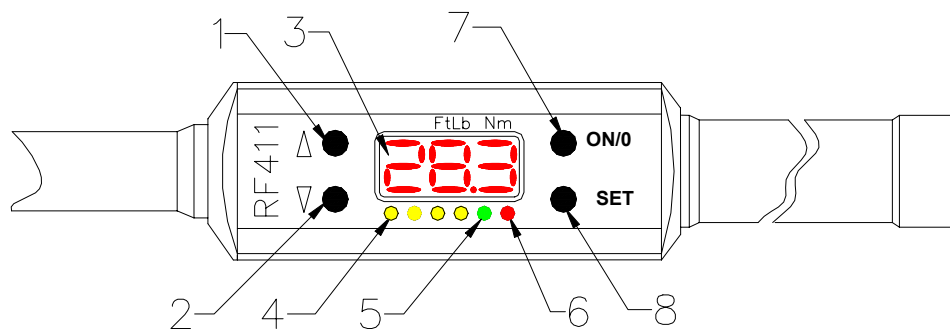


Figure 2

3.3 Charging device connection

There is a battery compartment to connect the charging device on the back panel.

4. OPERATION PRINCIPLE

4.1. As a threaded joint is tightened and torque is applied to the knob, the torque is imparted through the body to the resilient element and its tetrahedron with the end head. Torsional deformation of the resilient element is transformed into the linear displacement that is measured by the transducer, built in the wrench. Displacement data are sent to the electronic module in the form of a sequence of electric pulses, processed and translated to indicate the torque value.

4.2. In operation, the electronic module continuously measures the torque and shows its current values on the display. When torque is stopped or decreased, the electronic module stores the maximum torque value attained in this tightening cycle in the memory and shows it on the display. With subsequent loading of the wrench, readings of the display will go up only after the applied torque attained previously and indicated on the display has been surpassed.

4.3. The buttons on the front panel of the wrench allow presetting two threshold torque values: the maximum allowable value M_{max} and the minimum allowable value M_{min} . The attainment of these values is automatically controlled during the operation and indicated by the LED and sound alarm signals. The procedure of threshold values setting is described in **5.4.** section.

4.4. With the help of front panel buttons one can review the value of battery voltage, set sound signal tone, display brightness and choose the units of measurement and indication of tightening torque: Nm or FtLbs. The setting procedure is described in **5.5.** section.

5. PREPARING FOR WORK

5.1 Wrench turn-on

Before placing the wrench onto the threaded joint one should power the wrench up by pressing "ON/0" button. After the power is turned on the display will show blinking underlining symbol under the chosen measurement unit (Nm or FtLbs) for a short time and afterwards it will display "0.0". The wrench is ready for work. At this moment, threshold torque values M_{min} and M_{max} will be the same as those set during the last operation of the wrench since all the wrench parameters are kept in the nonvolatile memory.

5.2 Wrench charging

With the power up, supply voltage of the device is automatically checked, and if it is found to be lower than the control value an "ErP" symbol appears on the display. At that it is necessary to charge the batteries. Charging is performed by the charging device from the RF411 delivery set. The period of charging is 14 hours.

5.3 Preset thresholds viewing

To view the preset threshold torque values it is necessary to do the following:

- press "SET" button. The minimum allowable value M_{min} is showed on the numeric display device, green signaling LED is alight;
- press "SET" button. The maximum allowable value M_{max} is showed on the numeric display device, the red signaling LED is alight;
- press "SET" button. The numeric display device will show "0.0". The wrench is ready for work.

5.4 Thresholds changing

The change of threshold values M_{min} and M_{max} can be performed by the next way:

- press "SET" button. The preset value of M_{min} is indicated on the numeric display and the green LED is lightened;
- to change torque value it is necessary to use increasing " Δ " and decreasing " ∇ " buttons. A single pressing of any of the buttons changes the torque value by 1. By keeping the button in pressed position it is possible to quickly scan the whole range of values;
- after the required value of M_{min} is set on the display device, press "SET" button for the second time to enter it into the wrench memory;
- the red signaling LED lights up at putting M_{min} into the wrench memory and the display device shows the preset M_{max} value. In order to change it one should use increasing " Δ " and decreasing " ∇ " buttons again;
- to enter the set M_{max} value into the wrench memory it is necessary to press "SET" button for the third time;
- the numeric display device will show "0.0". The wrench is ready for work.

