The Drive & Control Company

Rexroth
Bosch Group

Nexo cordless Wi-Fi nutrunner by Rexroth

Project planning
3 608 870 A47/05.2017

Version AE
EN

The data specified serve to describe the product. Instructions on use, if any, only constitute application examples and suggestions. Catalog specifications are no warranted properties. The information given does not release the user from the obligation of own judgment and verification. Our products are subject to a natural process of wear and aging.

The title page shows an exemplary configuration. The supplied product may therefore vary from the illustration.

The original instructions were written in German.

Title Nexo cordless Wi-Fi nutrunner by Rexroth

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Purpose of documentation This documentation describes the *Nexo cordless Wi-Fi nutrunner by Rexroth*.

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Note Original documentation. This documentation is available as a PDF file.

Contents

1 About this documentation

This chapter contains general information on the present documentation.

1.1 Overview of this documentation

This documentation describes the tightening system in the following chapters:

Chapter	Title	Contents
1	About this documentation	Scope of this document, abbreviations, representations used, glossary.
2	Safety instructions	Safety precautions on how to avoid hazardous situations when using Rexroth tightening systems. Information on the intended use of Rexroth tightening systems.
3	Introduction	This chapter: Definitions, system structure, components, integration in an overall system.
4	Assembly	Assembly options for the Nexo cordless Wi-Fi nutrunner
5	Construction Guidelines	Planning as well as construction of a tightening system regarding the tightening cases to be processed with the system.
6	Control signals	Signals of the tightening controller (PLC), control signals for the tightening cell, PLC tables.
7	Data services	Available data services, e. g. exchange of data regarding tightening results and ID codes between the Nexo cordless Wi-Fi nutrunner and partner controllers.
8	Commissioning	All steps required for commissioning the Nexo cordless Wi-Fi nutrunner.
9	Operating system NEXO-OS	Browser-based operating system NEXO-OS: configuring and controlling the Nexo cordless Wi-Fi nutrunner from any computer.
10	Tightening processes	Various tightening program step types.
11	Troubleshooting	Troubleshooting by means of hardware and software, error hierarchy with error code tables.
12	License agreement	License information
13	Service and sales	Options for contacting Rexroth, sources for additional information on the tightening system.

1.2 Scope of the documentation

All of the information provided in this document refers to the *Nexo cordless Wi-Fi nutrunner by Rexroth*.

The *Nexo cordless Wi-Fi nutrunner by Rexroth* can be connected to and operated with the *Rexroth Tightening System 350* with software version V2.300 and higher.

1.3 Additional documentation

- Please also observe the current instructions for all tightening system components, as well as the documentation of the machine or system manufacturer.

You can find current documentation for project planning, as well as related documents, in the media directory at:
www.boschrexroth.com/various/utilities/mediadirectory/index.jsp?publication=NET

- Please also observe the generally applicable, legal or otherwise binding regulations of European or national legislation and the rules for the prevention of accidents and for environmental protection applicable in your country.

1.4 Representation of information

This section shows how the data, e.g. safety instructions, and symbols are represented in the present documentation.

1.4.1 Safety instructions

In this documentation, safety instructions precede an instruction when there is the danger of personal injury or damage to equipment. The hazard avoidance measures described must be observed.

Safety instructions have the following structure:

⚠ SIGNAL WORD

Type of DANGER

Consequences

▶ Precautions

- **Safety sign (warning triangle)**: draws attention to the danger
- **Signal word**: identifies the degree of the risk (type of risk)
- **Type of danger**: identifies the type or source of the danger
- **Consequences**: describes what occurs when the safety instructions are not complied with
- **Precautions**: states how the risk can be avoided

Warning symbols (e.g. dangerous electric voltage) warn of dangers and consequential damages or denote prohibitions. This documentation uses the following warning symbols:

Table 1–1: Warning symbols used

Symbol	Meaning
	This warning symbol cautions against dangers to your health. Observe all safety instructions that follow this symbol to avoid possible injuries or death.
	This warning symbol cautions against dangers to your health caused by electric voltages or currents. Observe all safety instructions that follow this symbol to avoid possible injuries or death.

The safety instructions describe the following types of risk. The type of risk describes the risk if the corresponding safety instruction is not observed. The signal words have the following meanings:

⚠ DANGER

Death or serious bodily harm will result.

⚠ WARNING

Death or serious bodily harm may result.

⚠ CAUTION

Bodily harm or damage to equipment may result.

NOTE

Damage to equipment may result.

If this information is not observed, the operating procedure may be impaired.

1.4.2 Symbols and representations

Table 1–2: Symbols and representations used in the documentation

Symbol	Explanation
✓	**Prerequisite** Ensure that the stipulated prerequisite is met before proceeding to the next step.
▶	**Step** This symbol indicates an individual step.
1. 2. 3.	**Sequence of steps** Take the steps specified while following the order specified.
↳	**Result** This symbol indicates the result of a step.
Example	Examples are in a gray field and illustrate the previously stated information.
	A tip provides additional information that is not decisive for working with the tightening system, but is **important** and **useful**.
Blue text	References to other sections are shown in blue. Click the reference in the PDF to jump directly to the referenced target.
Bold text	Special text is shown in bold. This includes operating elements, screen displays, or important text passages.
<n>	Angle brackets indicate a variable value that can be replaced with a specific value in the concrete case.

1.4.3 Terms

DMS Strain gauges. Measuring device that changes its electrical resistance in case of deformations even if these are minor and is thus used as a strain gauge sensor.

Torque filter factor Additional parameter for determining the gradient.

NX-SD Micro SD card On delivery, the NX-SD Micro SD card inserted in the Nexo cordless Wi-Fi nutrunner contains documentations and license information.

Ring memory Limited storage is available in the ring memory. The oldest data will be overwritten with the latest data if more storage space is required.

Tightening process The tightening process describes the entire tightening procedure including the various individually parameterized tightening program steps (such as "finding", "driving in" "tightening", etc.) until the target function is reached (torque, angle, etc.).

Tightening application Within a tightening application (also called application), 1 to a maximum of 40 tightening channels are coordinated.

Tightening channel Where the Nexo cordless Wi-Fi nutrunner is concerned, this refers to the nutrunner itself.

A tightening channel in the Tightening System 350 comprises the necessary components for tightening. This includes the complete tightening spindle, controller, servo amplifier, and connecting cable.

Tightening program The tightening program coordinates the tightening process/sequence. It is divided into various tightening steps, where tightening parameters are set.

Tightening position The tightening position is the defined location where tightening is performed using a tightening channel and a tightening program.

Tightening system A tightening system is a complete system with all tightening channels that are needed to carry out the defined tightening case.

Tightening cell The Nexo cordless Wi-Fi nutrunner is a separate tightening cell which features a data interface for communication with an operating program or a partner controller.

Torque threshold The torque threshold is a parameter to help measure the angle of turn for a target or monitoring function. The monitoring function of the angle is started as soon as the measured torque for the bolt reaches the value for the torque threshold for the first time. Afterwards, the torque threshold has no more influence on the tightening process, except for angle correction.

Chord angle The chord angle is an additional parameter for determining the gradient.

Controller Where the Nexo cordless Wi-Fi nutrunner is concerned, the controller is the tightening controller integrated in the nutrunner.

Monitoring function The monitoring function keeps track that the upper and lower limits are complied with during the tightening process by checking a monitoring parameter (e.g. gradient).

If the monitoring function has switching capabilities, the tightening step will be terminated immediately if a limit is exceeded. If it is has no switching capabilities, the step result changes to NOK, even if the target parameter has been reached.

Monitoring parameter The monitoring parameter is the measured quality (e.g. gradient) of a tightening step that must be kept within specific limits in order for a tightening process to be performed safely. If the limits are violated, the tightening step may be terminated.

Angle correction The angle correction is an additional parameter to measure the angle of turn. Since the angle of turn is never measured directly on a bolt, but above the output drive, there is a small deviation between the measured angle and the angle on the bolt as a result of the torsion of the output drive due to the torque. This deviation can be avoided with an angle correction at the end of the tightening process (never during tightening!). The angle value measured at the end of tightening after falling below the torque threshold is then used as the target or last monitoring parameter (the torsion of the output drive has then reset itself).

Target function The target function controls the process sequence of the tightening step by monitoring the target parameter (e.g. torque) and ends the step once the parameter has reached its target value.

Target parameter The target parameter is the measured variable (e.g. torque) of a tightening step, which must reach a specific value (target value) for a tightening process to be performed successfully. The tightening step is terminated once the target value has been reached.

Additional function The additional function defines further parameters for the tightening step. Although they have an effect on the tightening process (e.g. start-up suppression, speed setting), additional functions cannot interrupt it. They do not carry out an OK/NOK evaluation.

Additional parameters Additional parameters are parameters of a tightening step which cannot interrupt the tightening process (e.g. target speed, torque threshold) although they have an effect on it.

1.4.4 Abbreviations

This documentation uses the following abbreviations:

Table 1–3: Abbreviations for the components of the Nexo cordless Wi-Fi nutrunner

Abbreviation	Explanation
BT356	Subrack system 350 for max. 6 tightening channels
BS350	Operating System 350
CS	Compact System
ES	ErgoSpin hand-held nutrunner
HMI	Human-machine interface
IL	Integrated logic
KE350	System 350 communication unit without DVI interface
KE350G-IL	System 350 communication unit with DVI interface and integrated logic
LT35x	Size-dependent servo amplifiers for System 350 stationary tightening technology
LTS350D	Servo amplifier for tightening spindle
LTU350/1	Servo amplifier for System 350 ErgoSpin
LTE350D	Servo amplifier for System 350 ErgoSpin
MC/DMC	Measurement transducer
NK350	System 350 network coupler
NK350S	System 350 network coupler with external power supply
NXA	Nexo right-angle nutrunner

Table 1–3: Abbreviations for the components of the Nexo cordless Wi-Fi nutrunner

Abbreviation	Explanation
NXP	Nexo pistol grip nutrunner
SB356	System 350 system box for max. 6 tightening channels
SE352	System 350 controller for two-channel operation
SE352M	System 350 controller for two-channel operation with slot for B module
PLC	Programmable logic controller

2 Safety instructions

This chapter describes cardinal safety requirements to be met during operation of the Rexroth Tightening System 350 and the Nexo cordless Wi-Fi nutrunner by Rexroth (referred to as Rexroth tightening system below). It contains important information that is necessary for the safe use of the Rexroth tightening system.

2.1 About this chapter

2.1.1 Using and communicating the safety instructions

Read all supplied documents carefully before installing any components or commissioning the Rexroth tightening system. Read these safety instructions and all other user information each time before working with the Rexroth tightening system. If you do not have a copy of the user information for the Rexroth tightening system and components, please contact your Bosch Rexroth sales representative. Request that documents be immediately sent to the person responsible for safe operation of the Rexroth tightening system.

If the Rexroth tightening system and components are sold, lent, or otherwise passed on within the European Union (EU), these safety instructions must also be included in the language of one country of the European Union.

⚠ WARNING

Risk of injury!

Improper use of the Rexroth tightening system and components, non-compliance with the safety warnings stated here, or improper interventions in the safety equipment can cause damage to equipment, injury, electric shock, and even, in extreme cases, death.

- ▶ Observe the safety instructions.

2.1.2 Instructions for use

To prevent injury and/or damage to equipment, read the following instructions before commissioning the Rexroth tightening system and components. These safety instructions must be observed at all times.

- Bosch Rexroth AG does not assume any liability for damages resulting from non-compliance with the safety warnings in this documentation and in the documentation of all the Rexroth tightening system components.
- Read the operating, maintenance, and safety instructions prior to commissioning. If the documentation in the available language is not clearly understood, please contact the supplier and inform him of this.
- The prerequisites for correct, safe operation of the Rexroth tightening system are: proper transportation, storage, assembly, and installation, as well as careful operation and maintenance.
  - Check the product for visible defects, for example cracks in the housing or missing screws and seals.
  - Before commissioning, make sure that all the connection gaskets and plugs are installed correctly to ensure that they are leakproof and fluids and foreign bodies are prevented from penetrating the product.
  - Make sure that all electrical connections are either used or covered. Commission the product only if it is installed completely.
  - Only use Rexroth products within the performance range specified in the respective technical data.
  - Do not expose Rexroth products to any mechanical loads under any circumstances. Never use Rexroth products as a handle or step. Do not place any objects on Rexroth products.
- Only use accessories and spare parts that are approved by the manufacturer.
- Observe the safety regulations of the country in which the Rexroth tightening system and components are used.
- Rexroth tightening system components are designed for installation in machines used in industrial applications.
- Always observe the ambient conditions specified in the product documentation of the respective component.
  - Let new components acclimate for several hours before commissioning. Otherwise, water may condense, e.g. in the control housings.
  - Make sure that all electrical connections are either used or covered. Commission the component only if it is installed completely.
- Safety-relevant applications are only permitted if they are clearly and explicitly stated in the planning documents. If this is not the case, they are excluded.
  Safety-relevant applications are all applications that may result in injury to personnel or damage to equipment.
- In the respective product documentation, information is provided regarding use of the supplied components. These are application examples and suggestions only.
  The machine manufacturer and system installer must check that
  - the supplied components and specifications made in the respective documentation are suitable for the application on hand, and that they
  - correspond to the safety regulations and standards valid for that application. The machine manufacturer and system installer must implement the required measures, modifications, and amendments.
- Commissioning of the supplied components is prohibited until it has been determined that the machine or system in which they are installed corresponds to country-specific provisions, safety regulations, and standards for the specific application.
- Operation is only permitted in accordance with the national EMC regulations for the respective application.

- For instructions on EMC installations, refer to the documentation for the respective component. The manufacturer of the system or machine is responsible for maintaining the limit values required by national regulations.
- The technical data, connection conditions, and installation conditions can be found in the corresponding product documentation and must be complied with at all times.
- The Compact System CS351 is not designed to be directly connected to the public low-voltage power supply, but is only intended for use in industrial environments (emission class A).

Country-specific regulations that the user must observe

- European countries:
  - Corresponding EN European standards
- United States of America (USA):
  - National Electrical Code (NEC),
  - National Electrical Manufacturers Association (NEMA), as well as regional building codes
- Canada
  - Canadian Standards Association (CSA)
- Other countries:
  - International Organization for Standardization (ISO)
  - International Electrotechnical Commission (IEC)

2.1.3 Operating instructions

Observe the regulations for accident prevention and environmental protection for the country where the product is used and at the workplace.

Only allow persons who are authorized by the operator to access the system's direct operating area. This is also valid when the system is standing still.

In case of an emergency, fault or any other anomalies, switch the system off and protect it against being switched on again.

Only operate the control and power electronics for Rexroth tightening technology in a grounded network. Operation in non-grounded networks (IT network) is not permitted, as clearance and creepage distances in the system may be overloaded. Here, protective grounding is the permissible protective measure in accordance with EN 50178. The inlet cables to the control and power electronics must be equipped with a protective conductor (PE).

Make sure that there is potential equalization between the workpiece and nutrunner, as well as its carrier plate, so that potential equalization is ensured for all system components.

Protect the system from short circuits in the connector cables with a fuse provided by the customer.

2.1.4 Cleaning instructions

Observe the following notes in order to guarantee the IP protection classes of the components (IP54 when assembled):

- ▶ Cover all openings in Rexroth tightening system components with the appropriate protective equipment in order to prevent detergents from penetrating the system.
- ▶ Never use solvents or aggressive detergents.
- ▶ Do not use a high-pressure cleaner for cleaning.

Also observe the cleaning instructions in the operating instructions for the respective system component.

2.1.5 Maintenance and repair instructions

- Perform the prescribed maintenance work at the intervals specified in the operating instructions for the respective system component.
- Make sure that no lines, connectors or components are disconnected as long as the system is under pressure and voltage.
- After the system is switched off, protect it from being switched on again.

NOTE

Stable tool quality
Recommendation
- To ensure stable tool quality, a machine capability test (MCT) should be carried out at regular intervals.
- The MCT should comply with VDE/VDI2645 Sheet 2.
- Bosch Rexroth Service provides this service

2.1.6 Disposal instructions

- Dispose of Rexroth products in accordance with the currently applicable regulations in your country.

2.2 Intended use

2.2.1 Introduction

Bosch Rexroth products are developed and manufactured in accordance with the latest state of technology. They are checked for safe function before delivery.

The products may only be used as intended. If they are not used as intended, this may result in situations that cause injuries and damage to equipment.

As the manufacturer, Bosch Rexroth does not grant any warranty, assume any liability, or provide compensation for damages caused by improper use of the products. The user is solely responsible for risks caused by improper use of the products.

Before using any product from Bosch Rexroth, the following prerequisites must be fulfilled to ensure intended use:

- ✓ Anyone who deals with our products in any manner must read and understand the appropriate safety instructions and information on intended use.
- ✓ If dealing with hardware products, they must be kept in their original state, i.e. no modifications may be made to them. Software products may not be decompiled and the source code may not be changed.
- ✓ Damaged or faulty products may not be installed or commissioned.
- ✓ Before commissioning, ensure that the current firmware version (release or SP) is installed on the controllers.
- ✓ Make sure that the products have been installed in accordance with the specifications listed in the respective documentation.

2.2.2 Application areas

The Rexroth tightening system is a system used to perform, document, and analyze tightenings in accordance with freely programmable sequences.

See the associated documentation for information on the application areas for the respective components.

As the manufacturer, Bosch Rexroth does not grant any warranty, assume any liability, or provide compensation for damages caused by improper programming or configuration of the tightening system. The user is solely responsible for risks caused by programming and configuration of the tightening system.

Only accessories and add-on units that have been approved for use in Rexroth tightening systems may be used therein. Non-approved components may neither be added nor connected to the system. The same applies to cables and lines which belong to the Rexroth tightening system. Otherwise, functional and system safety is jeopardized.

The Compact System CS351 is not designed to be directly connected to the public low-voltage power supply, but is only intended for use in industrial environments (emission class A).

2.3 Improper use

Use of the Rexroth tightening system and components for any application not listed herein, or under operating conditions other than those described in the respective documentation and technical information, is considered improper use.

The Rexroth tightening system and components may not be used:

- If subjected to operating conditions that do not fulfill the specified ambient conditions. Operation is forbidden e.g. under water, at high air humidity, under extreme temperature fluctuations, or under extreme maximum temperatures.
- If used in applications that have not been explicitly approved by Bosch Rexroth. Always observe the safety instructions in the respective documentation.

2.4 Personnel qualifications

Rexroth tightening systems may only be used by trained and qualified personnel. That means:

- Only appropriately trained and qualified personnel are permitted to work with or near the Rexroth tightening system. Personnel are qualified if sufficiently familiar with assembly, installation, and operation of the Rexroth tightening system and components, as well as all warnings and precautionary measures in accordance with this documentation and the documentation of the respective component.
- Personnel must also be trained, instructed, or authorized to switch electrical circuits and devices on and off in accordance with the accepted rules of safety and current technology, ground them, and mark them according to the job requirements. Personnel must have appropriate safety equipment and be trained in first aid.
- Persons who assemble, operate, disassemble, or maintain Rexroth products must not consume any alcohol, drugs, or pharmaceuticals that may affect their ability to respond.

2.5 General safety instructions

This chapter describes general safety instructions for accident prevention. These safety instructions warn of general dangers that may e.g. result from the use or disposal of the product (or components thereof).

DANGER

High voltage and high operating current! Danger to life or risk of serious injury due to electric shock!

DANGER

Dangerous movements! Danger to life, risk of serious personal injury or property damage due to unintended motor movements!

WARNING

High voltage due to improper connection! Danger to life or risk of serious injury due to electric shock!

WARNING

Health risk for persons with pacemakers, metal implants, and hearing aids in the immediate vicinity of electrical equipment!

CAUTION

Hot surfaces possible on device housing! Risk of injury! Risk of burns!

CAUTION

Risk of injury due to improper handling! Injury due to crushing, shearing, cutting, impact, or improper handling of pressurized lines!

2.6 Product-related safety instructions for the Nexo cordless Wi-Fi nutrunner by Rexroth

In this chapter, general safety instructions are listed that relate to the technology used in the product.

2.6.1 General product-dependent instructions

- The warranty only applies to the delivered configuration.
- The warranty will not apply if the product is incorrectly assembled or handled or not used as intended.

Use and handling of the electric tool

⚠ CAUTION

Improper handling!

Damage to persons and property

- Keep the electric tool away from rain or moisture. Water penetrating into the electric tool will increase the risk of electric shocks.
- Secure the workpiece. A workpiece that is held by clamping devices or a vise is held more safely than if its held by hand.
- Hold the electric tool firmly and do not clamp it in a vise When tightening and loosening screws, high reaction torques may occur for short periods of time.
- Do not expose the electric tool to inadmissible mechanical loads under any circumstances. Never use the electric tool as a lever or hammer. Do not place any objects on it.
- Prior to performing any work on the electric tool (e.g., maintenance, tool replacement, etc.) and during transport and storage of the tool, put the program selector to its center position. You might be injured if you unintentionally operate the on/off switch.
- Only operate the electric tool with closed interface cover.

Using and handling the electrical tool with battery

⚠ CAUTION

Improper handling!

Damage to persons and property

- Remove the battery before making mechanical product settings and changing accessories. This also applies when you will not use the electrical tool for a prolonged time period. This precaution prevents the unintentional start of the electric tool.
- Only use original Rexroth batteries NX-BP36V. When using other batteries, e.g. imitations, reused batteries or third-party products, the battery may explode and cause injuries or damage to property.
- The battery is delivered partly charged. To ensure full battery power, fully charge the battery in the charger before using it for the first time.
- Only use chargers recommended by the manufacturer to charge your batteries. If a charger that is suitable for a certain type of battery, is used with other batteries it might cause a fire.
- Only use the battery with your Rexroth electric tool. This protects the battery from dangerous overloads.
- Only use the batteries intended for this purpose in the electric tools. The use of other batteries may cause injuries and a fire risk.
- Keep the battery away from rain or moisture. There is a risk of short-circuit.
- Protect the battery from heat, e.g. from permanent exposure to sun, and fire. The battery might explode.
- If the battery is damaged or not used as intended, vapors might escape. Ventilate the area with fresh air and consult a doctor if you experience any discomfort. The vapors may irritate the airways.
- If the battery is used incorrectly, fluids might leak from the battery. Avoid any contact with the fluid. If you do have unintended contact, flush with water. If the fluid gets in the eyes, seek medical help as well. Leaking battery fluid may irritate or burn the skin.
- Do not short-circuit the battery. The battery might explode.
- Do not open the battery. There is a risk of short-circuit.
- Keep the unused battery away from paper clips, coins, keys, nails, screws and other small metallic objects which might bridge the contacts. There is a risk of short-circuit.
- Do not use batteries if their housing or contacts are damaged. There is a risk of short-circuit.

Use of the electric tool with barcode scanner

⚠ CAUTION

Laser radiation – Laser class 2! Light emission in the visible range!

Looking directly into the radiation source of the barcode scanner (class 2 laser with low-energy diode) may result in damages to the eyes (retina).

- Do **not** look directly into the laser beam.
- Do **not** manipulate the laser source as this may result in an uncontrolled emission of hazardous laser radiation.
- Do **not** change the specified values as this may result in an uncontrolled emission of hazardous laser radiation.

Protection against the improper handling of the hand-held nutrunner

⚠ CAUTION

Improper handling!

- Check whether movable parts of the device function properly and do not jam, whether parts are broken or damaged in a way that the functioning of the hand-held nutrunner is compromised. Have damaged parts repaired before using the hand-held nutrunner.
- Use the hand-held nutrunner, accessories, attachment tools etc. in accordance with these instructions and as intended for this specific device type. Take into account the working conditions and the task you are to perform.
- Do not overestimate yourself. Make sure to stand safely and keep your balance.
- Do not overload the hand-held nutrunner.
- Maintain the hand-held nutrunner with care.

⚠ CAUTION

Risk of injury due to moving parts!

Loose clothes, jewelry or long hair may be caught in moving parts.

- Wear appropriate clothes.
- Do not wear loose clothes or jewelry.
- Keep hair, clothes and gloves away from moving parts.

Protection against loss of data

Do not insert or remove the NX-SD Micro SD card while the system is live.

2.6.2 Safety warning sticker

Table 2–1: Meaning of the symbols

Symbol	Meaning
	**Read all safety instructions and instructions.** Non-compliance with the safety instructions and instructions may cause electric shock, fire and/or serious injuries.
	For EU countries only: According to the European directive 2002/96/EC electric tools that can no longer be used and according to the European directive 2006/66/EC defective or drained accumulators/batteries must be collected separately and recycled in line with environmental regulations.

2.7 Product- and technology-dependent safety instructions for the Rexroth tightening system 350

2.7.1 Protection against accidental contact with electrical parts

This section only applies to devices and components with voltages above 50 V.

Contacting parts with voltages greater than 50 V can be dangerous to persons and lead to electric shock. When operating electrical equipment, it is unavoidable that some parts of such equipment conduct dangerous voltage.

DANGER

High voltage!

Danger to life, risk of injury due to electric shock, or risk of serious injury!

- This device may only be operated, maintained and/or repaired by personnel trained and qualified to work on or with electrical devices.
- Observe the general construction and safety regulations for working with high-voltage systems.
- Firmly connect the protective conductor to all electrical devices according to the connection diagram before switching the system on.
- Operation, even briefly for measuring or testing purposes, is only permitted if the protective conductor is firmly connected to the components at the intended points.
- Disconnect the device from the mains or voltage source before accessing electrical parts with voltages greater than 50 V. Protect it against being switched on again.
- After switching off the power supply, wait 10 seconds for the system to discharge before opening the housing or starting repair/maintenance work.
- For electrical drive and filter components:
  After switching off, take the specified discharge time for the respective components into account before accessing the devices. To eliminate the risk of contact, measure the voltage of the condensers before starting work.
- Do not touch the electrical connection points of the components when the device is switched on.

- Before switching on, attach the provided covers and protective devices (protection against accidental contact) to the devices. Also, before switching on, securely cover and protect live parts to prevent accidental contact.
- Do not touch the electrical connection points of the components when the device is switched on.
- A residual-current-operated protective device (RCD) cannot be used for multi-channel tightening systems! Protection against accidental contact must be ensured by other means, for example via an overload protection device corresponding to the relevant standards.
- Prevent accidental contact with electrical parts in installed devices by means of an external housing such as a switch cabinet.
- Before using the system or starting service/maintenance work, make sure you read and understand these operating instructions.

European countries: Corresponding to EN 50178/1998, paragraph 5.3.2.3.
USA: See National Electrical Code (NEC), National Electrical Manufacturers Association (NEMA), as well as regional building codes.
The operator must comply with all of the above points at all times.

For electrical drive and filter components:

DANGER

High housing voltage and high leakage current!

Danger to life, risk of injury due to electric shock!

- Before switching on, connect the electrical equipment and the housings of all electric devices and motors to the protective conductor at the grounding points, or ground them. Even prior to quick tests.
- Before commissioning, even for testing purposes, always connect the protective conductor or connect with ground wire. Otherwise, high voltages can occur on the housing that may cause an electric shock.

For multi-channel tightening systems:

- Always connect the protective conductor for the electrical equipment to the power supply permanently. The leakage current is greater than 3.5 mA.
- Use a copper wire diameter of 10 mm^2 or greater for the entire protective conductor!

For Compact Systems for ErgoSpin:

A 10 mm^2 copper wire diameter is not required for the protective conductor. The leakage current is less than 3.5 mA.

Safety warning sticker

Safety warning stickers on the compact system (CS), card rack field (BT), and system box (SB) indicate the risk of electric shock (sticker location, see Fig. 2–1).

Fig. 2–1: Safety warning sticker on compact system (CS), card rack field (BT), and system box (SB)

On the Compact System, the safety warning sticker is visible when the cover is open. On the system box, the sticker is visible when the door is open.

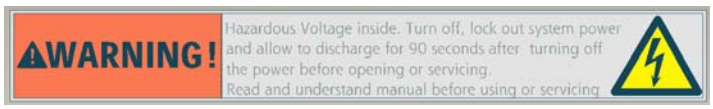


Fig. 2–2: Safety warning sticker on Compact System (CS)

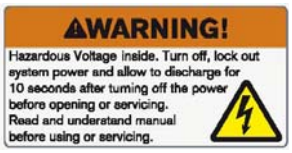


Fig. 2–3: Safety warning sticker on subrack (BT) and system box (SB)

WARNING

Dangerous voltage inside device!

Danger to life, risk of injury due to electric shock!

- Switch the device off.
- Disconnect the device from the mains supply.

Compact System (CS):

- Before opening the device or starting maintenance work, wait at least 90 seconds for the device to discharge.

Card rack (BT) and system box (SB):

- Before opening the device or starting maintenance work, wait at least 10 seconds for the device to discharge.
- Before starting maintenance work, make sure you read and understand these operating instructions.

2.7.2 Protective extra-low voltage for protection against electric shock

All connections and terminals with voltages of 5 to 50 V on Rexroth products are protective extra-low voltages which are designed to be safe to touch in accordance with the product standards.

WARNING

High voltage due to improper connection!

Danger to life, risk of injury due to electric shock!

- Only devices, electrical components, and cables with protective extra-low voltage (PELV) may be connected to connections and terminals with voltages of 0 to 50 V.
- Only connect voltages and electric circuits that are safely isolated from dangerous voltages. Safe isolation is obtained by means of isolating transformers, safe optocouplers, or battery operation disconnected from the mains.

2.7.3 Protection against dangerous movements

Dangerous movements can be caused by improper actuation of connected motors. Causes can be any of the following:

- Careless or improper wiring
- Errors while operating the components
- Incorrect input of parameters prior to commissioning
- Error in the measurement transducer or signal transducer
- Defective components
- Software errors

These errors can occur immediately after the system has been switched on or after operating for an indefinite time.

The monitoring devices in the drive components almost completely eliminate malfunctions in the connected drives. However, in view of personal safety, especially that involving risk of injury and/or damage to equipment, this alone is not sufficient. Until the installed monitoring devices become fully effective, faulty drive movements, whose magnitude depends on the controller type and the operating condition, must be anticipated.

DANGER

Dangerous movements!

Danger to life, risk of serious injury or damage to equipment!

- Ensure personal safety, either by means of monitoring devices or by superior measures directly on the system.
- The measures depend on the specific system conditions and are determined based on a risk and error analysis. The safety regulations applicable to the system must be taken into consideration. Unintended machine movements or other malfunctions may occur when the safety equipment is switched off, bypassed, or not activated.

Preventing accidents, injury, and/or damage to equipment:

- Do not enter the machine's and machine parts' area of travel. Possible measures to prevent unintended entry of persons include:
  - Protective barriers
  - Protective enclosures
  - Protective covers
  - Photocells
- Barriers and covers must be rigid enough to withstand the maximum possible momentum.
- The emergency OFF switch must be easily accessible in the immediate vicinity. Check the function of the emergency OFF system before commissioning. If the emergency OFF switch malfunctions, do not operate the device.
- Protection against unintended start-up by means of an emergency OFF circuit.
- Safely bring the drives to a standstill before accessing or entering the danger zone.
- Additionally secure vertical axes from falling or dropping after the motor is switched off by:
  - Mechanical lock on the vertical axis
  - External braking/catching/clamping device
  - Sufficient weight compensation of the axis
- Switch electrical equipment to a de-energized state at the mains and protect it against being switched on again during:
  - Maintenance and repair
  - Cleaning
  - Long disruptions in operation
- Avoid operating high-frequency, remote-controlled, or radio devices in the vicinity of the device electronics and cables. If this cannot be avoided, check the device and the system for malfunctions in all working positions. In some cases, a special EMC inspection of the entire system may be necessary.
- In the following cases, install a torque support at the ErgoSpin hand-held nutrunner:
  - ESM as of 10 Nm
  - ESA or ESV as of 40 Nm
- Use a torque support if tightenings with higher torques are to be performed with a hand-held tightening spindle.

2.7.4 Protection against magnetic and electromagnetic fields during operation and assembly

Magnetic and electromagnetic fields that surround live conductors and the permanent magnets of motors can pose a serious risk to persons with pacemakers, metal implants, or hearing aids.

DANGER

Health risk for persons with pacemakers, metal implants, and hearing aids in the immediate vicinity of electrical equipment!

Magnetic and electromagnetic fields may interfere with and impair the function of pacemakers or hearing aids as well as of metal implants. This may lead to a health risk for the persons concerned.

- Persons with pacemakers and metal implants are prohibited from entering the following areas:
  - Areas in which electrical devices and parts are assembled, operated, or commissioned
  - Areas in which motor parts with permanent magnets are stored, repaired, or assembled
- If persons with pacemakers need to enter these types of areas, a physician must first be consulted. The interference resistance of current or future pacemaker versions varies greatly. For this reason, no generally applicable rules exist.
- Persons with metal implants, metal shrapnel in the body, or hearing aids must consult a physician before entering these types of areas, as adverse health effects must be expected in these areas.

2.7.5 Protection against accidental contact with hot parts

CAUTION

Hot surfaces possible on motor housings and gearboxes!

Risk of injury! Risk of burns!

- Do not touch device housing surfaces at heat sources! Risk of burns!
- Do not touch housing surfaces of motors and gearboxes! Risk of burns!
- Depending on the operating conditions, temperatures during or after operation may exceed 60 °C (140 °F).
- After switching off the motors, allow them to cool down sufficiently before accessing them.
- Wear protective gloves or do not work near hot surfaces.
- For specific applications, the manufacturer must undertake measures on the end product, the machine, or the system to prevent burn injuries during the end use. These measures must be in accordance with the safety regulations. Examples of possible measures are: safety warnings, a separating safety device (shielding or locking), and technical documentation.

2.7.6 Protection during handling and assembly

Under unfavorable conditions, handling or assembling specific parts in an unsuitable manner could cause injuries.

⚠ CAUTION

Risk of injury due to improper handling!

Injury due to crushing, shearing, cutting, impact!

- Observe the general construction and safety regulations for handling and assembly.
- Use suitable assembly and transport equipment.
- Prevent trapping and crushing injuries by means of suitable provisions.
- Only use suitable tools. Use special tools if stipulated.
- Use lifting equipment and tools properly.
- If necessary, use suitable protective equipment (for example, protective goggles, safety shoes, protective gloves).
- Do not stand under suspended loads.
- Any fluids that have leaked onto the floor must be wiped up immediately to prevent slip hazards.
- Lay cables and lines in accordance with the permissible bending radiuses so that they cannot be damaged and no one can trip over them.

2.7.7 Protection when handling batteries

Batteries consist of active chemicals surrounded by a rigid housing. Improper handling can thus result in personal injuries or property damage.

⚠ CAUTION

Risk of injury due to improper handling!

The improper handling of batteries may lead to chemical burns or explosions that can again lead to injuries.

- Never attempt to reactivate dead batteries by heating or other methods (risk of explosion and chemical burns)!
- The batteries must never be recharged, as this could cause them to leak or explode.
- Do not incinerate batteries.
- Do not take batteries apart.
- Do not damage the electrical components installed in the devices.

Environmental protection and disposal: In the context of legal regulations, the batteries contained in this product are to be considered hazardous materials when transported on land, by sea, or by air (risk of explosion). Dispose of used batteries separately from other waste. Observe the national regulations of the country where the product is installed.

2.7.8 Protection against pressurized lines

According to the specifications in the planning documents, liquid-cooled and forced-air-cooled motors and drive controllers, as well as forced-air-driven leads, may be supplied with external, pressurized media such as compressed air, hydraulic fluid, coolant, and coolant lubricant. In this case, incorrect handling of external supply systems, supply lines, or connections may lead to personal injuries or property damage.

⚠ CAUTION

Risk of injury due to improper handling of pressurized lines!

The improper handling of pressurized lines may cause explosions that can again lead to injuries.

- Never attempt to disconnect, open, or cut pressurized lines (risk of explosion).
- Observe the operating instructions from the respective manufacturer.
- Discharge the pressure and medium from lines before disassembly.
- Use suitable protective equipment (for example, protective goggles, safety shoes, protective gloves).
- Any fluids that have leaked onto the floor must be wiped up immediately.

Environmental protection and disposal: The media used to operate this product may be harmful to the environment. Dispose of toxic media separately from other waste. Observe the national regulations of the country where the product is installed.

3 Introduction

This chapter gives an initial overview of the functions and application options of the Nexo cordless Wi-Fi nutrunner.

3.1 Nexo cordless Wi-Fi nutrunner

The Nexo cordless Wi-Fi nutrunner is designed for tightening operations of category A according to VDI 2862 that are critical in terms of safety. Results are stored and output, thus ensuring complete documentation of any information that is relevant for tightening.

The control and power electronics are fully integrated in the nutrunner. In each working step, the integrated controller monitors the tightening operation and initiates wireless transmission of the results to the existing network. In case of radio shadows, the data are buffered. Once the connection to the network is established, the data are transferred.

The graphical display on the nutrunner directly shows the tightening results to the user, irrespective of the their position and the radio connection.

The Nexo cordless Wi-Fi nutrunner is supplied with energy by a slide-in battery pack. Power supply is maintained for the buffer period when the battery is changed during operation (see page 45).

For further operating instructions and a description of the components, refer to the "Nexo" operating instructions that are supplied with the device.

3.1.1 NX-SD Micro SD card

The scope of delivery of the Nexo cordless Wi-Fi nutrunner includes a Micro SD card that can be inserted into the nutrunner. In state of delivery, this card contains documentations and license information.

The Micro SD card can be accessed via the NEXO-OS operating system in menu **Help** → **Access to NX-SD.**

Via the NEXO-OS operating system, the following data can be stored on the Micro SD card:

- Tightening results (menu **Settings** → **Data** → **Standard Nexo** → **NX-SD card**)
- Backups (menu **Settings** → **Backup/Restore**)
- Diagnosis data (menu **Diagnosis** → **Export log**)
- Images for display at the tool display. The respective images are uploaded in the **Help** menu for display.

NOTE

Format the mass storage device only with FAT32.
If the memory module is formatted differently, the system will return an error when it tries to access the Micro SD card.

NOTE

Saving the results in the NX-SD storage location may cause delays during saving, depending on the type of the Micro SD card or the batch. These may have an impact on the cycle time.

Protection against loss of data Do not insert or remove the NX-SD Micro SD card while the system is live.

3.1.2 NEXO-OS operating system

On delivery, the NEXO-OS operating system is pre-installed as an integral part of the Nexo cordless Wi-Fi nutrunner. It is used to program tightening jobs and to visualize and analyze measurement values.

The NEXO OS operating system for the Nexo cordless Wi-Fi nutrunner is a web application. The NEXO-OS operating system can be accessed via a web browser, e.g. Mozilla Firefox. The user interface with menus and clear icons can be operated intuitively.

Application options for the BSNEXO-OS operating system:

- Tightening system configuration
- Creating tightening programs by defining the tightening processes
- Tightening case analysis and diagnosis (e.g. error diagnosis)
- Creation of jobs
- Setting the operating mode

3.1.3 Tool display

NOTE

Damage due to improper handling!
Damage to the display.
- ▶ Do not touch the display with sharp-edged objects.
- ▶ Avoid knocking on the display.

The tool display shows various information, e.g. regarding the current tightening operation. The tool display includes the following elements:

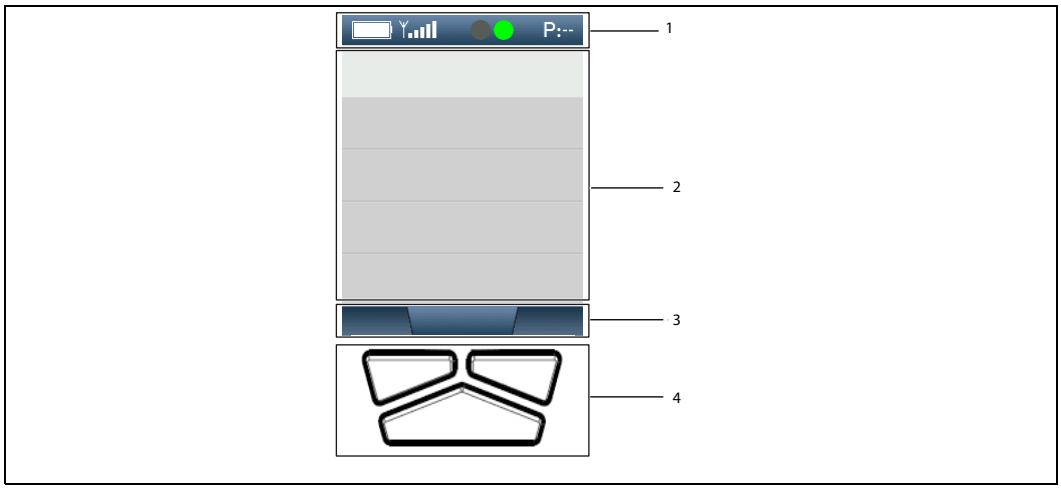
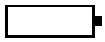


Fig. 3–1: Tool display

1 Status bar
2 Screen
3 Function fields
4 Function keys

1 - Status bar

Table 3–1: Status bar elements

Element	Description
	Shows the current charging condition of the inserted slide-in battery pack.
	WLAN activated. Indicates the radio communication signal strength
	WLAN deactivated.
	As of Nexo firmware version 1200, the status of the data connection is displayed. Activate the **Display data connection status** check box in menu **Settings** → **Tool display**. As of Nexo firmware version 1300, **Display data connection status** is activated by default. Nutrunner is in automatic mode: – Green symbol All active data services are connected. – Red symbol At least one data service is not connected. – Gray symbol No data service active.
	As of Nexo firmware version 1300. Nutrunner is in manual mode: – Green symbol All active data services are connected. – Red symbol At least one data service is not connected. – Gray symbol No data service active.
	Nutrunner operating state: Left-hand LED: – Yellow steady light Enable signal present ("Enable" or "Active Enable" PLC signals) Right-hand LED: – Green steady light Nutrunner ready for operation – Yellow flashing light Nutrunner not ready for operation – Red flashing light System errors
P:--	Display of the current tightening program.

2 - Screen

The screen of the display is set in the NEXO-OS operating system under menu **Settings** → **Tool display** (see page 206).

By default, the actual values are displayed.

3 - Function fields/ 4 - Function keys

The individual menu functions can be executed by pushing the corresponding function keys (left, center, right).

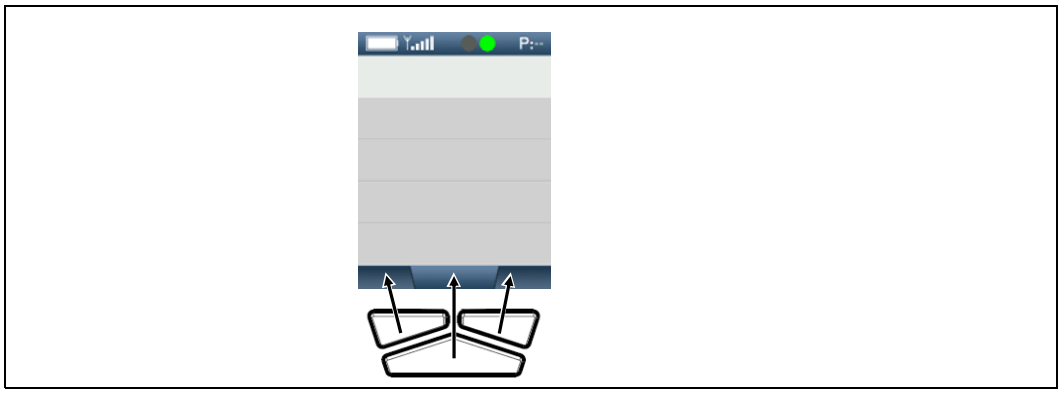


Fig. 3–2: Assignment of function keys and fields

The main menu can be accessed with the center function key.

As of Nexo firmware version 1200, the center position of the program selector triggers the screen of the PLC input signals **0.3**, **0.4** and **0.5** applied in the PLC module **tool** screen on the tool display. Any input signal can be applied. Refer to Input signals on page 74. The functional keys are then assigned the corresponding PLC signals.

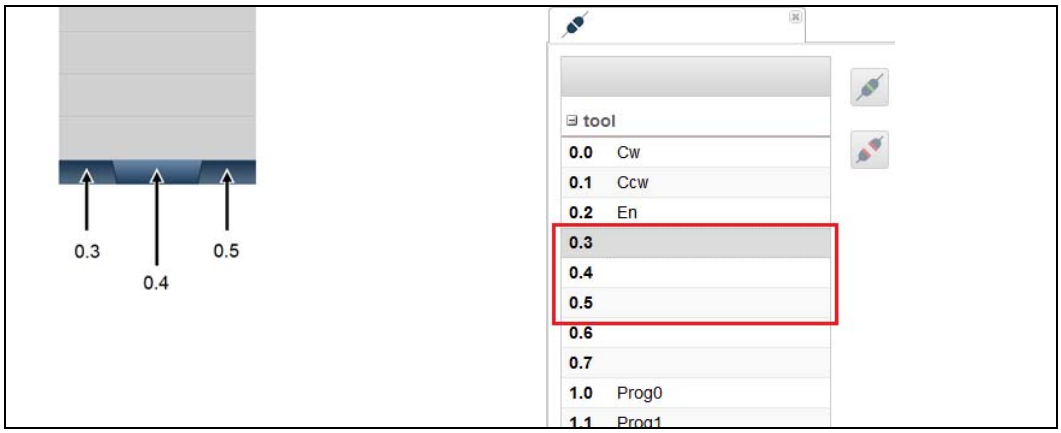


Fig. 3–3: Function fields for program selector in center position.

If you leave the display of the PLC signals, i.e. if the program selector is - from the center position - pushed to the left and/or to the right, the **0.3**, **0.4** and **0.5** PLC input signals applied in the PLC module **tool** will be reset. Even if the corresponding functional key is still operated.

Main menu

In menu **Settings** → **Tool display** → **Main menu** of the NEXO-OS operating system, the entries to be displayed in the main menu of the nutrunner display are defined.

On delivery of the Nexo cordless Wi-Fi nutrunner, some options in the main menu are already activated. Please check carefully the options to be activated for the user to ensure optimum working conditions with the Nexo cordless Wi-Fi nutrunner.

Table 3–2: Entries for the main menu

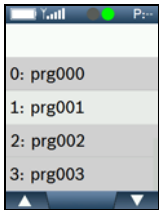
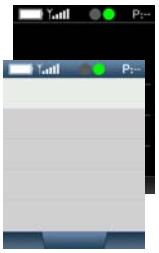
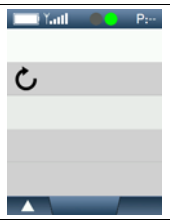
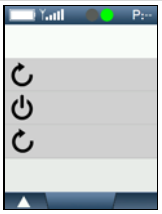
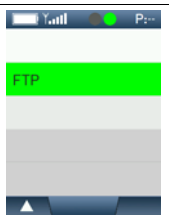
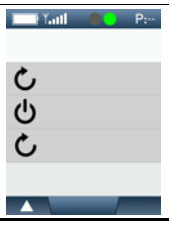
Element	Description	Screen
Actual values	Screen displaying the current tightening results: – Torque (T) – Angle (A) – Time (t) – Identification code (ID) The display is based on the tightening result - OK or NOK. For NOK tightening, the screen is flashing with the parameter causing the NOK result highlighted in red.	
Operating mode	As of Nexo firmware version 1300. Change-over between manual mode and automatic mode.	
Program selection	A selection of configured tightening programs available for selection if the Prog0 … Prog7 PLC signals are fully applied on the **tool** PLC module.	
Job selection	As of Nexo firmware version 1300. A selection of configured jobs available for selection if the Job0 - Job7 PLC signals are fully applied on the **tool** PLC module.	
Language selection	Selection of the display language: Chinese, German, English, Spanish, French, Italian, Hungarian, Polish, Portuguese, Slovak, Czech, Russian	
System information	Screen displaying hardware and software version of the Nexo cordless Wi-Fi nutrunner as well as additional information like IP address and WLAN network.	
Time & date	System time settings (date and time).	
Design	Selection of day or night design for the screen display.	
ID code display	Display of the current ID code.	
Job	On the tool display, the active job can be canceled.	

Table 3–2: Entries for the main menu

Element	Description	Screen
Switch-off	Under this setting, the nutrunner can be shut down, restarted or the WLAN connection can be re-established.	
Image view	Image viewer. The images for this screen have to be stored on the NX-SD Micro SD card in the **pictures** directory. The supported image formats are ***.jpg** and ***.png**. Go to the Help menu to upload the respective images to the tool display (see page 245).	
Backup/Restore [1)]	Creates a backup copy or imports backup data from the nutrunner NX-SD Micro SD card.	
Game 1	Play selection.	
Diagnosis	Display of the diagnosis data of the active network data and control services.	
WLAN on/off	Under this setting, the WLAN connection can be activated, deactivated or re-established.	

1. As of Nexo firmware version 1200, the **Backup/Restore** option is activated by default in the main menu on delivery of the Nexo cordless Wi-Fi nutrunner. The activation of this option supports initial commissioning. After commissioning of the Nexo cordless Wi-Fi nutrunner, this option is to be deactivated again to prevent triggering of unintended functions like starting of backup.

3.1.4 Nexo battery system

3.1.4.1 Lithium-ion batteries - Good to know

Cell voltage The voltage of an individual battery cell is referred to as cell voltage. The higher the cell voltage the less individual cells are required for a battery with high voltage. Lithium-ion cells feature high cell voltage. In comparison with NiCd batteries, lithium-ion batteries require less cells.

Energy density The energy density is the measurement of the amount of energy that can be stored in a cell per weight unit. Cells with higher energy density respectively weigh less at similar storage capacity. In comparison to cells based on nickel, lithium-ion cells offer a considerably higher energy density.

Memory effect The term “memory effect” describes a loss in capacity that may occur at NiCd batteries. In case of frequent partial discharge, parts of the electrode substance are not “used”. This way, crystalline formations occur considerably impairing future discharge of the affected electrode substance or even block it in extreme cases. This effect does not occur in lithium-ion batteries. Independently from their charging condition, lithium-ion batteries may be charged at any time without damaging the cells.

Lithium properties The properties of lithium, the lightest solid substance in the element system, enable the design of lighter means of energy storage. However, lithium is highly reactive with other substances. A burning lithium-ion cell is a metal fire. As lithium leads to a highly exothermic reaction with water, fires have to be extinguished with a substance suitable to extinguish metal fires like sand or salt.

Lithium-ion batteries are generally classified as hazardous. During transport, the transport regulations for hazardous material apply.

3.1.4.2 Slide-in battery pack NX-BP36V

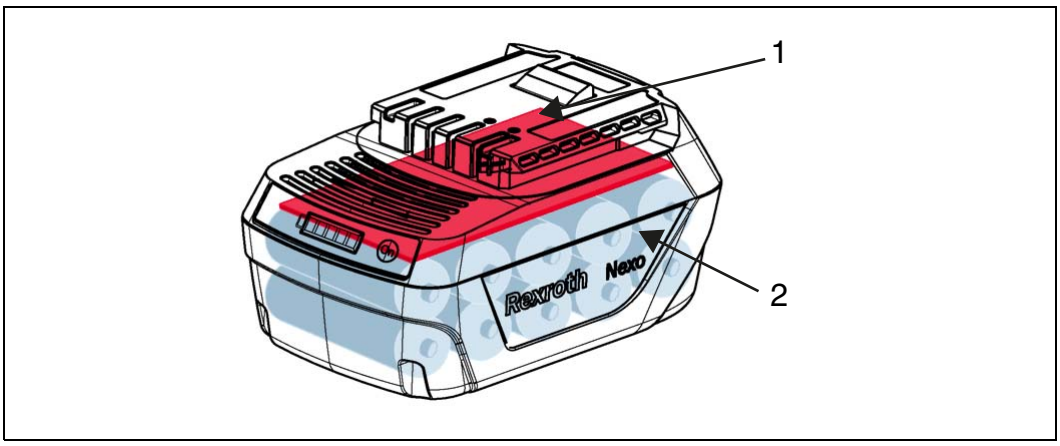


Fig. 3–4: Slide-in battery pack NX-BP36V

1 Battery management system
2 Lithium-ion cells

Battery management system

This electronic module includes safety functions, diagnostic functions including the charging condition indicator and balancing. Nexo battery packs offer an intelligent battery management system with individual cell monitoring, cell balancing, short circuit protection and intelligent communication. The battery management system monitors the temperature as well as the capacity of the battery. Uneven charging conditions of cells are balanced by the cell balancing function. This function is particularly activated if a cell exceeds its maximum or minimum voltage range.

Series connection of 10 lithium-ion cells

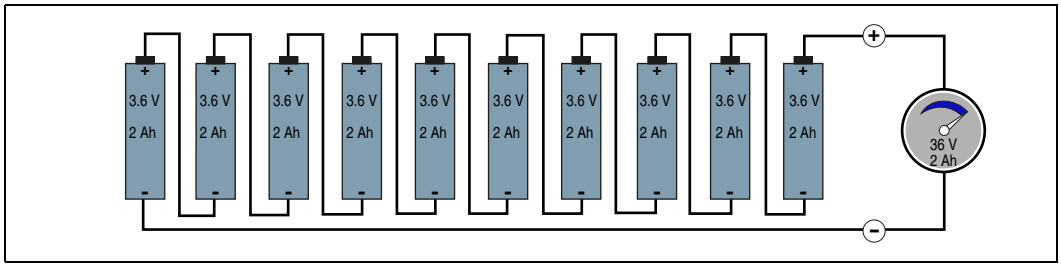


Fig. 3–5: Series connection of 10 lithium-ion cells

- 3.6 V cell voltage multiplied by 10 cells = 36 V battery voltage.
- Battery capacity = cell capacity = 2 ampere hours
- This results in a battery energy content of 36 V multiplied by 2 ampere hours = 72 watt hours

The rule “the weakest link defines the strength of the entire chain” also applies to series connection of battery cells. The series connection of individual battery cells is similar to the links of a chain. For this reason, Rexroth uses selected cells with absolutely equal capacities to provide users with the promised energy.

Change of the battery pack slide-in module

In case of battery change, the power supply of the integrated controller is maintained for 20 seconds. In case of high data transmission via WLAN, this time the power supply is maintained is reduced to approx. 10 seconds.

3.1.4.3 Single charger NX-BC36V

Lithium-ion batteries are generally charged using the CC/CV process. This means, a constant current is applied to charge the battery until the charger switches to constant voltage near the charging end voltage. Both parameters (charging current and charging end voltage) have a considerable effect on the service life of the battery. The temperature of the battery is also a crucial charging parameter. Batteries can often be discharged at higher temperatures than charged.

Communication is established as soon as the battery is plugged into the charger. Between the battery and the charger, important parameters are exchanged. This ensures that only faultless batteries of the Nexo series are charged and that each battery is treated according to its parameters.

The charger charges the battery at a constant current. On reaching the charging end voltage, the charger switches to constant voltage. This way, excessive battery charging is prevented even it is plugged into the charger for longer periods. Nevertheless, charged batteries should be unplugged from the charger to avoid power consumption of the electrical switchgear even if it is switched off.

The Nexo charging system cools the battery during charging. A fan integrated into the charger guides the air through the bottom of the battery via the contact interface into the charger and out through the vents in the base.

3.1.5 Technical data of the nutrunner

Right-angle nutrunner

Table 3–3: Technical data of the right-angle nutrunner

Designation	**NXA030S-36V NXA030S-36V-B**	**NXA011S-36V NXA011S-36V-B**
Order number	0 608 842 002 0 608 842 007	0 608 842 011 0 608 842 012
Working range [Nm]	9.0 - 30	3.0 - 11
Max. torque of output drive [min^{-1}]	310	850
Min. torque of output drive [min^{-1}]	16	43
Angular resolution [°]	0.233	0.644
Weight without / with battery [kg]	1.99 / 2.7	1.56 / 2.27
Length without / with battery [mm]	534 / 590	442 / 498
Tool mount	3/8“ external square	3/8“ external square
Reduction ratio of the angle head	5.21	1.40
Typ. efficiency of the angle head	0.94	0.95
Designation	**NXA015S-36V NXA015S-36V-B**	**NXA050S-36V NXA050S-36V-B**
Order number	0 608 842 001 0 608 842 006	0 608 842 003 0 608 842 008
Working range [Nm]	3.0 - 15	15 - 50
Max. torque of output drive [min^{-1}]	600	185
Min. torque of output drive [min^{-1}]	32	10
Angular resolution [°]	0.475	0.142
Weight without / with battery [kg]	1.56 / 2.27	2.03 / 2.74
Length without / with battery [mm]	442 / 498	534 / 590
Tool mount	3/8“ external square	3/8“ external square
Reduction ratio of the angle head	1.40	6.32
Typ. efficiency of the angle head	0.95	0.94
Designation	**NXA065S-36V NXA065S-36V-B**	**NXV012T-36V NXV012T-36V-B**
Order number	0 608 842 013 0 608 842 014	0 608 842 015 0 608 842 016
Working range [Nm]	20 - 65	3.0 -15 / 1.8 -12*
Max. torque of output drive [min^{-1}]	135	600 / 880*
Min. torque of output drive [min^{-1}]	7	32 / 45*
Angular resolution [°]	0.104	0.665
Weight without / with battery [kg]	2.03 / 2.74	1.56 / 2.27 1.35* / 2.06*
Length without / with battery [mm]	534 / 590	442 / 498
Tool mount	3/8“ external square	3/8“ external square
Reduction ratio of the angle head	6.32	1.40
Typ. efficiency of the angle head	0.94	0.95

*) Value without angle head

Pistol grip nutrunner

Table 3–4: Technical data of the pistol grip nutrunner

Designation	NXP012QD-36V	NXP012QD-36V-B
Order number	0 608 842 005	0 608 842 010
Working range [Nm]	1.8 - 12	
Max. torque of output drive [min^{-1}]	880	
Min. torque of output drive [min^{-1}]	45	
Angular resolution [°]	0.665	
Weight without / with battery [kg]	1.34 / 2.05	
Length without / with battery [mm]	237 / 295	
Tool mount	1/4" quick-change chuck	

3.1.6 Technical WLAN data

Table 3–5: Technical WLAN data

Function	Nexo cordless Wi-Fi nutrunner (all types)
Standard	IEEE 802.11 a, b, g, n
Security	– WPA/ WPA2 – Pre-shared Key Mode PSK – Enterprise – PEAP – EAP-TLS – EAP-TTLS
Typical range	50m subject to the access point
Channels	– 1-13 (2.412 - 2.472 GHz) – 36-165 (5.180 - 5.825 GHz)
Typical transmitting power	– 18.3 dBm, 11 Mbps, CCK (IEEE 802.11 b) – 14.4 dBm, 54 Mbps, OFDM (IEEE 802.11 g) – 12.5 dBm, 65 Mbps, OFDM (IEEE 802.11 n)
Typical sensitivity	– -88 dBm, 8% PER, 11 Mbps – -74 dBm, 10% PER, 54 Mbps – -72 dBm, 10% PER, 65 Mbps

3.1.7 Technical data of the barcode scanner

The barcode scanner is integrated into the control unit of the Nexo cordless Wi-Fi nutrunner.
Nexo cordless Wi-Fi nutrunners with integrated barcode scanners are labeled “-B” in the code, e.g. *NXA030S-36V-B*. Nexo cordless Wi-Fi nutrunner equipped with a barcode scanner can read a barcode with a maximum length of 256 characters.

3.2 WLAN (Wireless Local Area Network)

WLAN is short for wireless local area network. It makes the Ethernet-based communication of a LAN (Local Area Network) wireless. The typical WLAN standards are specified in standard IEEE 802.11.

The Nexo cordless Wi-Fi nutrunner is designed for operation on access points in infrastructure mode. This means that the access point manages communication with one or several clients (Nexo cordless Wi-Fi nutrunners). Ad-hoc connections are not provided for.

Since the clients (Nexo cordless Wi-Fi nutrunners) share the bandwidth available for the data transmission rate, the number of clients connected to an access point should be as low as possible to allow optimal operation. The same applies to the possible range. The available transmission rate decreases with an increasing number of Nexo cordless Wi-Fi nutrunners and increasing distance from the access point. The range is also dependent on the environment: Walls, concrete pillars, machine racks, etc. modify the electromagnetic field and may result in a limited range. An ideal configuration is a direct line of sight between the access point and the Nexo cordless Wi-Fi nutrunner.

Communication in the network requires that the Nexo cordless Wi-Fi nutrunner has a unique IP address. We do not recommend to assign the address via DHCP because this further limits the radio range.

We recommend to encode the WLAN for reasons of data privacy protection.

3.2.1 Access point

Due to the standardization in IEEE 802.11, commercially available access points can be used. In an industrial environment, access points for industrial use should be used as they offer the required radio technology, parameter options, range and coverage.

It is also possible to use WLAN capable devices as access points that can be operated as hotspots, such as industrial computers or laptops, and are equipped with the required software (e.g. Connectify). The command prompt of Windows 7 (and higher) can also be used to start a hotspot using the command ***netshell*** (netsh). First, enable the hotspot, then enter the parameters and protect the WLAN connection with a password. (Administrator rights are required to enable this function.) These solutions require less hardware and configuration. However, they offer significantly less range and coverage. Due to the data transfer availability there may be cycle time problems.

A hotspot can also be created using a tablet computer or mobile phone. iPads without a SIM card do not offer this functionality. Android devices without a SIM card can create a hotspot, but data cannot be exchanged with the web browser. The screen may also be too small as the NEXO-OS operating system was designed for computer applications.

CCX (Cisco Compatible eXtensions) are not supported.

- CCX are special Cisco functions which are available in different versions (CCXv4, CCXv5,...).
- They cannot be used due to license reasons.

3.2.2 Infrastructure mode using WLAN controller

In an industrial environment, the infrastructure mode is usually created in two different ways:

- Several access points are connected to a network. All are operated with the same SSID. Each access point operates independently and has to be configured independently.
- Several access points are connected to a WLAN controller. The WLAN controller controls all access points in the same way. A central computer administrates the network and sets its parameters. This structure is most frequently used in an industrial environment.

3.2.3 Diagnosis

Various simple diagnostic tools are available that can be used to capture basic information on the WLAN network.

There are Android apps (usually free of charge) for simple analyses. There is also software for Windows computers that offer these functions.

InSSIDer: With this app, a smartphone can be used as a simple WLAN measurement device. It provides graphical representations of the available networks using the SSID in the range of 2.4 and 5 Ghz (if the smartphone supports this). This offers a clear overview of available stable networks and also indicates the reception quality. The network conditions or if a hotspot with netsh is active can be easily determined.

WiFi Analyzer: Provides similar functions as InSSIDer.

3.3 Connection options of the Nexo cordless Wi-Fi nutrunner

Below, various connection options for the use of the Nexo cordless Wi-Fi nutrunner are described:

- Result storage without radio connection (page 50)
- Result storage via WLAN: (page 51)
- Control via VW-XML master PC (page 53)
- PLC control and result storage via WLAN (page 54)
- Fieldbus control and result storage via WLAN (page 55)
- Process Quality Manager (PQM) (page 56)

3.3.1 Result storage without radio connection

As of Nexo firmware version 1100, the results data can be stored in the “standard Nexo” format as a *.json file on the NX-SD Micro SD card inserted in the nutrunner. Using the NX-A programming adapter, the results data stored on the NX-SD Micro SD card can be viewed. The NX-SD Micro SD card can also be accessed using a commercially available Micro SD card reader.

Settings in the NEXO-OS operating system:

- As of Nexo firmware version 1200: The directory for filing of the results on the NX-SD Micro SD card can be defined under **Settings** → **Data** → **Standard Nexo** → **NX-SD card**. (page 210)
- Go to the menu **Help** → **Access to NX-SD card** to access the Micro SD card. The results data are stored in directory **results**.

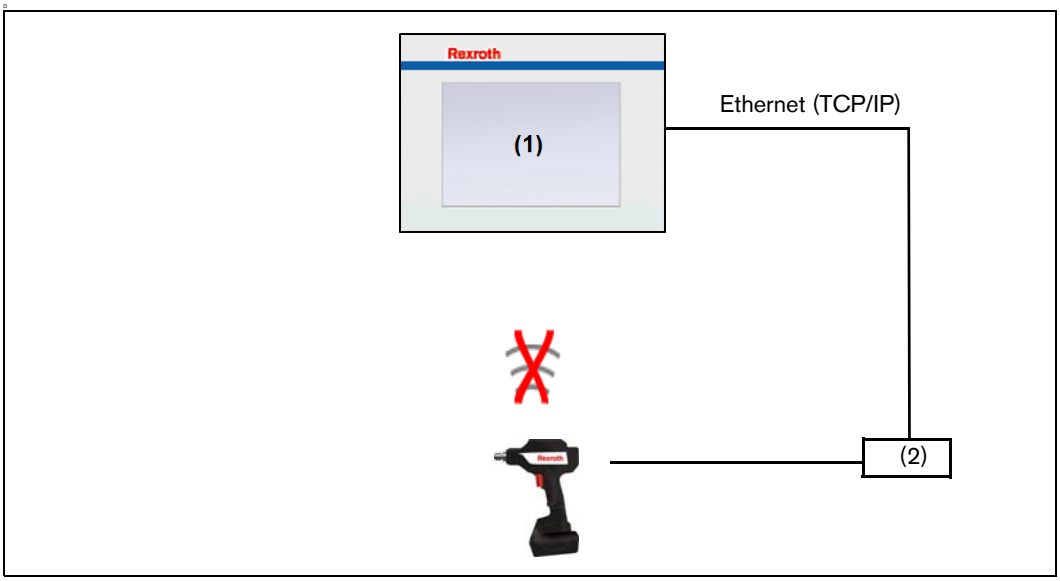


Fig. 3–6: Results storage without radio connection

(1) IPC (industrial computer), laptop or database server
(2) NX-A programming adapter

3.3.2 Result storage via WLAN:

The results data can be transmitted in the “standard Nexo” format as a *.json file via WLAN from the Nexo cordless Wi-Fi nutrunner to an FTP server (e.g. FileZilla) of the IPC, laptop or database server. As of Nexo firmware version 1200, a HTTP or File Share server can be used for transmission of the results data. The data may be transmitted via WLAN using an IPC, laptop or database server or via one or several external access points (see figure 3–7).

Settings in the NEXO-OS operating system:

- To configure the WLAN connection, go to **Settings** → **WLAN** (page 230).
- As of Nexo firmware version 1200: To configure the connection (FTP, HTTP or File Share) for results output, go to **Settings** → **Data** → **Standard Nexo** (page 209).
  In this menu, the parameters for results output can also be configured.

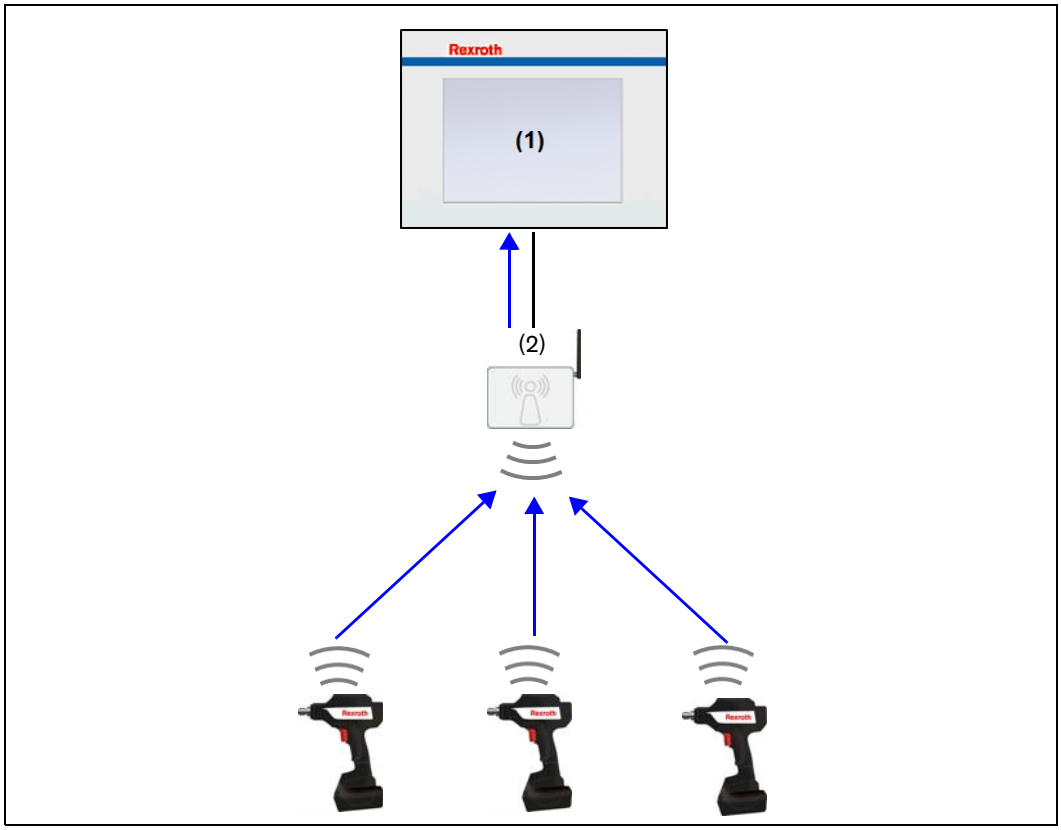


Fig. 3–7: Result storage via WLAN (external access point)

(1) IPC (industrial computer), laptop or database server with FTP, HTTP or File Share server
(2) Access point

3.3.3 Control and result storage via WLAN

The Nexo cordless Wi-Fi nutrunner uses the Rexroth Open Protocol for WLAN communication (control). The corresponding software with Open Protocol has to be installed on the IPC, laptop or database server.

Furthermore, the results data can be transmitted in the “standard Nexo” format as a *.json file via WLAN from the Nexo cordless Wi-Fi nutrunner to an FTP server of the IPC, laptop or database server. As of Nexo firmware version 1200, a HTTP or File Share server can be used for transmission of the results data. The data may be transmitted via WLAN using an IPC, laptop or database server or via one or several external access points (see figure 3–8).

Settings in the NEXO-OS operating system:

- To configure the WLAN connection, go to **Settings** → **WLAN** (page 230).
- As of Nexo firmware version 1200: To configure the connection (FTP, HTTP or File Share) for results output, go to **Settings** → **Data** → **Standard Nexo** (page 209).
  In this menu, the parameters for results output can also be configured.
- To set the communication with Rexroth Open Protocol, go to **Settings** → **Data** → **Open Protocol** (page 217).

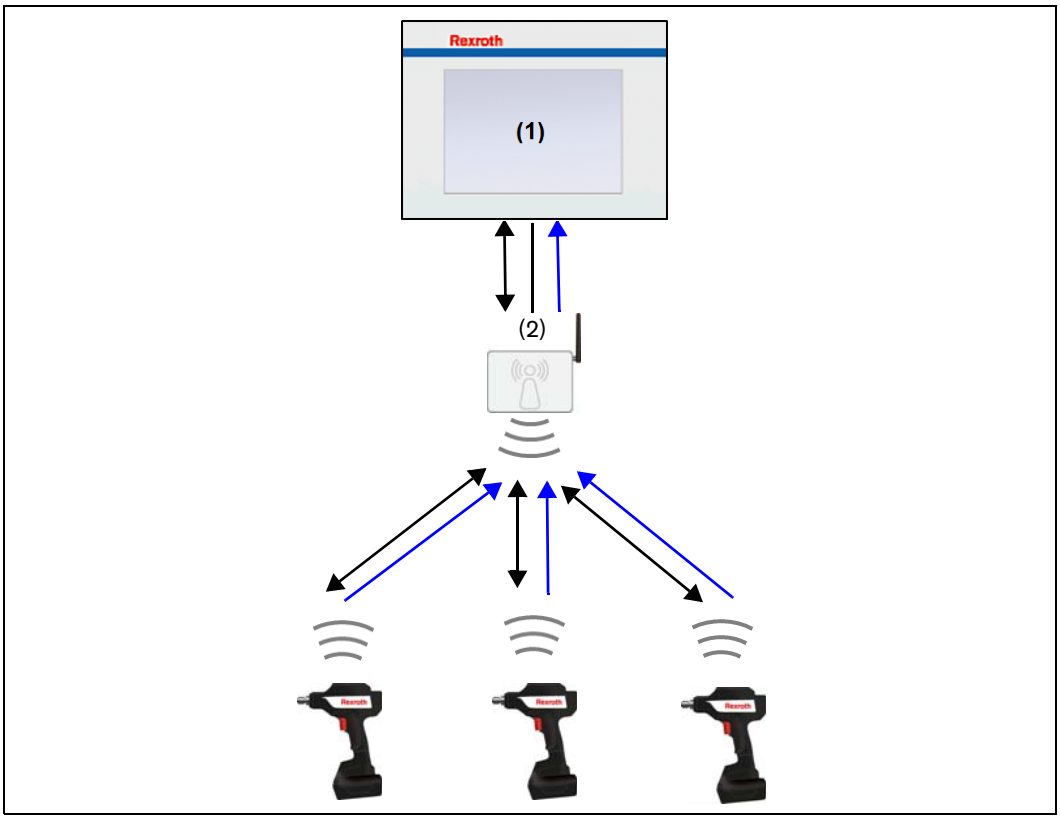


Fig. 3–8: Control and result storage via WLAN (external access point)

(1) IPC (industrial computer), laptop or database server with software for control via Open Protocol, FTP, HTTP or File Share server

(2) Access point

3.3.3.1 Control via VW-XML master PC

As of Nexo firmware version 1200, the VW-XML protocol is supported. VW-XML version 2.1 is supported.

Application of the VW-XML protocol outside of VOLKSWAGEN AG is subject to express written agreement of VOLKSWAGEN AG.

The VW-XML master PC controls the Nexo cordless Wi-Fi nutrunners and receives the tightening results. For this purpose, a VW-XML master software has to be available at the IPC. The data may be transmitted via WLAN to a VW-XML master PC or via one or several external access points (see figure 3–9).

Settings in the NEXO-OS operating system:

- To configure the WLAN connection, go to **Settings** → **WLAN** (page 230).
- To set the communication with VW-XML, go to **Settings** → **Data** → **VW-XML** (page 221).
- The PLC assignment table has to be applied as specified in chapter VW-XML protocol. To set the PLC assignment table, go to **Settings** → **PLC signals** (page 226).
- The tag <PI1> defined in the VW-XML protocol can be applied as ID code in Nexo. For this purpose, the **Selection of ID code source** can be set to **VW-XML** under mode in the start step (see page 185).

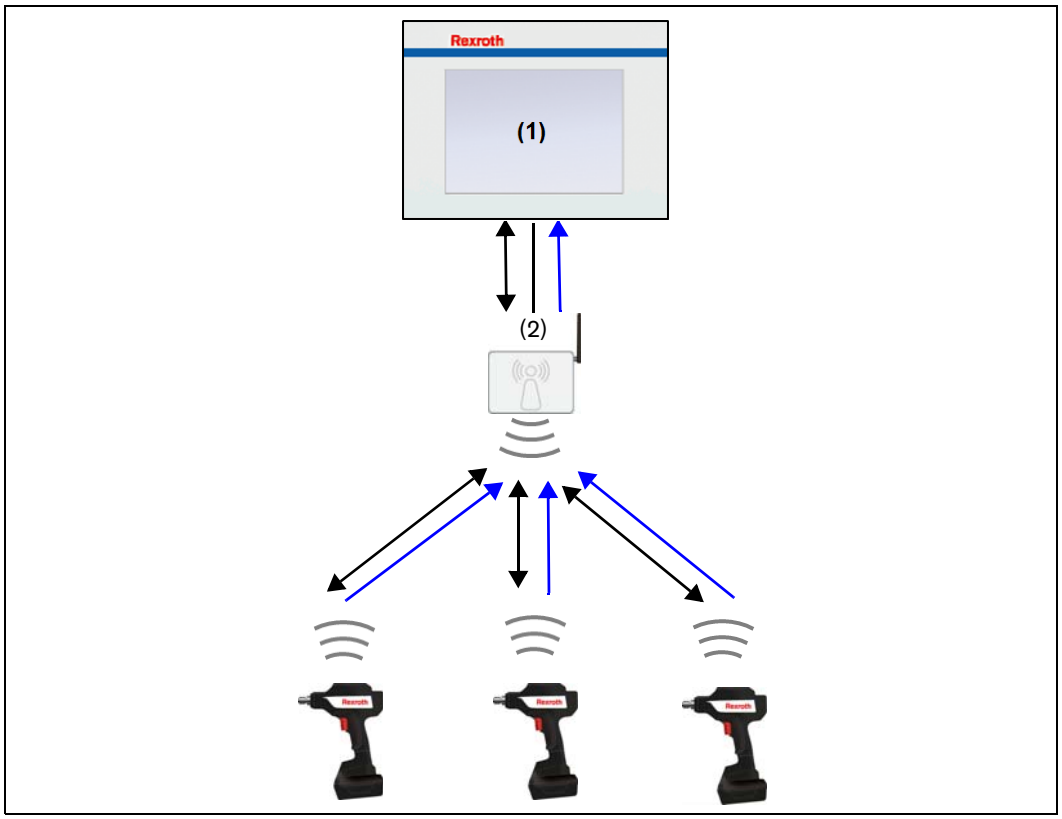


Fig. 3–9: Control via VW-XML master PC

(1) IPC (industrial PC) with VW-XML master software
(2) Access point

3.3.4 PLC control and result storage via WLAN

The Nexo cordless Wi-Fi nutrunner uses the Rexroth Open Protocol for WLAN communication (control). In addition, results (except graph data) can be transmitted using Rexroth Open Protocol. The PLC has to contain function blocks that provide for communication via Rexroth Open Protocol.

Furthermore, the results data can be transmitted in the “standard Nexo” format as a *.json file via WLAN from the Nexo cordless Wi-Fi nutrunner to an FTP server of the IPC or database server.
As of Nexo firmware version 1200, a HTTP or File Share server can be used for transmission of the results data. The data may be transmitted via WLAN using one or several external access points (see figure 3–10).

Settings in the NEXO-OS operating system:

- To configure the access point, go to **Settings** → **WLAN** (page 230).
- As of Nexo firmware version 1200: To configure the connection (FTP, HTTP or File Share) for results output, go to **Settings** → **Data** → **Standard Nexo** (page 209).
  In this menu, the parameters for results output can also be configured.
- To set the Rexroth Open Protocol, go to **Settings** → **Data** → **Open Protocol** (page 217).

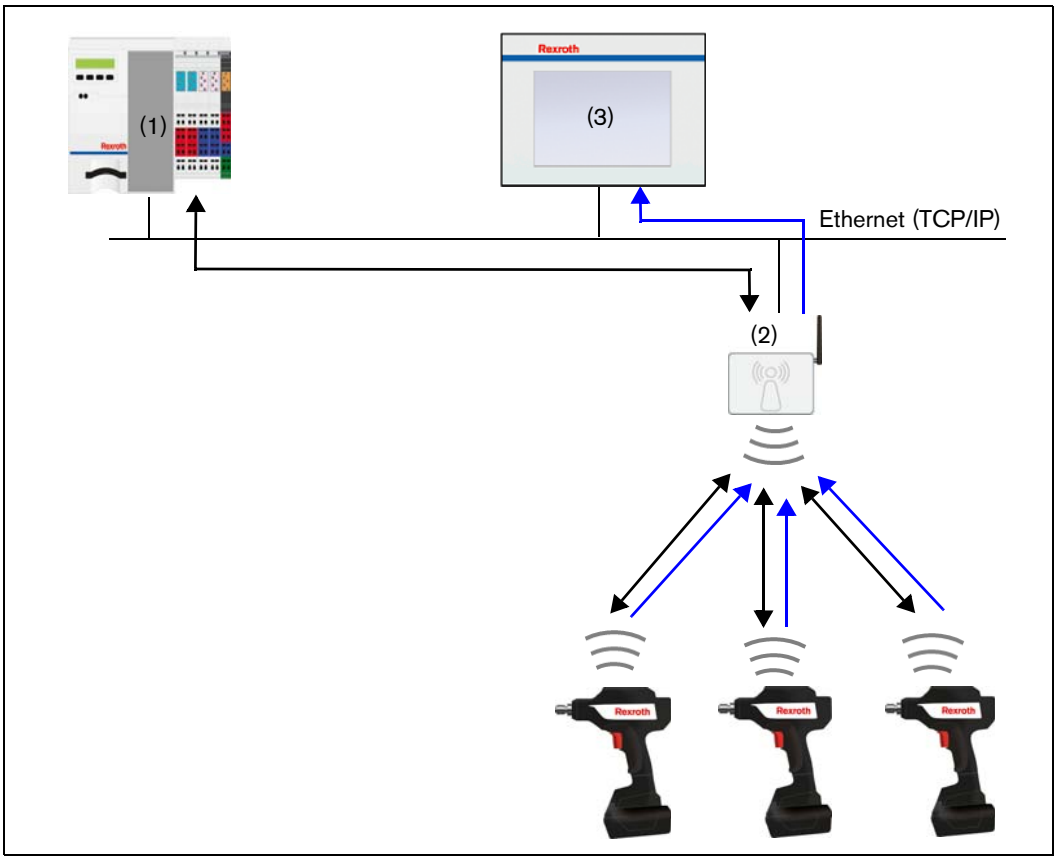


Fig. 3–10: PLC control and results storage via WLAN

(1) Partner controller
(2) Access point
(3) IPC (industrial computer) or database server

3.3.5 Fieldbus control and result storage via WLAN

With the integrated logic in the CS351 IL compact system, single channel control can be implemented as a gateway between the PLC fieldbus and the Nexo cordless Wi-Fi nutrunner. The CS351 IL and PLC communicate via fieldbus. The Nexo cordless Wi-Fi nutrunner and the CS351 IL use the Rexroth Open Protocol for WLAN communication.

In addition to an ErgoSpin hand-held nutrunner or a tightening spindle, several Nexo cordless Wi-Fi nutrunners - limited by fieldbus - can be connected to a CS351 IL compact system. The maximum number of transmittable results is limited by the fieldbus. The integrated logic of the CS351 IL has to contain function blocks that provide for communication with the Nexo cordless Wi-Fi nutrunner via Rexroth Open Protocol. The CS351 IL is equipped with two 24V interfaces, e.g. for the connection of socket trays. If more socket trays are to be used, they have to be connected directly to the PLC.

Furthermore, the results data can be transmitted in the “standard Nexo” format as a *.json file via WLAN from the Nexo cordless Wi-Fi nutrunner to an FTP server of the IPC or database server.
As of Nexo firmware version 1200, a HTTP or File Share server can be used for transmission of the results data.

The data may be transmitted via WLAN using one or several access points.

Settings in the NEXO-OS operating system:

- To configure the access point, go to **Settings** → **WLAN** (page 230).
- As of Nexo firmware version 1200: To configure the connection (FTP, HTTP or File Share) for results output, go to **Settings** → **Data** → **Standard Nexo** (page 209).
  In this menu, the parameters for results output can also be configured.
- To set the Rexroth Open Protocol, go to **Settings** → **Data** → **Open Protocol** (page 217).

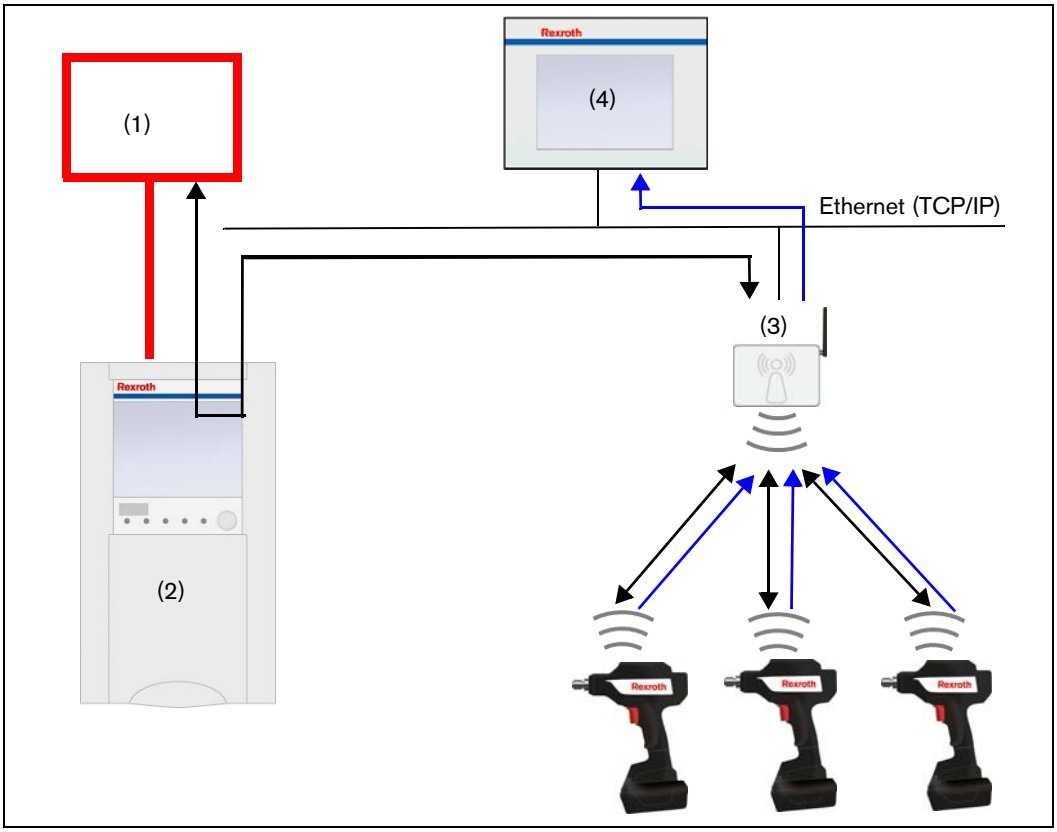


Fig. 3–11: Fieldbus control and results storage via WLAN

(1) Partner controller with fieldbus connection
(2) CS351 IL compact system
(3) Access point
(4) IPC (industrial computer) or database server

3.3.6 Process Quality Manager (PQM)

Process Quality Manager (PQM) is a software solution of Bosch Rexroth. It is designed to recognize and avoid non-conformities and errors in the production process as soon as possible. PQM offers safe and reliable monitoring and documentation of production processes.

PQM combines the data from the tightening processes and provides them in a screen on the tool display. Various screens for analysis of tightening results are available to ensure quick reaction to errors in the production process. If PQM is applied, the HTTP connection can be used to transmit the results output data of the Nexo cordless Wi-Fi nutrunner to the PQM.

Settings in the NEXO-OS operating system:

- As of Nexo firmware version 1200: To configure the HTTP connection for results output, go to **Settings** → **Data** → **Standard Nexo** (page 209).
  In this menu, the parameters for results output can also be configured.

4 Assembly

This chapter describes the assembly options for the Nexo cordless Wi-Fi nutrunner.

4.1 Overview

⚠ CAUTION

The product is not protected against incorrect assembly/disassembly!
Risk of injury and damage to the device during subsequent operation.
- ▶ Assemble/disassemble the product according to the following information and in the correct order.
- ▶ Never clamp the product with its housing cases, e.g. in a vise.

⚠ CAUTION

Improper handling!
Under unfavorable conditions, handling or assembling/disassembling specific parts and components in an unsuitable manner could cause injuries. Injury due to crushing, shearing, cutting, impact!
- ▶ Observe the general setup and safety regulations according to the state of the art, which refer to handling and assembling/disassembling the device.
- ▶ Use suitable assembly/disassembly and transport equipment.
- ▶ Prevent trapping and crushing injuries by using suitable precautions.
- ▶ Only use suitable tools.
- ▶ Use special tools if stipulated.
- ▶ Use tools appropriately.
- ▶ If necessary, use suitable protective equipment (e.g. protective goggles, safety shoes, protective gloves).
- ▶ Do not stand under suspended loads.

⚠ CAUTION

Risk of injury!
Unintentional activation of the product during assembly/disassembly may cause serious injuries!
- ▶ Before working on the product, put the program selector to its central position (switch lock) and remove the accumulator.

4.2 Initial commissioning, re-commissioning

The following steps must be taken before the hand-held nutrunner can be commissioned:
- Nexo cordless Wi-Fi nutrunner -NXA right-angle nutrunner
  - As necessary, readjust the angle head, see Adjusting the angle head from page 59
  - As necessary, attach the torque support, see Attaching the torque support from page 61
  - Install accessories, see Attaching the accessories from page 64
  - Slide-in battery pack.
- Nexo cordless Wi-Fi nutrunner - NXP pistol grip nutrunner
  - Install accessories, see Attaching the accessories from page 64
  - Slide-in battery pack.

4.3 Adjusting the angle head

NOTE

Damage to the product!

Do not start the nutrunner when the angle screw head has been removed.

▶ Do not start the nutrunner before you have completely assembled it.

NXA011S and NXA015S

You can adjust the angle head in a total of eight positions.

Tools required (not included in the scope of delivery):

- Open-end wrench, wrench size 22 mm
- Open-end wrench, wrench size 27 mm

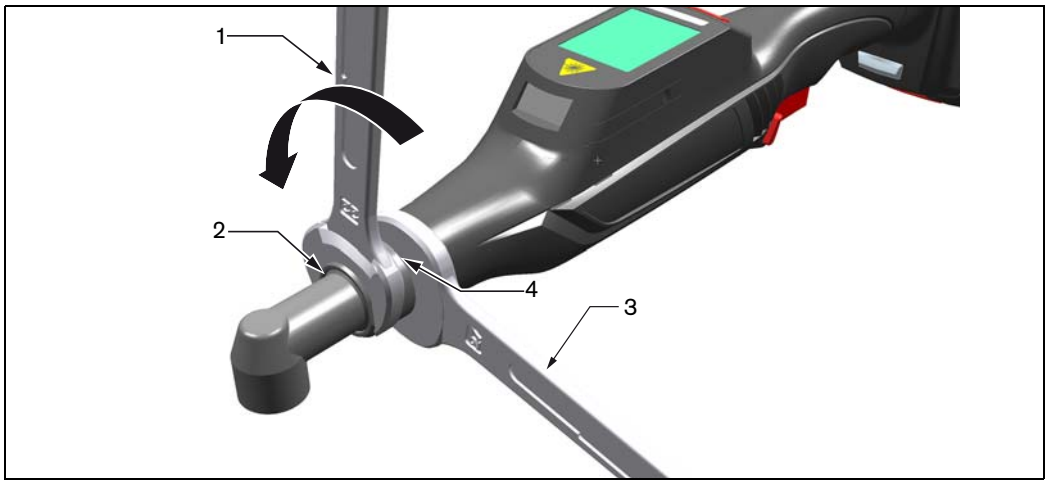


Fig. 4–1: Loosening the angle head

1. Use open-end wrench 3 to hold the hand-held nutrunner at wrench face 4 of the angle head flange (see figure 4–1).
2. Use open-end wrench 1 to loosen the union nut at wrench face 2 (see figure 4–1).

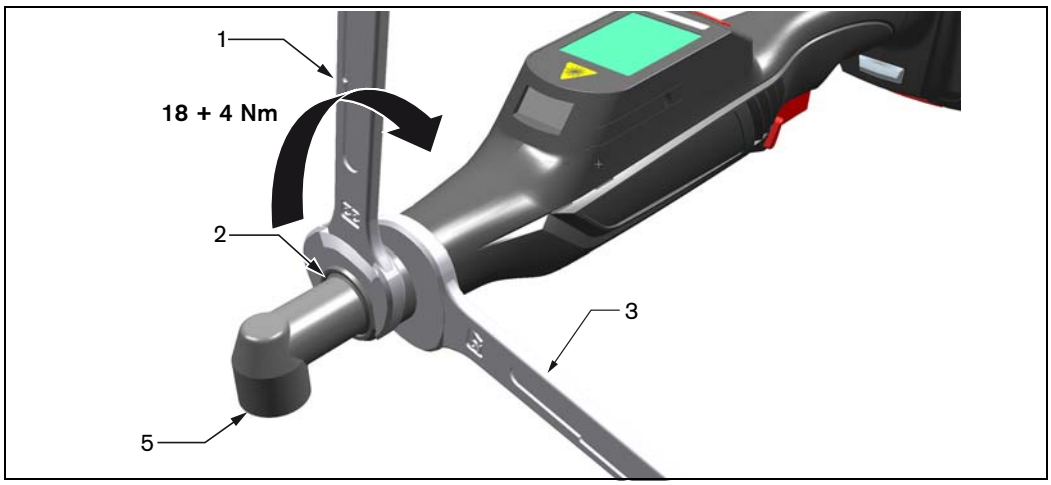


Fig. 4–2: Adjusting the angle head and tightening the lock nut

3. Adjust angle head 5 in increments of 45° until it reaches the desired position and use open-end wrench 1 to tighten the union nut at wrench face 2 again. Use open-end wrench 3 at the angle head flange to hold it in place (see figure 4–2).

To rotate the angle head, it must be removed from the lock (pull it forward as far as necessary). After having adjusted the angle head, make sure it is correctly locked in place before retightening the lock nut.

NXA030S, NXA050S and NXA065S

The angle head can be infinitely adjusted by 360°.

Tools required (not included in the scope of delivery):

- Hook wrench DIN 1810 shape B, external nut diameter 34-36 mm, pin diameter 4 mm
- Mounting aid for angle heads ESWM 3608876473

NOTE

Improper handling may cause damage!

Damage to the hand-held nutrunner.

- Attach the mounting aid only in the clamping area allowed for the torque support (see Attaching the torque support on page 61).

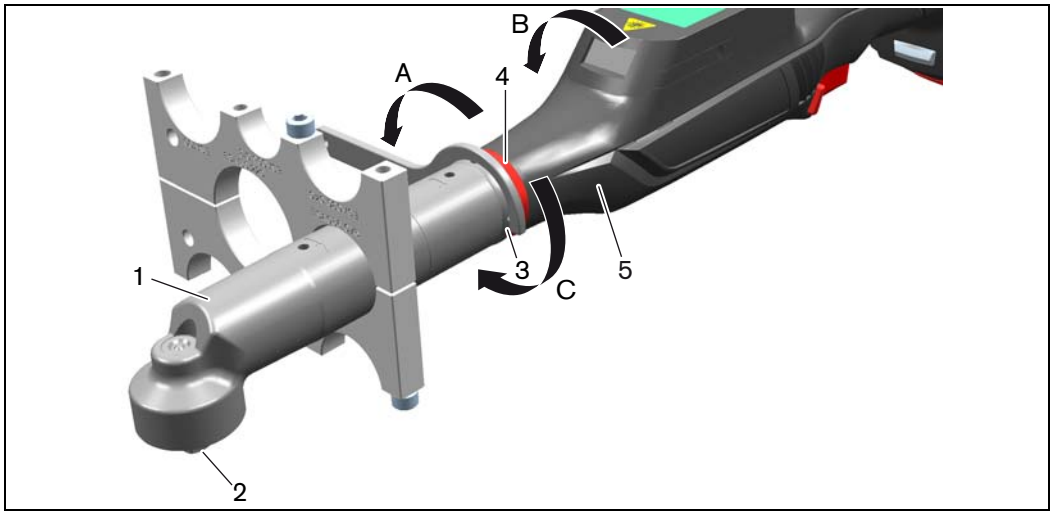


Fig. 4–3: Removing and adjusting the angle head

1. Clamp the mounting aid into a vise or similar.
2. Mount the angle head into the mounting aid (see the instruction leaflet for the mounting aid).
3. Hook the hook spanner into an opening of the counter nut and rotate it in the direction of arrow A (left hand thread) to loosen the counter nut 3 (see figure 4–3).
4. Rotate the nutrunner 5 in the direction of arrow B until you have reached the desired working angle, however not more than once by 360° (see figure 4–3).

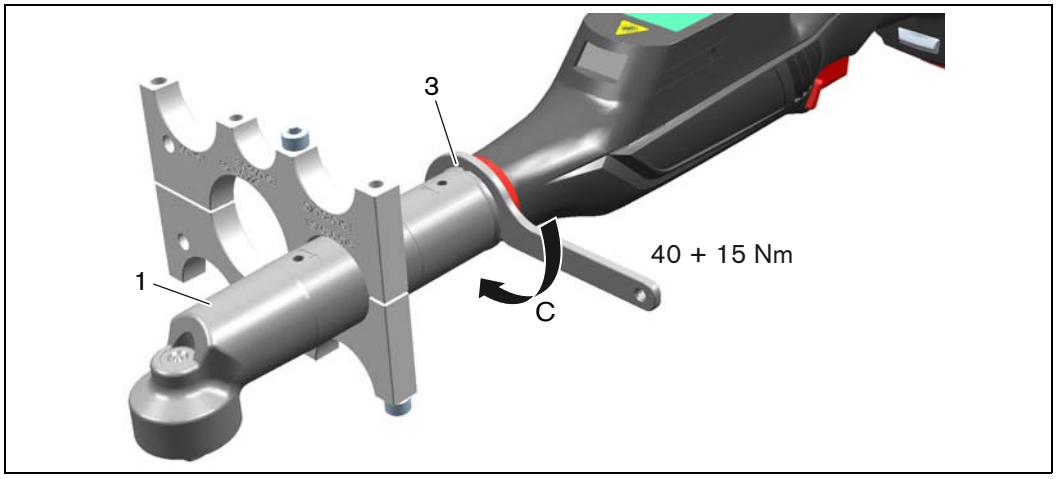


Fig. 4–4: Tightening the counter nut

5. Lock the angle screw head 1 in position by turning the counter nut 3 in the direction of arrow C (see figure 4–4).
6. Retighten the counter nut 3 (see figure 4–4).

4.4 Attaching the torque support

Install a torque support at the hand-held nutrunner to be able to tighten nuts using higher torques.