5.5 Parameters viewing and setting

The wrench makes it possible to review the value of battery voltage, to set sound signal tone, display brightness and choose the units of measurement.

5.5.1 Battery voltage review

Press " ∇ " button after turning on the power and, holding it, press "SET" button. The display will show the value of battery voltage.

5.5.2 Sound signal setting

To pass on to the sound signal setting mode one should press "SET" button. The current value of sound signal tone will appear on the display. Use " Δ " and " ∇ " buttons to change it. Press "SET" button to memorize the chosen sound signal tone value.

5.5.3 Brightness setting

While memorizing the sound signal the turn to the display brightness setup mode occurs. The display shows current value of brightness. In order to change it use " Δ " and " ∇ " buttons. Press "SET" button to memorize the chosen brightness value.

5.5.4 Measurement units choosing

While putting the brightness value into the memory there occurs the pass to the mode of measurement units choosing. The display shows underlining symbol under the chosen measurement units (Nm or FtLbs). Use " Δ " and " ∇ " buttons to change it. Press "SET" button to memorize the choice.

In this case the display shows "0.0" and the wrench is ready for work.

6. WORKING WITH THE WRENCH

6.1. Place the wrench onto threaded joint using the corresponding interchangeable end heads.

6.2. While holding the wrench with your left hand by the head of the resilient element, apply torque to the knob with your right hand watching its current value on the display until the green LED goes up and a short sound signal is produced by the acoustic head thus indicating attainment of preset minimum allowable value M_{\min} and coming of the load within the permissible torque range. At this point, the torque must be lifted, thus, finishing tightening of the joint. After unloading the green LED will remain lit, the alarm sound signal will stop, and the display will show a fixed maximum value attained in this joint tightening cycle.

6.3. Reset display readings to "0" by pressing the "ON/-0-" button after the wrench has been lifted from the joint. The display will show "0.0", and the wrench is ready for use for tightening the next threaded joint.

6.4. If, for any reason, tightening process continues after the torque M_{\min} value has been reached, red LED will go up and a prolonged alarm sound signal will be produced when the maximum allowable preset torque value M_{\max} is surpassed, indicating that the load has gone beyond the preset permissible torque range. After the load is lifted, the red LED will remain lit, the alarm sound signal will stop, and the display will fix the maximum value attained in this joint tightening cycle. In this case, the joint should be turned off with subsequent tightening to a preset allowable torque value.

6.5. If a preset torque value is attained by a succession of several loading steps, each followed by lifting of the load, the display will show maximum load value reached on a given joint tightening step.

6.1 Wrench turn-off

If no torque has been applied to the wrench for one minute from the moment of the last loading, the wrench is automatically de-energized. In this case, the "ON/-0-" button should be pressed to continue operating the wrench, the display will show "0.0", and the device is ready for work. Besides, it is possible to turn off the wrench by simultaneous pressing " Δ " and " ∇ " buttons.

7. CALIBRATION OF THE WRENCH

To ensure operation of the wrench within the declared accuracy range, periodic calibration is required. Calibration of the wrench consists in loading it with the torque of the given value in two

points of the working range and determining the calibration constants corresponding to these points. Preferably, the first loading point should correspond to 10 % of a working range, the second point should be settled maximum close to the end of the range. While calibrating the calibration constants are saved in the wrench memory and can be changed at the consequent calibrations. **Calibration of the wrench is made after its fabrication or repair as well as after testing which showed unsatisfactory results.**

7.1 Calibration apparatus

An example of wrench calibration apparatus is shown in figure 3. The apparatus consists of the base 1 to fix the wrench 2 in the horizontal position, extender 3 and bracket 4 with ball bearing 5, weight 6. Other ways of constructing the apparatus are also possible, but it is necessary to place the wrench frame horizontally within 5^0 . The effective torque value M_{eff} applied to the wrench is defined by the formula:

$$M_{\text{eff}} = P * L \quad (1)$$

where P is the force acting on the lever, N;

L is the distance from the wrench rotation axis to the point of force application, m.