⚠ CAUTION

Risk caused by missing torque support in case of high torques!
When hand-held nutrunners are used for making screwed connections with high torques, the developing forces may cause injuries, especially to joints.

- Recommendation: Right-angle nutrunners require the installation and use of a torque support when torques exceed 40 Nm.
- Recommendation: Pistol grip nutrunners require the installation and use of a torque support when torques exceed 10 Nm.
- Also observe country-specific and/or company-specific regulations.

NOTE

Damage due to improper assembly!
Damage to the hand-held nutrunner.

- Only install the torque support in the clamping area (A) intended for this purpose.

NXA011S, NXA015S, NXA030S, NXA050S and NXA065S

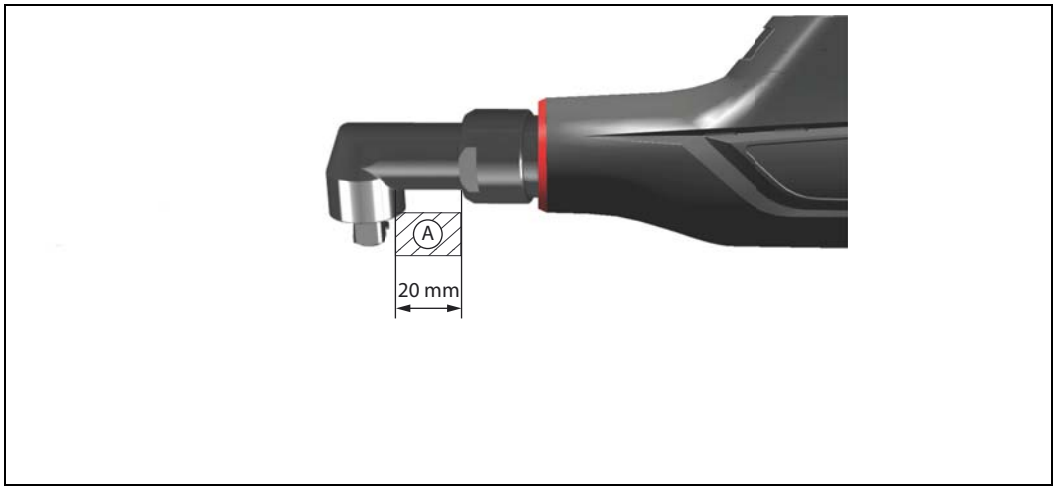


Fig. 4–5: Torque support clamping area - NXA011S/NXA015S

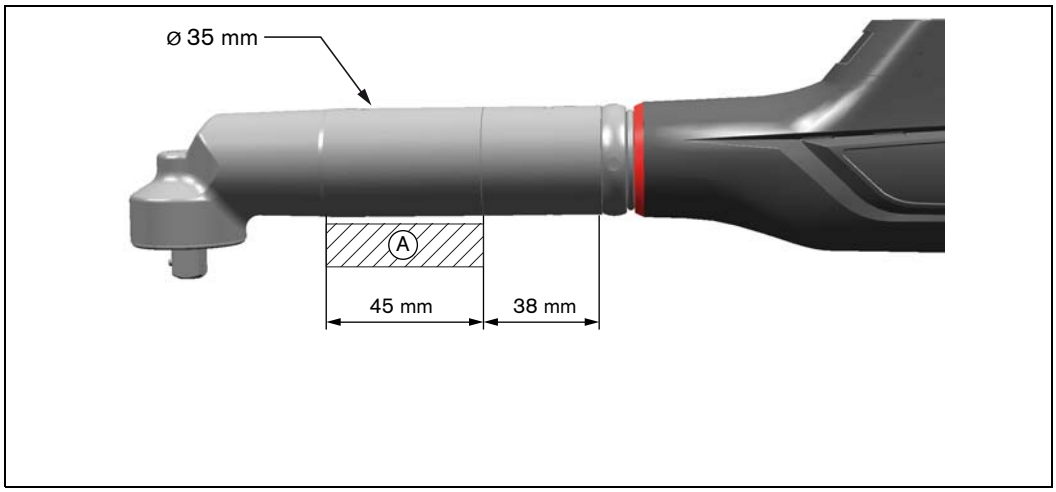


Fig. 4–6: Torque support clamping area - NXA030S/NXA050S/NXA065S

Torque and minimum clamping width for the torque support on right-angle nutrunners:

- Clamp the torque support to the right-angle nutrunner inside the marked area, making sure that it fits planar to the diameter of the nutrunner.
- Minimum clamping width: 12mm
- Tightening torque for clamping screws of size M6: 8 +1 Nm

NXP

Fig. 4–7: Torque support clamping area

Torque for the torque support on pistol grip nutrunners:

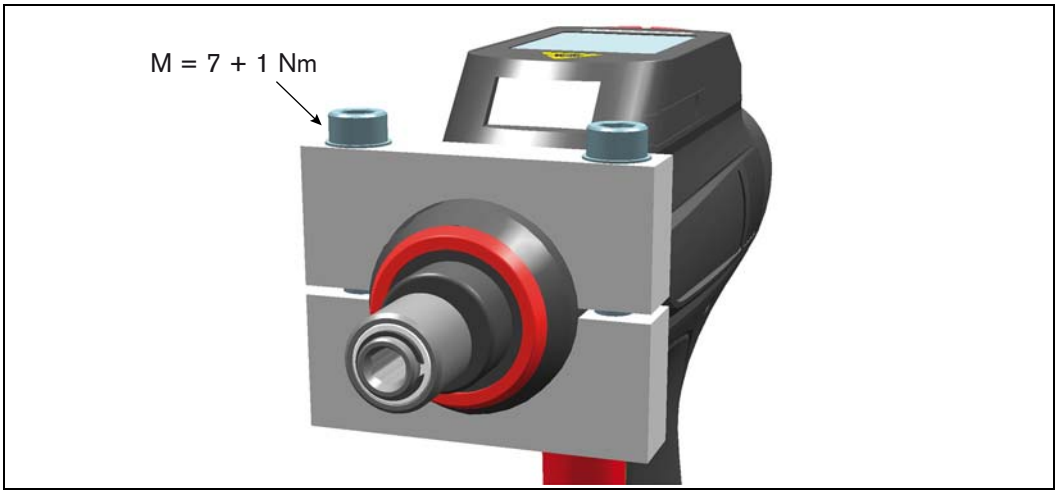


Fig. 4–8: Clamping piece mounting position

Example: Minimum clamping width for the torque support on pistol grip nutrunners:

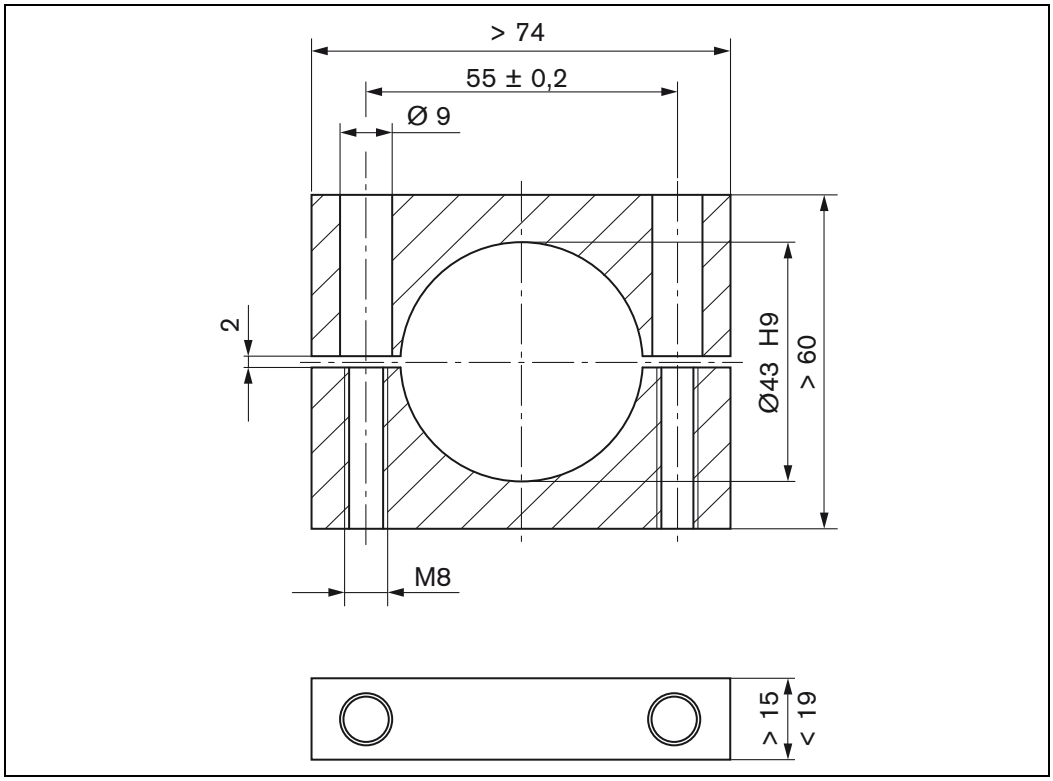


Fig. 4–9: Minimum clamping piece dimensions

4.5 Attaching the accessories

⚠ CAUTION

Risk of injury!

Unintentional activation of the product during assembly/disassembly may cause serious injuries!

- Before working on the product, put the program selector to its central position (switch lock) and remove the accumulator.

When attaching/removing accessories, be sure to observe the related instructions.

If flat output drives are to be installed, observe the clamping areas given for the positioning of the torque support.

5 Construction Guidelines

This chapter provides basic information about tightening operations to the extent to which they are relevant for the Nexo cordless Wi-Fi nutrunner by Rexroth. Additional information can be found online at: www.boschrexroth.com/schraubtechnik

5.1 Designing a bolted connection

The planning of a tightening system starts with the definition of the tightenings that are to be implemented.

Basics on bolted connections and tightening technology can also be found in “Tightening Technology”, ISBN 3-478-93073-1, Moderne Industrie publishers.

5.1.1 Clamp force and distortion of connected parts, operating forces

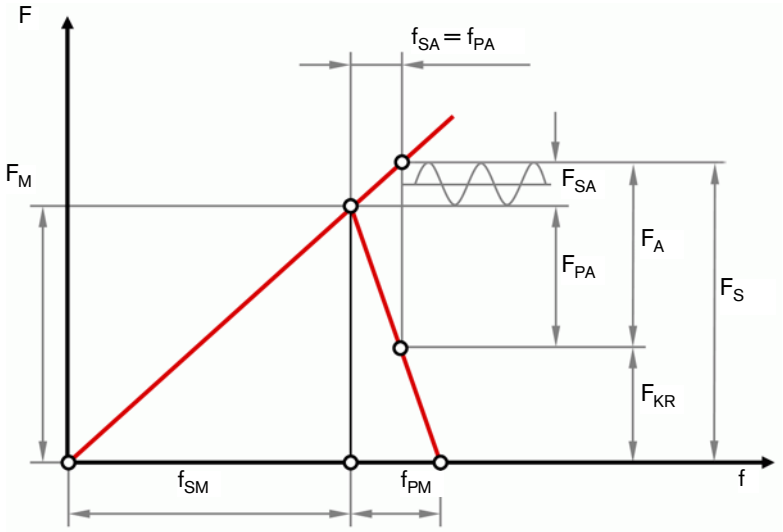


Fig. 5–1: Deformation diagram with acting operating force

F	Force
f	Distortion
F_M	Mounting clamp force
f_{SM}	Elastic stretching of the bolt due to F_M
f_{PM}	Elastic compression of the joined parts
f_{SA}	Increase in elastic stretching of the bolt
f_{PA}	Decrease in elastic compression of the joined parts
F_S	Total force (mounting clamp force and operating force)
F_A	Axial tightening force
F_{KR}	Residual clamp force
F_{PA}	Axial force, relief of the deformed parts
F_{SA}	Operating force

When a bolted connection is tightened, the mounting clamp force $F_M$stretches the bolt like a tension spring. The clamp force acts on the parts to be tightened (compression spring), pressing them together. Normally, tightening stretches the bolt more than the parts are compressed.

During assembly, the mounting clamp force F_M stretches the bolt by the amount f_{SM}. Due to the tightening forces exerted, the parts to be tightened are pressed together (compressed) by f_{PM}.

If operating forces act on the bolted connection, the operating force F_{SA} superimposes the mounting clamp force F_M. The bolt is additionally stretched by f_{SA} while the compression on the material f_{PM} is reduced by the amount f_{PA}. The deformed parts are relieved by the axial force f_{PA}, but the residual clamp force F_{KR} acting on the parts remains.

5.1.2 Determination of the required torque to create a bolted connection

When creating bolted connections, the mounting clamp force (clamping force) required for a secure connection of the parts is usually specified. As the clamping force is difficult to measure, the tightening torque or angle of turn is used as a parameter for the clamping force. When determining the clamp force using the measured tightening torque, the following factors must be taken into account.

5.1.2.1 Friction when tightening

The most influential factor is the friction that results when tightening the bolted connection. This friction mainly depends on the following conditions:

- Machining quality of the parts to be tightened
- Coarseness tolerances of bolt and nut
- Material pairs of the parts and bolts to be tightened
- Surface coating of bolts and components
- Thread form and pitch

The friction consists of a combination of the thread friction and the underhead friction. The actual friction itself does not make a calculation of the mounting clamp force from the tightening torque more difficult, rather the distribution of the friction values from bolted connection to bolted connection.

5.1.2.2 Settling

Settling occurs when the connected parts and/or bolts are plastically distorted after the tightening and the clamp force is permanently decreased.

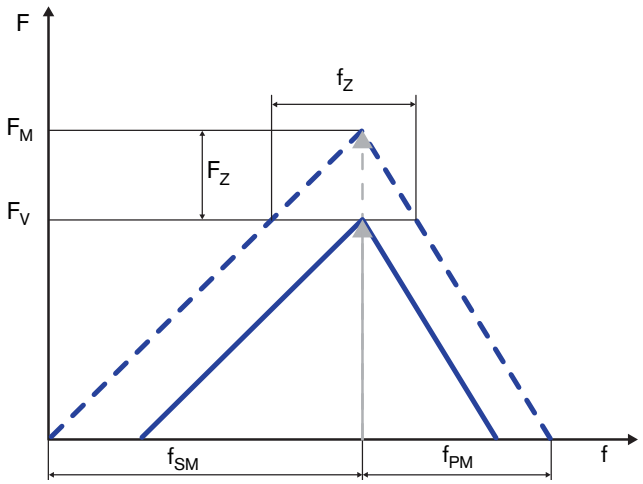


Fig. 5–2: Relation between clamp force and distortion of bolt and connected parts

Relations before the settling process (at the time of tightening)

Relations after the settling process

f	Distortion
F	Force
f_{PM}	Compression of the connected parts
f_{SM}	Extension of the bolt
f_Z	Amount of settling
F_M	Mounting clamp force before settling process
F_V	Mounting clamp force after settling process
F_Z	Loss of mounting clamp force due to settling process

Settling can be avoided or decreased using the following procedures:

- Design modification, e. g. of bearing surfaces, to prevent forces exceeding the yielding points (permissible surface pressing) of the materials
- selection of suitable (strong enough) materials
- suitable surface processing of the parts to be connected prevents settling near rough surfaces.
- Tightening processes where settling (e. g. near rough surfaces) occurs while tightening is in progress; the tightening result (tightening torque) is only determined after the settling process

5.1.2.3 Temperature influences

Due to fluctuations in temperature, the parts to be connected, as well as the bolt, can stretch or compress. Using materials with the same coefficient of expansion prevents the clamping force from changing when the temperature does.

5.1.2.4 Securing bolted connections

Mechanical and chemical securing devices and compounds must be considered particularly as regards to their settling characteristics. With elastic stop nuts, friction increases during tightening due to the plastic insert in the nut.

5.1.2.5 Tightening factor a_A (taking the tightening uncertainty into account)

The mounting clamp force of a bolted connection is influenced by numerous factors:

- The spread of the friction actually occurring under the bolt head and at the thread; only an assumed typical value can be used for calculation
- Differences depending on the selected tightening process, e. g. fast or slow tightening of the bolt, torque-controlled/angle-controlled process, yield point tightening
- Precision of the tightening system used

When designing a bolted connection, the influencing factors mentioned must be taken into account so that in the worst case (minimum mounting clamp force F_{Vmin} reached), the function of the bolted connection is maintained, and that, if maximum mounting clamp force F_{Vmax} is reached, the bolt is not destroyed.

The tightening factor describes the effect of the influencing factors on the mounting clamp force exerted by tightening. The higher the tightening factor, the larger the bolted connection (bolt diameter) must be dimensioned.

The definition for tightening factor a_A is:

$$a_A = \frac{F_{Vmax}}{F_{Vmin}} = \frac{\text{max. mounting clamp force}}{\text{min. required mounting clamp force}}$$

More information on typical values for the tightening factor are described in VDI guideline 2230.

5.1.2.6 Clamping force table according to VDI 2230

The following table lists the guide values for mounting clamp forces (F_M) and tightening torques (T_A) in relation to a friction factor (μ_G) for headless bolts with metric coarse-pitch threads according to DIN ISO 262 and head dimensions for hexagon bolts according to DIN EN ISO 4014 to 4018, fillister head bolts according to DIN EN ISO 4762, and “center” holes according to DIN EN 20 273.

Table 5–1: Clamp force table

Dimension	Property class	Mounting clamp force F_M in kN for μ_G							Tightening torque T_A in Nm for μ_G						
		0.08	0.10	0.12	0.14	0.16	0.20	0.24	0.08	0.10	0.12	0.14	0.16	0.20	0.24
M4	8.8	4.6	4.5	4.4	4.3	4.2	3.9	3.7	2.3	2.6	3.0	3.3	3.6	4.1	4.5
	10.9	6.8	6.7	6.5	6.3	6.1	5.7	5.4	3.3	3.9	4.8	4.6	5.3	6.0	6.6
	12.9	8.0	7.8	7.6	7.4	7.1	6.7	6.3	3.9	4.5	5.1	5.6	6.2	7.0	7.8
M5	8.8	7.6	7.4	7.2	7.0	6.8	6.4	6.0	4.4	5.2	5.9	6.5	7.1	8.1	9.0
	10.9	11.1	10.8	10.6	10.3	10.0	9.4	8.8	6.5	7.6	8.6	9.5	10.4	11.9	13.2
	12.9	13.0	12.7	12.4	12.0	11.7	11.0	10.3	7.6	8.9	10.0	11.2	12.2	14.0	15.5
M6	8.8	10.7	10.4	10.2	9.9	9.6	9.0	8.4	7.7	9.0	10.1	11.3	12.3	14.1	15.6
	10.9	15.7	15.3	14.9	14.5	14.1	13.2	12.4	11.3	13.2	14.9	16.5	18.0	20.7	22.9
	12.9	18.4	17.9	17.5	17.0	16.5	15.5	14.5	13.2	15.4	17.4	19.3	21.1	24.2	26.8
M7	8.8	15.5	15.1	14.8	14.4	14.0	13.1	12.3	12.6	14.8	16.8	18.7	20.5	23.6	26.2
	10.9	22.7	22.5	21.7	21.1	20.5	19.3	18.1	18.5	21.7	24.7	27.5	30.1	34.7	38.5
	12.9	26.6	26.0	25.4	24.7	24.0	22.6	21.1	21.6	25.4	28.9	32.2	35.2	40.6	45.1
M8	8.8	19.5	19.1	19.0	18.8	17.6	16.5	15.5	18.5	21.6	24.6	27.3	29.8	34.3	38.0
	10.9	28.7	28.0	27.3	26.6	25.8	24.3	22.7	27.2	31.8	36.1	40.1	43.8	50.3	55.8
	12.9	33.6	32.8	32.0	31.1	30.2	28.4	26.6	31.8	37.2	42.2	46.9	51.2	58.9	65.3
M10	8.8	31.0	30.3	29.6	28.8	27.9	26.3	24.7	36	43	48	54	59	68	75
	10.9	45.6	44.5	43.4	42.2	41.0	38.6	36.2	53	63	71	79	87	100	110
	12.9	53.3	52.1	50.8	49.4	48.0	45.2	42.4	62	73	83	93	101	116	129
M12	8.8	45.2	44.1	43.0	41.9	40.7	38.3	35.9	63	73	84	93	102	117	130
	10.9	66.3	64.8	63.2	61.5	59.8	56.3	52.8	92	108	123	137	149	172	191
	12.9	77.6	75.9	74.0	72.0	70.0	65.8	61.8	108	126	144	160	175	201	223
M14	8.8	62.0	60.6	59.1	57.5	55.9	52.6	49.3	100	117	133	148	162	187	207
	10.9	91.0	88.9	86.7	84.4	82.1	77.2	72.5	146	172	195	218	238	274	304
	12.9	106.5	104.1	101.5	98.8	96.0	90.4	84.8	171	201	229	255	279	321	356
M16	8.8	84.7	82.9	80.9	78.8	76.6	72.2	67.8	153	180	206	230	252	291	325
	10.9	124.4	121.7	118.8	115.7	112.6	106.1	99.6	224	264	302	338	370	428	477
	12.9	145.5	142.4	139.0	135.4	131.7	124.1	116.6	262	309	354	395	433	501	558
M18	8.8	107	104	102	99	96	91	85	220	259	295	329	360	415	462
	10.9	152	149	145	141	137	129	121	314	369	421	469	513	592	657
	12.9	178	174	170	165	160	151	142	367	432	492	549	601	692	769
M20	8.8	136	134	130	127	123	116	109	308	363	415	464	509	588	655
	10.9	194	190	186	181	176	166	156	438	517	592	661	725	838	933
	12.9	227	223	217	212	206	194	182	513	605	692	773	848	980	1092
M22	8.8	170	166	162	158	154	145	137	417	495	567	634	697	808	901
	10.9	242	237	231	225	219	207	194	595	704	807	904	993	1151	1284
	12.9	283	277	271	264	257	242	228	698	824	945	1057	1162	1347	1502
M24	8.8	196	192	188	183	178	168	157	529	625	714	798	875	1011	1126
	10.9	280	274	267	260	253	239	224	754	890	1017	1136	1246	1440	1604
	12.9	327	320	313	305	296	279	262	882	1041	1190	1329	1458	1685	1877
M27	8.8	257	252	246	240	234	220	207	772	915	1050	1176	1292	1498	1672
	10.9	367	359	351	342	333	314	295	1100	1304	1496	1674	1840	2134	2381
	12.9	429	420	410	400	389	367	345	1287	1526	1750	1959	2153	2497	2787

5.1.3 Tightening case (soft – hard)

Soft tightening case

A soft tightening case exists if a relative large angle of turn[1] is needed to reach the tightening torque. This is always the case if elastic (or soft) materials are being tightened, e.g. split washers, elastomers, or seals. When creating such bolted connections, the tightening system must withstand longer-lasting mechanical loads.

Hard tightening case

A hard tightening case exists if the end torque is reached within a small angle of turn[1)]. The requirement for a tightening system here is mainly to quickly end the tightening once the tightening torque has been reached and to prevent the spindle from coasting (inertia). Only then the tightening process can be classified as safe.

Tightening case determination according to ISO 5393

The definition of a hard or soft tightening case is set out in ISO 5393 as follows:

- **Hard tightening case:** Soft tightening case: Increase in torque from 10% to 100% of the target torque within an angle of turn of 27° (or from 0% to 100% within 30°).
- **Soft tightening case:** Soft tightening case: Increase in torque from 10% to 100% of the target torque within an angle of turn of 650° (or from 0% to 100% within 720°).

Tightening case determination according to VDI/VDE 2647

The definition is set out in VDI/VDE 2647 as follows:

- **Hard tightening case:** Increase in torque from 50% to 100% of the target torque within an angle of turn of 30°.
- **Soft tightening case:** Increase in torque from 50% to 100% of the target torque within an angle of turn of 360°.

The tightening case hardness is particularly relevant for selecting the speed in the last tightening step and thus also for the cycle times (page 70).

5.1.4 Tightening processes

A bolted connection should be designed in a way that the minimum mounting clamp force reached guarantees the function of the bolted connection, but the maximum mounting clamp force does not destroy the bolted connection or the bolt.

The following tightening processes are available for this:

- Angle of turn-controlled tightening process
- Torque-controlled tightening process
- Special tightening processes, e.g. loosening/retightening sequence

For detailed information, please refer to chapter Tightening processes from page 247.

5.2 Cycle times

The possible cycle time (effective minimum time for a tightening process) is determined by two factors:

- the duration of the tightening steps
- the heat output of the nutrunner

There is no cycle time loss when the slide-in battery pack is changed during the buffer period (see page 45).

1. The angle of turn considered here is the angle difference between reaching a threshold torque (10% of the nominal torque) and reaching the tightening torque (end of tightening process).

5.2.1 Total duration for all tightening steps

The total duration of all tightening steps can be determined by the expected maximum angle of turn and the selected speed of each tightening step. Thanks to the high acceleration when starting and stopping the spindles, these times need not be taken into account.

The total duration of all tightening steps or minimum cycle time is calculated by the sum of the individual times:

$t_{cycle} = t_{tight} + t_{pre} + t_{end}$ (for a three-stage tightening process)

5.3 Compatibility with foreign substances

All tightening system components from Rexroth are developed and tested in accordance with the latest state-of-the-art.

As it is impossible to follow the continuous development of all the substances with which our tightening system components may come into contact (e.g. lubricants for machine tools), reactions to the materials used by us cannot be excluded in every case.

For this reason, you must perform a compatibility test for all new lubricants, detergents, etc. with our housing materials prior to use.

5.4 Planning assistance

5.4.1 3-D/CAD data

All CAD data from Bosch Rexroth are available free of charge from the following internet address.

www.boschrexroth.com/schraubtechnik

Use the links on the website displayed to navigate to the appropriate component. The CAD data are available on the **CAD** tab.

6 Control signals

This chapter provides detailed information about the control signals of the tightening controller (PLC) of the Nexo cordless Wi-Fi nutrunner by Rexroth.

6.1 PLC signals

The default delivery of the Nexo cordless Wi-Fi nutrunner includes a PLC assignment table that has already been configured.

The PLC assignment table defines the assignment of the control signals to the physical interfaces of the Nexo cordless Wi-Fi nutrunner. These control signals can be used to integrate the tightening controller into a system sequence. The following numbers of inputs and outputs are available on the interfaces:

Table 6–1: Number of inputs and outputs

PLC module	Inputs	Outputs
tool - Nutrunner	16	0
oprtcl - Rexroth Open Protocol	48	16
vwXml - VW-XML	40	56

The configuration of the PLC assignment table can be adjusted to customer requirements using the NEXO-OS operating system; see menu item **Settings** → **PLC signals** (page 226).

6.2 Description of all PLC signals

The sections below provide a description of all PLC signals in alphabetic order.

6.2.1 Input signals

Overview of PLC input signals

Signal	Function	Description
ActEn	Active Enable	Enables a single tightening process
ActScan [1)]	Active Scanner	Enables a single scan process
AppIn0-15	Application In Bit 0-15	Application-specific input signal
Ccw	Counterclockwise	Loosen
CcwIgnore	Counter clock wise ignore	Ignores the Ccw switch
CwIgnore	Clock wise ignore	Ignores the Cw switch
CcwLock	Counter clock wise lock	Disables the loosening function
Cw	Clockwise	Starts tightening in clockwise direction
CwLock	Clock wise lock	Disables the starting function
CntRes	Counter Reset	Resets the counter value
CntSel0-7	Counter Select Bit 0-7	Selects the counter value
DisRp	Disable Report	Suppresses the results output
DisRpFtp	Disable Report Ftp	Suppresses the results output via FTP
En	Enable	Enables
EnScan [1)]	Enable Scanner	Enables the scanner
JobAbort [1)]	Job Abort	Aborts a job
JobEnable [1)]	Job Enable	Activate job
JobResRs [1)]	Job Reset Result	Resets a result
JobStart [1)]	Job Start	Starts a job
Job0-7 [1)]	Job 0-7	Job selection
ManOP [2)]	Manual Operation Mode	Change-over manual mode
NokAc	Not OK acknowledge	NOK acknowledge
Prog0-7	Program 0-7	Program selection
ResF	Reset Fault	Resets a system error
ResRs	Reset Result	Resets a result

1. Supported as of Nexo firmware version 1100
2. Supported as of Nexo firmware version 1300

ActEn **Active Enable: Enables a single tightening process**

This signal enables the tightening channel for a single tightening process.

After tightening, the tightening channel is disabled for the next tightening operation until ***ActEn*** changes from "high" to "low" and back to "high" again. The tightening channel is then enabled for the next tightening. This type of enabling only enables the channel for a single tightening.

The following table describes the enable function in the assignment of the PLC assignment table.

Signal in PLC assignment table		Enable function
En[1)]	ActEn[2)]	
Not applied	Not applied	Nutrunner blocked.
Applied	Not applied	The nutrunner is enabled if the signal En is at “High”.
Not applied	Applied	The nutrunner is only enabled for a single tightening process by changing the signal ActEn from “Low” to “High”.
Applied	Applied	Nutrunner is only enabled if En is at “High” or the ActEn signal changed from “Low” to “High”.

1. The signal enables the nutrunner.
2. This signal enables the nutrunner for a single tightening process.

ActScan **Active Scanner: Enables a single scan process**

This signal enables the scanner integrated into the nutrunner for a single scan process.

After scanning, the scanner is disabled until ***ActScan*** changes from “High” to “Low” and back to “High” again. The scanner is then enabled for the next scan. This type of enabling only enables the scanner for a single scan process.

AppIn0-15 **Application In Bit 0-15: Application-specific input signal**

Application-specific signals are used to make special adjustments for customer requirements.

BoxNutLED0-7 **Box Nut LED: Switches LED0-7 on in the socket tray**

Using this signal, a superior system informs the Tightening System350 on which LED(0…7) of the socket tray has to be activated.

BoxNutSel0-7 **Box Nut Selected: Socket 0-7 selected from socket tray**

Using this signal, the socket tray informs the Tightening System350 on which socket(0…7) has been selected from the socket tray.

Ccw **Counter clock wise: Loosen**

This signal starts the tightening program No. 99 (Loosen) in a tightening channel. The start signal must remain "high" while processing is in progress; otherwise, tightening is canceled with ***NOK*** and "Canceled by PLC". After an OK/NOK evaluation has been made, the signal can be set to "low" without any effect on tightening.

Program no. 99 (Loosen) is executed.

No zero point test is implemented when program no. 99 is started with the signal ***Ccw***.

CcwIgnore **Counter clock wise ignore: Ignores the Ccw switch**

This signal ignores the position of the Ccw switch of the nutrunner. The program selected is always started.

CwIgnore **Clock wise ignore: Ignores the Cw switch**

This signal ignores the position of the Cw switch of the nutrunner. Program no. 99 is always started.

CcwLock **Counter clock wise lock: Disables the loosening function**

This signal disables the tightening program no. 99 (Loosen) in a tightening channel.

Cw **Clock wise: Starts tightening in clockwise direction**

A selected tightening program is started with the ***Cw*** start signal. The start signal remains set to "high" during the entire execution, until OK/NOK evaluation. If the ***Cw*** start signal changes to "low" during tightening, the tightening program will be canceled with NOK and the quality evaluation "Canceled by PLC". After an OK/NOK evaluation has been made, the signal can be set to "low" without any effect on tightening.

If an attempt is made to start a faulty tightening program, the tightening program is exited immediately with an NOK evaluation. If an attempt is made to start a non-existent tightening program, the display shows a message stating that there is no tightening program. There is no evaluation.

If the **Play at start** function is active, a tightening start is not considered performed if the maximum occurring torque remained below the defined torque threshold[1]. In this case, the controller does not perform any evaluation (OK/NOK) and results output.

CwLock **Clock wise lock: Disables the starting function**

This signal serves to lock the start of the selected tightening program.

CntRes **Counter Reset: Resets the counter value**

When this signal is set to "high", both counters of the OK/NOK counter are reset to their programmed initial state. At the same time, the tightening channel is released, i.e. any nutrunners blocked by the OK/NOK counter will be released.

CntSel0-7 **Counter Select Bit 0-7: Selects the counter value**

These signals are used to select the OK/NOK counters. This selection takes effect irrespective of the tightening program, e.g. by the partner controller. If a new counter value is selected before the default value for the OK/NOK counter is reached, the channel is disabled (optional) and evaluated with ***CntCanceled*** = "high".

DisRp **Disable Report: Suppresses the results output**

When the ***DisRp*** signal is "high", the results output (e.g. printer output) can be suppressed for the subsequent tightening program. Outputs within the scope of the operating system are not suppressed.

DisRpFtp **Disable Report Ftp: Suppresses the results output via FTP**

The FTP results output can also be suppressed by the PLC using the ***DisRpFtp*** PLC signal (signal ***DisRpFtp*** = "high"). This avoids having to wait for the results output when restarting. This function is particularly useful when several tightening programs are started in a row.

En **Enable: Enables**

When the ***En*** signal is "high", it acts as a nutrunner start enable signal. If the ***En*** signal changes to "low" during a tightening process or sequence, the process or sequence will be canceled and the tightening program is evaluated as NOK.

EnScan **Enable scanner: Enables the scanner**

This signal enables the scanner in the nutrunner for the set duration (“1”) or disables the scanner (“0”).

The duration has to be set in the NEXO-OS operating system, in **Settings** → **Scanner** → **Scanner configuration**.

1. This threshold can be set in the start step of the tightening program; the default value is 5% of the nominal torque of the nutrunner.

JobAbort **Job Abort: Aborts a job**

This signal aborts a currently running job.

JobEnable **Job Enable: Activate job**

This signal activates a job.

JobResRs **Job Reset Result: Resets a job result**

This signal sets the OK evaluation to “0”, NOK to “1” and JobCyCmp to “0”.

JobStart **Job Start: Starts a job**

This signal starts a job.

Job0-7 **Job 0-7: Job selection**

Using these bits, the jobs 0 to 249 can be selected.

These eight inputs are used to transfer the binary encoded job number to the tightening controller. The job number is valid within the tightening controller if the job acknowledgement signals correspond to the selected job. The job number must be selected and acknowledged by the system before the job sequence is started.

If it is configured for the job, the OK/NOK counter is automatically selected when the job is started.

ManOp **Manual Operating Mode: Activate manual mode**

This signal activates the manual mode for the nutrunner if in the start step at mode, the **PLC signal ManOp** option has been activated under **Trigger.** If the nutrunner changes into manual mode, the signal is set to “1”.

NokAc **Not OK acknowledge: NOK acknowledge**

The tightening system also provides you with an option to prevent further starts after an NOK tightening. A restart is only possible after the ***NOKAc*** signal has been set to "low".

This function is active if the signal ***NOKAc*** is set to "high" at the starting point. If tightening is evaluated with NOK, the tightening system is ready to restart after the ***NOKAc*** signal has been reset to "low". The system is ready to start when the ***InCy*** or ***InCyCcw*** signal is shown to be "low". Setting ***NOKAc*** to "low" will also reset ***NOK*** on the PLC interface.

The ***NOKAc*** signal must be set to “high” before the ***Cw*** or ***Ccw*** signal so that the signal will be considered for this tightening.

After commissioning of the Nexo cordless Wi-Fi nutrunner, the signal ***NOKAc*** is set to “high” by default if it is applied on the **tool** PLC module. To start the nutrunner, the signal has to be set to “low”.

If the ***NOKAc*** signal is assigned to input 0.3, 0.4 or 0.5 in the PLC table, the signal is inverted, i.e. the signal changes to "low" when the functional key is pushed, and to "high" when it is released.

Prog0-7 **Programm 0-7: Program selection**

These eight inputs are used to transfer the binary encoded program number to the tightening controller. The program number is valid within the tightening controller if the program acknowledgement signals correspond to the selected program. The program number must be selected and acknowledged by the system before the start of the tightening.

If the OK/NOK counter is configured as required for the program, the counter will be automatically selected when the program is selected.

Tightening program	Prog7	Prog6	Prog5	Prog4	Prog3	Prog2	Prog1	Prog0
0	Low	Low	Low	Low	Low	Low	Low	Low
1	Low	Low	Low	Low	Low	Low	Low	High
2	Low	Low	Low	Low	Low	Low	High	Low
3	Low	Low	Low	Low	Low	Low	High	High
.			.	.	.	.	.	.
.			.	.	.	.	.	.
255	High	High	High	Low	High	High	High	High

As before, program 99 is the Loosen program.

ResF **Reset Fault: Resets a system error**

This input allows acknowledging a system error of error class 3. The system error is acknowledged provided error acknowledgement is allowed.

ResRs **Reset Result: Resets a result**

We recommend resetting the results before every restart.

ResRs signal = "high" sets the ***CyCmp*** and ***OK*** signals, the monitoring function signals, e.g. ***TorqH***, and the ***TrigOut*** signal to "low", and the ***NOK*** signal to "high".

Resetting the result (signal value is "high") does not delete the ID code in the input buffer. This allows using the sequence number.

In order to delete the ID code after tightening has been started, the **Delete ID code after start** option must be activated in the NEXO-OS operating system, in the ID input step mode.

6.2.2 Output signals

Overview of PLC output signals

Signal	Function	Description
Ack0-7	Acknowledge 0-7	Acknowledges program selection
ActEnAck	Active enable acknowledge	Acknowledges enabling of a single tightening process
ActScanAck [1]	Active scanner acknowledge	Acknowledges enabling of a single scan process
AnglH	Angle too high	Angle too high
AnglL	Angle too low	Angle too low
AppOut0-15	Application Out Bit 0-15	Application-specific output signal
BattOk	Battery OK	Checks the battery pack slide-in module
BattOff	Battery OFF	The battery pack slide-in module has been removed
CntSelAck0-7	Counter Select acknowledge Bit 0-7	Acknowledge counter set selection
CcwAck	Counter clock wise acknowledge	Acknowledges a loosening operation
CntCanceled	Counter canceled	Counter set canceled
CcwLockAck	Counter clock wise lock acknowl-edge:	Acknowledges that loosening is disabled
CCwSel	Counterclockwise Select	Loosening program selected at nutrunner
CwAck	Clock wise acknowledge	Acknowledges a start
CwLockAck	Clock wise lock acknowledge	Acknowledges that start is disabled
CntNOK	Counter NOK	NOK counter has reached default value
CntOK	Counter OK	OK counter has reached default value
CyCmp	Cycle Complete	Process end
CheckTool	Check the tool	Nutrunner test interval reached
EnAck	Enable acknowledge	Acknowledges enabling
EnScanAck [1]	Enable scanner acknowledge	Acknowledges that the scanner is enabled
FtpF	Ftp Fault	Results transfer error
InCy	In Cycle	Tightening program active
InCyCcw	In Cycle Counterclockwise	Loosening is active
JobAck0-7 [1]	Job acknowledge 0-7	Acknowledges the selected job
JobCyCmp [1]	Job Cycle Complete	The job is finished
JobIncy [1]	Job In Cycle	The job is active
JobNOK [1]	Job Not OK	The job result is not okay
JobOK [1]	Job OK	The job result is okay
JobRdy [1]	Job ready	The job is ready
ManOpAck [2]	Manual Operating Mode acknowl-edge	Manual mode acknowledgment
NF	No Fault	Nutrunner without system errors
NOK	Not OK	Result not OK
OK	OK	Results OK
RC0-4 [1]	Rework Code Bit 0-4	Rework code Bit 0-4
Rdy	Ready	Nutrunner ready for operation
ScanRdy [1]	Scanner ready	Scanner ready
ScanRxID [1]	Scanner read ID	Barcode read
StartBn	Start button	State of the start switch
TimeH	Time too high	Time too high
TorqH	Torque too high	Torque too high
TorqL	Torque too low	Torque too low

1. Supported as of Nexo firmware version 1100
2. Supported as of Nexo firmware version 1300

Ack0-7 **Acknowledge 0-7: Acknowledges program selection**

The signal acknowledges the selection of the program.

With the help of these signals, the PLC can determine whether the tightening program was selected successfully. The program number is only valid if the acknowledgement corresponds to the selection. The controller always uses the acknowledged program number as the basis for a tightening.

ActEnAck **Active Enable: Acknowledges enabling of a single tightening process**

The signal serves to confirm that the tightening channel has been enabled for a single tightening process.

ActScanAck **Active Scanner: Acknowledges enabling of a single scan process**

This signal acknowledges that the scanner integrated into the nutrunner was enabled for a single scan process.

AnglH **Angle too high: Angle too high**

Results description after a completed tightening sequence. The angle is above the defined tolerance window.

AnglL **Angle too low: Angle too low**

Results description after a completed tightening sequence. The angle is below the defined tolerance window.

AppOut0-15 **Application Out Bit 0-15: Application-specific output signal**

Application-specific signals are used to make special adjustments for customer requirements. They are, e.g., suitable for looping through signals: a signal can be read by the controller via interface modules and then output to the partner controller using the controller.

BattOK **Battery OK: State of the battery pack slide-in module**

This signal repors the state of the battery pack slide-in module.

BattOK = „High“: The battery state is okay. As soon as the battery charge condition does not allow tightening any longer or if the battery is defective, the signal changes to "low".

BattOff **Battery Off: Battery pack slide-in module not inserted**

This signal reports whether or not the battery pack slide-in module is inserted.

BattOff = “High”: The battery is not inserted. The signal changes to "low" when the battery is inserted.

CntSelAck0-7 **Counter Select acknowledge Bit 0-7 Acknowledge counter set selection**

These signals are used to acknowledge the counter value selection via signals ***CntSel0-7***. Signal ***CntSelAck0-7*** is output only if the **Select PLC signals CntSel0…CntSel7** option is selected in the OK/NOK counter.

CcwAck **Counter clock wise acknowledge: Acknowledges a loosening operation**

This signal confirms that the tightening program No. 99 (Loosen) has been started in a tightening channel.

CntCanceled **Counter canceled: Counter set canceled**

Cancelation of a counter set is indicated by CntCanceled is "high". The ***CntCanceled*** signal is output only if the program is changed within a non-completed counter value. The **Select PLC signals Pro0…Prog7** option must be selected in the OK/NOK counter.

CcwLockAck **Counter clock wise lock acknowledge: Acknowledges that loosening is disabled**

This signal acknowledges the locking of the tightening program no. 99 (Loosen) in a tightening channel.

CCwSel **Counter clock wise Select: Loosening program selected at nutrunner**

This signal changes to "high" when program no. 99 (Loosen) is selected using the program selector on the nutrunner.

The signal is only updated outside of the tightening operation.

BoxNutLED0-7Ack **Box Nut LED acknowledge: Acknowledges switch-on of LED0-7 in the socket tray**

Using this signal, the Tightening System350 activates the corresponding LED(0…7) of the socket tray.

BoxNutSelAck0-7 **Box Nut Selected acknowledge: Acknowledges selection of socket 0-7 from the socket tray**

Using this signal, the Tightening System350 informs a superior system on which socket(0…7) has been selected from the socket tray.

CwAck **Clock wise acknowledge: Acknowledges a start**

This signal serves to acknowledge the start of the selected tightening program.

CwLockAck **Clock wise lock acknowledge: Acknowledges that start is disabled**

This signal serves to acknowledge that a selected tightening program is disabled.

CntNOK **Counter NOK: NOK counter has reached default value**

This signal changes to "high" if the set default value of the NOK counter has been reached. The tightening channel can be optionally blocked when the NOK default value has been reached.

CntOK **Counter OK: OK counter has reached default value**

This signal changes to "high" if the set default value of the OK counter has been reached. The tightening channel can be optionally blocked when the OK default value has been reached.

CyCmp **Cycle Complete: Process end**

CyCmp = "high" signals the end of a tightening operation (sequence and results processing). The tightening channel is ready for the next tightening.

CyCmp is set once the current result has been filed to the results database.

Details on data output and its chronological order can be found in the individual chapters of Data services.

CheckTool **Check Tool: Nutrunner test interval reached**

This signal turns to "high" when a test interval set in the channel configuration has been reached with the nutrunner.

EnAck **Enable acknowledge: Acknowledges enabling**

This signal serves to acknowledge the release for the start of the nutrunner.

EnScanAck **Enable scanner acknowledge: Acknowledges that the scanner is enabled**

This signal indicates the status of the scanner in the nutrunner. The scanner is either enabled (***EnScanAck*** = 1) or it is locked or its release time has expired (***EnScanAck*** = 0).

FtpF **Ftp Fault: Results transfer error**

Setting: Transfer after completion of the tightening program:

The ***FtpF*** error signal will be set to "high" if a disruption occurs during the transfer to the FTP server. This signal will be automatically set to "low" after the next successful data transfer.

Setting: Transfer before completion of the tightening program:

If transfer via Ethernet is not possible, the tightening program or tightening process is stopped immediately. The ***FtpF*** error signal is "high" (FTP error) and the corresponding entry is made in the Error list.

GradAvrH **Gradient average too high: Gradient average value too high**

Results description after a completed tightening sequence. The gradient average value exceeds the defined tolerance window.

GradAvrL **Gradient average too low: Gradient average value too low**

Results description after a completed tightening sequence. The gradient average value is below the defined tolerance window.

GradH **Gradient too high: Gradient too high**

Results description after a completed tightening sequence. The gradient is above the defined tolerance window.

GradL **Gradient too low: Gradient too low**

Results description after a completed tightening sequence. The gradient is below the defined tolerance window.

InCy **In Cycle: Tightening program active**

This signal informs the partner controller that a tightening program has been started. It is of particular importance for hand-held tightening systems.

If the ***InCy*** is "high", the ***CyCmp***, ***OK*** and ***NOK*** signals are set to "low". Once the tightening program (***CyCmp*** = "high", ***Cw*** start signal "low") is exited, the ***InCy*** signal drops to "low".

If the ***NOKAc*** signal is used and tightening is NOK, the ***InCy*** signal remains "high" until the ***NOKAc*** signal is set to "low". Only thereafter will the ***InCy*** signal change to "low", thus signaling the readiness for restart.

InCyCcw **In Cycle Counter clock wise: Loosening is active**

This signal reports that a tightening program is active. It is of particular importance for hand-held tightening systems.

If the ***InCyCcw*** signal is "high", the ***CyCmp***, ***OK***, and ***NOK*** signals are set to "low". Once the tightening program (***CyCmp*** = "high") is exited and the ***FO x Cw*** start signal is set to "low", the ***InCyCcw*** signal drops to "low".

If the ***NOKAc*** signal is used and tightening is NOK, the ***InCy*** signal remains "high" until the ***NOKAc*** signal is set to "low". Only thereafter will the ***InCyCcw*** signal change to "low", thus signaling the readiness for restart.

JobAck0-7 **Job acknowledge 0-7: Acknowledges the selected job**

The signal acknowledges the job selection.

Using this signal, the PLC can determine whether the job was selected successfully. The job number is only valid if the acknowledgement corresponds to the selection. The controller always uses the acknowledged job number as a basis for a tightening operation or application.

JobCyCmp **Job Cycle Complete: The job is finished**

Job CyCmp = “high” signals the end of a tightening operation (sequence and results processing). The tightening channel is ready for the next tightening.

JobInCy **Job In Cycle: The job is active**

This signal reports the start of a job to a partner controller. It is of particular importance for hand-held tightening systems.

The ***Job InCy*** is "high", the ***Job CyCmp***, ***JobOK*** and ***JobNOK*** signals are set to "low". Once the job sequence (***Job CyCmp*** = "high", ***Job Start*** start signal "low") is exited, the ***Job InCy*** signal drops to "low".

JobNok **Job Not OK: The job result is not okay**

This signal indicates that the job was evaluated with NOK.

JobOk **Job OK: The job result is okay**

This signal indicates that the job was evaluated with OK.

JobRdy **Job ready: The job is ready**

A job for a tightening channel, tightening cell, KE, or tightening application cannot be started before the system indicates that it is "ready" with the ***JobRdy*** signal (signal ***JobRdy*** = "high").

ManOpAck **Manual Operating Mode acknowledge: Manual mode acknowledgment**

This signal acknowledges the manual mode.

NF **No Fault: Nutrunner without system errors**

NF = "high": no system error In the event of a fault, this signal will be set to "low". A tightening process will be canceled or the controller will not be started.

NOK **Not OK: Result not OK**

This signal indicates that the tightening process was evaluated with NOK. Once the results have been deleted using the ***ResRs*** signal, the NOK signal is set to "high" and set to "low" once the tightening process has started.

OK **OK: Results OK**

This signal indicates that the tightening process was evaluated with OK. It is set to "low" by starting the subsequent tightening program or by deleting the results with the ***ResRs*** signal.

RC0-4 **Rework Code Bit 0-4: Rework code bit 0-4**

These five output signals are used to output the binary encoded rework code. A rework code can be used to inform the user on the steps required for reworking a tightening operation that has been evaluated as NOK (e.g. as a message on the display of the nutrunner).

These signals are set at the end of a tightening operation; they change to “low” when tightening is started and when the ***Reset result*** signal is set.

RC0-4 **Rework Code Bit 0-4: Rework code bit 0-4**

These five output signals are used to output the binary encoded rework code. A rework code can be used to inform the user on the steps required for reworking a tightening operation that has been evaluated as NOK.

These signals are set at the end of a tightening operation; they change to “low” when tightening is started and when the ***Reset result*** signal is set.

Rdy **Ready: Nutrunner ready for operation**

A tightening channel cannot be started before the ***Rdy*** signal reports "ready" (***Rdy*** signal = "high").

Possible causes for ***Rdy*** = “low” are:

- Booting is in progress
- System error. For a list of all errors and faults, please refer to the NEXO_OS operating system under **Diagnosis** → **System errors**.

ScanRdy **Scanner ready: Scanner ready**

This signal indicates the current status of the scanner in the nutrunner. The scanner is ready when ***ScanRdy*** = "high". Otherwise, the scanner is disabled, not ready or inexistent.

ScanRxID **Scanner read ID: The ID code has been read**

Using this signal, the external partner controller is informed that an ID-code was recorded via the scanner in the nutrunner.

StartBn **Start button: State of the start switch**

This signal signals the status of the start switch at the nutrunner. When the start switch is pushed and held, the signal is "high"; when it is released, it changes to "low".

The signal is only updated outside of the tightening operation.

Stick slip **Stick slip too high: Number of stick slips too high**

Results description after a completed tightening sequence. The number of stick slips is above the defined tolerance window.

TimeH **Time too high: Time too high**

Results description after a completed tightening sequence. The time is above the defined tolerance window.

ToolBn **Tool button: Status of the tool button on the nutrunner**

This signal shows the status of the tool button on the cordless Wi-Fi nutrunner. Holding down the tool button keeps the signal at "high", releasing it changes the signal to "low".

This signal is only active for tightening channels with ErgoSpin. The signal is only updated outside of the tightening operation.

TorqH **Torque too high: Torque too high**

Results description after a completed tightening sequence. The torque is above the defined tolerance window.

TorqL **Torque too low: Torque too low**

Results description after a completed tightening sequence. The torque is below the defined tolerance window.

7 Data services

This chapter describes the basic principles and the application of the various data services which can be used for data output or for data exchange with a partner controller.

7.1 Overview of tightening results communication

The Nexo cordless Wi-Fi nutrunner can transmit tightening results via the access point to other devices for further processing or storage. The following protocols are available as data services for transferring data between these devices:

- File Transfer Protocol (FTP) which is based on TCP/IP.
- As of Nexo firmware version 1200: Hypertext Transfer Protocol (HTTP)
- As of Nexo firmware version 1200: File Share
- Rexroth Open Protocol which is a special protocol for tightening controllers based on TCP/IP.
- Rexroth IPM Protocol which is used for transferring tightening results and tightening graphs to a system for integrated process data management (IPM) via TCP/IP.
- As of Nexo firmware version 1200: VW-XML protocol

These protocols can also be used at the same time.

The settings for these protocols are made via the NEXO-OS operating system in the **Settings** → **Data** menu, see section Settings on page 203.

Each data service requires time to calculate and thus lengthens the duration of the tightening cycle. This is why it makes sense to only activate the necessary data services to avoid delays.

7.1.1 Identification code (ID code)

The results data record of a tightening operation is uniquely identified by an identification code (ID code) for internal or external further processing and can therefore be assigned to the tightened component.

The ID code can comprise up to 100 ASCII characters, e.g. parts of a workpiece number, production number, serial number, chassis number, or the like.

The ID code is transferred to the controller before the tightening process starts. The internal cycle counter or the Open Rexroth Protocol can be used for the creation of an ID code as an alternative. If the Nexo cordless Wi-Fi nutrunner is equipped with a barcode scanner, the read valid barcode or parts thereof can be used as an ID code.

As of Nexo firmware version 1100, the **Mode** menu item is used to set up the ID code to identify a set of results data (ID code source) (see page 184).

7.2 Data output via FTP

As of Nexo firmware version 1200: The settings for the protocol are made via the NEXO-OS operating system in the **Settings** → **Data** → **Standard Nexo** → **FTP** menu, see section Settings on page 203.

FTP provides appropriate mechanisms for a safe and reliable data transfer via Ethernet. Error protocols and checksums and, if necessary, repeated transfer of data blocks ensure a high transmission quality.

In case of data transfer via FTP, you distinguish between two connection types:

- Explicit (FTPES)
- Implicit (FTPS)

The Nexo cordless Wi-Fi nutrunner supports the explicit mode. I.e. the FTPS client must “explicitly request” the safety from an FTPS server and then approach an encryption method accepted by both parties. If a client does not request safety, the FTPS server may either admit this or reject the connection.

FTP has a client/server architecture, i.e. an FTP server provides its services to an FTP client, the Nexo cordless Wi-Fi nutrunner. The FTP client is the active user and can write data to and read data from the FTP server. The Nexo cordless Wi-Fi nutrunner only features write access.

Access to the FTP server is protected by user name and password. The protocol for data transfer is defined in RFC-959 (File Transfer Protocol). As of Nexo firmware version 1200 the data can be transmitted with SSL encoding. For configuration of the filing process and contents of the results file, various parameters are available.

7.2.1 Opening and closing the FTP connections for results output

Opening and closing the FTP connections is initiated by the tightening system.

The results data are always transferred asynchronously with the tightening process (after completion of the tightening operation). The results data records are buffered by being stored by the Nexo cordless Wi-Fi nutrunner within the tightening process, i.e. prior to **CyCmp**. The data are transferred independently of the tightening cycle. The tightening function is not impaired, as long as there is enough space for new results files.

All results files are transferred to the FTP server of the control unit (partner controller) in blocks. An FTP connection is established when results data are available. The error signal ***FtpF*** will be set to 1 if a disruption occurs during the transfer to the FTP server. This signal will be automatically reset to 0 after the next successful data transfer.

7.2.2 Data volume and expected transfer time for tightening results files

The data volume depends on the following criteria:

- Number of graph points configured in the tightening program
- Value range of graph parameters
- Number of tightening steps
- Number of active target and monitoring functions of the particular step

The biggest data volume is required saving the graph points: The following coarse guide value applies: At least 10 bytes are required for each graph point.

A maximum of 2000 graph points therefore results in:

10 bytes x 2000 graph points x 3 graph types = 58 kbytes of graph point data

7.3 Data output via HTTP

As of Nexo firmware version 1200, data output via HTTP is supported.

The settings for data output are made via the NEXO-OS operating system in the **Settings** → **Data** → **Standard Nexo** → **HTTP** menu, see section Settings on page 203.

For transmission of results data via HTTP (Hypertext Transfer Protocol), the tightening controller establishes a connection to the HTTP server. Using the HTTP 1.1 protocol, one results data record is exchanged during each connection. After data transmission, the connection between the tightening system and the server is not maintained. For transmission of additional results, the tightening controller establishes a new connection.

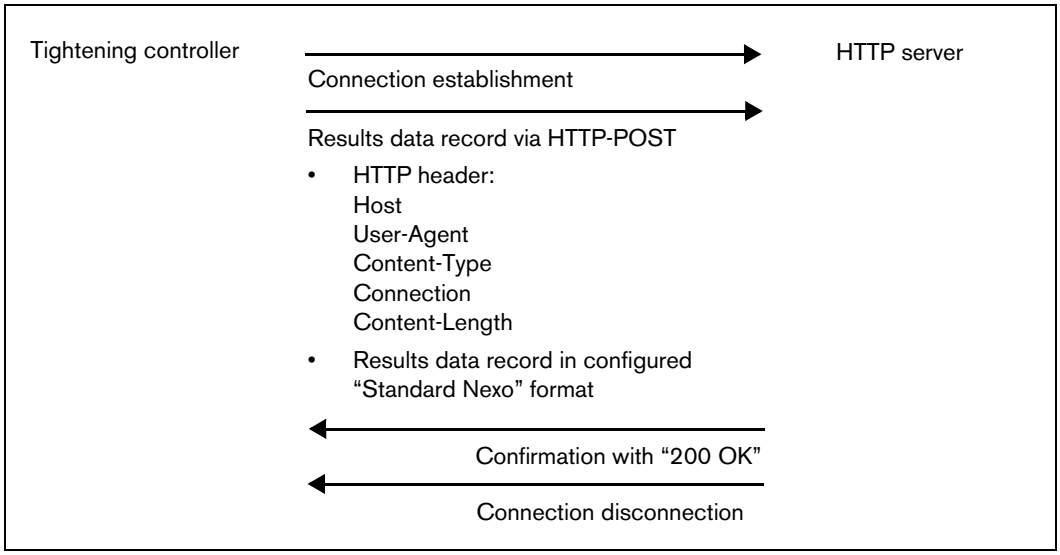


Fig. 7–1: Results data transfer via HTTP

7.4 Data output via File Share

As of Nexo firmware version 1200, data output via File Share is supported.

The settings for data output are made via the NEXO-OS operating system in the **Settings** → **Data** → **Standard Nexo** → **File Share** menu, see section Settings on page 203.

File Share is a protocol that enables access to files via a network.

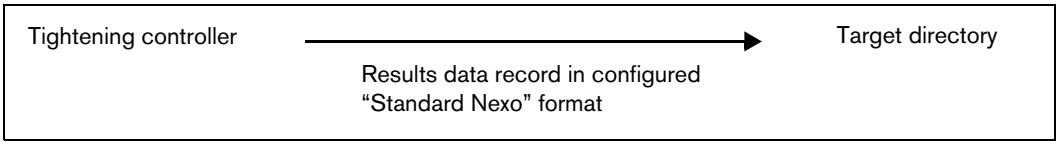


Fig. 7–2: Results data transfer via File Share

Access to the File Share server is protected by the group ID and user ID.

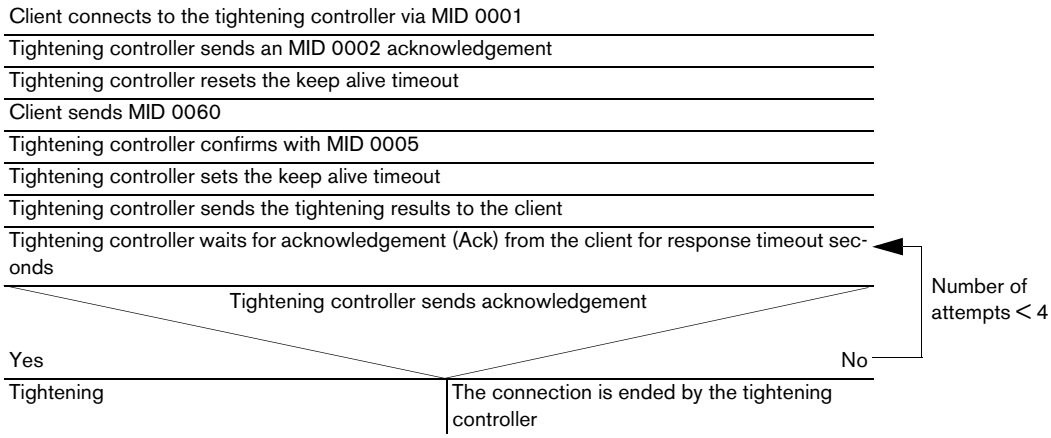
7.5 Rexroth Open Protocol

This chapter describes the communication between the superior computer and tightening controller via the Rexroth Open Protocol. During communication, the superior computer acts as a client and the tightening controller acts as a server.

The Rexroth Open Protocol is a communication protocol based on TCP/IP that has been specially developed for tightening controllers. Up to 5 clients connected to each other can be managed using the Open Protocol.. Users can configure a tightening controller and get information on events in the tightening controller via the client.

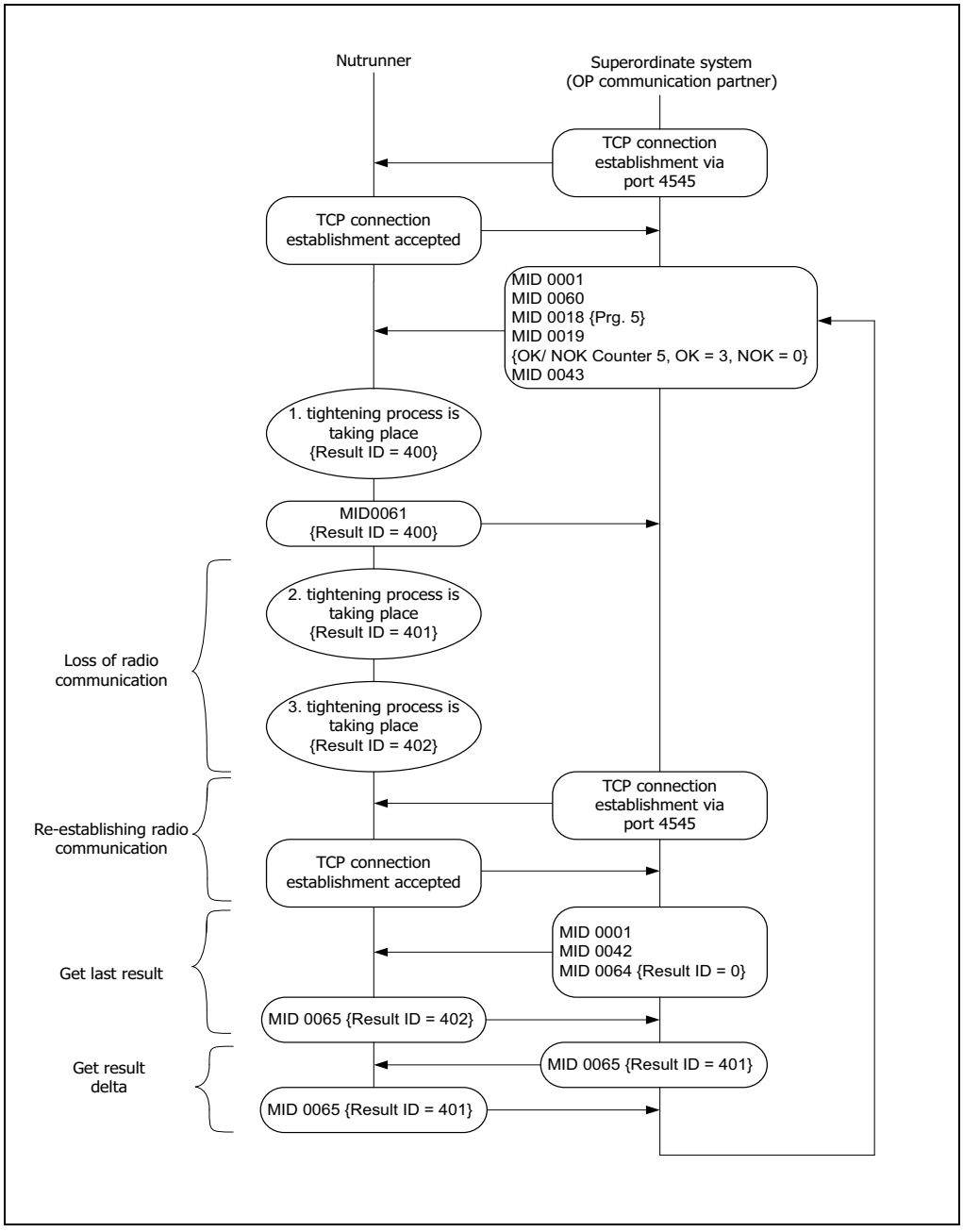
The settings for the protocol are made via the NEXO-OS operating system in the **Settings** → **Data** → **Open Protocol** menu, see section Settings on page 203.

Example of a communication sequence:

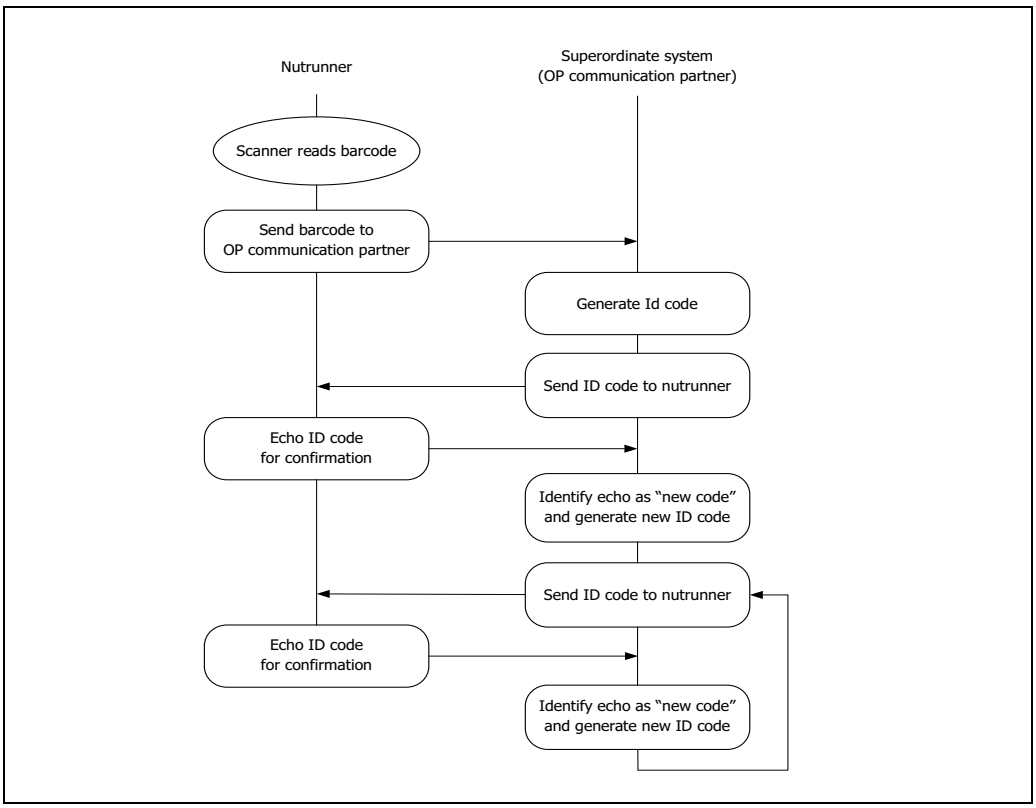


7.5.1 Sequence diagrams - examples

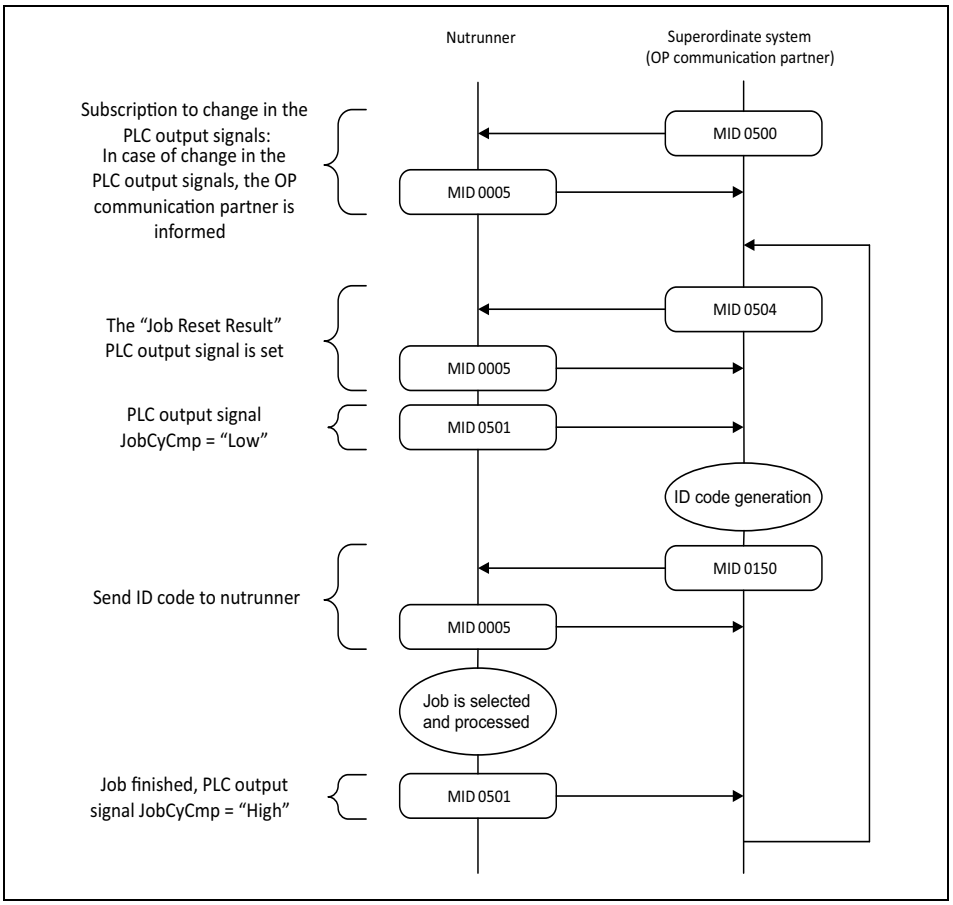
Loss of radio communication



Bar code scan



Job selection by means of sent ID code via OpenProtocol



7.5.2 Message structure

A message in the Rexroth Open Protocol has an ASCII format structure and consists of:

- Header (see Table 7–1)
- Data (see Tables 7–2, 7–3 and 7–4)
- End character (see Table 7–5)

The following table explains the message structure.

Table 7–1: Message structure in the Open Protocol (header)

Header components	Meaning		Bytes
Message length	Header length + data length Value range: 0000 – 9999 Example:		4
	Header length	20 bytes	
	Data length	37 bytes	
	Value	0057	
MID (Message ID)	Describes how the sent message should be interpreted. Each message ID is assigned to a specific message. Value range: 0000 – 9999 Example:		4
	Value	0002	
	Message	Acknowledgement of communication start	
Revision	Is required if different versions are available for the same MID. Value range: 000 – 999 Example:		3
	Revision	1	
	Value	001	
No Ack Flag	Only for subscription MIDs Presetting: 0 Reliable mode: If the No Ack Flag is not set (value = 0), the tightening system will expect acknowledgement of the messages. Unreliable mode: If the No Ack Flag is set (value = 1), the tightening system will not expect acknowledgement of the messages.		1
Reserve	Reserved space for future header expansions. This space must be filled with eight characters, which will not be evaluated (e. g. 00000000).		8
Header length			20

The following tables explain the data structure.

Table 7–2: Message structure in the Open Protocol (data: general)

Data				**Bytes**
	Example:			
	Parameter	Value	Value range	
	Cell ID	01		2
	Cell value	0001	0000 – 9999	4
	Channel ID	02		2
	Channel value	01	00 – 99	2
	Tightening system ID	03		2
	Tightening system name	Controller 1		25
	Value	010001020103Scontrol-ler1␣␣␣␣␣␣␣␣␣␣␣␣␣		
Data length				37

If the value of a parameter is only defined with numbers, the rest of the characters on the left will be filled with zeros.

Table 7–3: Message structure in the Open Protocol (data: Numbers)

Data			**Bytes**
	Example:		
	Cell ID value	1	
	Value	0001	4
	Channel ID value	1	
	Value	01	2

If the value of a parameter with ASCII characters is defined between 0x20 and 0x7F, the area on the right will be filled in with empty spaces <␣>.

Table 7–4: Message structure in the Open Protocol (data: ASCII characters)

Data			**Bytes**
	Example:		
	Tightening system name	Controller 1	
	Value	controller1␣␣␣␣␣␣␣␣␣␣␣␣␣␣␣	25

Table 7–5: Message structure in the Open Protocol (end character)

End character			**Bytes**
	The value of the end character is always “NUL”. The end character is not added to the full length of the message.		
	Value	NUL	1
End character length			1

The message in the above example would look as follows:

00570002001100000000100010201 03controller1␣␣␣␣␣␣␣␣␣␣␣␣␣␣␣NUL

Meanings of the individual values:

- 0057: Message length
- 0002: MID
- 001: Revision
- 1: No Ack Flag
- 00000000: Reserve
- 010001020103controller1␣␣␣␣␣␣␣␣␣␣␣␣␣␣␣: Data field value
- NUL: End character (ASCII (0x00))

7.5.3 Messages

7.5.3.1 Available messages

As of Nexo firmware version 1100, the Open Protocol “Rexroth OP-Ford” is available.

Table 7–6: Available messages

MID	Description	Rexroth OP	Rexroth OP-Ford
MID 0001	Communication start	x	x
MID 0002	Acknowledgement of communication start	x	x
MID 0003	Communication stop	x	x
MID 0004	Command error	x	x
MID 0005	Command accepted	x	x
MID 0010	Tightening program numbers upload request	x	x
MID 0011	Tightening program numbers upload response	x	x
MID 0012	Tightening program data upload request	x	x
MID 0013	Tightening program data upload response	x	x
MID 0014	Tightening program subscription selected	x	x
MID 0015	Tightening program selected	x	x
MID 0016	Tightening program selected acknowledgement	x	x
MID 0017	Cancel tightening program selected subscription	x	x
MID 0018	Select tightening program	x	x
MID 0019	Make the presetting for OK/NOK counter	x	x
MID 0020	Reset the OK/NOK counter	x	x
MID 0021	Deactivate the OK/NOK counter	x	
MID 0030	OK counter upload request	x	
MID 0031	OK counter upload response	x	
MID 0040	Tool data upload request	x	x
MID 0041	Tool data upload	x	x
MID 0042	Deactivate tool	x	x
MID 0043	Activate tool	x	x
MID 0045[1)]	Define calibration value request	x	
MID 0050	ID code download request	x	x
MID 0150	ID code download request	x	
MID 0051	ID code upload subscription	x	x
MID 0052	Upload ID code	x	x
MID 0053	Upload ID code acknowledgement	x	x
MID 0054	Cancel upload ID code subscription	x	x
MID 0060	Last tightening results data subscription	x	x
MID 0061	Upload last tightening results data response	x	x
MID 0062	Last tightening results data acknowledgement	x	x
MID 0063	Cancel last tightening results data	x	x
MID 0064	Archived tightening results upload request	x	x
MID 0065	Archived tightening results response	x	x
MID 0070	Resulting system errors subscription	x	x
MID 0071	Upload resulting system errors	x	x
MID 0072	Upload system errors acknowledgement	x	x
MID 0073	Cancel system errors subscription	x	x
MID 0074	System error in tightening controller acknowledged	x	x
MID 0075	Acknowledgement System error in tightening controller acknowledged	x	x
MID 0076	System error status	x	x
MID 0077	System error status acknowledgement	x	x
MID 0078	Acknowledge system error in tightening controller	x	
MID 0080	Time on the tightening controller request	x	x

Table 7–6: Available messages

MID	Description	Rexroth OP	Rexroth OP-Ford
MID 0081	Upload time	x	x
MID 0082	Set the time in the tightening controller	x	x
MID 0111	Message on the graphical display of the nutrunner	x	
MID 0127[2)]	Aborts a job	x	
MID 0400	Activate automatic/manual mode	x	
MID 0401	Upload automatic/manual mode	x	
MID 0402	Upload automatic/manual mode acknowledgement	x	
MID 0403	Deactivate automatic/manual mode	x	
MID 0404[3)]	Select automatic/manual mode	x	
MID 0410[2)]	AutoDisable setting request	x	x
MID 0411[2)]	AutoDisable setting response	x	x
MID 0500	Subscription Output signal change	x	
MID 0501	Upload Output signal change	x	
MID 0502	Acknowledgement Upload output signal change	x	
MID 0503	Cancel Output signal change	x	
MID 0504	Change value of input signals	x	
MID 0570[1)]	Activate job	x	
MID 0571[1)]	Start job sequence	x	
MID 0573[1)]	Select job number	x	
MID 0800[1)]	Battery level request	x	x
MID 0801[1)]	Battery level response	x	x
MID 0802[1)]	Battery level changes subscription	x	x
MID 0803[1)]	Battery level changes upload	x	x
MID 0804[1)]	Cancel battery level changes subscription	x	x
MID 0805[1)]	Reception quality request	x	x
MID 0806[1)]	Reception quality response	x	x
MID 0807[1)]	Reception quality change subscription	x	x
MID 0808[1)]	Reception quality change upload	x	x
MID 0809[1)]	Cancel reception quality change subscription	x	x
MID 9999	Keep alive message	x	x

1. As of Nexo firmware version 1100, this message is supported.
2. As of Nexo firmware version 1200, this message is supported.
3. As of Nexo firmware version 1300, this message is supported.

7.5.3.2 Message specification

MID 0001 Communication start

Sent by: superordinate computer

Activates the command connection. Until this is done, the tightening controller will not respond to any other command.

Note: This message must be sent to connect the client to the tightening system.

Revision: See MID 0002

Data field: is empty, 0 bytes

Possible responses	MID	Error no.	Remark
Acknowledgement of communication start	0002		
Command error	0004	96	Client already connected

MID 0002 Acknowledgement of communication start

Sent by: Tightening controller

Once communication has been established, the tightening controller sends a communication start acknowledgement as a response. This message contains basic information on the tightening controller that has accepted the connection (cell ID, channel ID, controller name, ...).

Note: -

Revision: 001, 002, 003

Data field: Data 37 bytes (revision 001), 42 bytes (revision 002), 105 bytes (revision 003)

Possible response: none

MID 0002 revision 001

Table 7–7: MID 0002 revision 001

Parameter	Comments		Bytes
Cell ID	This is where the 7th level of the location name is returned. The value consists of four ASCII characters.		
	ID	01	2
	Value range	0000 – 9999	
	Presetting	0001	
	Example:		
	Cell ID	3	
	Value	0003	4
Channel ID	The channel ID is the channel number value assigned in the channel configuration. Value range 1–99		
	ID	02	2
	Value range	01 – 20	
	Presetting	01	
	Example:		
	Channel number	04	
	Value	04	2
Controller name	The controller name is the channel name assigned in the configuration of the nutrunner. The value consists of 25 ASCII characters.		
	ID	03	2
	Value range	0x20 – 0x7F	
	Presetting	***, means no controller name	
	Example:		
	Controller name	Tightening channel	
	Value	Tightening channel␣␣␣␣␣␣␣␣␣␣␣␣	25
Data length revision 001			37

MID 0002 revision 002

Table 7–8: MID 002 revision 002

Parameter	Comments		Bytes
This revision includes the information from revision 001 and the following additional information:			
Manufacturer code	The value consists of three ASCII characters.		
	ID	04	2
	Fixed value	BRC	3
Data length revision 002 (= data length revision 001 + data length revision 002)			42

MID 0002 revision 003

Table 7–9: MID 002 revision 003

Parameter	Comments		Bytes
This revision includes the information from revision 002 and the following additional information:			
Open Protocol version	The Open Protocol version is transferred. The value consists of 19 ASCII characters.		
	ID	05	2
	Value range	0x20 – 0x7F	
	Presetting	-	
	Example:		
	Open Protocol version	7.0 version 34	
	Value	7.0␣version␣34␣␣␣␣␣	19
Software version	The version transferred is the firmware version of the nutrunner. The value consists of 19 ASCII characters.		
	ID	06	
	Value range	0x20 – 0x7F	
	Presetting	-	
	Example:		
	Software version	NxFw-V1000	
	Value	NxFw1000␣␣␣␣␣␣␣␣␣␣	19
Tool software version	The value consists of 19 ASCII characters. Only space characters are transmitted.		
	ID	07	2
	Value range	0x20 – 0x7F	
	Presetting	-	
	Example:		
	Software version	-	
	Value	␣␣␣␣␣␣␣␣␣␣␣␣␣␣␣␣␣␣␣	19
Data length revision 003 (= data length revision 002 + data length revision 003)			105

Example:

Using the values from the example above, the value of the data field for revision 2 would be as follows:

010003020403tightening channel␣␣␣␣␣␣␣␣␣␣␣␣␣04BRC

Meanings of the individual values:

- 01: Cell ID
- 0003: Cell ID value
- 02: Channel number
- 04: Channel number value
- 03: ID Controller name
- Tightening channel␣␣␣␣␣␣␣␣␣␣␣␣␣: Controller name value
- 04: Manufacturer code ID
- BRC: Manufacturer code fixed value

MID 0003 Communication stop

Sent by: superordinate computer
Ends the command connection.
Note: After this command has been received, the tightening controller will only respond to the communication start command (MID 0001).
Revision: 001
Data field: is empty, 0 bytes

Possible response	MID	Error no.	Comment
Command accepted	0005	–	

7.5.3.3 Request responses

MID 0004 Command error

Sent by: Tightening controller
The tightening controller uses this message if a request cannot be fulfilled for some reason.
Note: -
Revision: 001
Data field: Data 6 bytes
Possible response: none

Table 7–10: MID 0004 revision 001

Parameter	Comments		Bytes
MID	MID of the failed request		
	ID	-	
	Value range	0000 – 9999	
	Presetting	-	
	Example:		
	MID	18	
	Value	0018	4
Error number	Possible error numbers		
	ID	-	
	Value range	00 – 99	
	Presetting	-	
	Example:		
	Error number	2	
	Value	02	2
Data length revision 001			6

Example:

The select tightening program request (MID 0018) has failed, as the tightening program number did not exist in the tightening controller.

MID	0018
Error no.	02
Data field value	001802

MID 0005 Command accepted

Sent by: Tightening controller

With this message, the tightening controller confirms that the last request sent by the superior computer has been accepted.

Note: -

Revision: 001

Data field: Data 4 bytes

Possible response: none

Table 7–11: MID 0005 revision 1

Parameter	Comments		Bytes
MID	MID of the accepted request		
	ID	-	
	Value range	0000 – 9999	
	Presetting	-	
	Example:		
	MID	18	
	Value	0018	4
Data length revision 001			4

7.5.3.4 Tightening program messages

MID 0010 Tightening program numbers upload request

Sent by: superordinate computer			
Request for all available tightening program numbers			
Note: -			
Revision: 001			
Data field: is empty, 0 bytes			
Possible response	**MID**	**Error no.**	**Remark**
Tightening program numbers upload response	0011	–	All valid tightening program numbers in the tightening controller are transferred after this command is output.

MID 0011 Tightening program numbers upload response

Sent by: Tightening controller

Transfer of all available tightening program numbers from the tightening controller.

Note: Only program numbers 0 … 99 that are available are uploaded.

Revision: 001

Data field:

total data length = (1 + number of tightening programs) x 3 bytes

Possible response: none

Table 7–12: MID 0011 revision 001

Parameter	Comments		Bytes
Number of tightening programs	The value consists of three ASCII characters.		
	ID	-	
	Value range	000 – 999	
	Presetting	-	
	Example:		
	Number of tightening programs	1	
	Value	001	3
Tightening program number	The value consists of three ASCII characters.		
	ID	-	
	Value range	000 – 999	
	Presetting	-	
	Example:		
	Tightening program number	2	
	Value	002	3
Data length revision 001 (with one tightening program)			6

Example:

Two available tightening programs with the numbers 005 and 006:

Data field value	002005006

MID 0012 Tightening program data upload request

Sent by: superordinate computer

Request to upload the parameters from the last tightening step in a tightening program.

Note: -

Revision: 001

Data field: Tightening program number, 3 bytes

Possible responses	MID	Error no.	Remark
Tightening program data upload response	0013	-	
Command error	0004	02	Tightening program not available

MID 0013 Tightening program data upload response

Sent by: Tightening controller

The parameters from the last tightening step in the selected tightening program are sent to the superior computer.

Note: -

Revision: 001

Data field: Data 84 bytes

Possible response: none

MID 0013 revision 001

Table 7–13: MID 0013 revision 001

Parameter	Comments		Bytes
Tightening program number	The value consists of three ASCII characters.		
	ID	01	2
	Value range	000 – 999	
	Presetting	-	
	Example:		
	Tightening program ID	2	
	Value	002	3
Tightening program name	The program name is output. Fill with space characters if the tightening program name is < 25 characters. The value consists of 25 ASCII characters.		
	ID	02	2
	Value range	0x20 – 0x7F	
	Presetting	-	
	Example:		
	Parameter set name	prog1	
	Value	prog1␣␣␣␣␣␣␣␣␣␣␣␣␣␣␣␣␣␣␣␣␣␣␣	25
Direction of rotation	– 1: Clockwise (CW) – 2: Counterclockwise (CCW) The value consists of one ASCII character.		
	ID	03	2
	Value range	0 – 9	
	Presetting	-	
	Example:		
	Direction of rotation	Clockwise (CW)	
	Value	1	1
Placeholder value	The value consists of two ASCII characters.		
	ID	04	2
	Fixed value	00	2

Table 7–13: MID 0013 revision 001

Parameter	Comments		Bytes
Minimum torque	The minimum torque limit is multiplied by 100, rounded, and sent as a whole number. The value consists of six ASCII characters.		
	ID	05	2
	Value range	000000 – 999999	
	Presetting	-	
	Example:		
	Minimum torque	234.00	
	Value	023400	6
Maximum torque	The maximum torque limit is multiplied by 100 and then sent as a whole number (rounded to two decimals). The value consists of six ASCII characters.		
	ID	06	2
	Value range	000000 – 999999	
	Presetting	-	
	Example:		
	Maximum torque	321.11	
	Value	032111	6
Target torque	The target torque is multiplied by 100 and then sent as a whole number (rounded to two decimals). The value consists of six ASCII characters.		
	ID	07	2
	Value range	000000 – 999999	
	Presetting	-	
	Example:		
	Target torque	250.00	
	Value	025000	6
Minimum angle	The value consists of five ASCII characters.		
	ID	08	2
	Value range	00000 – 99999	
	Presetting	-	
	Example:		
	Minimum angle	30	
	Value	00030	5
Maximum angle	The value consists of five ASCII characters.		
	ID	09	2
	Value range	00000 – 99999	
	Presetting	-	
	Example:		
	Maximum angle	45	
	Value	00045	5
Target angle	The target angle is output in degrees. The value consists of five ASCII characters.		
	ID	10	2
	Value range	00000 – 99999	
	Presetting	-	
	Example:		
	Target angle	40	
	Value	00040	5
Data length revision 001			84

MID 0014 Tightening program subscription selected

Sent by: superordinate computer

A message (tightening program selected, MID 0015) is sent to the superior computer each time a new tightening program is selected. This message is also sent as a direct answer to the activation message, after the response (command accepted, MID 0005) has been sent.

Note: Sends the appropriate data to the superordinate controller each time the tightening program is changed.

Revision: 001

Data field: is empty, 0 bytes

Possible responses	MID	Error no.	Comment
Command accepted	0005	–	
Command error	0004	13	Subscription for tightening program selection already available

MID 0015 Tightening program selected

Sent by: Tightening controller

A new tightening program is selected in the tightening controller.

The message contains the number of the last selected tightening program, as well as the date/time of the last change to the tightening program settings. This message is also sent as a direct response to the activation for the tightening program selection (MID 0014).

Note: Sends the appropriate data to the superordinate controller each time the tightening program is changed.

Revision: 001

Data field: Data 22 bytes

Possible response	MID	Error no.	Remark
Tightening program selected acknowledgement	0016	–	

MID 0015 revision 001

Table 7–14: MID 0015 revision 001

Parameter	Comments		Bytes
Tightening program number	The value consists of three ASCII characters.		
	ID	-	
	Value range	000 – 999	
	Presetting		
	Example:		
	Tightening program number	2	
	Value	002	3
Date of the last change	Date output in YYYY-MM-DD:HH:MM:SS format. The value consists of 19 ASCII characters.		
	ID	-	
	Value range	0 – 9, - and :	
	Presetting	-	
	Example:		
	Date of the last change	2008-07-30:19:48:22	
	Value	2008-07-30-19:48:22	19
Data length revision 001			22

MID 0016 Tightening program selected acknowledgement

Sent by: superordinate computer
Acknowledgement for the selection of a new tightening program
Note: -
Revision: 001
Data field: is empty, 0 bytes
Possible response: none

MID 0017 Cancel tightening program selected subscription

Sent by: superordinate computer			
Reset the subscription for the tightening program selection			
Note: -			
Revision: 001			
Data field: is empty, 0 bytes			
Possible responses	**MID**	**Error no.**	**Comment**
Command accepted	0005	–	
Command error	0004	14	Subscription for tightening program selection is not available

MID 0018 Select tightening program

Sent by: superordinate computer			
Select tightening program			
Note: Program selection signals must be listed in the PLC assignment table in the OP module.			
Revision: 001			
Data field: tightening program number, 3 ASCII characters (000–999), 3 bytes			
Possible responses	**MID**	**Error no.**	**Comment**
Command accepted	0005	–	
Command error	0004	03	Tightening program cannot be selected

MID 0019 Make the presetting for OK/NOK counter

Sent by: superordinate computer

This message sets the presetting for the OK counter and the NOK counter of the **Automatic** operating mode (parameter "OK counter limit") for the counter value specified in the command ("Tightening program number" parameter)

Note: -

Revision: 001, 002

Data field: Data 7 bytes

Possible responses	MID	Error no.	Comment
Command accepted	0005	–	
Command error	0004	01	Invalid data

MID 0019 revision 001

Table 7–15: MID 0019 revision 001

Parameter	Comments		Bytes
Tightening program number	The value consists of 3 ASCII characters.		
	ID	-	
	Value range	000 – 999	
	Presetting	-	
	Example:		
	Tightening program number	3	
	Value	003	3
OK counter value	The value consists of 2 ASCII characters.		
	ID	-	
	Value range	00 – 99	
	Presetting	-	
	Example:		
	OK counter value	9	
	Value	09	2
Data length revision 001			5

MID 0019 revision 002

Table 7–16: MID 0019 revision 002

Parameter	Comments		Bytes
This revision includes the information from revision 001 and the following additional information:			
NOK counter value	The value consists of 2 ASCII characters.		
	ID	-	
	Value range	00 – 99	
	Presetting	-	
	Example:		
	NOK counter value	5	
	Value	05	2
Data length revision 002			7

MID 0020 Reset the OK/NOK counter

Sent by: superordinate computer

This message allows to reset the OK/NOK counter of the **Automatic** operating mode for the counter value specified in the command (“Tightening program number” parameter)

Note: The current counter values for all programs will be reset.

Revision: 001

Data field: tightening program number, three ASCII characters (000–999), 3 bytes

Possible responses	MID	Error no.	Comment
Command accepted	0005	–	
Command error	0004	01	Invalid data
		04	Tightening program not active

MID 0021 Deactivate the OK/NOK counter

Sent by: superordinate computer

With this message all set values of the OK/NOK counters of the **Automatic operating mode** can be reset.

Note: All counters of all programs are switched off. The counter values have to be re-enabled via MID 0019.

Revision: 001

Data field: is empty, 0 bytes

Possible responses	MID	Error no.	Comment
Command accepted	0005	–	

7.5.3.5 Job messages

MID 0030 OK counter upload request

Sent by: superordinate computer

All of the configured OK counters (0 to 47) in the tightening system are transferred as a result of this request.

Note: -

Revision: 001

Data field: is empty, 0 bytes

Possible response	MID	Error no.	Remark
Job numbers upload response	0031	–	

MID 0031 OK counter upload response

Sent by: Tightening controller

Transfer of all configured OK counters in the tightening system.

Note: -

Revision: 001

Data field:

total data field length = (1 + number of configured OK counters) x 2 bytes.

Possible response: none

MID 0031 revision 001

Table 7–17: MID 0031 revision 001

Parameter	Comments		Bytes
Number of configured OK-counters	The value consists of two ASCII characters.		
	ID	-	
	Value range	00 – 99	
	Presetting		
	Example:		
	Two configured OK-counters	02	
	Value	02	2
OK counter number	The value consists of two ASCII characters.		
	ID	-	
	Value range	00 – 99	
	Presetting	-	
	Example:		
	Two OK counter numbers	25, 36	
	Value	2536	4
Data length revision 001 (with a configured OK counter)			6

7.5.3.6 Tool messages

MID 0040 Tool data upload request

Sent by: superordinate computer

This function can be used to retrieve the tool data.

Note: -

Revision: See MID 0041

Data field: is empty, 0 bytes

Possible response	MID	Error no.	Remark
Tool data upload response	0041	–	

MID 0041 Tool data upload

NOTE

Stable tool quality

The change in MCE factor via MID 0041 has an effect on the quality of the tool.

- To ensure stable tool quality, a machine capability test (MCT) should be carried out after a change in MCE factor via MID 0041.

Sent by: Tightening controller

Tool data transmission.

Note: -

Revision: 001, 002-1

Data field: Data 101 bytes

Possible response: none

MID 0041 revision 001

Table 7–18: MID 0041 revision 001

Parameter	Comments		Bytes
Tool number	Serial number The value consists of 14 ASCII characters.		
	ID	01	2
	Value range	0x20 – 0x7F	
	Presetting	-	
	Example:		
	Tool number	A123456	
	Value	A123456␣␣␣␣␣␣␣	14
Cycles	Cycle counter The value consists of ten ASCII characters.		
	ID	02	2
	Value range	0x20 – 0x7F	
	Presetting	-	
	Example:		
	Cycles	5467	
	Value	0000005467	10
Date of the last maintenance	The value consists of 19 ASCII characters: is not supported.		
	ID	03	2
	Value range	0 – 9, - and :	
	Presetting	-	
	Example:		
	Date of the last maintenance	1/12/2009:2:43:57 PM	
	Value	␣␣␣␣␣␣␣␣␣␣␣␣␣␣␣␣␣␣	19
Serial number	The value consists of ten ASCII characters: is not supported.		
	ID	04	
	Value range	0000000000 - 9999999999	
	Presetting		
	Example:		
	Serial number	476547	
	Value	␣␣␣␣␣␣␣␣␣␣	10
Data length revision 001			61

MID 0041 revision 002-1

Table 7–19: MID 0041 revision 002-1

Parameter	Comments		Bytes
This revision includes the information from revision 001 and the following additional information:			
MCE factor	The value is multiplied by 1000 and transferred as a whole number (rounded to 3 decimals). The value consists of 4 ASCII characters.		
	ID	05	2
	Value range	500 - 2000	
	Example:		
	MCE factor	1.0001	
	Value	1000	4
Date of the last check	Date output in YYYY-MM-DD:HH:MM:SS format. The value consists of 19 ASCII characters.		
	ID	06	2
	Value range	0 – 9, - and :	
	Presetting	-	
	Example:		
	Date of the last check	1/12/2009:2:43:57 PM	
	Value	1/12/2009:2:43:57 PM	19
Cycles since maintenance	Calculated from the cycles during the last maintenance and the current number of cycles The value consists of ten ASCII characters.		
	ID	07	2
	Value range	0000000000 – 9999999999	
	Presetting	-	
	Example:		
	Cycles since maintenance	123412	
	Value	0000123412	10
Tool type	The value consists of two ASCII characters.		
	ID	08	2
	Value range	00 – 99	
	Value	Nexo: 05	2
Motor size	Fixed value 01 The value consists of two ASCII characters.		
	ID	09	2
	Value range	00 – 99	
	Presetting	-	
	Example (tightening spindle):		
	Motor size	03	
	Value	03	2
Open end data	The value consists of three ASCII characters.		
	ID	10	2
	Fixed value	000	3

Table 7–19: MID 0041 revision 002-1

Parameter	Comments		Bytes
Software version	Firmware version of the nutrunner. The value consists of 19 ASCII characters.		
	ID	11	2
	Value range	0x20 – 0x7F	
	Presetting	-	
	Example:		
	Software version	NxFw-V1000	
	Value	NxFw1000␣␣␣␣␣␣␣␣␣␣	19
Data length revision 002 (= data length revision 001 + data length revision 002)			136

MID 0042 Deactivate tool

Sent by: superordinate computer

This command can be used to disable the nutrunner.

Note:

In the PLC assignment table, the Enable signal must be applied to the OP module (see section PLC signals from page 74). In the PLC assignment table, the Enable signal must be applied to bit 1.0 of the OP PLC module.

Revision: 001

Data field: is empty, 0 bytes

Possible response	MID	Error no.	Comment
Command accepted	0005	-	
Command error	0004	98	Request timeout in the controller or PLC signal not assigned in the PLC assignment table.

MID 0043 Activate tool

Sent by: superordinate computer

This command can be used to enable the nutrunner.

Note:

In the PLC assignment table, the Enable signal must be applied to the OP module (see section PLC signals from page 74). In the PLC assignment table, the Enable signal must be applied to bit 1.0 of the OP PLC module.

Revision: 001

Data field: is empty, 0 bytes

Possible response	MID	Error no.	Comment
Command accepted	0005	-	
Command error	0004	98	Request timeout in the control or PLC signal not assigned in the PLC assignment table

MID 0045 Define calibration value request

Sent by: superordinate computer			
Calibration value request			
Note: -			
Revision: 001			
Data field: is empty, 0 bytes			
Possible response	**MID**	**Error no.**	**Comment**
Command accepted	0005	–	
Command error	0004	70	Calibration failed

Table 7–20: MID 0045 revision 001

Parameter	Comments		Bytes
Unit of the calibration value	– 0: no units The value consists of one ASCII character.		
	ID	01	2
	Value range	0 – 4	
	Presetting	-	
	Fixed value	0	1
Calibration value	The value is multiplied by 1000 and transferred as a whole number (rounded to 3 decimals). The value consists of six ASCII characters.		
	ID	02	2
	Value range	500 – 2000	
	Presetting	-	
	Example:		
	Calibration value	1.345	
	Value	001345	6
Data length revision 001			11

7.5.3.7 ID code messages

MID 0050 ID code download request

Is still supported, but if a new version is implemented, MID 0150 should be used.