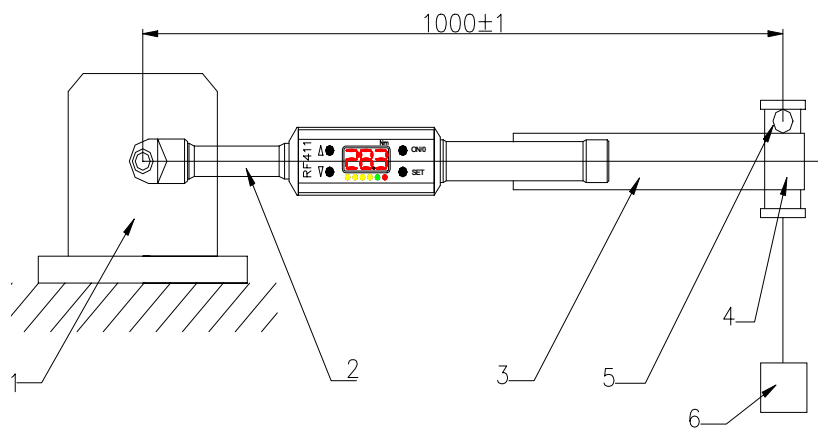


Figure 3

7.2 Calibration procedure

Calibration should be carried out in accordance with the following procedure:

- fix the wrench horizontally on the calibration apparatus;
- to stabilize performance of the resilient element, load the wrench with the torque value corresponding to the upper bound of the measurement range and leave it in this position for 5 minutes;
- lift the load;
- power up the wrench.

The following steps should be done:

- switch the wrench to the calibration mode as follows: press the " Δ " button and, keeping it pressed, press and release the "SET" button;
- when the display shows the symbol "Clb", release the " Δ " button;
- press and release the "SET" button, the display will show the load value corresponding for the first loading point and green LED will go up;

- calibration torque can be changed if necessary by using "∇" and "Δ" buttons;
- press "SET" button, the display will show the value of the calibration constant for the first calibration point which has been obtained in the previous calibration session;
- press "∇" button, display indicates "0.0" value;
- load the wrench with the torque value corresponding to the first calibration point. Loading should be effected by hanging standard force measures to the apparatus carrier. Deviation of the rod from horizontal position should not be more than 5^0 ;
- with the wrench loaded with the torque corresponding to the first calibration point, the display shows the value of a new calibration constant;
- press "SET" button, the display will show the torque value corresponding to the second calibration point, the red LED goes up;
- calibration torque can be changed if necessary by using "∇" and "Δ" buttons;
- load the wrench with the torque corresponding to the second calibration point;
- the display shows the value of a new calibration constant, corresponding to the second calibration point;
- press "SET" button, the display will show "Clb";
- to enter the constant to the device memory, press "SET" button holding "Δ" button (pressing "SET" button with released "Δ" button will not provide storing). Display will indicate "0.0" value;
- lift the load, remove the wrench from the calibration apparatus, press the "ON/-0-" button and perform testing of the wrench in the whole measurement range.

7.3 Calibration points viewing

The wrench makes it possible to browse torque values of the first and second calibration points and the corresponding calibration constants. To browse do the following:

- switch the wrench into the calibration mode as follows: press the "Δ" button and, keeping it pressed, press and release the "SET" button;
- when the display shows the symbol "Clb", release the "Δ" button;
- at successive pressings of the "SET" button the indicator shows consecutively the value corresponding for the first calibration point and the calibration constant, correspondig to it, the torque value corresponding to the second calibration point and the calibration constant, correspondig to it;
- when browsing is completed, the "ON/-0-" or "SET" button should be pressed; the display will show "0", and the wrench is ready for work.

8. SECURITY MEASURES INSTRUCTIONS

8.1 Working with the wrench on the industrial equipment, the following security measures requirements are to be fulfilled: it is necessary to place and lift the wrench with two hands, do not allow falling it down on the floor or shelf;

8.2. Perform tightening the threaded joint smoothly, without jerks.

8.3. While using, the wrench overload should not be over 25% of upper end of measuring range.

9. WARRANTY POLICY

Warranty assurance for the electronic torque wrench- RF411 12 months from the date of putting in operation; warranty shelf-life - 12 months.