Sent by: superordinate computer			
Is used by the superior computer to send an ID code to the tightening controller.			
Note: OP must be configured as the ID code source.			
Revision: 001			
Data field: ID code maximum of 25 ASCII characters (25 bytes). If the ID code is shorter than 25 characters, the field will be filled with space characters.			
Possible responses	**MID**	**Error no.**	**Comment**
Command accepted	0005	–	
Command error:	0004	08	Entry source for ID code not permissible

MID 0150 ID code download request

Sent by: superordinate computer

Is used by the superior computer to send an ID code to the tightening controller.

Note:

OP must be configured as the ID code source.

Revision: 001

Data field: ID code of 100 ASCII characters maximum (100 bytes). If the ID code is shorter than 100 characters, the field will be filled with space characters.

Possible responses	MID	Error no.	Comment
Command accepted	0005	–	
Command error	0004	01	Invalid data
		08	Entry source for ID code not permissible

MID 0051 ID code upload subscription

Sent by: superordinate computer

The superior controller sends a subscription for the current ID codes with this message.

Note: -

Revision: See MID 0052

Data field: is empty, 0 bytes

Possible responses	MID	Error no.	Comment
Command accepted	0005	–	
Command error	0004	06	Activation of ID code upload already available

MID 0052 Upload ID code

Sent by: Tightening controller

Transfer the current ID code.

Note: If the option **Forwarding of ID codes even from unselected sources** is activated, this message is used to transfer those ID codes that are not an active ID code source.

Revision: 001, 002

Data field: Data 25 bytes (revision 001), 108 bytes (revision 002)

Automatic transfer of a new ID code received by the controller is only supported with the following ID code devices:

– FTP

– Open Protocol

Possible response	MID	Error no.	Remark
Upload ID code acknowledgement	0053	–	

MID 0052 revision 001

Table 7–21: MID 0052 revision 001

Parameter	Comments		Bytes
ID code part 1	Contains the first 25 characters of the ID code (ASCII). The value consists of 25 ASCII characters.		
	ID	-	
	Value range	0x20 – 0x7F	
	Presetting	-	
	Example:		
	ID code part 1	12345123451234512345123 45	
	Value	12345123451234512345123 45	25
Data length revision 001			25

MID 0052 revision 002

Table 7–22: MID 0052 revision 002

Parameter	Comments		Bytes
ID code part 1	Contains the first 25 characters of the ID code (ASCII). The value consists of 25 ASCII characters.		
	ID	01	02
	Value range	0x20 – 0x7F	
	Presetting	-	
	Example:		
	ID code part 1	12345123451234512345123 45	
	Value	12345123451234512345123 45	25
ID code part 2	Contains characters 26 – 50 of the ID code. The value consists of 25 ASCII characters.		
	ID	02	2
	Value range	0x20 – 0x7F	
	Presetting	-	
	Example:		
	ID code part 2	54321543215432154321543 21	
	Value	54321543215432154321543 21	25
ID code part 3	Contains characters 51 – 64 of the ID code. The rest of the characters are filled with space characters. The value consists of 25 ASCII characters.		
	ID	03	2
	Value range	0x20 – 0x7F	
	Presetting	-	
	Example:		
	ID code part 3	11112222333344	
	Value	11112222333344␣␣␣␣␣␣␣␣␣␣␣	25
ID code part 4	Contains nothing but empty spaces. The value consists of 25 ASCII characters.		
	ID	04	2
	Value range	␣	
	Presetting	-	
	Example:		
	ID code part 4		
	Value	␣␣␣␣␣␣␣␣␣␣␣␣␣␣␣␣␣␣␣␣␣␣␣	25
Data length revision 002 (= data length revision 001 + data length revision 002)			108

MID 0053 Upload ID code acknowledgement

Sent by: superordinate computer
Upload ID code acknowledgement
Note: -
Revision: 001
Data field: is empty, 0 bytes
Possible response: none

MID 0054 Cancel upload ID code subscription

Sent by: superordinate computer			
Reset the subscription for the ID code that is received by the tightening controller.			
Note: -			
Revision: 001			
Data field: is empty, 0 bytes			
Possible responses	**MID**	**Error no.**	**Comment**
Command accepted	0005	–	
Command error	0004	07	Activation of ID code upload not available

7.5.3.8 Messages on tightening results

MID 0060 Last tightening results data subscription

Sent by: superordinate computer			
Tightening results data subscription			
Note: -			
Revision: See MID 0061			
Data field: is empty, 0 bytes			
Possible responses	**MID**	**Error no.**	**Comment**
Command accepted	0005	–	
Command error	0004	09	Activation for the last tightening result already available

MID 0061 Upload last tightening results data response

Sent by: Tightening controller			
Upload last tightening results data response			
Note: Revision 999 is intended for superordinate computers with a limited receive capacity (small receive buffer). In order to limit the size of the MID 0061 as much as possible, the parameter IDs that would usually be sent in the message have been removed.			
Revision: 001, 002, 003, 004, 005, 999			
Data field: Data 211 bytes (revision 001), 365 bytes (revision 002), 399 bytes (revision 003), 480 bytes (revision 004), 101 bytes (revision 999)			
Possible response	**MID**	**Error no.**	**Remark**
Last tightening results data acknowledgement	0062	–	

MID 0061 revision 001

Table 7–23: MID 0061 revision 001

Parameter	**Comments**		**Bytes**
Cell ID	This is where the 7th level of the location name is returned. The value consists of four ASCII characters.		
	ID	01	2
	Value range	0000 – 9999	
	Presetting	-	
	Example:		
	Cell ID	21	
	Value	0021	4

Table 7–23: MID 0061 revision 001

Parameter	Comments		Bytes
Channel ID	The first two characters of a channel name are used as channel ID. A channel name consists of the channel ID and the name of the controller, both of which are separated by a space. The value consists of two ASCII characters.		
	ID	02	2
	Value range	01 – 20	
	Presetting	01	
	Example:		
	Channel ID	04 tightening channel	
	Value	04	2
Controller name	The second part of the channel name is used as the controller name. The value consists of 25 ASCII characters.		
	ID	03	2
	Value range	0x20 – 0x7F	
	Presetting	***	
	Example:		
	Controller name	04 tightening channel	
	Value	Tightening channel␣␣␣␣␣␣␣␣␣␣␣␣␣	25
ID code	Contains the first 25 bytes of the ID code. The value consists of 25 ASCII characters.		
	ID	04	2
	Value range	0x20 – 0x7F	
	Presetting	-	
	Example:		
	ID code	123456	
	Value	123456␣␣␣␣␣␣␣␣␣␣␣␣␣␣␣␣␣␣␣␣␣	25
Job number	Number of the selected OK/NOK counter The value consists of two ASCII characters.		
	ID	05	2
	Value range	01 – 99	
	Presetting	-	
	Example:		
	Job number	2	
	Value	02	2
Tightening program number	Number of the current tightening program. The value consists of three ASCII characters.		
	ID	06	2
	Value range	000 – 999	
	Presetting	-	
	Example:		
	Tightening program number	5	
	Value	005	3
OK counter limit	OK counter presetting The value consists of four ASCII characters.		
	ID	07	2
	Value range	0000 – 9999	
	Presetting	-	
	Example:		
	OK counter limit	12	
	Value	0012	4

Table 7–23: MID 0061 revision 001

Parameter	Comments		Bytes
OK counter value	Actual value of the OK counter **The value consists of four ASCII characters.**		
	ID	08	2
	Value range	0000 – 9999	
	Presetting	-	
	Example:		
	OK counter value	4	
	Value	0004	4
Tightening status	– 0: NOK – 1: OK The value consists of one ASCII character.		
	ID	09	2
	Value range	0 – 5	
	Presetting	-	
	Example:		
	Tightening status	OK	
	Value	1	1
Torque status	– 0: Low – 1: OK – 2: High The value consists of one ASCII character.		
	ID	10	2
	Value range	0 – 2	
	Presetting	-	
	Example:		
	Torque status	High	
	Value	2	1
Angle status	– 0: Low – 1: OK – 2: High The value consists of one ASCII character.		
	ID	11	2
	Value range	0 – 2	
	Presetting	-	
	Example:		
	Angle status	OK	
	Value	1	1
Minimum torque limit (T-)	The value is multiplied by 100 and transferred as a whole number (rounded to 2 decimals). The value consists of six ASCII characters.		
	ID	12	2
	Value range	000000 – 999999	
	Presetting	-	
	Example:		
	Minimum torque limit (T-)	12.13	
	Value	001213	6

Table 7–23: MID 0061 revision 001

Parameter	Comments		Bytes
Maximum torque limit (T+)	The value is multiplied by 100 and transferred as a whole number (rounded to 2 decimals). The value consists of six ASCII characters.		
	ID	13	2
	Value range	000000 – 999999	
	Presetting	-	
	Example:		
	Maximum torque limit (T+)	20.00	
	Value	002000	6
Target torque (TP)	The value is multiplied by 100 and transferred as a whole number (rounded to 2 decimals). The value consists of six ASCII characters.		
	ID	14	2
	Value range	000000 – 999999	
	Presetting	-	
	Example:		
	Target torque (TP)	23.00	
	Value	002300	6
Torque (T)	The value is multiplied by 100 and transferred as a whole number (rounded to 2 decimals). The value consists of six ASCII characters.		
	ID	15	2
	Value range	000000 – 999999	
	Presetting	-	
	Example:		
	Torque (T)	20.50	
	Value	002050	6
Minimum angle (A-)	The value is output in degrees. The value consists of five ASCII characters.		
	ID	16	2
	Value range	00000 – 99999	
	Presetting	-	
	Example:		
	Minimum Minimum (A-)	5	
	Value	00005	5
Maximum angle (A+)	The value is output in degrees. The value consists of five ASCII characters.		
	ID	17	2
	Value range	00000 – 99999	
	Presetting	-	
	Example:		
	Angle Maximum (A+)	450	
	Value	00450	5

Table 7–23: MID 0061 revision 001

Parameter	Comments		Bytes
Target angle (AP)	The value is output in degrees. The value consists of five ASCII characters.		
	ID	18	2
	Value range	00000 – 99999	
	Presetting	-	
	Example:		
	Target angle (AP)	90	
	Value	00090	5
Angle (A)	The value is output in degrees. The value consists of five ASCII characters.		
	ID	19	2
	Value range	00000 – 99999	
	Presetting	-	
	Example:		
	Angle (A)	60	
	Value	00060	5
Time stamp	Date and time of tightening. The value consists of 19 ASCII characters in YYYY-MM-DD:HH:MM:SS format.		
	ID	20	2
	Value range	0 – 9, - and :	
	Presetting	-	
	Example:		
	Time stamp	1/12/2009:2:43:57 PM	
	Value	1/12/2009:2:43:57 PM	19
Date/time of the last change	Date and time of the last change in the tightening program settings. The value consists of 19 ASCII characters in YYYY-MM-DD:HH:MM:SS format.		
	ID	21	2
	Value range	0 – 9, - and :	
	Presetting	-	
	Example:		
	Date/time of the change	1/12/2009:2:43:57 PM	
	Value	1/12/2009:2:43:57 PM	19
OK/NOK counter status	Status of the OK/NOK counter. – 0: unless 1 or 2 – 1: Ch x.y CntOK = 1 – 2: OK/NOK counter not used (not configured) The value consists of one ASCII character.		
	ID	22	2
	Value range	0 – 2	
	Presetting	-	
	Example:		
	OK/NOK counter status	OK/NOK counter not used	
	Value	2	1

Table 7–23: MID 0061 revision 001

Parameter	Comments		Bytes
Tightening ID	With an activated OP, consecutive number for each tightening result (for further information, see MID 0064). The value consists of ten ASCII characters.		
	ID	23	2
	Value range	0000000000 – 9999999999	
	Presetting	-	
	Example:		
	Tightening ID	123456	
	Value	0000123456	10
Data length revision 001			211

MID 0061 revision 002

Table 7–24: MID 0061 revision 002

Parameter	Comments		Bytes
Cell ID	This is where the 7th level of the location name is returned. The value consists of four ASCII characters.		
	ID	01	2
	Value range	0000 – 9999	
	Presetting	-	
	Example:		
	Cell ID	21	
	Value	0021	4
Channel ID	The first two characters of a channel name are used as channel ID. A channel name consists of the channel ID and the name of the controller, both of which are separated by a space. The value consists of two ASCII characters.		
	ID	02	2
	Value range	01 – 20	
	Presetting	01	
	Example:		
	Channel ID	04 tightening channel	
	Value	04	2
Controller name	The second part of the channel name is used as the controller name. The value consists of 25 ASCII characters.		
	ID	03	2
	Value range	0x20 – 0x7F	
	Presetting	***	
	Example:		
	Controller name	04 tightening channel	
	Value	Tightening channel␣␣␣␣␣␣␣␣␣␣␣␣	25
ID code	Contains the first 25 bytes of the ID code. The value consists of 25 ASCII characters.		
	ID	04	2
	Value range	0x20 – 0x7F	
	Presetting	-	
	Example:		
	ID code	123456	
	Value	123456␣␣␣␣␣␣␣␣␣␣␣␣␣␣␣␣␣␣␣␣␣	25

Table 7–24: MID 0061 revision 002

Parameter	Comments		Bytes
Job number	Number of the selected OK/NOK counter The value consists of four ASCII characters.		
	ID	05	2
	Value range	0001 – 9999	
	Presetting	-	
	Example:		
	Job number	2	
	Value	0002	4
Tightening program number	Number of the current tightening program. The value consists of three ASCII characters.		
	ID	06	2
	Value range	000 – 999	
	Presetting	-	
	Example:		
	Tightening program number	5	
	Value	005	3
Placeholder value	The value consists of two ASCII characters.		
	ID	07	2
	Fixed value	99	2
Placeholder value	The value consists of five ASCII characters.		
	ID	08	2
	Fixed value	00000	5
OK counter limit	OK counter presetting The value consists of four ASCII characters.		
	ID	09	2
	Value range	0000 – 9999	
	Presetting	-	
	Example:		
	OK counter limit	12	
	Value	0012	4
OK counter value	Actual value of the OK counter The value consists of four ASCII characters.		
	ID	10	2
	Value range	0000 – 9999	
	Presetting	-	
	Example:		
	OK counter value	4	
	Value	0004	4
Tightening status	– 0: NOK – 1: OK The value consists of one ASCII character.		
	ID	11	2
	Value range	0 – 5	
	Presetting	-	
	Example:		
	Tightening status	OK	
	Value	0	1

Table 7–24: MID 0061 revision 002

Parameter	Comments		Bytes
OK/NOK counter status	Status of the OK/NOK counter. – 0: unless 1 or 2 – 1: Ch x.y CntOK = 1 – 2: OK/NOK counter not used (not configured) The value consists of one ASCII character.		
	ID	12	2
	Value range	0 – 2	
	Presetting	-	
	Example:		
	OK/NOK counter status	OK/NOK counter not used	
	Value	2	1
Torque status	– 0: Low – 1: OK – 2: High The value consists of one ASCII character.		
	ID	13	2
	Value range	0 – 2	
	Presetting	-	
	Example:		
	Torque status	High	
	Value	2	1
Angle status	– 0: Low – 1: OK – 2: High The value consists of one ASCII character.		
	ID	14	2
	Value range	0 – 2	
	Presetting	-	
	Example:		
	Angle status	OK	
	Value	1	1
Total angle status	Total angle status: not supported The value consists of one ASCII character.		
	ID	15	2
	Fixed value	1	1
Power redundancy monitoring status	Power redundancy monitoring status: not supported The value consists of one ASCII character.		
	ID	16	2
	Fixed value	1	1
Tapping status of self-tapping bolts	Tapping status of self-tapping bolts: not supported. The value consists of one ASCII character.		
	ID	17	2
	Fixed value	0	1
Placeholder value	The value consists of one ASCII character.		
	ID	18	2
	Fixed value	0	1
Placeholder value	The value consists of one ASCII character.		
	ID	19	2
	Fixed value	0	1

Table 7–24: MID 0061 revision 002

Parameter	Comments		Bytes
Tightening error status	Error bits indicate errors in the tightening system and are generated from the following bits in the quality code: – Bit 3 (TorqH): The torque is above the defined tolerance window. – Bit 4 (AnglH): The angle is above the defined tolerance window. – Bit 14 ((C)Cw=0): CCw or Cw deactivated during tightening. – Bit 15 (TorqL): The torque is below the defined tolerance window. – Bit 18 (start-up test): Start-up test NOK – Bit 21 (TimeH): The time is above the defined tolerance window. – Bit 23 (En=0): Enable deactivated during tightening. The value consists of ten ASCII characters.		
	ID	20	2
	Value range	0000000000–9999999999	
	Presetting	-	
	Example:		
	Tightening error status	AngTotH	
	Value	0000000001	10
Minimum torque limit (T-)	The value is multiplied by 100 and transferred as a whole number (rounded to 2 decimals). The value consists of six ASCII characters.		
	ID	21	2
	Value range	000000 – 999999	
	Presetting	-	
	Example:		
	Minimum torque limit (T-)	12.00	
	Value	001200	6
Maximum torque limit (T+)	The value is multiplied by 100 and transferred as a whole number (rounded to 2 decimals). The value consists of six ASCII characters.		
	ID	22	2
	Value range	000000 – 999999	
	Presetting	-	
	Example:		
	Maximum torque limit (T+)	20.11	
	Value	002011	6
Target torque (TP)	The value is multiplied by 100 and transferred as a whole number (rounded to 2 decimals). The value consists of six ASCII characters.		
	ID	23	2
	Value range	000000 – 999999	
	Presetting	-	
	Example:		
	Target torque (TP)	23.40	
	Value	002340	6

Table 7–24: MID 0061 revision 002

Parameter	Comments		Bytes
Torque (T)	The value is multiplied by 100 and transferred as a whole number (rounded to 2 decimals).		
	The value consists of six ASCII characters.		
	ID	24	2
	Value range	000000 – 999999	
	Presetting	-	
	Example:		
	Torque (T)	20.03	
	Value	002003	6
Minimum angle (A-)	The value is output in degrees.		
	The value consists of five ASCII characters.		
	ID	25	2
	Value range	00000 – 99999	
	Presetting	-	
	Example:		
	Minimum angle (A-)	5	
	Value	00005	5
Maximum angle (A+)	The value is output in degrees.		
	The value consists of five ASCII characters.		
	ID	26	2
	Value range	00000 – 99999	
	Presetting	-	
	Example:		
	Maximum angle (A+)	45	
	Value	00045	5
Target angle (AP)	The value is output in degrees.		
	The value consists of five ASCII characters.		
	ID	27	2
	Value range	00000 – 99999	
	Presetting	-	
	Example:		
	Target angle (AP)	90	
	Value	00090	5
Angle (A)	The value is output in degrees.		
	The value consists of five ASCII characters.		
	ID	28	2
	Value range	00000 – 99999	
	Presetting	-	
	Example:		
	Angle (A)	60	
	Value	00060	5
Total angle (AT-)	Total angle (AT-): not supported		
	The value consists of five ASCII characters.		
	ID	29	2
	Fixed value	00000	5
Total angle (AT+)	Total angle (AT+): not supported		
	The value consists of five ASCII characters.		
	ID	30	2
	Fixed value	00000	5

Table 7–24: MID 0061 revision 002

Parameter	Comments		Bytes
Total angle (AT)	Total angle (AT): not supported The value consists of five ASCII characters.		
	ID	31	2
	Fixed value	00000	5
Min. power redundancy monitoring	Min. power redundancy monitoring: not supported The value consists of three ASCII characters.		
	ID	32	2
	Fixed value	000	3
Max. power redundancy monitoring	Max. power redundancy monitoring: not supported The value consists of three ASCII characters.		
	ID	33	2
	Fixed value	000	3
Power redundancy value	Power redundancy value: not supported The value consists of three ASCII characters.		
	ID	34	2
	Fixed value	000	3
Minimum self-tapping	Self-tapping bolts: is not supported. The value consists of six ASCII characters.		
	ID	35	2
	Fixed value	000000	6
Maximum self-tapping	Self-tapping bolts: is not supported. The value consists of six ASCII characters.		
	ID	36	2
	Fixed value	000000	6
Self-tapping torque	Self-tapping bolts: is not supported. The value consists of six ASCII characters.		
	ID	37	2
	Fixed value	000000	6
Minimum friction torque	Friction torque of self-tapping bolts: is not supported. The value consists of six ASCII characters.		
	ID	38	2
	Fixed value	000000	6
Maximum friction torque	Friction torque of self-tapping bolts: is not supported. The value consists of six ASCII characters.		
	ID	39	2
	Fixed value	000000	6
Friction torque	Friction torque of self-tapping bolts: is not supported. The value consists of six ASCII characters.		
	ID	40	2
	Fixed value	000000	6
Tightening ID	With an activated OP, consecutive number for each tightening result (for further information, see MID 0064). The value consists of ten ASCII characters.		
	ID	41	2
	Value range	0000000000 – 9999999999	
	Presetting	-	
	Example:		
	Tightening ID	123456	
	Value	0000123456	10

Table 7–24: MID 0061 revision 002

Parameter	Comments		Bytes
Job sequence number	Job sequence number is not supported. The value consists of five ASCII characters.		
	ID	42	2
	Fixed value	00000	5
Sync tightening ID	Cycle counter The value consists of five ASCII characters.		
	ID	43	2
	Value range	00000 – 99999	
	Presetting	-	
	Example:		
	Sync tightening ID	3232	
	Value	03232	5
Serial number	Nutrunner The value consists of 14 ASCII characters.		
	ID	44	2
	Value range	0x20 – 0x7F	
	Presetting	-	
	Example:		
	Serial number	A36363	
	Value	A36363␣␣␣␣␣␣␣␣	14
Time stamp	Date and time of tightening. The value consists of 19 ASCII characters in YYYY-MM-DD:HH:MM:SS format.		
	ID	45	2
	Value range	0 – 9, - and :	
	Presetting	-	
	Example:		
	Time stamp	1/12/2009:2:43:57 PM	
	Value	1/12/2009:2:43:57 PM	19
Date/time of the last change	Date and time of the last change in the tightening program settings. The value consists of 19 ASCII characters in YYYY-MM-DD:HH:MM:SS format.		
	ID	46	2
	Value range	0 – 9, - and :	
	Presetting	-	
	Example:		
	Date/time of the change	1/12/2009:2:43:57 PM	
	Value	1/12/2009:2:43:57 PM	19
Data length revision 002			365

MID 0061 revision 003

Table 7–25: MID 0061 revision 003

Parameter	Comments		Bytes
This revision includes the information from revision 002 and the following additional information:			
Tightening program name	Fill in with empty spaces if < 25 characters. The value consists of 25 ASCII characters.		
	ID	47	2
	Value range	0x20 – 0x7F	
	Presetting	-	
	Example:		
	Tightening program name	Tightening program 3	
	Value	Schraubprogramm3␣␣␣␣␣␣␣␣␣	25
Torque value units	– 1: Nm – 2: Ftlb – 3: Inlb – 4: Kpm – 5: Kgfm – 6: Kgm – 0: All other units The value consists of one ASCII character.		
	ID	48	2
	Value range	0 – 4	
	Presetting	-	
	Example:		
	Torque value units	Nm	
	Value	1	1
Result type	– 1: Tighten (programs 0 to 98) – 2: Loosen (program 99) The value consists of two ASCII characters.		
	ID	49	2
	Value range	01 – 02	
	Presetting	-	
	Example:		
	Result type	Program 99	
	Value	02	2
Data length revision 003 (= data length revision 003 + data length revision 002)			399

MID 0061 revision 004

Table 7–26: MID 0061 revision 004

Parameter	Comments		Bytes
This revision includes the information from revision 003 and the following additional information:			
ID code part 2	Contains characters 26 – 50 of the ID code. The value consists of 25 ASCII characters.		
	ID	50	2
	Value range	0x20 – 0x7F	
	Presetting	-	
	Example:		
	ID code part 2	5432154321543215432154321	
	Value	5432154321543215432154321	25
ID code part 3	Contains characters 51 – 75 of the ID code. The rest of the characters are filled with space characters. The value consists of 25 ASCII characters.		
	ID	51	2
	Value range	0x20 – 0x7F	
	Presetting	-	
	Example:		
	ID code part 3	11112222333344	
	Value	11112222333344␣␣␣␣␣␣␣␣␣␣␣	25
ID code part 4	Contains characters 76 – 100 of the ID code. The rest of the characters are filled with space characters. The value consists of 25 ASCII characters.		
	ID	52	2
	Value range	␣	
	Presetting	-	
	Example:		
	ID code part 4	1122334455	
	Value	1122334455␣␣␣␣␣␣␣␣␣␣␣␣␣	25
Data length revision 004 (= data length revision 004 + data length revision 003)			480

MID 0061 revision 005

Table 7–27: MID 0061 revision 005

Parameter	Comments		Bytes
This revision includes the information from revision 004 and the following additional information:			
Tightening error code customer	Contains the error code that occurred at the customer's during tightening. The value consists of four ASCII characters (always: “0000”).		
	ID	53	2
	Value range	0000	
	Presetting	0000	
	Example:		
	ID code part 2	0000	
	Value	0000	4
Data length revision 005 (= data length revision 005 + data length revision 004)			486

MID 0061 revision 999

Table 7–28: MID 0061 revision 999

Parameter	Comments		Bytes
ID code	Contains the first 25 bytes of the ID code. The value consists of 25 ASCII characters.		
	ID	-	
	Value range	0x20 – 0x7F	
	Presetting	-	
	Example:		
	ID code	123456	
	Value	123456␣␣␣␣␣␣␣␣␣␣␣␣␣␣␣␣␣␣␣␣	25
Job number	Number of the selected OK/NOK counter The job number consists of two ASCII characters.		
	ID	-	
	Value range	01 – 99	
	Presetting	-	
	Example:		
	Job number	2	
	Value	02	2
Tightening program number	Number of the current tightening program. The value consists of three ASCII characters.		
	ID	-	
	Value range	000 – 999	
	Presetting	-	
	Example:		
	Tightening program number	5	
	Value	005	3
OK counter limit	OK counter presetting The value consists of four ASCII characters.		
	ID	-	
	Value range	0000 – 9999	
	Presetting	-	
	Example:		
	OK counter limit	12	
	Value	0012	4
OK counter value	– Start as a single channel: Actual value of the OK counter – Start in an application: Fixed value 1 The value consists of four ASCII characters.		
	ID	-	
	Value range	0000 – 9999	
	Presetting	-	
	Example:		
	OK counter value	4	
	Value	0004	4

Table 7–28: MID 0061 revision 999

Parameter	Comments		Bytes
OK/NOK counter status	Status of the OK/NOK counter. – 0: unless 1 or 2 – 1: Ch x.y CntOK = 1 – 2: OK/NOK counter not used (not configured) The value consists of one ASCII character.		
	ID	-	
	Value range	0 – 2	
	Presetting	-	
	Example:		
	OK/NOK counter status	OK/NOK counter not used	
	Value	2	1
Tightening status	– 0: NOK – 1: OK The value consists of one ASCII character.		
	ID	-	-
	Value range	0 – 5	
	Presetting	-	
	Example:		
	Tightening status	OK	
	Value	0	1
Torque status	– 0: Low – 1: OK – 2: High The value consists of one ASCII character.		
	ID	-	
	Value range	0 – 2	
	Presetting	-	
	Example:		
	Torque status	High	
	Value	2	1
Angle status	– 0: Low – 1: OK – 2: High The value consists of one ASCII character.		
	ID	-	
	Value range	0 – 2	
	Presetting	-	
	Example:		
	Angle status	OK	
	Value	1	1
Torque (T)	The value is multiplied by 100 and transferred as a whole number (rounded to 2 decimals). The value consists of six ASCII characters.		
	ID	-	
	Value range	000000 – 999999	
	Presetting	-	
	Example:		
	Torque (T)	20.00	
	Value	002000	6

Table 7–28: MID 0061 revision 999

Parameter	Comments		Bytes
Angle (A)	The value is output in degrees. The value consists of five ASCII characters.		
	ID	-	
	Value range	00000 – 99999	
	Presetting	-	
	Example:		
	Angle (A)	60	
	Value	00060	5
Time stamp	Date and time of tightening. The value consists of 19 ASCII characters in YYYY-MM-DD:HH:MM:SS format.		
	ID	-	
	Value range	0 – 9, - and :	
	Presetting	-	
	Example:		
	Time stamp	1/12/2009:2:43:57 PM	
	Value	1/12/2009:2:43:57 PM	19
Date/time of the last change	Date and time of the last change in the tightening program settings. The value consists of 19 ASCII characters in YYYY-MM-DD:HH:MM:SS format.		
	ID	-	
	Value range	0 – 9, - and :	
	Presetting	-	
	Example:		
	Date/time of the change	1/12/2009:2:43:57 PM	
	Value	1/12/2009:2:43:57 PM	19
Tightening ID	With an activated OP, consecutive number for each tightening result (for further information, see MID 0064). The value consists of ten ASCII characters.		
	ID	-	
	Value range	0000000000 – 9999999999	
	Presetting	-	
	Example:		
	Tightening ID	123456	
	Value	0000123456	10
Data length revision 999			101

MID 0062 Last tightening results data acknowledgement

Sent by: superordinate computer
Last tightening results data acknowledgement
Note: -
Revision: 001
Data field: is empty, 0 bytes
Possible response: none

MID 0063 Cancel last tightening results data

Sent by: superordinate computer

Reset the subscription for the last tightening result.

Note: -

Revision: 001

Data field: is empty, 0 bytes

Possible responses	MID	Error no.	Comment
Command accepted	0005	–	
Command error	0004	10	Activation for the last tightening result not available

MID 0064 Archived tightening results upload request

Sent by: superordinate computer

Each tightening result will be provided with a consecutive ID (beginning with 1). With tightening ID 0, the currently available result is uploaded. This way, the last tightening result can be requested when a connection is started, for example.

Note: -

Revision: See MID 0065

Data field: Tightening ID, 10 bytes

Possible responses	MID	Error no.	Remark
Archived tightening results response	0065	–	
Command error	0004	15	Requested tightening ID not found

MID 0065 Archived tightening results response

Sent by: Tightening controller

Upload the archived tightening.

Note: -

Revision: 001, 002, 003, 004

Data field: Data 98 bytes (revision 001), 206 bytes (revision 002), 213 bytes (revision 003), 294 bytes (revision 004)

Possible response: none

MID 0065 revision 001

Table 7–29: MID 0065 revision 001

Parameter	Comments		Bytes
Tightening ID	With an activated OP, consecutive number for each tightening result. The value consists of ten ASCII characters.		
	ID	01	2
	Value range	0000000000 – 9999999999	
	Presetting	-	
	Example:		
	Tightening ID	123456	
	Value	0000123456	10
ID code	Contains the first 25 bytes of the ID code. The value consists of 25 ASCII characters.		
	ID	02	2
	Value range	0x20 – 0x7F	
	Presetting	-	
	Example:		
	ID code	123456	
	Value	123456␣␣␣␣␣␣␣␣␣␣␣␣␣␣␣␣␣␣␣␣	25

Table 7–29: MID 0065 revision 001

Parameter	Comments		Bytes
Tightening program number	Number of the current tightening program. The value consists of three ASCII characters.		
	ID	03	2
	Value range	000 – 999	
	Presetting	-	
	Example:		
	Tightening program number	5	
	Value	005	3
OK counter value	Actual value of the OK counter The value consists of four ASCII characters.		
	ID	04	2
	Value range	0000 – 9999	
	Presetting	-	
	Example:		
	OK counter value	4	
	Value	0004	4
Tightening status	– 0: NOK – 1: OK The value consists of one ASCII character.		
	ID	05	2
	Value range	0 – 5	
	Presetting	-	
	Example:		
	Tightening status	OK	
	Value	0	1
Torque status	– 0: Low – 1: OK – 2: High The value consists of one ASCII character.		
	ID	06	2
	Value range	0 – 2	
	Presetting	-	
	Example:		
	Torque status	High	
	Value	2	1
Angle status	– 0: Low – 1: OK – 2: High The value consists of one ASCII character.		
	ID	07	2
	Value range	0 – 2	
	Presetting	-	
	Example:		
	Angle status	OK	
	Value	1	1

Table 7–29: MID 0065 revision 001

Parameter	Comments		Bytes
Torque (T)	The value is multiplied by 100 and transferred as a whole number (rounded to 2 decimals). The value consists of six ASCII characters.		
	ID	08	2
	Value range	000000 – 999999	
	Presetting	-	
	Example:		
	Torque (T)	20.00	
	Value	002000	6
Angle (A)	The value is output in degrees. The value consists of five ASCII characters.		
	ID	09	2
	Value range	00000 – 99999	
	Presetting	-	
	Example:		
	Angle (A)	60	
	Value	00060	5
Time stamp	Date and time of tightening. The value consists of 19 ASCII characters in YYYY-MM-DD:HH:MM:SS format.		
	ID	10	2
	Value range	0 – 9, - and :	
	Presetting	-	
	Example:		
	Time stamp	1/12/2009:2:43:57 PM	
	Value	1/12/2009:2:43:57 PM	19
OK/NOK counter status	Status of the OK/NOK counter. – 0: unless 1 or 2 – 1: Ch x.y CntOK = 1 – 2: OK/NOK counter not used (not configured) The value consists of one ASCII character.		
	ID	11	2
	Value range	0 – 2	
	Presetting	-	
	Example:		
	OK/NOK counter status	OK/NOK counter not used	
	Value	2	1
Data length revision 001			98

MID 0065 revision 002

Table 7–30: MID 0065 revision 002

Parameter	Comments		Bytes
Tightening ID	With an activated OP, consecutive number for each tightening result. The value consists of ten ASCII characters.		
	ID	01	2
	Value range	0000000000 – 9999999999	
	Presetting	-	
	Example:		
	Tightening ID	123456	
	Value	0000123456	10

Table 7–30: MID 0065 revision 002

Parameter	Comments		Bytes
ID code	Contains the first 25 bytes of the ID code. The value consists of 25 ASCII characters.		
	ID	02	2
	Value range	0x20 – 0x7F	
	Presetting	-	
	Example:		
	ID code	123456	
	Value	123456␣␣␣␣␣␣␣␣␣␣␣␣␣␣␣␣␣␣␣␣	25
Job number	Number of the selected OK/NOK counter The job number consists of two ASCII characters.		
	ID	03	4
	Value range	01 – 99	
	Presetting	-	
	Example:		
	Job number	2	
	Value	02	2
Tightening program number	Number of the current tightening program. The value consists of three ASCII characters.		
	ID	04	2
	Value range	000 – 999	
	Presetting	-	
	Example:		
	Tightening program number	5	
	Value	005	3
Placeholder value	The current strategy of the tightening controller. The value consists of two ASCII characters.		
	ID	05	2
	Fixed value	99	2
Placeholder value	The value consists of five ASCII characters.		
	ID	06	2
	Fixed value	00000	5
OK counter limit	– Start as a single channel: OK counter presetting The value consists of four ASCII characters.		
	ID	07	2
	Value range	0000 – 9999	
	Presetting	– No presetting for single channels – Fixed value 0001 when starting in an application	
	Example:		
	OK counter limit	12	
	Value	0012	4
OK counter value	Actual value of the OK counter The value consists of four ASCII characters.		
	ID	08	2
	Value range	0000 – 9999	
	Presetting	-	
	Example:		
	OK counter value	4	
	Value	0004	4

Table 7–30: MID 0065 revision 002

Parameter	Comments		Bytes
Tightening status	Rexroth OP: – 0: NOK – 1: OK The value consists of one ASCII character.		
	ID	09	2
	Value range	0 – 5	
	Presetting	-	
	Example:		
	Tightening status	OK	
	Value	0	1
OK/NOK counter status	Status of the OK/NOK counter. – 0: unless 1 or 2 – 1: Ch x.y CntOK = 1 – 2: OK/NOK counter not used (not configured) The value consists of one ASCII character.		
	ID	10	2
	Value range	0 – 2	
	Presetting	-	
	Example:		
	OK/NOK counter status	OK/NOK counter not used	
	Value	2	1
Torque status	– 0: Low – 1: OK – 2: High The value consists of one ASCII character.		
	ID	11	2
	Value range	0 – 2	
	Presetting	-	
	Example:		
	Torque status	High	
	Value	2	1
Angle status	– 0: Low – 1: OK – 2: High The value consists of one ASCII character.		
	ID	12	2
	Value range	0 – 2	
	Presetting	-	
	Example:		
	Angle status	OK	
	Value	1	1
Total angle status	Total angle status: not supported The value consists of one ASCII character.		
	ID	13	2
	Fixed value	1	1
Power redundancy monitoring status	Power redundancy monitoring status: not supported The value consists of one ASCII character.		
	ID	14	2
	Fixed value	1	1

Table 7–30: MID 0065 revision 002

Parameter	Comments		Bytes
Tapping status of self-tapping bolts	Tapping status of self-tapping bolts: not supported. The value consists of one ASCII character.		
	ID	15	2
	Fixed value	0	1
Placeholder value	The value consists of one ASCII character.		
	ID	16	2
	Fixed value	0	1
Placeholder value	The value consists of one ASCII character.		
	ID	17	2
	Fixed value	0	1
Tightening error status	Error bits indicate errors in the tightening system and are generated from the following bits in the quality code: – Bit 1 (AngTotH): The total angle is above the defined tolerance window. – Bit 2 (AngTotL): The total angle is below the defined tolerance window. – Bit 3 (TorqH): The torque is above the defined tolerance window. – Bit 4 (AnglH): The angle is above the defined tolerance window. – Bit 14 ((C)Cw=0): CCw or Cw deactivated during tightening. – Bit 15 (TorqL): The torque is below the defined tolerance window. – Bit 18 (start-up test): Start-up test NOK – Bit 21 (TimeH): The time is above the defined tolerance window. – Bit 23 (En=0): Enable deactivated during tightening. The value consists of ten ASCII characters.		
	ID	18	2
	Value range	0000000000–9999999999	
	Presetting	-	
	Example:		
	Tightening error status	AngTotH	
	Value	0000000001	10
Torque (T)	The value is multiplied by 100 and transferred as a whole number (rounded to 2 decimals). The value consists of six ASCII characters.		
	ID	19	2
	Value range	000000 – 999999	
	Presetting	-	
	Example:		
	Torque (T)	20.11	
	Value	002011	6
Angle (A)	The value is output in degrees. The value consists of five ASCII characters.		
	ID	20	2
	Value range	00000 – 99999	
	Presetting	-	
	Example:		
	Angle (A)	60	
	Value	00060	5
Total angle (AT)	Total angle (AT): not supported The value consists of five ASCII characters.		
	ID	21	2
	Fixed value	00000	5

Table 7–30: MID 0065 revision 002

Parameter	Comments		Bytes
Power redundancy value	Power redundancy value: not supported The value consists of three ASCII characters.		
	ID	22	3
	Fixed value	000	3
Self-tapping torque	Self-tapping bolts: is not supported. The value consists of six ASCII characters.		
	ID	23	2
	Fixed value	000000	6
Maximum friction torque	Friction torque of self-tapping bolts: is not supported. The value consists of six ASCII characters.		
	ID	24	2
	Fixed value	000000	6
Job sequence number	Job sequence number is not supported.		
	ID	25	2
	Fixed value	00000	5
Sync tightening ID	Cycle counter The value consists of five ASCII characters (maximum value: 65535).		
	ID	26	2
	Value range	00000 – 99999	
	Presetting	-	
	Example:		
	Sync tightening ID	3232	
	Value	03232	5
Serial number	Nutrunner The value consists of 14 ASCII characters.		
	ID	27	2
	Value range	0x20 – 0x7F	
	Presetting	-	
	Example:		
	Serial number	A36363	
	Value	A36363␣␣␣␣␣␣␣␣	14
Time stamp	Date and time of tightening. The value consists of 19 ASCII characters in YYYY-MM-DD:HH:MM:SS format.		
	ID	28	2
	Value range	0 – 9, - and :	
	Presetting	-	
	Example:		
	Time stamp	1/12/2009:2:43:57 PM	
	Value	1/12/2009:2:43:57 PM	19
Data length revision 002			206

MID 0065 revision 003

Table 7–31: MID 0065 revision 003

Parameter	Comments		Bytes
This revision includes the information from revision 002 and the following additional information:			
Torque value units	– 1: Nm – 2: Ftlb – 3: Inlb – 4: Kpm – 5: Kgfm – 6: Kgm – 0: All other units The value consists of one ASCII character.		
	ID	29	2
	Value range	0 – 4	
	Presetting	-	
	Example:		
	Torque value units	Nm	
	Value	1	1
Result type	– 1: Tighten (programs 0 to 98) – 2: Loosen (program 99) The value consists of two ASCII characters.		
	ID	30	2
	Value range	01 – 02	
	Presetting	-	
	Example:		
	Result type	Program 99	
	Value	02	2
Data length revision 003 (= data length revision 003 + data length revision 002)			213

MID 0065 revision 004

Table 7–32: MID 0065 revision 004

Parameter	Comments		Bytes
This revision includes the information from revision 003 and the following additional information:			
ID code part 2	Contains characters 26 – 50 of the ID code. The value consists of 25 ASCII characters.		
	ID	31	2
	Value range	0x20 – 0x7F	
	Presetting	-	
	Example:		
	ID code part 2	543215432154321543215432154321	
	Value	543215432154321543215432154321	25
ID code part 3	Contains characters 51 – 64 of the ID code. The rest of the characters are filled with space characters. The value consists of 25 ASCII characters.		
	ID	32	2
	Value range	0x20 – 0x7F	
	Presetting	-	
	Example:		
	ID code part 3	11112222333344	
	Value	11112222333344␣␣␣␣␣␣␣␣␣␣␣	25
ID code part 4	Contains nothing but empty spaces. The value consists of 25 ASCII characters.		
	ID	33	2
	Value range	␣	
	Presetting	-	
	Example:		
	ID code part 4		
	Value	␣␣␣␣␣␣␣␣␣␣␣␣␣␣␣␣␣␣␣␣␣␣␣␣␣	25
Data length revision 004 (= data length revision 004 + data length revision 003)			294

7.5.3.9 System error messages

MID 0070 Resulting system errors subscription

Sent by: superordinate computer

A subscription for the system errors that can be reported on the tightening controller.

Note: After successful subscription, a status message (MID 0076) will be sent to the superordinate computer for each active error in the controller.

Revision: 001

Data field: is empty, 0 bytes

Possible responses	MID	Error no.	Comment
Command accepted	0005	–	
Command error	0004	11	Activation of system errors already available

MID 0071 Upload resulting system errors

Sent by: Tightening controller

If a system error occurs in the tightening controller, it will be reported to the superior computer.

Note: -

Revision: 001

Data field: Data 33 bytes

Possible response: none

MID 0071 revision 001

Table 7–33: MID 0071 revision 001

Parameter	Comments		Bytes
Error number	The error number consists of four ASCII characters.		
	ID	01	2
	Value range	0000 – 9999	
	Presetting	-	
	Example:		
	Error number	105	
	Value	0105	4
Controller ready status	Always NOK (=0), as no differentiation is made between controller and tool. The value consists of one ASCII character.		
	ID	02	2
	Fixed value	0	1
Tool ready status	Only NOK if error comes from tool. – 1: OK – 0: NOK The value consists of one ASCII character.		
	ID	03	2
	Value range	0 – 1	
	Presetting	-	
	Example:		
	Tool ready status	OK	
	Value	1	1
Time	Date and time when the error occurred. The value consists of 19 ASCII characters in YYYY-MM-DD:HH:MM:SS format.		
	ID	04	2
	Value range	0 – 9, "-" and ":"	
	Presetting	-	
	Example:		
	Time	1/12/2009:11:54:29 AM	
	Value	1/12/2009:11:54:29 AM	19
Data length revision 001			33

MID 0072 Upload system errors acknowledgement

Sent by: superordinate computer

Acknowledgment for MID 0071

Note: -

Revision: 001

Data field: is empty, 0 bytes

Possible response: none

MID 0073 Cancel system errors subscription

Sent by: superordinate computer			
Cancel system errors subscription			
Note: -			
Revision: 001			
Data field: is empty, 0 bytes			
Possible responses	**MID**	**Error no.**	**Comment**
Command accepted	0005	–	
Command error	0004	12	Activation of system errors not available

MID 0074 System error in tightening controller acknowledged

Sent by: Tightening controller			
The tightening controller sends this message to inform the superior computer that an error has been acknowledged.			
Note: -			
Revision: 001			
Data field: Error number, 4 bytes			
Possible response	**MID**	**Error no.**	**Remark**
Acknowledgement System error in tightening controller acknowledged	0075	–	

MID 0075 Acknowledgement System error in tightening controller acknowledged

Sent by: superordinate computer
Acknowledgment for MID 0074
Note: -
Revision: 001
Data field: is empty, 0 bytes
Possible response: none

MID 0076 System error status

Sent by: Tightening controller			
The system error status is sent after a subscription for system errors from the tightening controller has been accepted.			
Note: The system error status informs the superior computer that a system error is currently active in the connected controller. Exactly one system error status message is sent for each active system error in the connected controller.			
Revision: 001			
Data field: Data 36 bytes			
Possible response	**MID**	**Error no.**	**Remark**
System error status acknowledgement	0077	–	

MID 0076 revision 001

Table 7–34: MID 0076 revision 001

Parameter	Comments		Bytes
System error status	– 0: No system error active – 1: A system error is currently active The value consists of one ASCII character.		
	ID	01	2
	Value range	0 – 1	
	Presetting	-	
	Example:		
	System error status	A system error is active	
	Value	0	1
Error number	The value consists of four ASCII characters.		
	ID	02	2
	Value range	0000 – 9999	
	Presetting	-	
	Example:		
	Error number	105	
	Value	0105	4
Controller ready status	Always NOK (=0), as no differentiation is made between controller and tool. The value consists of one ASCII character.		
	ID	03	2
	Fixed value	0	1
Tool ready status	Only NOK if error comes from tool. – 1: OK – 0: NOK The value consists of one ASCII character.		
	ID	04	2
	Value range	0 – 1	
	Presetting	-	
	Example:		
	Tool ready status	OK	
	Value	1	1
Time	Date and time when the error occurred. The value consists of 19 ASCII characters in YYYY-MM-DD:HH:MM:SS format.		
	ID	05	2
	Value range	0 – 9, "-" and ":"	
	Presetting	-	
	Example:		
	Time	1/12/2009:11:54:29 AM	
	Value	1/12/2009:11:54:29 AM	19
Data length revision 001			36

MID 0077 System error status acknowledgement

Sent by: superordinate computer
Acknowledgment for MID 0076
Note: -
Revision: 001
Data field: is empty, 0 bytes
Possible response: none

MID 0078 Acknowledge system error in tightening controller

Sent by: superordinate computer			
Class 3 errors can be acknowledged by the superior computer with this message.			
Note: -			
Revision: 001			
Data field: is empty, 0 bytes			
Possible responses	**MID**	**Error no.**	**Comment**
Command accepted	0005	–	
Command error	0004	58	No system error available
		01	Invalid data

7.5.3.10 Time messages

MID 0080 Time on the tightening controller request

Sent by: superordinate computer			
Time on the tightening controller request			
Note: -			
Revision: 001			
Data field: is empty, 0 bytes			
Possible response	**MID**	**Error no.**	**Remark**
Upload time	0081	–	

MID 0081 Upload time

Sent by: Tightening controller
Upload time
Note: -
Revision: 001
Data field: Date and time YYYY-MM-DD:HH:MM:SS, 19 bytes
Possible response: none

MID 0082 Set the time in the tightening controller

Sent by: superordinate computer			
Set the time in the tightening controller			
Note: -			
Revision: 001			
Data field: Date and time YYYY-MM-DD:HH:MM:SS, 19 bytes			
Possible response	**MID**	**Error no.**	**Comment**
Command accepted	0005	–	

7.5.3.11 Visualization messages

MID 0111 Message on the graphical display of the nutrunner

Sent by: superordinate computer

This message can be used to show text on the graphical display of the nutrunner. The user can also specify a time for the text to be displayed and whether the text has to be confirmed by the operator.

Note: -

Revision: 001

Data field: Data 117 bytes. Divided into four lines, each with 25 ASCII characters. Lines with less than 25 characters must be filled with space characters (0x20). The tool display can represent up to 15 characters per line.

Possible responses	MID	Error no.	Comment
Command accepted	0005	–	
Command error	0004	01	Invalid data

MID 0111 revision 001

Table 7–35: MID 0111 revision 001

Parameter	Comments		Bytes
Display duration	Time in seconds that the text should be displayed. The value consists of four ASCII characters.		
	ID	01	2
	Value range	0000 – 9999	
	Presetting	-	
	Example:		
	Display duration	60	
	Value	0060	4
Deletion condition	– 0: Hide text after display duration or after clicking the OK-button – 1: OK button must be clicked (display duration parameter is ignored) The value consists of one ASCII character.		
	ID	2	2
	Value range	0 – 1	
	Presetting	-	
	Example:		
	Deletion condition	Hide text after display duration or after clicking the OK button	
	Value	0	1
Line 1	Fill in with empty spaces if < 25 characters. The value consists of a maximum of 25 ASCII characters. The tool display can represent up to 15 characters per line.		
	ID	3	2
	Value range	0x20 – 0x7F	
	Presetting	-	
	Example:		
	Line 1	Title	
	Value	Title␣␣␣␣␣␣␣␣␣␣␣␣␣␣␣	25
Line 2	Fill in with empty spaces if < 25 characters. The value consists of a maximum of 25 ASCII characters. The tool display can represent up to 15 characters per line.		
	ID	4	2
	Value range	0x20 – 0x7F	
	Presetting	-	
	Example:		
	Line 2	Line 2	
	Value	Line␣2␣␣␣␣␣␣␣␣␣␣␣␣␣␣␣␣␣␣	25

Table 7–35: MID 0111 revision 001

Parameter	Comments		Bytes
Line 3	Fill in with empty spaces if < 25 characters. The value consists of a maximum of 25 ASCII characters. The tool display can represent up to 15 characters per line.		
	ID	5	2
	Value range	0x20 – 0x7F	
	Presetting	-	
	Example:		
	Line 3	Line 3	
	Value	Line␣3␣␣␣␣␣␣␣␣␣␣␣␣␣␣␣␣␣␣	25
Line 4	Fill in with empty spaces if < 25 characters. The value consists of a maximum of 25 ASCII characters. The tool display can represent up to 15 characters per line.		
	ID	6	2
	Value range	0x20 – 0x7F	
	Presetting	-	
	Example:		
	Line 4	Line 4	
	Value	Line␣4␣␣␣␣␣␣␣␣␣␣␣␣␣␣␣␣␣␣	25
Data length revision 001			117

MID 0127 Aborts a job

Sent by: superordinate computer

This command can be used to abort a running job.

Note: The **Job Abort** PLC signal has to be applied at the input of the **oprtcl** module.

Revision: 001 (supported by Rexroth OP)

Data field: is empty, 0 bytes

Possible response	MID	Error no.	Comment
Command accepted	0005	–	
Command error	0004	98	Request timeout in the controller or PLC signal not assigned in the PLC assignment table.

7.5.3.12 Operating mode messages

MID 0400 Activate automatic/manual mode

Sent by: superordinate computer

As a consequence of this message, the superior computer is informed about every change in the operating mode of the tightening system (between "automatic" and "manual") by means of a message (upload automatic/manual mode, MID 0401). After confirmed logon (command accepted, MID 0005), the tightening controller moreover sends a message (upload automatic/manual mode, MID 0401) with the current operating mode to the superior computer.

Note: -

Revision: 001

Data field: is empty, 0 bytes

Possible response	MID	Error no.	Comment
Command accepted	0005	–	
Command error	0004	82	Activation for automatic/manual mode already available

MID 0401 Upload automatic/manual mode

Sent by: Tightening controller

After having changed the operating mode ("automatic" or "manual") the tightening controller uses this message to inform the superior computer about the new operating mode.

Note: -

Revision: 001

Data field: Operating mode, 1 byte. The operating mode is identified by one ASCII character and can be as follows:

0: automatic mode

1: manual mode

Possible response	MID	Error no.	Remark
Upload automatic/manual mode acknowledgement	0402	–	

MID 0402 Upload automatic/manual mode acknowledgement

Sent by: superordinate computer

The superordinate computer acknowledges the change in operating mode (upload automatic/manual mode, MID 0401).

Note: -

Revision: 001

Data field: is empty, 0 bytes

Possible response: none

MID 0403 Deactivate automatic/manual mode

Sent by: superordinate computer

The subscription to the change in operating mode (Logon automatic/manual mode, MID 0400) is reset.

Note: -

Revision: 001

Data field: is empty, 0 bytes

Possible response	MID	Error no.	Comment
Command accepted	0005	–	
Command error	0004	83	Activation for automatic/manual mode not available

MID 0404 Select automatic/manual mode

Sent by: superordinate computer

The operating mode is changed.

Note: -

Revision: 001 (supported by Rexroth OP)

Data field: Operating mode, 1 byte. The operating mode is identified by one ASCII character and can be as follows:

0: automatic mode

1: manual mode

Possible response	MID	Error no.	Comment
Command accepted	0005	–	

MID 0410 AutoDisable setting request

Sent by: superordinate computer

Requests the setting “Disable tool” of the active OK/NOK counter.
It is set in the NEXO-OS operating system: Menu **Settings → OK/NOK counter → Disable when OK/NOK number is reached**

Note: -

Revision: 001 (Rexroth OP-Ford)

Data field: is empty, 0 bytes

Possible response	MID	Error no.	Remark
AutoDisable setting response	0411	–	

MID 0411 AutoDisable setting response

Sent by: Tightening controller

The setting is transmitted.

Note: -

Revision: 001 (Rexroth OP-Ford)

Data field: Data 4 bytes

Possible response	MID	Error no.	Comment
Command accepted	0005	–	

MID 0411 revision 001

Table 7–36: MID 0411 revision 001

Parameter	Comments		Bytes
AutoDisable status	Status of the automatic disable on option **Disable when OK/NOK number is reached** at **OK/NOK counter** Possible values: – 00: not selected – 01: selected The value consists of two ASCII characters.		
	ID	-	
	Value range	00 – 01	
	Presetting	-	
	Example:		
	AutoDisable status	Not set	
	Value	00	2
OK/NOK counter value	Fixed value 00		
	Fixed value	00	2
Data length revision 001			4

7.5.3.13 PLC output signal messages

MID 0500 Subscription Output signal change

Sent by: superordinate computer

As a consequence of this message, the superior computer is informed about every change in the configurable output signals at the OP PLC module by means of a message (upload change in output signals, MID 0501). After confirmed logon (command accepted, MID 0005), the tightening controller moreover sends a message (upload change in the output signals, MID 0501) with the current assignment of the output signals to the superior computer.

Note: -

Revision: 001

Data field: is empty, 0 bytes

Possible response	MID	Error no.	Comment
Command accepted	0005	–	
Command error	0004	86	Activation for output signal change already available

MID 0501 Upload Output signal change

Sent by: Tightening controller

The assignment of the output signals at the OP PLC module has changed.

Note: -

Revision: 001, 002

Data field: Number of signals, 8 bytes or 16 bytes

Possible response	MID	Error no.	Remark
Acknowledge Upload output signal change	0502	–	

MID 0501 revision 001

Table 7–37: MID 0501 revision 001

Parameter	Comments	Bytes
This revision outputs the values of the first eight (8) assignable output signals of the OP PLC module. The output is effected in the order in which the signals have been stored by the user.		

Table 7–37: MID 0501 revision 001

Parameter	Comments		Bytes
Signals	Every signal is represented by a byte. The meaning of each signal (e.g. position recognition) results from the special case.		
	ID	None	
	Value range	0 (not active) or 1 (active)	
	Presetting	-	
	Example:		
	Signals	The signals can be assigned as desired.	
	Value	001 001 00, e.g. with: Rdy = 0 NF = 0 InCy = 1 CyCmp = 0 Ok = 0 Nok = 1 BattOk = 0 StartBn = 0 The first bit of the data flow corresponds to bit **0.0** of the **oprtcl** PLC module.	8
Data length revision 001			8

MID 0501 revision 002

Table 7–38: MID 0501 revision 002

Parameter	Comments		Bytes
This revision outputs the values of the first 16 assignable output signals of the OP PLC module. The output is effected in the order in which the signals have been stored by the user.			
Signals	Every signal is represented by a byte. The meaning of each signal (e.g. position recognition) results from the special case.		
	ID	None	
	Value range	0 (not active) or 1 (active)	
	Presetting	-	
	Example:		
	Signals	The signals can be assigned as desired.	
	Value	0010010000000001, e.g. with: InCy = 0 Nok = 0 Ok = 1 AppOut3 = 0 AppOut4 = 0 CyCmp = 0 AppOut6 = 0 AppOut7 = 0 AppOut8 = 0 AppOut9 = 0 AppOut10 = 0 AppOut11 = 0 AppOut12 = 0 AppOut13 = 0 AppOut14 = 0 CmtOK = 1 The first bit of the data flow corresponds to bit **0.0** of the **oprtcl** PLC module.	16
Data length revision 001			16

MID 0502 Acknowledgment Upload output signal change

Sent by: superordinate computer

The superior computer acknowledges the change in the output signals (upload change in the output signals, MID 0501).

Note: -

Revision: 001

Data field: is empty, 0 bytes

Possible response: none

MID 0503 Cancel Output signal change

Sent by: superordinate computer

The subscription of the changes in the output signals (Logon change in the output signals, MID 0500) is reset.

Note: -

Revision: 001

Data field: is empty, 0 bytes

Possible response	MID	Error no.	Comment
Command accepted	0005	–	
Command error	0004	87	Activation for output signal change not available

MID 0504 Change value of input signals

Sent by: superordinate computer

Using this message, the values of the 16 configurable input signals of the Open Protocol PLC module may be changed.

Note: -

Revision: 001

Data field: Number of signals, 16 bytes

Possible response	MID	Error no.	Comment
Command accepted	0005	–	

MID 0504 revision 001

Table 7–39: MID 0504 revision 001

Parameter	Comments		Bytes
Signals	Every signal is represented by a byte. The meaning of each signal (e.g. position recognition) results from the special case.		
	ID	None	
	Value range	0 (not active) or 1 (active)	
	Presetting	-	
	Example:		
	Signals	The signals can be assigned as desired.	
	Value	001 001 0000000001, e.g. with: 0 0 1 – 0 0 1 – 0 0 0 0 0 0 0 0 0 0 = = = = = = = = = = = = = = = = AppIn0 AppIn1 ResRs AppIn3 AppIn4 DisRp AppIn6 AppIn7 AppIn8 AppIn9 AppIn10 CntRes AppIn12 AppIn13 ResE AppIn15 The first bit of the data flow corresponds to bit **0.0** of the **oprtcl** PLC module.	16
Data length revision 001			16

7.5.3.14 Job messages

MID 0570 Activate job

Sent by: superordinate computer			
This command can be used to enable the job function of the tightening channel.			
Note: In the PLC assignment table, the ***JobEnable*** signal must be applied to the OP module.			
Revision: 001			
Data field: 1 byte			
Possible response	**MID**	**Error no.**	**Comment**
Command accepted	0005	–	
Command error	0004	98	Request timeout in the controller or PLC signal not assigned in the PLC assignment table.

MID 0570 revision 001

Table 7–40: MID 0570 revision 001

Parameter	Comments		Bytes
Job status	Defines the status of the job. The value consists of one ASCII character.		
	ID	01	2
	Value range	– 0 (deactivated) – 1 (activated)	
	Presetting	-	
	Example		
	Job status	deactivated	
	Value	0	1
Data length revision 001			3

MID 0571 Start job sequence

Sent by: superordinate computer			
This command can be used to start the job function of the tightening channel.			
Note: In the PLC assignment table, the ***JobStart*** signal must be applied to the OP module.			
Revision: 001			
Data field: 3 bytes			
Possible response	**MID**	**Error no.**	**Comment**
Command accepted	0005	–	
Command error	0004	98	Request timeout in the controller or PLC signal not assigned in the PLC assignment table.

MID 0571 revision 001

Table 7–41: MID 0571 revision 001

Parameter	Comments		Bytes
Tightening channel number	Number of the tightening channel. The value consists of three ASCII characters.		
	ID	01	2
	Value range	0 – 1	
	Presetting	-	
	Example		
	Tightening channel number	1	
	Value	1	1
Data length revision 001			3

MID 0573 Select job number

Sent by: superordinate computer

This command can be used to select the job number of the tightening channel.

Note: In the PLC assignment table, the ***Job<n>*** signal must be applied to the OP module.

Revision: 001

Data field: 3 bytes

Possible response	MID	Error no.	Comment
Command accepted	0005	–	
Command error	0004	98	Request timeout in the controller or PLC signal not assigned in the PLC assignment table.

MID 0573 revision 001

Table 7–42: MID 0573 revision 001

Parameter	Comments		Bytes
Job number	Number of the job. The value consists of three ASCII characters.		
	ID	-	
	Value range	000 - 999	
	Presetting	-	
	Example		
	Job number	001	
	Value	001	3
Data length revision 001			3

7.5.3.15 Level of the battery pack slide-in module and radio reception quality

MID 0800 Battery level request

Sent by: superordinate computer

Battery level request

Note: -

Revision: 001

Data field: is empty, 0 bytes

Possible response	MID	Error no.	Remark
Battery level response	0801	–	As a result of this command the battery level is transmitted.

MID 0801 Battery level response

Sent by: Tightening controller

Transmission of the battery level

Note: -

Revision: 001

Data field: Data 8 bytes

Possible response: none

Table 7–43: MID 0801 revision 001

Parameter	Comments		Bytes
Capacity of the battery pack slide-in module	Capacity of the battery pack slide-in module in percent. The value consists of three ASCII characters.		
	ID	01	2
	Value range	000 – 100	
	Presetting	-	
	Example:		
	Capacity of the battery pack slide-in module	30%	
	Value	030	3
State of the battery pack slide-in module	– 0: The battery pack slide-in module is not inserted. – 1: The battery level is critical (system is shut down) – 2: The battery level is insufficient for any more tightening jobs. – 3: The battery level is okay. – 4: The battery pack slide-in module was reinserted (the state if charge of the battery is being checked). – 5: The battery level warning level is reached. The value consists of one ASCII character.		
	ID	02	2
	Value range	0 – 5	
	Presetting	-	
	Example:		
	State of the battery pack slide-in module	The battery level is okay.	
	Value	3	1
Data length revision 001			8

MID 0802 Battery level changes subscription

Sent by: superordinate computer

Subscription for changes in the battery level.

As a consequence of this message, the superior computer is informed about every change in the battery level by means of a message (Battery level changes upload, MID 0803). After confirmed logon (command accepted, MID 0005), the tightening controller moreover sends a message (Battery level changes upload, MID 0803) with the current battery level to the superior computer.

Note: -

Revision: 001

Data field: Data 2 bytes

Possible response	MID	Error no.	Comment
Command accepted	0005	-	
Command error	0004	35	There is already a subscription for changes in the battery level.

Table 7–44: MID 0802 revision 001

Parameter	Comments		Bytes
Change in the battery level	Selection of the value for the change in capacity of the battery pack slide-in module in percent of maximum capacity (100%). If the capacity changes, the superior computer is informed about the change in the battery level by means of a message (Battery level changes upload, MID 0803). The value consists of two ASCII characters.		
	ID	-	
	Value range	00 – 99	
	Presetting	-	
	Example:		
	Change in the battery level	Entered value: 25 (=25%) Battery level: 100% A message will be sent when the battery level is at 75%. The next messages will be sent when the battery level is at 50% and 25%.	
	Value	25	2
Data length revision 001			2

MID 0803 Battery level changes upload

Sent by: Tightening controller

If the battery level changes, it will be reported to the superior computer.

Note: -

Revision: 001

Data field: Data 8 bytes

Possible response: none

Table 7–45: MID 0803 revision 001

Parameter	Comments		Bytes
Capacity of the battery pack slide-in module	Capacity of the battery pack slide-in module in percent. The value consists of three ASCII characters.		
	ID	01	2
	Value range	000 – 100	
	Presetting	-	
	Example:		
	Capacity of the battery pack slide-in module	30%	
	Value	030	3
State of the battery pack slide-in module	– 0: The battery pack slide-in module is not inserted. – 1: The battery level is critical (system is shut down) – 2: The battery level is insufficient for any more tightening jobs. – 3: The battery level is okay. – 4: The battery pack slide-in module was reinserted (the state if charge of the battery is being checked). – 5: The battery level warning level is reached. The value consists of one ASCII character.		
	ID	02	2
	Value range	0 – 5	
	Presetting	-	
	Example:		
	State of the battery pack slide-in module	The battery level is okay.	
	Value	3	1
Data length revision 001			8

MID 0804 Cancel battery level changes subscription

Sent by: superordinate computer

Cancels the battery level changes subscription

Note: -

Revision: 001

Data field: is empty, 0 bytes

Possible response	MID	Error no.	Comment
Command accepted	0005	–	
Command error	0004	36	There is no subscription for changes in the battery level.

MID 0805 Reception quality request

Sent by: superordinate computer

Reception quality request

Note: -

Revision: 001

Data field: is empty, 0 bytes

Possible response	MID	Error no.	Remark
Reception quality response	0806	–	As a result of this command the reception quality is transmitted.

MID 0806 Reception quality response

Sent by: Tightening controller
Transmission of the reception quality
Note: -
Revision: 001
Data field: 6 bytes
Possible response: none

Table 7–46: MID 0806 revision 001

Parameter	Comments		Bytes
Reception quality	The value consists of four ASCII characters.		
	ID	01	2
	Value range	-45 – -90 dbm	
	Presetting	-	
	Example:		
	Reception quality	-80 dbm	
	Value	-080	4
Data length revision 001			6

MID 0807 Reception quality change subscription

Sent by: superordinate computer
Subscription for changes in the reception quality.
Note: -
Revision: 001
Data field: Data 2 bytes

Possible response	MID	Error no.	Comment
Command accepted	0005	-	
Command error	0004	37	There is already a subscription for changes in the reception quality.

Table 7–47: MID 0807 revision 001

Parameter	Comments		Bytes
Change of reception quality	Selection of the value for the change in the reception quality as integer. If the reception quality changes, the superior computer is informed about the change in the reception quality by means of a message (Reception quality change upload, MID 0808). The value consists of two ASCII characters.		
	ID	-	
	Value range	00 – 99 dbm	
	Presetting	-	
	Example:		
	Change of reception quality	10 dbm	
	Value	10	2
Data length revision 001			2

MID 0808 Reception quality change upload

Sent by: Tightening controller

If the reception quality changes, it will be reported to the superior computer.

Note: -

Revision: 001

Data field: Data 6 bytes

Possible response: none

Table 7–48: MID 0806 revision 001

Parameter	Comments		Bytes
Reception quality	The value consists of four ASCII characters.		
	ID	01	2
	Value range	-45 – -90 dbm	
	Presetting	-	
	Example:		
	Reception quality	-80 dbm	
	Value	-080	4
Data length revision 001			6

MID 0809 Cancel reception quality change subscription

Sent by: superordinate computer

Resets the subscription for reception quality changes

Note: -

Revision: 001

Data field: is empty, 0 bytes

Possible response	MID	Error no.	Comment
Command accepted	0005	–	
Command error	0004	38	There is no subscription for changes in the reception quality.

7.5.3.16 Keep alive messages

MID 9999 Keep alive message

Sent by: superordinate computer

The superior computer sends a keep alive message to the tightening controller. The tightening controller returns the received message to the superior computer.

A communication timeout of 15 s (can be parameterized by the OS) applies to the tightening controller, i.e. if no message is exchanged between the superior computer and the tightening controller within 15 s, the tightening controller considers the connection disrupted and disconnects it.

Note:

We recommend sending a message (keep alive or other) to the tightening controller at the latest every 10 seconds to avoid undesired connection disruptions (with high latency times with TCP/IP).

Revision: 001

Data field: is empty, 0 bytes

Possible response	MID	Error no.	Remark
Keep alive message MID 9999 (mirrored from the tightening controller)		–	

7.5.3.17 Error numbers

Table 7–49: Error numbers

Error no.	Description
01	Invalid data
02	Tightening program not available
03	Tightening program cannot be specified
04	Tightening program not active
06	Activation of ID code upload already available
07	Activation of ID code upload not available
08	Entry source for ID code not permissible
09	Activation for the last tightening result already available
10	Activation for the last tightening result not available
11	Activation of system errors already available
12	Activation of system errors not available
13	Subscription for tightening program selection already available
14	Subscription for tightening program selection is not available
15	Requested tightening ID not found
16	Connection rejected, max. number of connections exceeded
35	There is already a subscription for changes in the battery level.
36	There is no subscription for changes in the battery level.
37	There is already a subscription for changes in the reception quality.
38	There is no subscription for changes in the reception quality.
58	No system error available
70	Calibration failed
82	Activation for automatic/manual mode already available
83	Activation for automatic/manual mode not available
86	Activation for output signal change already available
87	Activation for output signal change not available
96	Client already connected
98	Request timeout in the controller or PLC signal not assigned in the PLC assignment table or Open Protocol PLC module (**oprtcl**) not configured.

7.6 Rexroth IPM Protocol

The settings for the protocol are made via the NEXO-OS operating system in the **Settings** → **Data** → **IPM** menu, see section Settings on page 203.

IPM output of torque values is always with two decimals.

The Rexroth IPM Protocol is used for transferring tightening results and tightening graphs to a system for integrated process data management (IPM) via TCP/IP.

The "IPM" application package has standardized interfaces via which devices of different manufacturers automatically transmit their values to the IPM software. In this way, Rexroth IPM Protocol helps to avoid heterogeneous software architectures and to link quality-relevant information from different parts of the production chain.

Rexroth IPM Protocol is a data protocol for the communication with an IPM communication partner that must imperatively be installed in the overall system. This IPM communication partner is, however, no Bosch Rexroth product. The IPM communication partner is an application package consisting of gateway, server, database and web interface for visualization, analysis and archiving. The application package consists of the following components, see Fig. 7–3:

- IPM gateway and IPM server

  The IPM gateway receives the measurement data (telegrams) of the Nexo cordless Wi-Fi nutrunner and checks it for correctness and then sends it to the IPM server. The IPM server sends the data to the database.

  There are 1…n IPM gateways and IPM servers whereas they always exist as pairs in a 1:1 relationship.
- IPM database

  In the IPM database, the measurement data is stored. The IPM web interface retrieves any necessary information from the database. Currently, all Oracle versions from 8.x are supported. Installation on other databases is, however, also possible.
- IPM web interface

  The IPM web interface provides the user with numerous data analysis possibilities. Via a browser, the IPM web interface is available without any installation on the client side.

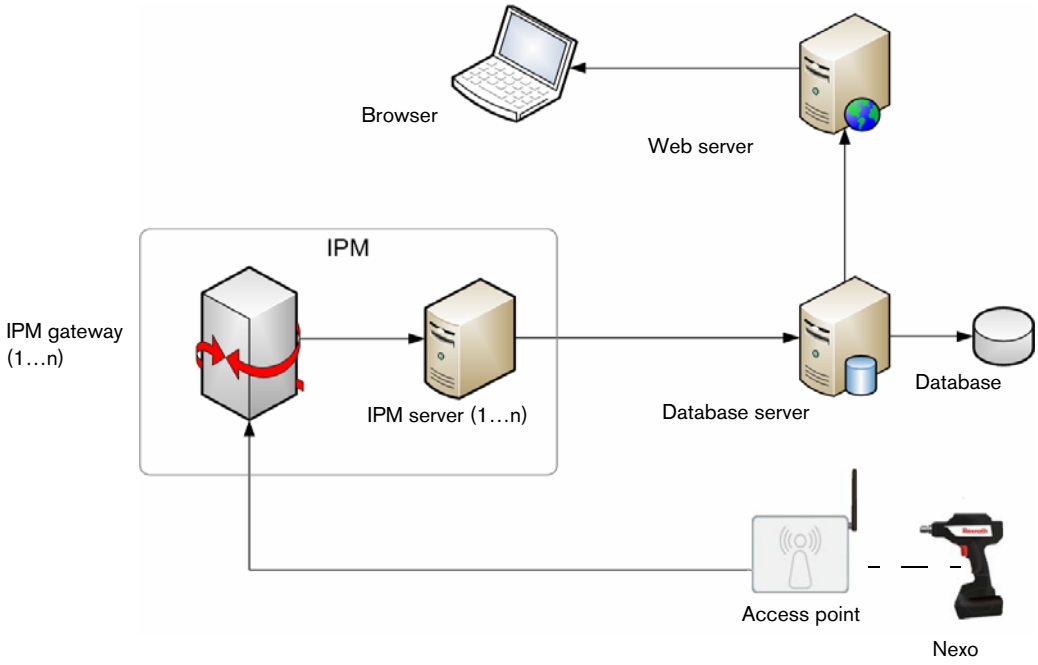


Fig. 7–3: IPM architecture

Before transmission of the tightening results and tightening graphs via the Rexroth IPM Protocol, the data are converted into the format used by the IPM process data and analysis system. In this format, tightening channel and tightening program are used for the identification of a measurement point, the so-called "work sequence" (AFO). By means of the assignment between tightening channel/tightening program and AFO, the physical process information and process data is then assigned to the logical features. This assignment is defined and managed by configuring it in the NEXO-OX operating system. The number of data records is also configured via the NEXO-OS operating system, using the **Settings** → **Data** → **Results storage** menu (see page 208).

7.6.1 Message structure

Table 7–50 shows the basic structure of a message of the Rexroth IPM Protocol.

Table 7–50: Rexroth IPM Protocol message structure

Message component	Element	Element description	Remark
Header	AFO	AFO description	For identification of a work sequence (AFO) and/or tightening position
	Name	AFO name	
Data fields	Steps	Tightening steps	
	Actual values/ characteristics[1]	Measured actual values like – Torque (TA) – Angle (AA) – Gradient (GA) – Time (TA) – Torque threshold (SA)	Parameters belonging to the actual values: – TA: TV, T+, T-, TS – AA: AV, A+, A-- – GA: GV, G+, G- – TA: TV, T+ – SA: without parameters
	Set values/parameters	Parameterized values from KE/CS, set values and limit values as well as parameters from the database like torque threshold set value	Parameters are clearly identified via the combination of KE/CS, tightening channel and tightening program
Graphs	Graphs	Filtered tightening result graphs (graph filter) with and without tightening steps	

1. If there is no actual value for a feature, e.g. because the corresponding monitoring function in the tightening program is not activated, a so-called "actual dummy value" having the value -9999999 will be transferred. In the subsequent evaluation on the IPM web interface, this pseudo measurement value can then be filtered out again.

Torque values related to data output from the Nexo cordless Wi-Fi nutrunner are rounded to two decimals for transfer to the IPM communication partner. This may result in an error evaluation on the IPM communication partner. Please note that rounded values may result in error evaluations.

7.7 VW-XML protocol

As of Nexo firmware version 1200, the VW-XML protocol is supported. VW-XML version 2.1 is supported.

Application of the VW-XML protocol outside of VOLKSWAGEN AG is subject to express written agreement of VOLKSWAGEN AG.

The VW-XML protocol is the implementation of the VW corporate requirement specifications "Controlled tightening systems", chapter 4 “Communication with superior units", for the Nexo cordless Wi-Fi nutrunner. This documentation only documents the settings for the Nexo cordless Wi-Fi nutrunner regarding the VW-XML data protocol (see page 221); the basic and general information is described in the requirement specifications mentioned above.

The settings for the protocol are made via the NEXO-OS operating system in the **Settings** → **Data** → **VW-XML** menu, see section Settings on page 203.

Communication between the Nexo cordless Wi-Fi nutrunner and the superordinate computer (master PC) can be realized via VW-XML protocol. During communication, the superordinate computer acts as master and the Nexo cordless Wi-Fi nutrunner acts as slave.

The VW-XML protocol is a communication protocol based on standard Ethernet TCP/IP.

The VW-XML protocol uses the OK/NOK counters of the Nexo cordless Wi-Fi nutrunner. For setting the OK/NOK counter via menu **Settings** → **OK/NOK counter**, the following has to be observed:

1. Under **Select PLC signals**, activate **Prg0… Prg7**.
2. Make the following settings under **Counter records**:
   a. Under **OK counting direction** and **NOK counting direction**, the counting direction is increasing (1,2,..,n).

      The potential value for NOK tightening defined by the VW-XML master PC (tag <MNO>) is increased by 1 as one more tightening process is to be allowed after the last NOK tightening as defined in the VW corporate requirement specifications.
   b. Enable the **Disable when reaching the number of OK/NOK** check box for **nutrunner** and **Prg99**. If the OK or NOK counter is reached, the nutrunner and Prg99 are disabled.

      After the first tightening process, the Nexo cordless Wi-Fi nutrunner is neither disabled in case of OK nor NOK result.

7.7.1 Assignment of PLC signals

To ensure proper function of the VW-XML protocol, the **vwXml** PLC module has to be activated in menu **Settings** → **PLC signals**.

- Except for the **Cw** and **Ccw** signals, all control signals have to be applied under **Inputs** to the **vwXml** module according to the designation highlighted in gray. The **Cw** and **Ccw** signals are applied on the **tool** PLC module.
- All control signals have to be applied under **Outputs** to the **vwXml** module according to the designation highlighted in gray.

7.7.2 Particularities with VW-XML results output

The VW corporate requirement specifications "Controlled tightening systems" defines five tightening processes. This section describes the necessary parameterizations of the relevant tightening programs as well as their control functions in the NEXO-OS in order to satisfy the requirements of VW-XML.

Comparison of tightening step designations

VW corporate requirement specifications	Nexo category of the tightening step
Start-up step	Start
Finding step	Function A
Waiting step	Function B
Loosening step	Tightening program not active
Pre-tightening step	Preliminary torque
Final tightening	Final torque

The following configuration data of the nutrunner (under **Settings** → **Configuration**) are implemented in the VW-XML results protocol:

Parameter	Implementation VW-XML
Code	<PRC_SST><PAR><FAS><GRP><TYP>
Serial number	<PRC_SST><PAR><FAS><GRP><SNR>
Channel name	<PRC_SST><PAR><FAS><GRP><SBZ>

7.7.3 Tightening process

The Nexo cordless Wi-Fi nutrunner does not offer pre-configured tightening program steps for the tightening processes defined in the VW corporate requirement specifications (see chapter 2.3.2.3 in the VW corporate requirement specifications). In order to detect the AD process or AW process in the output VW-XML, the relevant tightening programs must satisfy certain requirements and have special characteristics.

Tightening process torque (AD process)

Table 7–51 shows how the AD tightening process has to be parameterized in the Nexo cordless Wi-Fi nutrunner.

Table 7–51: Parameterization of the AD process

Function in NEXO-OS	Parameter in NEXO-OS	Parameter in VW corporate requirement specifications	Comments
1. Target function	Torque	Torque set value [T_A]	
2. Target function	Angle	Angle upper limit (switching) [A_O]	
Speed		Speed set value [n]	
Torque threshold		Torque threshold value [T_T]	
Torque min. value monitoring	T–	Lower tolerance torque [T–]	
Torque max. value monitoring	T+	Upper tolerance torque [T+]	
Angle min. value monitoring	A–	Lower tolerance angle [A–]	
Angle max. value monitoring	A+	Upper tolerance angle [A+]	
Time upper limit	Time	Upper tolerance time [t+]	
Time lower limit	Always fixedly assigned the value "0"	Lower tolerance time [t-]	

Tightening process angle of turn (AW process)

Table 7–52 shows how the AW tightening process has to be parameterized in the Nexo cordless Wi-Fi nutrunner.

Table 7–52: Parameterization of the AW process (top torque)

Function in NEXO-OS	Parameter in NEXO-OS	Parameter in VW corporate requirement specifications	Comments
1. Target function	Angle	Angle set value [A_A]	
2. Target function	Torque	Torque upper limit (switching) [T_O]	
Torque lower limit	Always fixedly assigned the value "0"	Torque lower limit (switching) [T_U]	
Speed		Speed set value [n]	
Torque threshold		Torque threshold value [T_T]	
Torque min. value monitoring	T–	Lower tolerance torque [T–]	
Torque max. value monitoring	T+	Upper tolerance torque [T+]	
Angle min. value monitoring	A–	Lower tolerance angle [A–]	
Angle max. value monitoring	A+	Upper tolerance angle [A+]	
Time upper limit	Time	Upper tolerance time [t+]	
Time lower limit	Always fixedly assigned the value "0"	Lower tolerance time [t-]	

Tightening process torque/angle of turn (ADW process)

This tightening process cannot be clearly defined by parameterization of the tightening program and is respectively not supported by the Nexo cordless Wi-Fi nutrunner.

The control functions described in the VW corporate requirement specifications are not supported by the Nexo cordless Wi-Fi nutrunner.

8 Commissioning

This document describes the commissioning and necessary configuration of the Nexo cordless Wi-Fi nutrunner by Rexroth.

8.1 Overview

Before commissioning, check if a new service pack is available in the download section[1)] at www.boschrexroth.com/schraubtechnik. There, you can also find further information on:

- Service packs for older versions (if available)
- Current firmware updates
- Further information on upgrading/downgrading different versions releases.

1) www.boschrexroth.com/business_units/brc/en/information_en/software_en/download_se_en/index.jsp

NOTE

Danger to system safety

System safety is put at risk when firmware is downloaded during ongoing operation.

▶ Before downloading firmware, ensure that the tightening system is not in operation.

A description on how to use the firmware updates and service packs can be found under Full versions (see page 174).

8.1.1 Overview of commissioning steps

Optional for right-angle nutrunner NXA: Adjusting the angle head (see page 59)
Optional for right-angle nutrunner NXV012-T: Attaching a special output drive

↓

Attaching the torque support (see page 61)

↓

Attaching accessories at the nutrunner (see page 64)

↓

Inserting the slide-in battery pack

↓

Activating the slide-in battery pack activate - push the red button at the battery

↓

Shortly press the start button at the hand-held nutrunner

↓

Calling the NEXO-OS operating system (see page 175)

↓

Optional: Updating the firmware version (see page 175)

↓

Configuring the cordless Wi-Fi nutrunner using the NEXO-OS operating system (see page 171)

Fig. 8–1: Overview of commissioning steps

8.2 NEXO-OS operating system

8.2.1 Commissioning

The following web browsers are supported for the NEXO-OS operating system:

- Internet Explorer version 7.0 and higher
- Mozilla Firefox version 3.6 and higher
- Apple Safari version 6.1.2 and higher
- Google Chrome

Opening the NEXO-OS operating system

1. Complete all mounting steps.
2. Insert the battery and press the red button on the battery to activate it.
3. Briefly actuate the start switch on the hand-held nutrunner.
4. Slide the interface cover forward.
5. Insert the MicroUSB to Ethernet adapter NX-A into the interfaces provided.
6. Open the network connections on your PC and add a new LAN connection:
   - Click **LAN Connections - Properties**.
   - Activate **Internet Protocol Version 4 (TCP/IPv4)**.
   - Click **Properties** and enter address **192.168.1.** plus any one- to three-digit number (no **10**).

     Note: Use one of the addresses **192.168.1.1** ... **192.168.1.9 as address.** Otherwise, routing problems may occur if WLAN is used in the same subnet.
   - Confirm your settings with **OK**.
7. Now open your web browser and enter the default IP address of the Nexo cordless Wi-Fi nutrunner:

   192.168.1.10
8. Then enter the default user data on the login page.
   - User: **Bosch**
   - Password: **Robert**

Configuring the NEXO-OS operating system

- Configuring the WLAN (see page 230)
- Defining the tightening programs (see page 208)
- Defining the PLC assignment table (see page 226)
- Setting the nutrunner time (see page 203)

Access via access point

The browser-based NEXO-OS operating system allows configuring the Nexo cordless Wi-Fi nutrunner on any computer desired. An access point is required for wireless transmission of data via WLAN between the Nexo cordless Wi-Fi nutrunner and an operating computer. Existing access points of the infrastructure (WLAN standard IEE 802.11 a, b, g and h) can be used.

The WLAN interface is deactivated by default. After it is activated, the connection to the access point is established.

For information on how to install the access point, refer to the operating instructions of the access point.

For detailed information on data communication, refer to chapter Data services from page 85.

For detailed information on control signal exchange, refer to chapter Control signals from page 73.

8.2.2 Assigning IP addresses for the Nexo cordless Wi-Fi nutrunner

IP addresses for the Nexo cordless Wi-Fi nutrunner are assigned via the NEXO-OS operating system. For more information, refer to section WLAN (page 230).

An IP address may be assigned only once.

8.3 Configuration

The standard configuration is set by default on delivery of the Nexo cordless Wi-Fi nutrunner.

Any further configuration of the Nexo cordless Wi-Fi nutrunner and setting of the tightening programs are made via the NEXO-OS operating system (see page 173).

For detailed information about troubleshooting of configuration conflicts, refer to chapter Troubleshooting from page 251.

In the **Settings** → **Defaults** menu of the NEXO-OS operating system, all settings of the Nexo cordless Wi-Fi nutrunner can be reset to default.

9 Operating system NEXO-OS

This chapter describes the NEXO-OS operating system for the Nexo cordless Wi-Fi nutrunner with its menus and functions.

9.1 General information about the NEXO-OS operating system

The operating system for the Nexo cordless Wi-Fi nutrunner is a web application. On delivery of the Nexo cordless Wi-Fi nutrunner, it is pre-installed as an integral part of the nutrunner.

9.1.1 Full versions

The functionality of the Nexo cordless Wi-Fi nutrunner is implemented by software.

This software (full version) is created during product development and is pre-installed on delivery of the Nexo cordless Wi-Fi nutrunner.

Updates for the full version are also provided via the Internet as a part of product development.

Service packs are provided on the Internet at http://www.schraubtechnik.com.

9.1.1.1 Software and firmware version requirements

All components are delivered with installed firmware.

If you use the components in an existing system as a replacement or an extension, you must install the firmware that is used in the system.

The requirements for the software and firmware versions are currently stored on the Internet at: http://www.schraubtechnik.com. You can also find instructions for upgrades/downgrades there.

NOTE

Incompatible software and firmware versions may impair the functionality of the tightening system

From one software and firmware version to the next, changes were made in some of the software and/or firmware areas; some of these changes are rather comprehensive. This means that, after an upgrade or downgrade of the system components, the system may sometimes behave differently or may not be able to run immediately. In some cases, after upgrade/downgrade, the system is not immediately ready for operation again.

- After updating firmware, carry out a functional test to ensure that the tightening system functions properly.

9.1.2 Updating the firmware version

To start updating the firmware version, go to the **Settings** → **Firmware** menu item of the NEXO-OS operating system, see section Firmware (on page 225).

When updating to a higher firmware version, the configurations are converted.

As of version 1100 of the Nexo firmware, firmware updates can only be started with a capacity of the battery pack slide-in module of ≥ 25%.

Update to version 1300

As of Nexo firmware version 1300, the operating mode (manual mode or automatic mode) can be selected for the Nexo cordless Wi-Fi nutrunner.

With a firmware update to version 1300, the previous configuration for the mode is transferred to column A as Automatic operating mode without changes.

In the mode, column B is added for the **manual** operating mode. This operating mode comprises the following default settings in the start step:

- The source of the ID code for the results output is the cycle counter.
- The program selection is enabled.
- The job selection is not enabled.

Downgrade

When downgrading from version 1200, the results database is deleted.

Downgrading may be carried out in the following circumstances:

- To an older version that was already installed on the nutrunner.

  When updating to the previously installed firmware version, the already existing configurations are applied.
- To an older version that was not installed on the nutrunner.

  When updating to a lower firmware version, the configurations are not converted (default configurations are applied).

Following the downgrade, check all configurations, settings and programs and the MCE factor.

9.2 Starting the program

The browser-based NEXO-OS operating system allows configuring and controlling the Nexo cordless Wi-Fi nutrunner on any computer desired. The user can simultaneously connect to several operating systems of different Nexo cordless Wi-Fi nutrunners from one computer, e.g. in different browser windows. It is also possible connect to the operating system of one Nexo cordless Wi-Fi nutrunner from several computers.

1. Open a web browser on your computer.
2. Enter the IP address of the Nexo cordless Wi-Fi nutrunner in the address bar of the browser.
   - When accessing via NX-A programming adapter:

     192.168.1.10
   - When accessing via WLAN:

     IP address entered in the **Settings** → **WLAN** (see page 230) menu item.

   ↳ This opens the login page of the NEXO-OS operating system.

Display of actual values and actual graph

As of Nexo firmware version 1200, the user does not need to be logged into the NEXO-OS operating system for display of the actual values and the actual graph:

1. Open a web browser on your computer.
2. After the IP address of the cordless Wi-Fi nutrunner, enter the following into in the address bar of the browser:
   - **/ActualValues** - for display of the current actual values
   - **/ActualGraph** - for display of the actual graph

   Example: **192.168.1.10/ActualValues**

Separators for floating decimal numbers

As a rule, the separators for floating decimal numbers in the language of the user login to the NEXO-OS operating system are used, see figure 9–1.

Login page

The default language shown on the login page is the language used to configure the web browser.

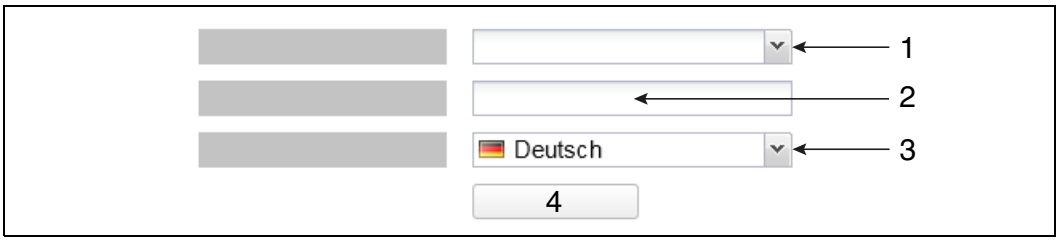


Fig. 9–1: Login

Table 9–1: Login - Elements

Element	Description
1	Select the user Default setting: **Bosch**
2	Enter the password for the user name specified Default setting: **Robert**
3	Select the language
4	Click the button to open the main window of the NEXO-OS operating system.

9.2.1 Main window of the NEXO-OS operating system

After the user has successfully logged in to the NEXO-OS operating system, the screen displays the main window.

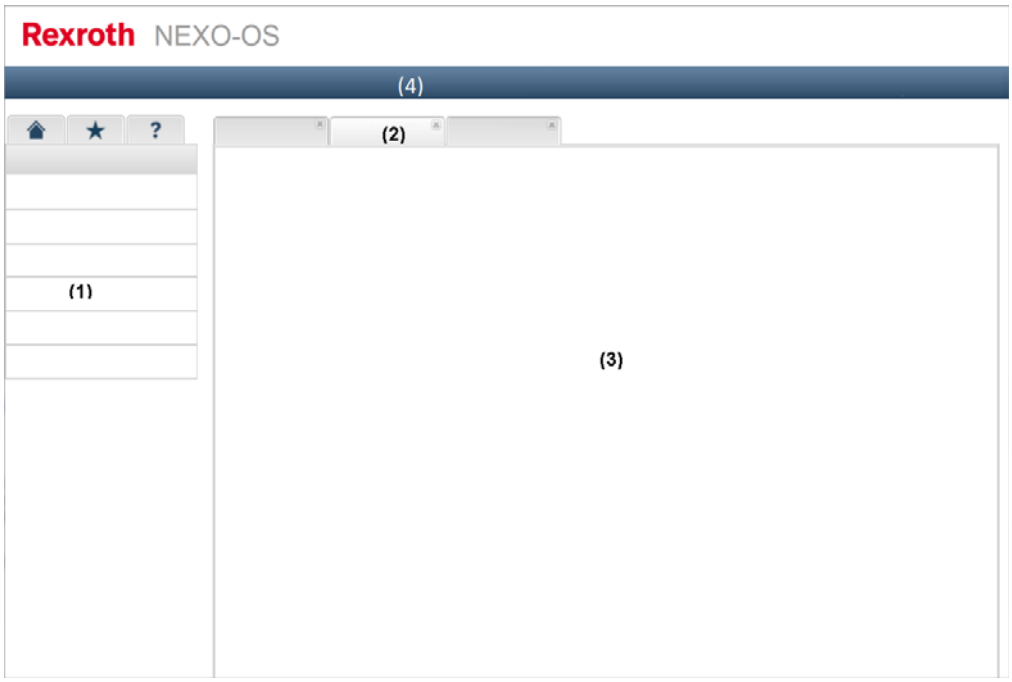


Fig. 9–2: NEXO-OS operating system – main window

The main window of the NEXO-OS operating system is subdivided into the following areas:

- (1) Navigation panel
- (2) Tab bar
- (3) Work space
- (4) Status bar

(1) Navigation panel

Table 9–2: Elements in the navigation panel

Element	Description
	Displays the menus available. The number of available menus depends on the rights the user or user group has (see page 204). Click a menu item to open the menu in the work space. Some of the menus provide additional menu items that can be selected.
	Favorites
	If a NX-SD Micro SD card is inserted into the Nexo cordless Wi-Fi nutrunner, use this symbol to see documentations and license information.

(2) Tab bar

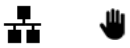
A separate tab is assigned to each opened menu in the header. Click on the tab to display the corresponding menu in the foreground. This allows quick access to the different menus. To close the menu, click the tab once again.

(3) Work space

After the NEXO-OS operating system has been started, the work space is blank. Once you have opened a menu, a separate window will be opened for it in the work space.

(4) Status bar

Table 9–3: Status bar elements

Element	Description
	As of Nexo firmware version 1100: Next to the symbol, the name of the channel set during configuration of the nutrunner is displayed, see section VW-XML, (on page 221).
	Shows the current charging condition of the inserted slide-in battery pack
	Indicates radio communication
	As of Nexo firmware version 1300. Display of the data connection status Automatic mode or manual mode – Green symbol All active data services are connected. – Red symbol At least one data service is not connected. – Gray symbol No data service active.
	Nutrunner operating state Left-hand LED: – Yellow steady light Enable signal present ("Enable" or "Active Enable" PLC signals) – Off Enable signal not present ("Enable" or "Active Enable" PLC signals) Right-hand LED: – Green steady light Nutrunner ready for operation – Yellow flashing light Nutrunner not ready for operation – Red flashing light System error
Cycle: ----	Number of tightening jobs
	Display **Online/Offline**
	User logged in to the NEXO-OS operating system
	Log off from the NEXO-OS operating system
--:--	Time set on the nutrunner

Period of the active connection

If you access the Nexo cordless Wi-Fi nutrunner using the operating system, the connection is automatically disconnected after a default duration of 15 minutes.

In the following cases, the connection is not disconnected automatically:

- You are currently active, i.e. you exchange data with the hardware (retrieve or transmit data). This includes e.g.:
  - You are logging in to the system
  - You are transmitting configurations or tightening programs to the hardware
  - You are reading available tightening programs from the hardware
  - You are retrieving diagnosis data
- You have opened one of the menus in the operating system:
  - **Analysis → Actual values**
  - **Analysis → Stored values**
  - **Analysis → Actual graph**
  - **Analysis → Stored graphs**

9.2.2 Exiting the program

Click the following icon in the status bar to log off from the NEXO-OS operating system:

↳ This opens a dialog window where you have to confirm that you are logging off.

↳ The login page of the NEXO-OS operating system reappears.

9.3 Function overview

The following table shows the available menus and their functions.

Menu	Menu item 1	Menu item 2	Description	Page
Analysis	Actual values		Displays the previous tightening result	(page 182)
	Stored values		Displays all stored tightening results	(page 182)
	Actual graph		Displays the previous tightening result in a graphical diagram	(page 183)
	Stored graphs		Displays all stored tightening results in a graphical diagram	(page 183)
Mode [1)]			Setting the operating mode	(page 184)
Job [1)]			Creating and changing jobs	(page 189)
Programs			Creating and changing tightening programs	(page 195)
Settings	Time & date		Date and time setting for the Nexo cordless Wi-Fi nutrunner	(page 203)
	User accounts	Users	Can be used to add, edit or delete users	(page 204)
		Membership	Can be used to add, edit or delete the participation of users in a group	(page 205)
		Groups	Can be used to add, edit or delete groups	(page 205)
		Permissions	Can be used to add, edit or delete group rights	(page 205)
		My account	Displays the user's own profile and allows changing the password Export of the user data of a super user to Micro SD card [3)].	(page 206)
	Tool display		Setting for the graphical display on the Nexo cordless Wi-Fi nutrunner and for the operating system	(page 206)
	Data	Result storage	Settings for the internal result storage	(page 208)
		Standard Nexo	FTP: Settings for FTP output NX-SD card [2)]: Settings for results storage on the NX-SD Micro SD card HTTP [2)]: Settings for HTTP output File Share [2)]: Settings for File Share output	(page 209) (page 210) (page 210) (page 211)
		Open Protocol	Settings for communication with Rexroth Open Protocol	(page 217)
		IPM	Settings for communication with Rexroth IPM Protocol	(page 218)
		VW-XML [2)]	Settings for communication via the VW-XML Protocol	(page 221)
	Configuration		Displays the configuration data of the nutrunner	(page 223)
	Firmware		Updates to a new firmware version	(page 225)
	PLC signals		Can be used to create and edit the PLC assignment table	(page 226)
	OK/NOK counter		OK/NOK counter configuration	(page 227)
	Quality code [1)]		Settings for the quality code and rework code	(page 228)
	WLAN		Configures the WLAN connection	(page 230)

Menu	Menu item 1	Menu item 2	Description	Page
Settings (Continuation)	Encryption [1)]		Enabling HTTPS	(page 235)
	LED [1)]		Settings for the tightening position illumination of the nutrunner	(page 236)
	ID assignment [1)]		Configuration of the ID assignment table	(page 238)
	Scanner [1)]		Configuration of the barcode scanner in the Nexo cordless Wi-Fi nutrunner	(page 238)
	Defaults [2)]		Reset to default	(page 240)
	Backup/Restore		Backup of data and loading of stored data	(page 240)
Diagnosis	System information		Displays information about hardware and software	(page 241)
	Event viewer		Displays all events	(page 241)
	Log book		Displays the logs of previous actions in the operating system	(page 242)
	Status		Status display	(page 242)
	System errors		Error messages and statistic data	(page 242)
	Web server log		Error messages of the web server	(page 243)
	Screenshot		Shows the tool display	(page 243)
	Network	WLAN	Display of WLAN error	(page 243)
		Ping [2)]	Check of availability of a computer	(page 244)
		TCP data [2)]	Evaluation of Rexroth network traffic Open Protocol	(page 244)
		Search clients [2)]	Searching of additional clients in the network	(page 244)
	Export logs		Diagnostic report for Rexroth Service	(page 244)

[1)] Supported as of Nexo firmware version 1100
[2)] Supported as of Nexo firmware version 1200
[3)] Supported as of Nexo firmware version 1300

9.4 Analysis

The **Analysis** menu contains the following menu items:

- Actual values (page 182)
- Stored values (page 182)
- Actual graph (page 183)
- Stored graphs (page 183)

The various screens additionally provide the following information:

J (job number), **P** (tightening program number), **S** (step in tightening program), **OC** (switch-off criterion), **QC** (quality code), **Ch** (tightening channel) and **RC** (rework code).

9.4.1 Actual values

Analysis → Actual values

Use this menu item to call up a window displaying the results of the current tightening jobs.

Result display:

- Torque (T)
- Angle (A)
- Time (t)

Table 9–4: Actual values tab

Element	Description
Previous step	Displays the actual values of the previous step
Next step	Displays the actual values of the next step

9.4.2 Stored values

Analysis → Stored values

Use this menu item to call up a window displaying the results of an internally stored tightening job.

Result display:

- Torque (T)
- Angle (A)
- Time (t)

Table 9–5: Stored values tab

Element	Description
<<	Jumps to the first stored tightening job
<	Jumps to the previous stored tightening job
<number>	Enter a tightening number. The result of the respective tightening job will then be displayed in the stored values.
>	Jumps to the next stored tightening job
>>	Jumps to the last stored tightening job
All	Displays all of the stored tightening jobs
OK	Displays nothing but stored OK tightening jobs
NOK	Displays nothing but stored NOK tightening jobs
Σ	Depending on the selection of **All**, **OK** or **NOK**, the number of saved tightenings will be displayed.
Previous step	Displays the actual values of the previous step
Next step	Displays the actual values of the next step

9.4.3 Actual graph

Analysis → Actual graph

Use this menu item to display the results of the current tightening job, if any, in a graphical diagram. The measurement values are displayed against the angle (**Angle** button) or against the time (**Time** button).

After displaying the actual graph, the operating system automatically requests the next graph.

Table 9–6: Actual graph tab

Element	Description
Min	Lower zoom area limit
Max	Upper zoom area limit
100%	Shows the complete graph
Points	Number of graph points contained in the zoom area and total number of graph points (display only)

If Internet Explorer version ≤ 8 is used as browser, a problem may arise in connection with curves that are represented with a great number of points. In this case, the "Stop running this scrip" error message will be displayed.

9.4.4 Stored graphs

Analysis → Stored graphs

Use this menu item to display the results of a stored tightening job, if any, in a graphical diagram. The measurement values are displayed against the angle (**Angle** button) or against the time (**Time** button).

After displaying the actual graph, the operating system automatically requests the next graph.

Table 9–7: Curve memory tab

Element	Description
<<	Jumps to the first stored graph
<	Jumps to the previous stored graph
<number>	Enter a tightening number. The result of this tightening process will then be displayed in the stored graphs.
>	Jumps to the next stored graph
>>	Jumps to the last stored graph
All	Displays all of the stored graphs
OK	Displays nothing but stored OK graphs
NOK	Displays nothing but stored NOK graphs
Σ	Depending on the selection of **All**, **OK** or **NOK**, the number of saved tightenings will be displayed.
Min	Lower zoom area limit
Max	Upper zoom area limit
100%	Shows the complete graph

9.5 Mode

As of Nexo firmware version 1100, the mode function is supported.

Use this menu item to set the nutrunner's operating mode for various operational conditions. With this menu item you can also specify the settings for the ID code to identify a set of results data and the configuration of a superordinate ID input step (outside of the job function). The read ASCII code can be linked to a tightening program or a job, i.e. when the code is read, the respective tightening program or the job starts. This setting defines the assignment table via menu
Settings → **ID assignment**.

In menu **Settings** → **OK/NOK counter**, a maximum value for OK/NOK tightening processes can be defined. If **Scanner** is defined as the ID input source in the mode in the **ID input** step, the OK/NOK counter can be reset by repeated scanning after the maximum number is reached.

As of Nexo firmware version 1100, the mode function is used to set up the ID code to identify a set of results data (**Selection of the ID code source**) via the start step.

As of Nexo firmware version 1300, the operating mode (manual mode or automatic mode) can be selected for the Nexo cordless Wi-Fi nutrunner. From version 1300, program selection by means of HMI is only possible in the **manual** operating mode.

9.5.1 Structure of the Mode tab

The header of the **Mode** tab features the following buttons:

Table 9–8: Mode tab

Element	Description
	Saves the current settings.
	Opens the **Information mode** dialog. There, a comment on the current program can be saved.
	All settings in this tab are reset to the factory setting.

On its left, it shows icons to start various functions:

Table 9–9: Mode - functions

Element	Description
	As of Nexo firmware version 1300. Adds a branch.
	Adds an ID input step.
	Opens the dialog for editing the selected step.
	Deletes a selected mode.
	As of Nexo firmware version 1300. Deletes the branch.

9.5.2 Mode steps

A mode always begins with the start step and ends with the end step; the two steps are preset.

Table 9–10: Available mode steps

Element	Designation	Explanation	See page
	Operating mode step	As of Nexo firmware version 1300. Determination which operating mode will be active after restart or mode storage	(page 185)
	Start step	Start of the mode	(page 185)
	ID input	Adds an ID input step. A maximum of two ID input steps can be added.	(page 186)
	End step	End of the mode	(page 188)

9.5.3 Change mode

You can change the mode.

Accept values

- Click **OK** to apply the edited values to the mode. Click **Cancel** to discard your changes.
  - The dialog window will be closed in either case.
  - Click **Save** to apply the mode.

9.5.3.1 Operating mode step

As of Nexo firmware version 1300, the operating mode (manual mode or automatic mode) can be selected for the Nexo cordless Wi-Fi nutrunner.

Double clicking the operating mode step or the respective icon will open a dialog where the associated parameters can be entered.

Settings

Table 9–11: Operating mode step dialog

Element	Description
Active column selection	Determination which operating mode will be active after restart or mode storage.

9.5.3.2 Start step

Every operating mode has exactly one start step. The properties of the start step apply to the relevant operating mode.

Double clicking the start step or the respective icon will open a dialog where the associated parameters can be entered.

In this step, define the settings for the operating modes and for the identification code which identifies a result data record of the Nexo cordless Wi-Fi nutrunner.

Options

Table 9–12: Start step dialog

Element	Description
Display time	Indication how long the text will be displayed at the tool display. Default setting: 1 second

ID code source

Table 9–13: Start step dialog

Element	Description
Selection of the ID code source	Use this selection to set the source of the ID code for the results output. – **No ID code** Receipt of ID codes is ignored. – **Cycle counter** Default setting. The internal cycle counter numbers are used to create the ID code. – **Open Protocol** The ID input made available via Open Protocol is used for generating the ID code. – **Scanner** The valid barcode scanned last is used as ID code. The settings in the ID input step(s) in mode or job are ignored for output of the ID code. – **Mulitple ID inputs** The ID input made available via the ID input step(s) in the job and/or mode is used to generate the ID code. – **VW-XML** (As of Nexo firmware version 1200) The tag set by the VW-XML master PC <PI1> is used for generating the ID code.
Delete ID code after start	Display only for **Open Protocol**, **Scanner** and **VW-XML**: Enable the check box to delete the ID code after start.

Operating mode settings

Table 9–14: Start step dialog

Element	Description
Operating mode	Use this selection to set the operating mode of the cordless Wi-Fi nutrunner: **Automatic** (automatic mode) or **Manual** (manual mode)
Trigger [1)]	Definition of the trigger conditions for the activation of the relevant operating mode: **HMI**, **Open Protocol** or **PLC signal ManOp**
Admit HMI program selection [1)]	If the check box is activated, the program selection is released. Default setting: activated
Admit HMI job selection [1)]	If the check box is activated, the job selection is released. Default setting: deactivated

1. Configuration only possible in the **manual** operating mode.

9.5.3.3 ID input

In this step, define the settings for the treatment of the ID input.

Double clicking the ID input step or the respective icon opens the corresponding dialog for entering the parameters.

General

Table 9–15: ID input step dialog - timeout options panel

Element	Description
Name	Step name Admissible characters are ASCII characters, numbers, spaces, hyphens, dashes and underscore.
Comments	Enter a comment for the step. Admissible characters are ASCII characters, numbers, spaces, hyphens, dashes and underscore.

ID code source

Under **ID code source**, the settings defined in the start step under **ID code source** are displayed.

ID input options

Table 9–16: ID input step dialog - ID input options panel

Element	Description
Source selection ID input	Use this selection to set the source of the ID input of this step. – **Open Protocol** The ID code made available via Open Protocol is used. – **Scanner** (only for nutrunners with integrated barcode scanners) The scanned valid barcode is used.
Choose target for ID input	This provides the following settings for the treatment if the ID input: – **ID code** The ID input is used to create an ID code. – **ID assignment** The ID input is used to select a program or job using the ID assignment table. – **ID code + ID assignment** The ID input is used to create an ID code and to select a program or job using the ID assignment table.
Masking: ID code / masking: ID assignment	Depending on the selection made in **Target selection ID input**, **Masking: ID code** and/or **Masking: ID assignment** is displayed. Selects where the ID input and the ID code are used. Enter numbers and/or ranges separated by semicolon. Masking counts up from 1. Example: Read-in bar code: **N**25**E**9**XO1234**5 Masking: 1;4;6-11 ID code part: **NEXO1234**
Tool display text	You can save a text for all steps. The text will be displayed on the tool display.
External job monitoring	If the check box is enabled, the PLC signals are used when the job is selected.

Timeout options

Table 9–17: ID input step dialog - timeout options panel

Element	Description
Timeout	Enter the maximum time when an event, e.g. a successful barcode scan, has to take place. If no event occurs in this time, the step is terminated.
Error message	Enter an error message that will be displayed on the tool display after the timeout.

Scan options

The field is only displayed, if **Scanner** is selected as ID input source.

Table 9–18: ID input step dialog - scan options panel

Element	Description
Trigger scan process	The laser beam of the barcode scanner can be activated using the start switch or the function keys. This starts the scanning of the barcode. If the PLC signal **EnScan** is present, the approval for this has to be present beforehand. – **Play at start switch** – **Center function key** – **Function key Left** – **Function key Right** – **PLC signals**
Laser on time	Maximum time that the laser is turned on.
Acoustic signal	If the checkbox is selected, an acoustic signal will resound after recognition of a bar code.

Barcodes

The field is only displayed, if **Scanner** is selected as ID input source. Activate the respective barcode types.

9.5.3.4 End step

All modes end with the end step. The tool is disabled in this step.

Double clicking the end step or the respective icon opens the corresponding dialog for entering the parameters.

9.6 Job

As of Nexo firmware version 1100, the job function is supported.

The job function is used to run process chains. The process chains (e.g. Scan barcode → Enable nutrunner → three tightenings → Block nutrunner) that are usually programmed using a PLC can be directly parameterized in the NEXO-OS operating system as so-called jobs.

Use this menu item to create and edit jobs. The jobs are parameterized similarly as tightening programs with a job being a sequence of internal steps, see „Job steps“ (on page 190).

9.6.1 Structure of the Job tab

The header of the **Job** tab features the following buttons:

Table 9–19: Job tab

Element	Description
	Up to 256 jobs can be programmed.
	Saves the current job.
	Opens the **Job information** dialog. There you can save a comment on the current job, max. 1000 characters. Admissible characters are ASCII characters, numbers, spaces, hyphens, dashes and underscore.
	Deletes the current job. This displays a prompt asking whether the user really wishes to remove the job.
	Opens the **Name** dialog. There you can enter a new name for the job.

On its left, it shows icons to start various functions:

Table 9–20: Job - functions

Element	Description
	Adds an individual program.
	Adds an ID input step. A maximum of five ID code steps can be added before an individual program step.
	Opens the dialog for editing the selected step.
	Deletes the selected step.
	Opens the **Import** dialog. Select the corresponding Job that is to be imported.
	Opens a dialog for exporting the job.
	Opens the **Import all** dialog to import all defined jobs.
	Opens a dialog to export all jobs.

9.6.2 Job steps

A job always begins with the start step and ends with the end step; the two steps are preset in a new job.

Different or identical job steps can be inserted between these two steps. Selection, number, and order of these job steps depend on the required tightening process. New steps are always inserted in the job before a selected step. A job can contain no more than 20 job steps.

The following table provides an overview of the job steps available.

Table 9–21: Available job steps

Element	Designation	Explanation	See page
	Start step	Starts the job	(page 190)
	ID input	Step for the treatment of an ID input	(page 191)
	Single program	Step for basic processing	(page 192)
	End step	Completes the job	(page 194)

As of Nexo firmware version 1200, the sub-menus in the steps are no longer opened by drop down menu and instead by clicking on the plus sign (left).

9.6.3 Create new job/change job

New jobs can be configured or existing jobs can be edited.

Accept values

- Click **OK** to apply the edited values to the tightening program. Click **Cancel** to discard your changes.
  - The dialog window will be closed in either case.
  - Click **Save** to apply the tightening program.

9.6.3.1 Start step

Every job has exactly one start step. The properties of the start step apply to the complete job sequence.

Double clicking the step or the respective icon will open a dialog where the associated parameters can be entered.

General

Table 9–22: Start step dialog – General panel

Element	Description
Name	Step name Admissible characters are ASCII characters, numbers, spaces, hyphens, dashes and underscore.
Comments	Enter a comment for the step. Admissible characters are ASCII characters, numbers, spaces, hyphens, dashes and underscore.

Options

Table 9–23: Start step dialog - options panel

Element	Description
Show text at the nutrunner display	You can save a text for all job steps. The text will be displayed on the tool display.
Display time	Indication how long the text will be displayed at the tool display. Default setting: 1 second
Job abort when NOK result in job step	Cancels the job as soon as the job step supplies a NOK result.
Delete ID code in end step	Removes the ID code from the input buffer. A new ID code must be transmitted to the system for the next job.

9.6.3.2 ID input

In this step, define the settings for the treatment of the ID input.

Click the icon to insert a new ID input step in the job program before the selected step. Double clicking the step or the respective icon opens the corresponding dialog for entering the parameters.

General

Table 9–24: ID input step dialog - general panel

Element	Description
Identifier	Name for the clear identification of the step.
Name	Step name Admissible characters are ASCII characters, numbers, spaces, hyphens, dashes and underscore.
Comments	Description of the step Admissible characters are ASCII characters, numbers, spaces, hyphens, dashes and underscore.

ID input options

Table 9–25: ID input step dialog - ID input options panel

Element	Description
Source selection ID input	Use this selection to set the source of the ID input of this step. – **Open Protocol** The ID input made available via Open Protocol is used for generating the ID code. – **Scanner** The valid barcode scanned last is used as ID code.
Choose target for ID input	**ID code** (display only): The ID input is used as ID code for this step.
Masking	Selects where the ID input and the ID code are used. Enter numbers and/or ranges separated by semicolon. Masking counts up from 1. Example: Read-in bar code: **N**25**E**9**XO1234**5 Masking: 1;4;6-11 ID code part: **NEXO1234**
Tool display text	You can save a text for all steps. The text will be displayed on the tool display.

Timeout options

Table 9–26: ID input step dialog - timeout options panel

Element	Description
Timeout	Enter the maximum time when an event, e.g. a successful barcode scan, has to take place. If no event occurs in this time, the step is terminated.
Error message	Enter an error message that will be displayed on the tool display after the timeout.

Scan options

The field is only displayed, if **Scanner** is selected as ID input source.

Table 9–27: ID input step dialog - scan options panel

Element	Description
Trigger scan process	The laser beam of the barcode scanner can be activated using the start switch or the function keys. This starts the scanning of the barcode. If the PLC signal **EnScan** is present, the approval for this has to be present beforehand. – **Start switch** – **Center function key** – **Function key Left** – **Function key Right** – **PLC signals**
Laser on time	Maximum time that the laser is turned on.
Acoustic signal	If the checkbox is selected, an acoustic signal will resound after recognition of a bar code.

Barcodes

The field is only displayed, if **Scanner** is selected as ID input source. Activate the respective barcode types.

9.6.3.3 Single program

This job step comprises the basic functions for a single job sequence.

Click the icon to insert a new single program step in the job program before the selected step. Double clicking the step or the respective icon opens the corresponding dialog for entering the parameters.

General

This panel defines the general properties of the job.

Table 9–28: Single program dialog - general panel

Element	Description
Name	Step name Admissible characters are ASCII characters, numbers, spaces, hyphens, dashes and underscore.
Comments	Description of the job step Admissible characters are ASCII characters, numbers, spaces, hyphens, dashes and underscore.

ID code

Table 9–29: Single program dialog - ID code panel

Element	Description
Combine multiple ID inputs	If the check box is enabled, the results of various ID input steps can be combined in an ID code. To create the new ID code, you can define a prefix and a postfix as well as a max. of 10 more components. You can select the following values: – $Mode Result of the mode. – Userdefined Text User defined text. – IDInput<xx> Result of a scan step of the respective job. Example: $ID Input1@**A2** is the result in the step, column A, line 2. The ID code will be displayed on the tool display.

Example: Combine multiple ID inputs

The results of one ID input step in the mode and three ID input steps in the job are combined in one ID code in the single program step.

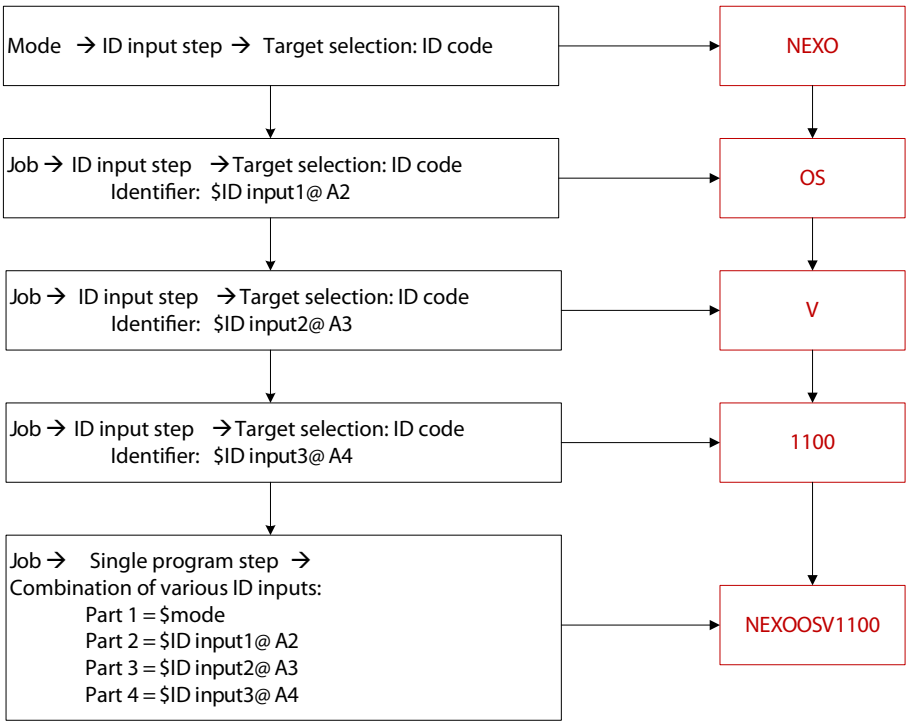


Fig. 9–3: Example: Combine multiple ID inputs

Tightening

Table 9–30: Single program dialog - tightening panel

Element	Description
Tool display text	You can save a text for all steps. The text will be displayed on the tool display.
Enable tool	Enable nutrunner is activated (display only): The nutrunner is enabled in this step.
Tightening program	– **Program no.** Defines the tightening program that is to be processed next in this stop step. Integer values between 0 and 255 (tightening programs 0-255) are valid characters. – **Max. OK** Defines the maximum number of OK tightening operations for this tightening program. Integer values between 0 and 255 are valid characters. – **Max. NOK** Defines the maximum number of NOK tightening operations for this tightening program. Integer values between 0 and 255 are valid characters.
Conditional blocking of the loosen program	– **Block loosen program after OK tightening** Blocks the loosen program no. 99 after an OK tightening. – **Block loosen program after NOK tightening** Blocks the loosen program no. 99 after a NOK tightening.

Timeout options

Table 9–31: Single program dialog - timeout options panel

Element	Description
Timeout	Enter the maximum time when an event has to take place. If no event occurs in this time, the step is terminated.
Error message	Enter an error message that will be displayed on the tool display after the timeout.

9.6.3.4 End step

A job ends with the end step.

Double clicking the end step or the respective icon opens the corresponding dialog for entering the parameters.

General

Table 9–32: End step dialog – General panel

Element	Description
Name	End step name Admissible characters are ASCII characters, numbers, spaces, hyphens, dashes and underscore.
Comments	Description of the job step Admissible characters are ASCII characters, numbers, spaces, hyphens, dashes and underscore.

Options

Table 9–33: End step dialog – options panel

Element	Description
Enable nutrunner	Enable nutrunner is disabled (display only): The nutrunner is disabled in this step.

9.7 Tightening programs

Use this menu item to create and edit tightening programs.

9.7.1 Definition: Target, monitoring, additional function

In the tightening steps, a distinction is made between target, monitoring, and additional functions.

9.7.1.1 Target function

The target function is the relevant control function within a tightening step (e. g. torque with torque-controlled tightening processes). The tightening step is ended once the target parameter (= set value) has been reached. In addition to the permanently activated 1st target function, it is also possible to activate a 2nd target function. If two target functions are activated, the target function that is the first one to be reached will end the tightening step.

9.7.1.2 Monitoring function

One or more monitoring functions can be activated within a tightening step. They "watch" the tightening process in the tightening step. The monitoring parameters (=limit(s) of the monitoring function) are the basis for tightening step evaluation. It is possible to define monitoring parameters with an upper and a lower limit value (e.g. M+ and M–), but also with only one limit value (e.g. time)

A distinction is made between evaluating and switching monitoring functions.

Evaluating monitoring functions

With evaluating monitoring functions, achieved tightening results (e. g. torque, angle of turn) are compared to all monitoring functions assigned to the tightening step at the end of the tightening step. The tightening step is evaluated as OK if the actual values of all monitoring functions are within the specified monitoring parameters. The tightening step is evaluated as NOK if one or more limits have been exceeded. Limit violations occur in the following cases:

- Upper limit: Actual value ≥ monitoring parameter
- Lower limit: Actual value ≤ monitoring parameter

Switching monitoring functions

Switching monitoring functions always contain an evaluating function. Additionally, they end the tightening step prematurely (i.e. before reaching the target function) as NOK if a monitoring parameter is violated.

The pertinent checkbox (**Standard tightening step** → **Monitoring** (see page 200) menu item) defines whether a monitoring function is evaluating or switching.

9.7.1.3 Additional function

Additional functions influence the tightening process (e. g. start-up suppression, speed setting) but cannot interrupt it. They do not carry out an OK/NOK evaluation.

9.7.2 Programs tab structure

The header of the **Programs** tab features the following buttons:

Table 9–34: Programs tab

Element	Description
	Up to 255 tightening programs and 1 loosening program (program no. 99) can be programmed with a maximum of 12 steps each (including start and end step).
	Saves the current tightening program.
	Opens the **Program information** dialog. There you can save a comment on the current program, max. of 1000 characters. Admissible characters are ASCII characters, numbers, spaces, hyphens, dashes and underscore.
	Deletes the current tightening program. This displays a prompt asking whether the user really wishes to remove the program.
	Opens the **Name** dialog. There you can enter a new program name for the tightening program.

On its left, it shows icons to start various functions.

Table 9–35: Programs – functions

Element	Description
	Inserts a new tightening step.
	Opens the dialog for editing the selected step.
	Deletes a selected tightening step.
	Opens the **Import** dialog. Select the tightening program to be imported. As of Nexo firmware version 1100, only individual tightening programs with the file extension ***.nxprg** can be imported. To import individual tightening programs from NEXO-OS V1000, change the file extension to ***.nxprg**.
	Opens a dialog for exporting the tightening program.
	Opens the **Import all** dialog to import all defined tightening programs.
	Opens a dialog to export all tightening programs.

9.7.3 Gradient average value of the step

The tightening program always begins with the start step and ends with the end step; in a new tightening program, both are already assigned in the **Programs** menu. Different or identical job steps can be inserted between these two tightening steps. Selection, number, and order of these tightening steps and auxiliary steps depend on the required tightening process. New steps are always inserted in the tightening program before a selected step.

The following table provides an overview of the steps available in a tightening program.

Table 9–36: Steps available in a tightening program

Element	Designation	Explanation	See page
	Start step	Start of tightening program	(page 198)
	Standard tightening step	These tightening steps control the nutrunner and thus the tightening process.	(page 200)
	End step	End of the tightening program	(page 202)

As of Nexo firmware version 1200, the steps are displayed as property sheets.

9.7.4 Creating a new tightening program/editing an existing tightening program

A tightening program contains the following information:

- Type and order of tightening steps
- Target and monitoring parameters of each tightening step

Accept values

▶ Click **OK** to apply the edited values to the tightening program. Click **Cancel** to discard your changes.

↳ The dialog window will be closed in either case.

↳ Click **Save** to apply the tightening program.

9.7.4.1 Start step

Double clicking the start step or the respective icon of a tightening program will open a dialog where the associated parameters can be entered.

Table 9–37: Start step dialog

Element	Description
Name	Start step name Admissible characters are ASCII characters, numbers, spaces, hyphens, dashes and underscore.
Category	Is used to select the category for determining the quality code. The quality code describes whether a tightening job was evaluated as OK or NOK. In case of an NOK evaluation, the cause will also be described. In NOK cases, the **category** is used as a detailed distinction, so that a different quality code can be output in different tightening steps for the same NOK cause (e.g. M < M–). Possible categories include e. g.: – Tightening – Pre-tightening – Final tightening – Loosen – Rework

Graph characteristics

Table 9–38: Start step dialog - graph properties panel

Element	Description
Graph resolution	Is used to select the graph resolution in angular degrees. The smallest value (0.25°) results in the highest resolution and the highest value (50°) in the lowest resolution. Default setting: 1° The resolution selected here applies to the entire tightening program. However, each tightening step can be set individually, if necessary, e.g. to display less interesting graph sections with a lower resolution.
Measuring points	Is used to select the measuring points for creating the graph. Value range: 100 - 2000
Torque unit	Selects the desired unit to be used by the NEXO-OS operating system to display and calculate the torque for this tightening program. The pre-set value is the value selected in menu **Settings** during configuration of the nutrunner.

The resolution and number of measuring points must be properly adjusted for each tightening process.

Parameter

Table 9–39: Start step dialog – parameter panel

Element	Description
Play at start switch	Is used to select the torque threshold for playing at the start switch in percent of the nominal torque. At and above this threshold value, evaluations (OK/ NOK) and results output are implemented for a tightening job. The evaluation and results output are suppressed if the maximum occurring torque is below the set threshold. Default setting: 5 % Values between 0 and 100% can be set.
Torque correction	This correction factor serves to synchronize the Nexo cordless Wi-Fi nutrunner with an external reference system. Value range: 0.8 - 1.2

Start-up test

At the beginning of a tightening job, the start-up test recognizes whether a bolt has already been tightened. In this process, the nutrunner rotates with the set parameters from the activated start-up test. If the start-up test recognizes that a bolt has already been tightened, the tightening process will be ended with an NOK result.

Table 9–40: Start step dialog – start-up test panel

Element	Description
Active	Tick the checkbox to activate the start-up test. The start-up test reduces the possibility of bolt heads and output drives being torn off if an already tightened bolt is re-tightened.
Speed	Is used to select the value for the speed (in % of the nominal speed of the configured nutrunner) at which the start-up test is to be conducted. Default setting: 5 %
Start-up suppression	Selection of the time span during which - after start of the tightening step - the tightening process is not evaluated. The start-up suppression refers to the start of the torque evaluation. The measurement of the angle values starts independently of the set value. The start-up suppression will only become active if the speed has changed compared to the previous step. This function is used to ignore torque peaks when accelerating heavy masses. Torque peaks may be caused by, e.g., tools on the hand-held nutrunner with high moments of inertia. Default setting: 30 ms

First target function

Table 9–41: Start step dialog – target function panel

Element	Description
Angle	Is used to select the angle for the target function.

Monitoring functions (switching)

Table 9–42: Start step dialog – monitoring function panel

Element	Description
Max. torque	Is used to select the value for the start-up test (in % of the nominal torque of the configured nutrunner; default setting is 5%). If this value is exceeded, the tightening process is immediately interrupted with an NOK result.
Max. time	Is used to select the time for the start-up test. If this value is exceeded, the tightening process is immediately interrupted with an NOK result.

9.7.4.2 Standard tightening step

The standard tightening step fulfills the usual requirements for a tightening step through a selection of target, additional, and monitoring functions.

Click the icon to insert a new tightening step in the tightening program before the tightening step selected. Double clicking the tightening step or the respective icon opens the corresponding dialog for entering the parameters.

This panel defines the general start properties of the tightening step.

Table 9–43: Tightening step dialog - designation panel

Element	Description
Name	Is used to enter the name of the tightening step. Appropriate designations for the tightening steps make it easier to understand the tightening programs in the program overview (e.g. 2, A first tightening, 3, A end tightening).
Category	Is used to select the category for determining the quality code. The quality code describes whether a tightening job was evaluated as OK or NOK. In case of an NOK evaluation, the cause will also be described. In NOK cases, the **category** is used as a detailed distinction, so that a different quality code can be output in different tightening steps for the same NOK cause (e.g. M < M–). Possible categories include e. g.: – Tightening – Pre-tightening – Final tightening – Loosen – Rework
Graph resolution	Is used to select the graph resolution in angular degrees. The settings in the start step specify the graph resolution for the entire tightening program. However, this can also be set individually for each tightening step. This allows you to display steps with very low resolution and steps with very high resolution within one tightening job. The entire course of the graph can be made visible without increasing the number of graph points. – **Resolution** Setting for the resolution of the graph in angular degrees. The smallest value corresponds to the highest resolution and the largest value to the lowest resolution. Default setting: **Same as on start-up** The following resolution steps are possible: – 0.25° – 0.5° – 1° – 2° – 5° – 10° – 20° – 50° The actual graph resolution depends on the nutrunner configuration. It is usually not possible to display the entire course of the graph if you use the maximum resolution (0.25°) and the maximum number of measuring points (2000). In such cases, you should adjust the resolution, i.e. make it less high.

Target

This panel provides the additional parameters required for the tightening step, which have an effect on the tightening process (e.g. start-up suppression) but cannot interrupt it.

Table 9–44: Tightening step dialog - target panel

Element	Description
Speed	Is used to select the speed (= set speed) to be used for tightening in this tightening step. A negative speed means counterclockwise rotation, a positive speed means clockwise rotation.
Start-up suppression	Is used to select the time for the start-up suppression in ms after the tightening step has been started during which the tightening process is not monitored. This start-up suppression is necessary to hide torque peaks that are caused by the inertia of masses. One possible reason for excessive torque peaks may be large speed jumps, e.g. acceleration from n = 0 to 500 min-1. Usually, the preset value of 0 ms does not need to be changed. This time must be changed, however, if large masses (e. g. special chucks) are attached to the output drive or the tightening step is very short (hard tightening case). Values between 0 and 100 ms can be set.
Torque threshold	Is used to select the torque threshold for starting angular measurement.

First target function

The target function controls the process sequence of the tightening step by monitoring the target parameter (e.g. torque) and ends the step if the parameter has reached its target value. The target parameter is the measured variable (e.g. torque) of a tightening step, which must reach a specific value (target value) for a tightening process to be performed successfully. The tightening step is terminated once the target value has been reached.

Table 9–45: Tightening step dialog - first target function panel

Element	Description
First target function	Selection of a target function and entry of the appropriate target parameter. – **Torque** The target parameter within a tightening step is the measured torque. This parameter must reach a specific value (set value) to ensure that the tightening job is completed successfully; this will end the tightening step. – **Angle** The bolt is rotated by a specified angle. Angle counting begins when the torque threshold is exceeded. – **Time** The tightening step ends once the specified tightening time has been reached. The **Time** monitoring function activated by default must be greater than the tightening time in order for the tightening case to be evaluated as **OK**.

(Or) 2. Target function

In addition to the permanently activated 1st target function, it is also possible to select a 2nd target function. It is not allowed to select identical target functions. If two target functions are activated, the target function that is the first one to be reached will end the tightening step.

Monitoring function

The monitoring function keeps track that the upper and lower limits are complied with during the tightening process by checking a monitoring parameter.

If the monitoring function has switching capabilities, the tightening step will be terminated immediately if a limit is exceeded. If it is has no switching capabilities, the step result changes to NOK, even if the target parameter has been reached.

The monitoring parameter is the measured variable (e.g. gradient) of a tightening step that must be maintained within specific limits, in order for a tightening process to be performed safely. If the limits are violated, the tightening step may be terminated.

Table 9–46: Tightening step dialog - monitoring panel

Element	Description
Torque, torque min. value, torque max. value, angle, angle min. value, angle max. value	These monitoring functions can also be selected. Each of the monitoring limits can be marked as switching. If a limit is switching, the tightening process will be stopped with an NOK result when it exceeds or falls below its limit. If it is not switching, the tightening process will be completed as usual, however, the result will be NOK.
Time	This monitoring function is always active, i.e. a time span must be entered for a timeout.

9.7.4.3 End step

A tightening program ends with the end step.

Double clicking the end step or the respective icon opens the corresponding dialog for entering the name.

The end step ends the tightening program and terminates each program column (A, B, etc.) in the run sequence. The tightening program may have several end steps if it contains branches. The end step is automatically inserted into the tightening program and cannot be deleted.

The entire tightening job can only be evaluated as OK, if it is terminated in column A. Otherwise, it will be evaluated as NOK.

Table 9–47: End step dialog – settings panel

Element	Description
Name	End step name

9.8 Settings

The **Settings** menu contains the following menu items:

- Time & date (page 203)
- User accounts (page 204)
- Tool display (page 206)
- Data (page 208)
- Configuration (page 221)
- Firmware (page 225)
- PLC signals (page 226)
- OK/NOK counter (page 227)
- Quality code (page 228)
- WLAN (page 230)
- Security (page 235)
- LED (page 236)
- ID assignment (page 238)
- Scanner (page 238)
- Defaults (page 240)
- Backup/Restore (page 240)

9.8.1 Time & date

Settings → Time & date

Select this menu item to define the date and time settings for the Nexo cordless Wi-Fi nutrunner and for the operating system.

All tightening system outputs use the local time of the nutrunner. This also applies to outputs in the operating system like actual values or graphs.

If the slide-in battery pack is not inserted, the local time of the nutrunner is supplied for one week. Thereafter, the local time must be reconfigured.

Table 9–48: Time & date tab

Element	Description
System time	Displays the current date and time setting of the Nexo cordless Wi-Fi nutrunner.
Time zone	Is used to select the time zone.
PC time	Displays the current PC time.
Custom time	These values can be changed by directly entering numbers or by clicking the buttons.
NTP server	The **NTP server** menu item allows setting the clock automatically via a time server. In this case, the clock is periodically (each hour) synchronized with the timeserver clock.
Save	Applies the selected setting as system time.

9.8.2 User accounts

Settings → User accounts

This menu item is intended for user administration and features additional menu items:

- Users (page 204)
- Membership (page 205)
- Groups (page 205)
- Permissions (page 205)
- My account (page 206)

User administration concept

A (new) user is entered in the NEXO-OS operating system with its user data. Every user is assigned to a user group and is therefore provided with user rights.

The rights of a user group can be set by enabling read and write access rights.

Users must be activated to be able to log in on the login page of the NEXO-OS operating system.

9.8.2.1 Users

Settings → User accounts → Users

Use this menu item to show, add or delete users with their user names and data.

Table 9–49: Users tab

Element	Description
Add	Click **Add** to add a new user: 1. Click the button. A new line will appear at the end of the list. 2. Click **Edit** to define the data for the new user entry.
Remove	Click **Remove** to remove a user from the list: 1. Select a user entry from the list. 2. Click the **Remove** button. The user is removed from the list.
Edit	Click **Edit** to edit an existing user entry: 1. Select an entry and click on the **Edit** button. 2. Edit the data. 3. Click **Set password** to change the password. 4. Tick the checkbox to activate the user. 5. Click **Confirm** to confirm the setting.
Save	Click **Save** to save the edited data.
Discard	Click **Discard** to discard the edited data.

9.8.2.2 Membership

Settings → User accounts → Membership

Use this menu item to change the participation in a group. All users entered for the NEXO-OS operating system and their participation in a group are displayed in the form of a matrix.

1. Select the user from the list.
2. Click on the corresponding group. A checkmark identifies the new participation in a group.
3. Click **Save** to save the edited data. Click **Discard** to discard the edited data.

If no group is selected for a user, the user does not have any rights.

9.8.2.3 Groups

Settings → User accounts → Groups

Use this menu item to show, add or delete groups with their names and descriptive text.

Table 9–50: Groups tab

Element	Description
Add	Click **Add** to add a new group. 1. Click the button. A new line will appear at the end of the list. 2. Enter the corresponding name.
Remove	Click **Remove** to remove a group entry from the list. – Select a group entry from the list. – Click the **Remove** button. The group is removed from the list.
Edit	Click the **Edit** button to edit an existing group entry. You can change the name and enter or edit a description.
Save	Click **Save** to save the edited data.
Discard	Click **Discard** to discard the edited data.

9.8.2.4 Permissions

Settings → User accounts → Permissions

Use this menu item to display all user groups entered for the NEXO-OS operating system and their rights in the form of a matrix.

1. Activate the corresponding right for the group. Read and write access rights are identified by icons.
2. Click **Save** to save the edited data. Click **Discard** to discard the edited data.

Adding read and write access rights

Element	Description
	Click this icon to assign read access rights to the group for the function selected.
	Click this icon to assign write access rights to the group for the function selected.

9.8.2.5 My account

Settings → User accounts → My account

This menu item displays the user data of the logged-in user. The user data of a super user can be exported to the Micro SD card NX-SD.

Table 9–51: My account tab

Element	Description
Change password	Click **Change password** to change your password: 1. Enter your old password, then your new password and confirm the latter. 2. Click **Confirm** to confirm the setting.
Export super user to SD card	As of Nexo firmware version 1300. Using **Export super user to SD card**, the user data of a super user (user with level 5 rights) can be exported to the Micro SD card NX-SD. In the next login, the **<Username>_sd** super user can be selected.

9.8.3 Tool display

Settings → Tool display

Use this menu item to define the settings for the display on the portable Nexo cordless Wi-Fi nutrunner. Also see section Tool display (page 39).

General panel

Under **General**, the first screen of the tool display can be defined.

Table 9–52: Tool display index card - General panel

Element	Description
First view	Under **First screen**, select the screen to be displayed first on the display of the Nexo cordless Wi-Fi nutrunner.
Design	Selects the display representation: **Day** or **Night**
Language	Selects the display language

Options panel

Table 9–53: Tool display index card - Options panel

Element	Description
Allow confirmation of system errors	Enable **Allow confirmation of system errors** to acknowledge system errors using the tool display.
Allow confirmation of NOK results	As of Nexo firmware version 1200: Enable **Allow confirmation of NOK results** to acknowledge NOK results using the tool display. Note: Activation does not become active before the first tightening process after commissioning of the Nexo cordless Wi-Fi nutrunner. If the **NokAc** PLC input signal is applied to **0.3** - **0.5** in the **tool** PLC module, NOK results can also be acknowledged at the tool display (program selector in center position). On application of the **NokAc** PLC input signal in the PLC table and activation of the **Allow acknowledgment of NOK results** option, the option has priority on the tool display. Note: If with activated **Allow acknowledgment of NOK results** option, a NOK result occurs, the **Rdy** PLC output signal will be set to “Low”**.** After confirmation, the signal will change back to “High”.
Display data connection status	As of Nexo firmware version 1200: Enable the check box to display the data connection status on the tool display. As of Nexo firmware version 1300, **Display data connection status** is activated by default.
Show laser warning	Activate **Show laser warning** to output a warning when the barcode scanner is enabled and prevent injuries. Tick the checkbox to display an additional option featuring the **Force read access** checkbox.

Main menu panel

Table 9–54: Tool display index card - Main menu panel

Element	Description
Entries	Click **Entries** to select the entries to be displayed in the main menu on the display of the portable Nexo cordless Wi-Fi nutrunner and define their order. If the check box is selected, the entry in the main menu is displayed on the display of the cordless Wi-Fi nutrunner.
Move up / Move down	Click **Move up** or **Move down** to change the order.

Buttons

Table 9–55: Buttons

Element	Description
Save	Click **Save** to save the edited data.
Discard	Click **Discard** to discard the edited data.

9.8.4 Data

Settings → Data

Use this menu item to manage and transfer data of the Nexo cordless Wi-Fi nutrunner: This menu features additional menu items:

- Result storage (page 208)
- Standard Nexo (page 209)
- Open Protocol (page 217)
- IPM (page 218)
- VW-XML (page 221)

As of Nexo firmware version 1100, the **Mode** menu item is used to set up the ID code to identify a set of results data (see page 184).

9.8.4.1 Result storage

Settings → Data → Results storage

As of Nexo firmware version 1100, the results are stored in the internal memory of the nutrunner. In addition, the results can be stored in the ***.json** format on the
Micro SD card inserted into the nutrunner.

Use this menu item to define the storage location and the settings for saving the measurement results.

Further information on data output can be found in chapter Data services (see page 85).

Table 9–56: Result storage tab

Element	Description
Max. results	Selects a maximum number of results to be saved. The storage comprises up to 5,000 results with actual value and graph.
Use ring buffer	Defines whether a ring memory is to be used for the results: The oldest result will be overwritten with the most recent one if the maximum number of tightening jobs is exceeded. If the ring memory is not selected, result storage will stop once the maximum number of tightening jobs for which results are saved has been reached. The result storage must first be deleted to reactivate storage after such a stop.
Remove result storage	All saved results are deleted.
Save	Click **Save** to save the edited data.
Discard	Click **Discard** to discard the edited data.

9.8.4.2 Standard Nexo

Use this menu item to define the configuration of the respective connection (FTP, HTTP or File Share) for results output. Under **NX-SD card**, the sub-directory for filing of tightening results on the NX-SD Micro SD card and the contents of the file are defined.

- FTP (page 209)
- NX-SD card (page 210)
- HTTP (page 210)
- File Share (page 211)

FTP

Settings → Data → Standard Nexo → FTP

Use this menu item to define the configuration of the FTP connection to the results output.

Table 9–57: FTP tab

Element	Description
Active	Tick the checkbox to activate data output via FTP. If results output is disabled, no more results files will be generated. Results files which have already been generated and are still existing will not be output before FTP output has been reactivated.
IP address / DNS	Either directly enter the IP address of the FTP server or the DNS entry of the FTP server.
Port	Selection of the TCP/IP port for data transfer, value range 0 - 65535 Default setting: 21
Users	Enter the user name for FTP connection. The user name has to be valid on the FTP server and has to have write access to the target directory and authorization to create directories. If necessary, ask your system administrator whether the user has write access.
Password	Enter the password for the indicated user name.
Directory	[1]Tightening results directory on the FTP server.
SSL	As of Nexo firmware version 1200: Activate the **SSL** check box (Secure Sockets Layer) to transfer the data with SSL encoding.
Save	Click **Save** to save the edited data.
Discard	Click **Discard** to discard the edited data.
Data	See Data button (page 212)
Storage	See File button (page 216)
Restore defaults	All settings in this dialog are reset to the factory setting.

1. This refers to the root directory for the registered user. This directory can be located several levels below the actual root directory of the drive. If no directory has been entered, the root directory for the indicated user will automatically be used as the storage location.

NX-SD card

Settings → Data → Standard Nexo → NX-SD card)

Under this menu item, the sub-directory for filing of tightening results on the NX-SD Micro SD card and the contents of the file are defined.

The tightening results are stored on the NX-SD Micro SD card in directory **results**.

Table 9–58: NX-SD card index card

Element	Description
Active	Enable the check box to activate the setting.
Save	Click **Save** to save the edited data.
Discard	Click **Discard** to discard the edited data.
Data	See Data button (page 212)
Storage	See File button (page 216)
Restore defaults	All settings in this dialog are reset to the factory setting.

HTTP

Settings → Data → Standard Nexo → HTTP

Use this menu item to define the configuration of the HTTP connection for results output.

The Nexo firmware uses the HTTP/1.1 standard.

Table 9–59: HTTP index card

Element	Description
Active	Enable the check box to activate data output via HTTP. If results output is disabled, no more results files will be generated. Results files which have already been generated and still exist will not be output before HTTP output has been reactivated.
IP address / DNS	Either directly enter the IP address of the HTTP server or the DNS entry of the HTTP server.
Port	Selection of the TCP/IP port for data transfer, value range 0 - 65535 Default setting: 8080
Page	Under **Page**, enter the target page of the results files.
User agent	Enter the user agent of the HTTP header. Default setting: SYS350[1]
Content type	Enter the content type of the HTTP header. Default setting: application/json[1]
Save	Click **Save** to save the edited data.
Discard	Click **Discard** to discard the edited data.
Data	See Data button (page 212)
Storage	See File button (page 216)
Restore defaults	All settings in this dialog are reset to the factory setting.

1. Setting for transmission to Process Quality Manager (PQM). If PQM is applied, the HTTP connection can be used to transmit the results output data of the tightening controller to the PQM.

File Share

Settings → Data → Standard Nexo → File Share

Use this menu item to define the configuration of the File Share connection for results output.

Table 9–60: File Share index card

Element	Description
Active	Enable the check box to activate data output via File Share. If results output is disabled, no more results files will be generated. Results files which have already been generated and still exist will not be output before File Share output has been reactivated.
IP address / DNS	Either directly enter the IP address of the File Share server or the DNS entry of the File Share server.
Group ID	Enter the group ID for File Share connection. The group ID has to be valid on the File Share server and has to have write access to the target directory and authorization to create directories. If necessary, ask your system administrator whether the user has write access.
User ID	Enter the user ID for File Share connection. The user ID has to be valid on the File Share server and has to have write access to the target directory and authorization to create directories. If necessary, ask your system administrator whether the user has write access.
Directory	Enter the directory[1] for the tightening results on the File Share server.
Type	Select the classification of data: – **NFS** For Unix and Linux operating systems. – **CIFS** CIFS (Common Internet File System) for Windows operating systems.
Save	Click **Save** to save the edited data.
Discard	Click **Discard** to discard the edited data.
Data	See Data button (page 212)
Storage	See File button (page 216)
Restore defaults	All settings in this dialog are reset to the factory setting.

1. This refers to the root directory for the registered user. This directory can be located several levels below the actual root directory of the drive. If no directory has been entered, the root directory for the indicated user will automatically be used as the storage location.

Data button

Click on the button to display the **Data** dialog. In the dialog, the parameters for output of tightening results can be configured. Depending on activation, the output of OK tightening and/or NOK tightening results data is realized differently.

Table 9–61: Parameters dialog

Element	Description
Tightening result / Step result	Under **Tightening result** or **Step result**, the parameters for OK tightening and/or NOK tightening output are defined. To do so, activate the respective check box. For an overview of parameters, see (on page 213).
Add	Click **Add** to add a new user-defined parameter. Click **Save** to save the changes or **Cancel** to discard the changed data.
Edit	Click **Edit** to edit a user-defined parameter. Change the presettings and click **Save** to save the changes or **Cancel** to discard the changed data.
Remove	Click **Remove** to remove a user-defined parameter.
Move up / Move down	Click **Move up** or **Move down** to change the order of parameters in the results data record.
Save	Click **Save** to save the edited data.
Discard	Click **Discard** to discard the edited data.
Basic settings	All settings in this dialog are reset to the factory setting.

Parameter of results output

The output file includes the following parameters:

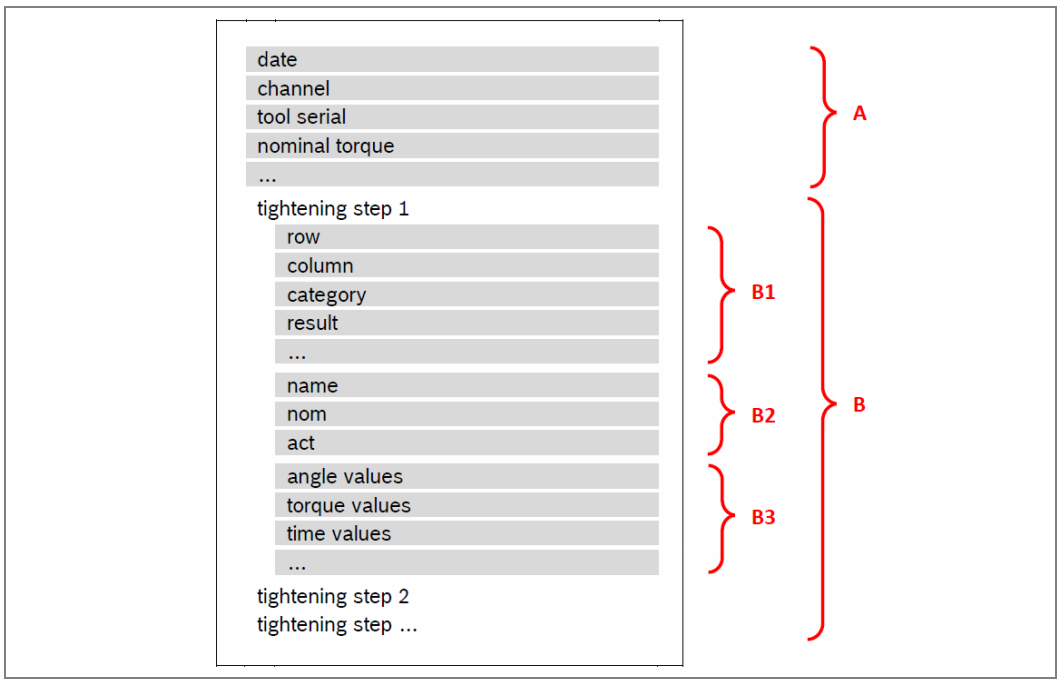


Fig. 9–4: "Standard Nexo" output format

A General tightening result parameters (see page 213)

B Step data: In the results file, all tightening steps of the program are put out individually.

B1 Step result parameters (see page 214)

B2 Tightening function parameters (see page 215): All target and monitoring functions relating to the step, including designation, target value and actual value are put out.

B3 Graph parameters (graph) (see page 215): In addition, the associated graph points are returned under each step:

General tightening result parameters

Table 9–62: General tightening result parameters and their meaning

Parameter	Meaning
date	Date/time of tightening
channel	Channel name
no.	Channel number
cell id	Cell ID
tool serial	Nutrunner serial number
nominal torque	Nominal spindle torque of the nutrunner
torque unit	Unit of the torque
MCE factor	MCE factor of the nutrunner
cycle	Nutrunner cycle counter
id code	ID code
job Nr	0-255 = number of the job -1 = job inactive or not available
prg nr	Number of the tightening program
prg name	Name of the tightening program
prg date	Date of the last change in the tightening program
result	Total tightening result OK/NOK
quality code	Quality code
total time	Total tightening time

Table 9–62: General tightening result parameters and their meaning

Parameter	Meaning
rework code	Rework code
rework text	Rework instruction
last cmd	Last tightening program command of the steps
batch nr	OK counter number
batch direction OK	0 = descending direction of counting 1 = ascending direction of counting
batch direction NOK	0 = descending direction of counting 1 = ascending direction of counting
batch canceled	Shows whether the OK/NOK counter value was changed while it was being processed: 0 = counter not changed 1 = counter changed
batch max OK	OK counter target value
batch OK	Current OK counter value
batch max NOK	NOK counter target value
batch NOK	Current NOK counter value
batch valid	Value of the OK/NOK counter
hardware	Nutrunner code e. g. NXA030S-36V
mac0	MAC address of the nutrunner
ip0	IP address of the nutrunner
sw version	Software version
sw build	Build version
total angle threshold nom	Set value of the total angle counting torque threshold
total angle threshold act	Actual value of the total angle counting torque threshold
total angle	Total angle sum
last step column	Result step column number
last step row	Result step row number

Step result parameters

Table 9–63: Step result parameters and their meaning

Parameter	Meaning
row	Tightening step row number
column	Tightening step column number
name	Step name
category	Tightening step category
result	Step result OK/NOK
last cmd	Last tightening program command of the step
speed	Set speed
torque	Step final torque
angle	Step final angle
duration	Step duration in seconds
angle threshold nom	Set value of angle counting torque threshold
angle threshold act	Actual value of angle counting torque threshold
quality code	Quality code
step type	Tightening step type

Tightening function parameters

Table 9–64: Tightening function parameters and their meaning

Parameter	Meaning
name	Function name TF Angle: Target function Angle TF Torque: Target function Torque TF Time: Target function Time MFs TimeMax: Monitoring function Time, switching MFs TorqueMax: Monitoring function Torque max, switching MF TorqueMax: Monitoring function Torque max MFs TorqueMin: Monitoring function Torque min, switching MF TorqueMin: Monitoring function Torque min MF AngleMin: Monitoring function Angle min MFs AngleMax: Monitoring function Angle max, switching MF AngleMax: Monitoring function Angle max
nom	Set value of function
act	Actual value of function

Graph parameters

Table 9–65: Graph parameters and their meaning

Parameter	Meaning
angle values	Table of angle values
torque values	Table of torque values
time values	Table of time values
point	Number of graph points
angle scale	Multiplication factor of the angle value (fixed value: 1)
torque scale	Multiplication factor of the torque values (fixed value: 1)
time scale	Multiplication factor of the time values (fixed value: 1)

Meaning of switch-off criteria

In each tightening step, the ***last_cmd*** key specifies the reason for finishing the tightening step, i.e. the switch-off criterion:

Table 9–66: Switch-off criteria

Last command	Meaning
TF Angle	Target function Angle
TF Torque	Target function Torque
TF Time	Target function Time
MFs TimeMax	Monitoring function Time, switching
MFs TorqueMax	Monitoring function Upper torque, switching
MFs TorqueMin	Monitoring function Lower torque, switching
MFs AngleMax	Monitoring function Angle max, switching
Cw->0	PLC Signal Cw removal
Ccw->0	PLC Signal Ccw removal
En->0	PLC Signal En removal
SysFault	System errors
rdy->0	Ready for operation during tightening removed

File button

Click on the button to display the **File** dialog. In the dialog, the respective parameters for storage of results data can be edited, deleted or additional memory parameters added.

Table 9–67: Memory dialog

Element	Description
Output format	Output format for results data. – **Type** Selection of the **json** output format. – **JSON-formatted** Select **yes** to display the results data in a readable JSON format (including line breaks and spaces). Select **no** to receive an unformatted JSON data set.
File name	Display on selection of **FTP, NX-SD card** and **File Share**: Under **file name** the file name for the saved results data file is defined. The file name can be composed of different parameters. Activate the respective parameters. Additional user-defined parameters can be added.
File extension	Display on selection of **FTP, NX-SD card** and **File Share**: Displays the file extension **json** of the saved results data file.
Sub-directory	Display on selection of **FTP, NX-SD card** and **File Share**: Under **Sub-directory**, a sub-directory is created. The file name of the sub-directory can be composed of different parameters. Activate the respective parameters.
Number of files	Display on selection of **NX-SD card**: On the applied file system of the NX-SD card, sub-directories can only contain a defined number of files. Due to this restriction, an additional sub-directory with the current time stamp (**YYYY-MM-DD_hh-mm-ss**) is created in the configured directory for storage of each results data set. If the configured number of files is reached, a new sub-directory is automatically generated with the current time stamp for storage of the results data. A maximum of 10000 result data records per sub-directory can be stored.
Add	Click **Add** to add a new parameter. Click **Save** to save the changes or **Cancel** to discard the changed data.
Edit	Click **Edit** to edit a memory parameter. Change the presettings and click **Save** to save the changes or **Cancel** to discard the changed data.
Remove	Click **Remove** to remove a parameter.
Move up / Move down	Click **Move up** or **Move down** to change the order of parameters for composition of the file name of the sub-directory.
Save	Click **Save** to save the edited data.
Discard	Click **Discard** to discard the edited data.
Basic settings	All settings in this dialog are reset to the factory setting.

9.8.4.3 Open Protocol

Settings → Data → Open Protocol

Use this menu item to define the setting for communication with Rexroth Open Protocol of the Nexo cordless Wi-Fi nutrunner.

Rexroth Open Protocol must be selected for data connection to the tightening system 350.

Table 9–68: Open Protocol tab

Element	Description
Active	Tick this checkbox to enable communication with Rexroth Open Protocol.
TCP/IP port	Selects the TCP/IP port for data transfer. Value range: 0 - 65535 Default setting: 4545
Version	Selects the **Rexroth OP R1.0** data protocol.
Keep alive timeout	Selects the time span within which messages are received. If no message is received within this time, the connection will be disconnected. Default setting: 15 seconds
Response timeout	Selects the time span within which the message to acknowledge the data transfer must be sent (default setting: 10 seconds). This information is only required for reliable mode. This time will be set a max. of 4 times. If no acknowledgement is received within the 4th time span of the data transfer, the connection will be disconnected.
Suppress echo from ID codes	If **Open Protocol** is selected under **Select device** in the **ID code** menu and **Suppress echo from ID codes** is enabled, this will result in the following: – ID codes that are received via Open Protocol (MID 0050 or MID 0150) are then not transmitted to the respective subscribers of the ID codes via Open Protocol (MID 0052). – This means that this option (default setting: disabled) prevents a situation where new ID codes are constantly generated but the actual tightening job is never carried out at the tightening position.
Also forward ID codes from non-selected sources	**Also forward ID codes from non-selected sources** affects the subscription of ID codes to be transferred (MID 0051). If this option is enabled, new ID codes from an ID code source, e.g. a scanner, are transferred in the subscription even if this source has not been configured as an active ID code device in the NEXO-OS operating system.
Asynchronous mode	Activate **Asynchronous mode** to operate specific uncritical functionalities asynchronously. This allows for a higher communication speed between tightening system and communication partner.
Save	Click **Save** to save the edited data.
Discard	Click **Discard** to discard the edited data.

9.8.4.4 IPM

Settings → Data → IPM

Use this menu item to define the setting for communication with Rexroth IPM Protocol of the Nexo cordless Wi-Fi nutrunner.

Table 9–69: IPM tab

Element	Description
Active	Tick this checkbox to enable communication with Rexroth IPM Protocol.
IPM IP address	IP address of the IPM gateway to which the data are to be sent (target address).
IPM port	IP port of the IPM gateway to which the data are to be sent (target address). Value range: 0 - 65535 Default setting: 5501
ID code mask	The IPM data set has different (text) data fields to which flexible parts of the ID code can be mapped. The maximum number of characters that can be entered is 255. This element can be used for this purpose, with the following characters being allowed for the ID code mask (IDCodeMask): – _ Placeholder; character at this position is ignored – * New placeholder character to provide a clearer view – I Character at the position marked by I is taken over in IPM ID code
IP code data	The IPM data set has different (text) data fields to which flexible parts of the ID code can be mapped. The maximum number of characters that can be entered is 255. This element can be used for this purpose, with the following characters being allowed for ID code data (IDCodeKeys): – A AFO extension field – V Fields for process number – B Fields for component carrier ID – T Fields for component type designation/type number – Z Additional ID
IPM version	Version of the IPM protocol that is used for transmission. The version must comply with the version supported by the IPM gateway used.
AFO	Work sequences (definitions of the individual entries per work sequence, see table 9–70) – **Add** Inserts a new AFO – **Add Loosen** Adds a new AFO, based on the selected channel for program 99 ("Loosen") – **Remove** Deletes an AFO
Save	Click **Save** to save the edited data.
Discard	Click **Discard** to discard the edited data.
Basic settings	All settings in this tab are reset to the factory setting.

Each work sequence (AFO) is represented by one line in the AFO table, see table 9–70. In the AFO table, an unlimited number of AFOs can be inserted and deleted.

Table 9–70 is a schematic presentation of the clear assignment of the combination of channel number and program number ("physical process information") to a work sequence ("logic IPM feature").

Table 9–70: Assignment of the combination of channel number and program number

Element	Description
Active	– Ticked Data is transferred to the IPM gateway. – Not ticked Data with this channel/program number are not transferred to the IPM gateway. Applications: – AFO is defined, however not activated: This option is used if the transmission of the results is to be avoided, e.g. loosen processes. – Tightening program not defined in the AFO list is tightened: An AFO (AFO name) is automatically generated and the tightening result is sent to the IPM gateway, see table footnote[1].
Channel no.	The channel number can be edited in the **Settings** - **Configuration** (page 221) menu.
Prg	Selects the program number for this work sequence.
AFO	Name of the work sequence (no more than 30 characters) Allowed character set: 7-bit US-ASCII (no umlauts)
Description	Allowed character set: 7-bit US-ASCII (no umlauts, no more than 30 characters) This field may remain empty so that the description can be assigned to this AFO at the server at a later point. In this case, you can then e.g. create country-specific descriptions with umlauts.
Graph filter	Selection of the results type to be stored: – **OK/NOK graphs** All result graphs – **OK graphs** Limited to graphs with OK result – **NOK graphs** Limited to graphs with NOK result – **No graphs** No results graphs
OK graph	Defines how the graph is to be transmitted to the IPM system in case of OK: – **Last step** Graph range of the last tightening step – **All steps** Entire tightening graph
NOK graph	Defines how the graph is to be transmitted to the IPM system in case of NOK: – **Last step** Graph range of the last tightening step – **All steps** Entire tightening graph
Tension relief	– Ticked Tension relief range is not cut off – Not ticked Tension relief range is cut off
Absolute angle	If this option is selected, the graph is converted into a presentation where it rises monotonically with the angle.
Loosen	If this option is selected, the tightening job is interpreted as "loosen".

Table 9–70: Assignment of the combination of channel number and program number

Element	Description
Step number	Defines the step number for IPM data output: **Sequential** Every docu step receives a sequentially assigned number (1…n), according to the output order in the tightening system. The last tightened step receives either number 99 (final tightening step) or number 0 (no final tightening step). The information whether there is a final tightening step is buffered by the last tightening position with OK tightening of this AFO.
Step category	Defines the step category for IPM data output: – **End final tightening mode** Possible output values are either "unknown" or "end tightening". "End tightening" is only output if the step number is identical with the buffered end tightening step number of an OK tightening of this AFO completed in advance. – **Step type** The number of the step type of the tightening step of the tightening system is accepted without changes.
Step filter	Defines the tightening steps that are transferred to IPM: – **All steps** – **Last step**
Step output order	Defines the order in which the tightening steps are transferred to IPM: **Sequential**

1. If the table does not contain a combination of channel/program, the data is always forwarded to the IPM gateway (with an automatically generated AFO) so that no data can get lost.

9.8.4.5 VW-XML

Settings → Data → VW-XML

Use this menu item to define the setting for communication with VW-XML of the Nexo cordless Wi-Fi nutrunner.

Table 9–71: VW-XML index card

Element	Description
Active	Enable the check box to activate communication with VW-XML.
System data	Under **System data**, the corresponding parameters for VM-XML tightening results output can be configured. Tag default setting: empty – **System name <ABZ>** In the “ABZ” tag, 32 characters are available (e.g. wheel assembly). – **Plant <WRK>** In the “WRK” tag, 16 characters are available. – **Production segment <FSG>** In the “FSG” tag, 16 characters are available. – **Production section <FAB>** In the “FAB” tag, 16 characters are available. – **Production unit <FBR>** In the “FBR” tag, 16 characters are available. – **System location <ORT>** In the “ORT” tag, 16 characters are available. – **Assembly side <ABS>** Selection of the connection side: – Counterclockwise – Clockwise – Undefined: empty In the “ABS” tag, one character is available. “R” for selection of **right** and “L” for selection of **left**.
Interface	– **TCP/IP port A (control data)** Selection of the desired TCP/IP port for data exchange with the tightening controller (default setting: 4700) – **Keep alive timeout (A)** Indication of the time in which a message from the master PC is to be received. If no message is received within this time at the port, the connection will be disconnected (default setting: 8 seconds). Recommendation: Set the keep alive timeout to a higher value than that of the master PC. – **TCP/IP port B (process data)** Selection of the desired TCP/IP port for process data and event-controlled message exchange (default setting: 4710) – **Keep alive timeout (B)** Indication of the time in which the tightening controller must send a message to the master PC. If no message is received within this time at the port of the master PC, it will disconnect the connection. (Default setting: 6 seconds). Recommendation: Set the keep alive timeout to a lower value than that of the master PC. – **ACK timeout** Indication of the time in which a confirmation (acknowledge) is to be received. If no confirmation is received within this time at the port, the connection will be disconnected (default setting: 3 seconds).

Table 9–71: VW-XML index card

Element	Description
Options	Selection of the default transmission class that is to be used by default for the transmission of the tightening results data. – **OK** Selection of transmission class 1 to 5 for OK tightening results data. – **NOK** Selection of transmission class 1 to 5 for NOK tightening results data.
Save	Click **Save** to save the edited data.
Discard	Click **Discard** to discard the edited data.
Import	Opens the **Import** dialog. Select the file to be imported.
Export	Exports the current settings to the download area.
Restore defaults	All settings in this tab are reset to the factory setting.

9.8.5 Configuration

Settings → Configuration

Use this menu option to call up the current configuration of the nutrunner.

To use Rexroth Open Protocol, the cell ID and the channel number must be configured.

Table 9–72: Configuration tab

Element	Description
Nutrunner	– **Order number** Displays the order number of the nutrunner – **Code** Display of the nutrunner code – **Serial number** Displays the serial number of the nutrunner – **Channel name** Enter the channel name, max. 100 characters. As of Nexo firmware version 1100: The channel name is displayed in the status bar next to the nutrunner icon. – **Channel number** Channel number of the nutrunner – **Cell ID** Cell ID of the nutrunner – **Torque unit** Selection of the torque unit. As of Nexo firmware version 1200, the units **Ftlb**, **Inlb**, **Kpm**, **Kgfm** and **Kgm** are available for selection. The torque unit defined in the tightening programs is independent from this setting. – **ID number** Number used to identify the nutrunner – **Comments** Enter a comment
MCE	– **MCE factor** The MCE factor serves to adjust the Nexo measuring system to the reference measuring system in the machine capability examination (MCE). – **Date** Enter exactly when the entry was made.
Next check	– **Activated** Yes: Check enabled No: Check disabled If in active monitoring, the set limits are reached in the next check, the controller sends the PLC output signal CheckTool ((see page 81)) and enters a class 0 system error. The PLC signal is reset if one of the following events occurs: – **Cycle** Enter the cycle during which the check is to be carried out. – **Date** Date for the next check.
Last check	– **Date** Enter exactly when the check was carried out. – **Cycle** Enter exactly in which cycle the check was carried out.

Table 9–72: Configuration tab

Element	Description
Output drive	– **Order number** Component order number – **Serial number** Component serial number – **Efficiency** Enter the efficiency – **Transmission** Enter the transmission
Special component	– **Order number** Component order number – **Serial number** Component serial number – **Efficiency** Enter the efficiency – **Transmission** Enter the transmission – **Torque** Maximum torque at which special components may be used. – **Reverse spin direction** Specification of an option for a reverse spin direction.
Nutrunner limits	The parameters displayed here are calculated according to the configuration. The parameters are static values of the overall tool and cannot be changed. If the settings for **Efficiency** and **Transmission** under **Output drive** and/or **Special component** are changed, the displayed parameters are newly calculated. – **Overload** The overload calculation is based on the nominal torque of the encoder and the output drive data. – **Min. speed** Programmed minimum speed – **Max. speed** Programmed maximum speed – **Min. torque** Programmed minimum torque with torque target function – **Max. torque** Programmed maximum torque with torque target function
Save	Click **Save** to save the edited data.
Discard	Click **Discard** to discard the edited data.

9.8.6 Firmware

Settings → Firmware

This menu item is used to display the firmware version and to start the firmware update.

When the firmware is updated, the NEXO-OS operating system is also updated.

As of version 1100 of the Nexo firmware, firmware updates can only be started with a capacity of the battery pack slide-in module of ≥ 25%.

After the new firmware version has been uploaded, the Nexo cordless Wi-Fi nutrunner is rebooted. Thereafter, the new firmware is effective for the Nexo cordless Wi-Fi nutrunner.

Table 9–73: Firmware tab - firmware

Element	Description
Refresh	Click **Update** to load a new firmware version: 1. The **Update nutrunner firmware** dialog is opened. 2. Select the file (***.nxfw**) for updating the firmware. 3. Click **Update** to start the update. Click **Cancel** to stop the update.

Firmware update was not carried out or canceled:

In this case restart the firmware update via the NEXO-OS. If the firmware update fails again, remove the battery pack slide-in module of the nutrunner, wait until the nutrunner is de-energized and reinsert the battery pack. Start the nutrunner and wait until it is started up. Start the firmware update again via the NEXO-OS.

Table 9–74: Firmware tab - previously installed firmware and configurations

Element	Description
Previously installed firmware and configurations	Click the **Start** button to load the previously installed firmware version and the respective configurations.

9.8.7 PLC signals

Settings → PLC signals

Use this menu item to create a PLC assignment table. The assignment table describes the assignment of the PLC signals to inputs and outputs.

Table 9–75: PLC signals tab

Element	Description
Inputs/outputs	The input signals are on the left side of the window and the output signals on the right.
Control signals/status signals	The signal list shows all of the signals available. – Already assigned and no longer available signals in the signal list will be gray. – Each input signal can only be assigned once. Each output signal can be assigned up to a maximum of four times.
	Inserts a signal highlighted in the signal list in the selected insert position of the assignment table.
	Removes the highlighted signal from the assignment list.
 **oprtcl**	PLC signals from Rexroth Open Protocol - PLC module **oprtcl**
 **tool**	PLC signals of the nutrunner - PLC module **tool** As of Nexo firmware version 1300. If the nutrunner is in manual mode, the **Prg0-Prg7 signals can no longer be applied.**
 **vwXml**	PLC signals of VW-XML - PLC module **vwXml**
Activate	Click **Activate** to activate the PLC signals of the module selected.
Deactivate	Click **Deactivate** to deactivate the PLC signals of the module selected.
Save	Click **Save** to save the edited data.
Discard	Click **Discard** to discard the edited data.
Restore defaults	All settings in this tab are reset to the factory setting.

9.8.8 OK/NOK counter

Settings → OK/NOK counter

Use this menu item to define the settings for the OK/NOK counters. The counters for OK and NOK tightening are used to assess a sequence of tightening jobs. Each tightening job is counted according to its evaluation. If a counter reaches its specified maximum value, a control signal is output (CntOK or CntNOK) and, if desired, the tightening channel is blocked.

As of Nexo firmware version 1300, the operating mode (manual mode or automatic mode) of the Nexo cordless Wi-Fi nutrunner can be selected. For both operating modes, separate OK/NOK counters can be configured. The processing via OpenProtocol (MID 0019, MID 0020, and MID 0021) is only possible for the OK/NOK counter of the **Automatic** operating mode.

Table 9–76: OK/NOK counter tab

Element	Description
Operating mode	Selection of the operating state.
Select PLC signals	Use **Select PLC signals** to select the counters: – **Prg0 ... Prg7** The counters are selected using the control signals used to select the tightening program. Thus, a counter with the same number is assigned to each tightening program, i.e. the sequence consists of tightening jobs with the same tightening program. – **CntSel0 ... CntSel7** The counters are selected using these control signals. This selection is implemented independently of the tightening program e.g. by the partner controller. Thus, different tightening programs can be used within the sequence.
Counter set	The **Counter value** option allows setting a total of 255 OK/NOK counters. A maximum value for OK tightening jobs and a maximum value for NOK tightening jobs are defined for each counter. – Click **Add** or **Remove** to add or delete a counter value, respectively. – **OK/NOK** Set the counting direction, i.e. whether counting is to be ascending or descending. – **Disable when OK/NOK number is reached** The appropriate control signal is output (CntOK or CntNOK) when the maximum number of the current counter is reached. Here, you can define whether the nutrunner is to be disabled once the maximum number is reached or whether the loosening program no. 99 is to be enabled or disabled. This setting also has an effect on changing to a different counter (changing the control signals **Prog0** … **Prog7** or **CntSel0** … **CntSel7**). If a counter is active (the counter is configured and has counted at least one tightening job), but none of the maximum values for OK or NOK tightening jobs have been reached, the PLC output signal **CntCanceled**will always be output when a different counter is selected. – **Disable program no. 99 after** This option allows defining whether program no. 99 ("Loosen") is to be disabled after an OK tightening job or after an NOK tightening job. Within one counter set, program no. 99 ("Loosen") can be disabled for one or more OK or NOK tightening jobs.

If the configured number of OK tightening jobs (**Max OK**) and NOK tightening jobs (**Max NOK**) has been reached within a counter value, the settings under **Disable program no. 99 after** are no longer effective. In this case, the setting under **Disable when OK/NOK number is reached** become effective.

9.8.9 Quality code

Settings → Quality code → Configuration of quality codes

The quality code (QC) provides information on the results of a tightening job. If an NOK evaluation is output, the cause will also be listed.

By assigning the cause of NOK evaluations from tightening processes to specific quality codes, it is possible to subdivide the results into certain areas. This can be useful e.g. when evaluating the output tightening results.

In addition to the quality code, the PLC OK/NOK signal must also be used for the evaluation. A monitoring function not selected in the tightening program is regarded as OK on assignment of the quality code.

Table 9–77: Quality code basic settings

Quality code	Rework codes	TJ* NOK	TJ* OK	all other TJ*	Category
1	0	–		All OK	System
130	0	Cw = 0		OK/NOK	System
131	0	Ccw = 0		OK/NOK	System
132	0	En = 0		OK/NOK	System
139	0	StartUp		OK/NOK	System
129	0	Fault		OK/NOK	System
2	0	A+		OK/NOK	All
4	0	A-		OK	All
8	0	T+		OK	All
10	0	T+, A+		OK	All
12	0	T+, A-		OK	All
16	0	T-		OK	All
18	0	T-, A+		OK	All
20	0	T-, A-		OK	All
128	0	NOK		OK/NOK	System

*)MF = monitoring function

Table 9–78: Quality codes tab - TJ NOK selection criteria

Characteristic	Description
Cw = 0	Canceled by turning the start signal off
Ccw = 0	Canceled by turning the start signal off
En = 0	Canceled by turning the enable signal off
StartUp	NOK start-up test
Fault	Canceled due to system error
T+	upper limit value of torque monitoring exceeded
T-	lower limit value of torque monitoring exceeded
A+	upper limit value of angle monitoring exceeded
A-	lower limit value of angle monitoring exceeded
t+	Time monitoring exceeded

Table 9–79: Quality code tab - configuration of quality codes

Element	Description
Add	Opens a dialog to add a quality code.
Edit	Opens a dialog to edit the selected quality code.
Remove	Deletes an entry from the quality code assignment table.
Move up / Move down	The table is searched from top to bottom when selecting the quality code. Thus, the order of the entries may be decisive for the selection of the quality code. Use **Move up** or **Move down** to move the selected entry up or down.

Table 9–79: Quality code tab - configuration of quality codes

Element	Description
Save	Click **Save** to save the edited data.
Discard	Click **Discard** to discard the edited data.
Import	Opens the **Import** dialog. Select the file to be imported.
Export	Exports the current settings to the download area.
Restore defaults	All settings in this tab are reset to the factory setting.

Settings → Quality code → Rework codes

A rework code can be used to inform the user of the necessary steps to rework a tightening that has been evaluated as NOK. The rework instructions can be output via appropriate control signals (RC0-4).

31 rework codes are provided internally. These codes can each be assigned a text (max. 80 characters). The code is output as a binary encoded control signal.

On delivery of the Nexo cordless Wi-Fi nutrunner, the quality code assignment table does not contain any assigned rework codes. A maximum of 31 rework codes can be defined. Code 0 is not defined

Table 9–80: Quality code tab - rework codes

Element	Description
Save	Click **Save** to save the edited data.
Discard	Click **Discard** to discard the edited data.
Import	Opens the **Import** dialog. Select the file to be imported.
Export	Exports the current settings to the download area.

9.8.10 WLAN

Settings → WLAN

Use this menu item to define the WLAN settings for data exchange with the Nexo cordless Wi-Fi nutrunner.

Table 9–81: WLAN tab

Element	Description
Active	On delivery, the Wi-fi functionality of the cordless Wi-Fi nutrunner is disabled. Tick the checkbox to activate radio communication.
Save	Click this button to save the configuration.
Discard	Click this button to discard the edited data.
Restart	Press this button to restart the NEXO-OS. A restart may be required in case of WLAN problems, for example.

Table 9–82: WLAN tab – Hardware

Element	Description
Wireless mode	The WLAN network is selected via the IEEE 802.11 standards. IEEE 802.11 is an IEEE standard for communication in wireless networks. Go to the wireless mode and select the frequency range. – **802.11b/g** (2.4 GHz frequency band) – **802.11a** (5 GHz frequency band) – **802.11a/g** (2.4 GHz and 5 GHz frequency bands) The standard 802.11 n is supported.
Country code	The enabled channels in the WLAN frequency ranges vary depending on the country. Select the target country using the country code. Check with Rexroth if there is a radio certification for the target country. – **Europe (ETSI)**[1] (European Telecommunications Standards Institute) – **USA (FCC)** (Federal Communications Commission) – **Australia (ACMA)** – **Argentina (CNC)** – **Brazil** – **Canada (IC)** (Industry Canada) – **China (SRRC Cert)** (State Radio Regulatory Commission) – **India (WPC Cert)** (Wireless Planning and Coordination Wing) – **Malaysia** – **Mexico (ANCE)** – **New Zealand (ACMA)** – **Russia** – **South Africa (ICASA)** – **South Korea** – **Thailand (Sdoc)**

1. The term **Europe** refers to the following countries: Andorra, Belgium, Bosnia and Herzegovina, Bulgaria, Denmark, Germany, Estonia, Finland, France, Georgia, Gibraltar (UK), Greece, Greenland, Great Britain, Isle of Man, Ireland, Island, Italy, Jan Mayen Island, Jersey, Juan de Nova Island, Virgin Islands (UK), Croatia, Latvia, Liechtenstein, Lithuania, Luxembourg, Malta, Mayotte, Macedonia, Monaco, Montenegro, Montserrat, the Netherlands, the Netherlands Antilles, Norway, Austria, Pitcairn Islands (UK), Poland, Portugal, Romania, San Marino, Sweden, Switzerland, Slovakia, Slovenia, Spain, Spitsbergen, Czech Republic, Hungary, Cyprus

The following table provides an overview of the channels supported for the Nexo cordless Wi-Fi nutrunner and their use:

Channel no.	Freq. (MHz)	Europe (ETSI)/ Russia	India (WPC Cert)	Argentina/ Thailand	Malaysia
1	2412	✓	✓	✓	✓
2	2417	✓	✓	✓	✓
3	2422	✓	✓	✓	✓
4	2427	✓	✓	✓	✓
5	2432	✓	✓	✓	✓
6	2437	✓	✓	✓	✓
7	2442	✓	✓	✓	✓
8	2447	✓	✓	✓	✓
9	2452	✓	✓	✓	✓
10	2457	✓	✓	✓	✓
11	2462	✓	✓	✓	✓
12	2467	✓	✓	✓	✓
13	2472	✓	✓	✓	✓
36	5180	✓	✓	✓	✓
40	5200	✓	✓	✓	✓
44	5220	✓	✓	✓	✓
48	5240	✓	✓	✓	✓
52 [1]	5260	DFS / TPC	✓	✓	DFS
56 [1]	5280	DFS / TPC	✓	✓	DFS
60 [1]	5300	DFS / TPC	✓	✓	DFS
64 [1]	5320	DFS / TPC	✓	✓	DFS
100 [1]	5500	DFS / TPC	-	✓	DFS / TPC
104 [1]	5520	DFS / TPC	-	✓	DFS / TPC
108 [1]	5540	DFS / TPC	-	✓	DFS / TPC
112 [1]	5560	DFS / TPC	-	✓	DFS / TPC
116 [1]	5580	DFS / TPC	-	✓	DFS / TPC
120 [1]	5600	DFS / TPC	-	✓	DFS / TPC
124 [1]	5620	DFS / TPC	-	✓	DFS / TPC
128 [1]	5640	DFS / TPC	-	✓	DFS / TPC
132 [1]	5660	DFS / TPC	-	✓	✓
136 [1]	5680	DFS / TPC	-	✓	✓
140 [1]	5700	DFS / TPC	-	✓	✓
149 [1]	5745	-	-	✓	✓
153 [1]	5765	-	-	✓	✓
157 [1]	5785	-	-	✓	✓
161 [1]	5805	-	-	✓	✓
165 [1]	5825	-	-	✓	✓

✓ Supported

\- Not supported

DFS Dynamic Frequency Selection - dynamic selection of channels due to radar

TCP Transmit Power Control - no active background scanning in these channels.

[1]) Supported as of Nexo firmware version 1100

Chan-nel no.	Freq. (MHz)	USA (FCC) Brazil Canada (IC) Mexico	China (SRRC Cert)	Australia / New Zealand	South Africa	South Korea
1	2412	✓	✓	✓	✓	✓
2	2417	✓	✓	✓	✓	✓
3	2422	✓	✓	✓	✓	✓
4	2427	✓	✓	✓	✓	✓
5	2432	✓	✓	✓	✓	✓
6	2437	✓	✓	✓	✓	✓
7	2442	✓	✓	✓	✓	✓
8	2447	✓	✓	✓	✓	✓
9	2452	✓	✓	✓	✓	✓
10	2457	✓	✓	✓	✓	✓
11	2462	✓	✓	✓	✓	✓
12	2467	-	✓	✓	✓	✓
13	2472	-	✓	✓	✓	✓
36	5180	✓	✓	✓	✓	✓
40	5200	✓	✓	✓	✓	✓
44	5220	✓	✓	✓	✓	✓

48	5240	✓	✓	✓	✓	✓
52 [1]	5260	DFS	DFS / TPC	✓	✓	DFS / TPC
56 [1]	5280	DFS	DFS / TPC	✓	✓	DFS / TPC
60 [1]	5300	DFS	DFS / TPC	✓	✓	DFS / TPC
64 [1]	5320	DFS	DFS / TPC	✓	✓	DFS / TPC
100 [1]	5500	DFS	-	-	✓	DFS / TPC
104 [1]	5520	DFS	-	-	✓	DFS / TPC
108 [1]	5540	DFS	-	-	✓	DFS / TPC
112 [1]	5560	DFS	-	-	✓	DFS / TPC
116 [1]	5580	DFS	-	-	✓	DFS / TPC
120 [1]	5600	-	-	-	✓	DFS / TPC
124 [1]	5620	-	-	-	✓	DFS / TPC
128 [1]	5640	-	-	-	✓	DFS / TPC
132 [1]	5660	DFS	-	-	✓	-
136 [1]	5680	DFS	-	-	✓	-
140 [1]	5700	DFS	-	-	✓	-
149 [1]	5745	✓	✓	✓	-	✓
153 [1]	5765	✓	✓	✓	-	✓
157 [1]	5785	✓	✓	✓	-	✓
161 [1]	5805	✓	✓	✓	-	✓
165 [1]	5825	✓	✓	✓	-	✓

✓ Supported

- Not supported

DFS Dynamic Frequency Selection - dynamic selection of channels due to radar

TCP Transmit Power Control - no active background scanning in these channels.

[1]**)** Supported as of Nexo firmware version 1100

Table 9–83: WLAN tab - WLAN

Element	Description
SSID	In **SSID**, enter the SSID (Service Set IDentifier) of the access point, maximum of 32 characters.
BSSID	Activate **BSSID** to enter the BSSID (Basic Service Set Identification) of the access point.

Table 9–84: WLAN tab - address

Element	Description
Host name	Supported as of Nexo firmware version 1100: Assignment of a permanent network name, maximum of 63 characters. The network name is used to address the nutrunner. For example, when the NEXO-OS operating system is started, enter the network name in the address bar of the web browser instead of the IP address.
Method	You can select configuration either via DHCP (Dynamic Host Configuration Protocol) or by specifying a fixed IP address. – **IP address** Assignment of a fixed IP address – **Subnet mask** Enter the subnet mask. – **Gateway** Enter the gateway address. – **DNS** Enter the DNS server. – **DHCP** The IP address (IP = Internet Protocol) is assigned by the access point. It identifies the participant during data exchange.

Table 9–85: WLAN tab - security

Element	Description
Method	Select the safety method: – **Uncoded** – **WPA/WPA2 Personal** – **WPA/WPA2 enterprise** WPA (WiFi Protected Access) is used to encrypt information. This ensures that no other persons than those having the appropriate authorization can access the network. If WPA2 is used, an individual code is assigned to each user; if WPA is used, a pre-installed code is used for the users; in this case, the same passphrase is assigned to each user. WPA2 has a higher safety level than WPA.
Authentification	Is displayed with **Method = WPA/WPA2 enterprise** Select the authentification: – **PEAP** – **None** – **EAP-TLS** – **EAP-TTLS**
User name	Is displayed with **Method = WPA/WPA2 enterprise** Enter the user name.
Password	Is displayed with **Method = WPA/WPA2 Personal / WPA/WPA2 Enterprise** Enter the WPA passphrase in **Password**, 32 characters maximum. Click **Hide** to display the passphrase as encryption or **Show** to display it as normal text.
Root Certificate	Is displayed with **Method = WPA/WPA2 enterprise** Using a certificate for encryption. Please note: Certificates usually have a period of validity. This means they are subject to a date. If the time is not set at the nutrunner or if the internal battery back-up is depleted, the time has to be set again at the nutrunner before it can connect to the network.[1]
	Click on the icon to directly load the root certificate: 1. The dialog **Upload root certificate** is displayed. 2. Select the file. 3. Click **Upload** to start the upload. Click **Cancel** to stop the update.
TKIP	Enable **TKIP** to use a safety protocol for wireless networks (Temporal Key Integrity Protocol - TKIP).

1. To set the time in the NEXO-OS operating system, go to the **Settings** → **Time & date** menu. The time may also be set directly at the tool display via **Time & date** if it was configured accordingly in the NEXO-OS.

Settings for WLAN roaming

Roaming refers to the nutrunner traveling from one access point to another using the same access data.

Roaming is used if the range of an access point is insufficient in an application or if it does not cover all relevant areas. In this case, multiple
access points (with identical access data) increase the range and coverage.

In company networks such installations are often implemented using networks with a
central controller that manages the access points.

With the roaming function the Nexo travels between the individual access points without losing network connection and having to reconnect. With the roaming function access points can also be changed faster.

Table 9–86: WLAN tab - roaming

Element	Description
Active	If the function is disabled, the Nexo stays at the same access point until it loses connection. Only then it looks for an SSID to establish a new network connection (possibly at another access point). Enable the checkbox to activate the roaming function. The nutrunner carries out a background scan for access points with the same access data and registers them in an internal list (Roaming Candidate List). The number of candidates is limited to eight. If the signal quality becomes to bad, the nutrunner switches to an access point on the list.
Setup	Set the parameters for the roaming behavior in **Setup**: – **Lowpass filter** Time in seconds after that the nutrunner changes the access point when a roaming condition occurs. This time prevents frequent changes if the signal is unstable. – **Quality indicator** Received power in [dBm] The minimum received power that an alternative access point needs to have to be used. – **Low rssi threshold** Received power in [dBm] If the received level falls short of this limit, the nutrunner starts roaming. The **Quality indicator** threshold should be greater than the **Low rssi threshold**. The difference between the two thresholds then indicates the required improvement in the received signal of the new access point compared to the existing access point. – **Low snr threshold** Minimum signal-to-noise ratio [dBm] that triggers roaming. – **Data retry threshold** Consecutive number [pcs] of lost data packages that triggers roaming. – **Num expected tbtt for bss loss** Consecutive number [pcs] of lost beacons that triggers roaming. – **Tx rate threshold** The (minimum) data rate [MBit/s] specified at the nutrunner (by the access point) that triggers roaming. – **Low quality for background scan** Received level in [dBm] If the received level falls short of this limit, the nutrunner increases its background scans for alternative access points. – **Normal quality for background scan** If the received level falls short of this limit, the nutrunner carries out normal background scans for alternative access points. If the received level exceeds this limit, the nutrunner does not carry out any background scans.
Roaming channel configuration	Supported as of Nexo firmware version 1100: The number of channels to be scanned can be limited. This leaves more time for other transmissions. The channel selection is based on the **Wireless mode** and **Regulatory domain** settings. The function is useful, if the user divided the usable channels and only channels 100 and 104 are available for tightening devices, for example. By limiting scans to these two channels, system availability can be increased.

9.8.11 Security

Settings → Encryption

Use this menu item to enable the HTTPS protocol.

Hypertext Transfer Protocol Secure (HTTPS) is a communication protocol in the World Wide Web used to protect data from interception during transmission. The HTTPS protocol is used to encrypt and authenticate the communication between the web server of the NEXO-OS and the web browser, e.g. Firefox.

The web server of the NEXO-OS is preset to HTTP port 80. When HTTPS is activated, the NEXO-OS web server is set to port 443.

Table 9–87: Security tab

Element	Description
Use HTTPS	Tick the checkbox to enable the HTTPS protocol. Please note: When HTTPS is used, the system will be significantly slower than with HTTP and warnings due to unsigned certificates may be displayed.
Save	Click this button to save the setting. The change will only become effective after the NEXO-OS web server has been restarted. In the displayed message, you can save the change and restart the web browser.
Discard	Click this button to discard the setting.

9.8.12 LED

Settings → LED

Use this menu item to specify the color and intensity of the tightening position illumination at the handheld nutrunner for different nutrunner states.

Table 9–88: LED tab

Element	Description
Active	Tick this check box to enable the following settings for the tightening position illumination (consisting of an illumination LED and a signal LED) at the handheld nutrunner.
Before tightening	Activate this check box in order to enable the tightening position illumination after the trigger mode and before the tightening process. – **Illumination LED** Intensity: Use the slider control to define the brightness of the illumination LED. – **Signal LED** RGB: Use the slider to define the color of the signal LED in the RGB color space (red, green, blue). – **Delay** Sets the delay between releasing the start switch and turning off the tightening position illumination. Values from 0 to 30 seconds are valid. – **Flashing cycle** Sets the flashing cycle of the tightening position illumination. – **Trigger mode** Start switch: The tightening position illumination is turned on by pressing the start switch.
During tightening	Activate this check box in order to enable the tightening position illumination during the tightening process. – **Illumination LED** Intensity: Use the slider control to define the brightness of the illumination LED. – **Signal LED** RGB: Use the slider to define the color of the signal LED in the RGB color space (red, green, blue). – **Delay** Sets the delay between releasing the start switch and turning off the tightening position illumination. Values from 0 to 30 seconds are valid. This setting is only applied for “Play at start switch”. – **Flashing cycle** Sets the flashing cycle of the tightening position illumination. This setting is only applied for “Play at start switch”.
OK result	Activate this check box in order to enable the tightening position illumination in an OK tightening process. – **Illumination LED** Intensity: Use the slider control to define the brightness of the illumination LED. – **Signal LED** RGB: Use the slider to define the color of the signal LED in the RGB color space (red, green, blue). – **Delay** Sets the delay between reception of the result and turning off the tightening position illumination. Values from 0 to 30 seconds are valid. – **Flashing cycle** Sets the flashing cycle of the tightening position illumination.

Table 9–88: LED tab

Element	Description
NOK result	Activate this check box in order to enable the tightening position illumination in a NOK tightening process. – **Illumination LED** Intensity: Use the slider control to define the brightness of the illumination LED. – **Signal LED** RGB: Use the slider to define the color of the signal LED in the RGB color space (red, green, blue). – **Delay** Sets the delay between reception of the result and turning off the tightening position illumination. Values from 0 to 30 seconds are valid. – **Flashing cycle** Sets the flashing cycle of the tightening position illumination.
System errors	Activate this check box in order to enable the tightening position illumination in case of a system error. – **Illumination LED** Intensity: Use the slider control to define the brightness of the illumination LED. – **Signal LED** RGB: Use the slider to define the color of the signal LED in the RGB color space (red, green, blue). – **Flashing cycle** Sets the flashing cycle of the tightening position illumination.
Save	Click **Save** to save the edited data.
Discard	Click **Discard** to discard the edited data.

9.8.13 ID assignment

Settings → ID assignment

The ASCII code can be linked to a tightening program or a job, i.e. when the code is read, the respective tightening program or the job starts. Specify the required settings in the ID assignment table.

Configure the respective operating mode in the **Mode** tab. Go to **ID code step** under **Target selection ID input** to specify that a tightening program or job is to be selected using the ID assignment table.

Table 9–89: ID assignment tab

Element	Description
ID assignment table	Use this menu item to change the ID assignment table. – **ASCII** Enter the ASCII characters of the code to select a tightening program or job. – **Program** Enable the checkbox to activate the tightening program. – **Job** Enable the checkbox to activate the job. – **No.** Enter the number of the tightening program or job. Integer values between 0 and 255 are valid characters. – **Comments** Enter a comment.
Add	Adds a new entry in the assignment table.
Remove	Deletes an entry from the assignment table.
Save	Click **Save** to save the edited data.
Discard	Click **Discard** to discard the edited data.
Import	Opens the **Import** dialog. Select the file to be imported.
Export	Exports the current settings to the download area.
Restore defaults	All settings in this tab are reset to the factory setting.

9.8.14 Scanner

Settings → Scanner

Use this menu item to define the configuration of the scanner integrated into the hand-held nutrunner.

Settings → Scanner → Scanner configuration

Table 9–90: Scanner tab - scanner configuration

Element	Description
Active	Enable the checkbox to activate the barcode scanner.
Barcodes	For an overview of the supported barcodes, see table 9–91. There are several options for the length of the corresponding barcode: – **L1** Entry of a fix length, e.g. „L1=12“ – **L1**;**L2** Entry of 2 fixed lengths, e.g. “L1=16;L2=8” – **L1-L2** Entry of a length range, e.g. „L1=3–L2=9“ – **Any** No length restriction
Save	Click **Save** to save the edited data.
Discard	Click **Discard** to discard the edited data.

Table 9–91: Supported barcode types

Barcode type	Length	Option
Code 128		UCC/EAN128 ISBT 128
Code 39	– L1 – L1;L2 – L1-L2 – Any	Trioptic Code Convert to Code 32 (Italian Pharma Code) Code 32 Prefix Check Digit Verification Transmit Digit Verification Full ASCII
Code 93	– L1 – L1;L2 – L1-L2 – Any	
Code 11	– L1 – L1;L2 – L1-L2 – Any	Check Digit Verification Transmit Digit Verification
Interleaved 2 of 5	– L1 – L1;L2 – L1-L2 – Any	Check Digit Verification Check Digit 2 of 5 to EAN-13
Codebar	– L1 – L1;L2 – L1-L2 – Any	CLSI Editing NOTIS Editing
MSI	– L1 – L1;L2 – L1-L2 – Any	Check Digit Transmit Check Digit Check Digit Algorithm

9.8.15 Defaults

Settings → Defaults

Under this menu item, all settings of the Nexo cordless Wi-Fi nutrunner can be reset to default.

Table 9–92: Defaults index card

Element	Description
Basic settings	Click **Basic settings** to reset all settings to default.
Discard	Click **Discard** to discard the edited data.

9.8.16 Backup/Restore

Settings → Backup/Restore

Use the **Export** function to generate backup copies and save them to a data carrier or to the NX-SD Micro SD card inserted in the nutrunner. In addition to the current nutrunner configuration (settings in **Settings → Configuration**) all settings and programs will be saved.

Table 9–93: Backup/Restore tab - export

Element	Description
Export to file	Save data to a data carrier. The ***.cfg** filename extension cannot be changed. Assign a unique file name to be able to distinguish the files.
Export to NX-SD card	Save data to the NX-SD Micro SD card inserted in the nutrunner.

Use the **Import** function to import selected data from a backup copy.

As of Nexo firmware version 1100, the configurations to be imported can be selected from a list.

Table 9–94: Backup/Restore tab - import

Element	Description
Select local *.nxcfg file	Load stored data from a file.
Select *.nxcfg file from NX-SD card	Load stored data from the NX-SD Micro SD card inserted in the nutrunner.

9.9 Diagnosis

The **Diagnosis** menu contains the following menu items:

- System information (page 241)
- Event viewer (page 241)
- Log book (page 242)
- Status (page 242)
- System errors (page 242)
- Web server log (page 243)
- Screenshot (page 243)
- Network (page 243)
- Export logs (page 244)

By default, some menu items will not be displayed. Set the display of menu items in the user administration (**User accounts** → **Rights**).

9.9.1 System information

Diagnosis → **System information**

Use this menu item to display information about the hardware and software of the Nexo cordless Wi-Fi nutrunner:

- **Hardware**

  Information about the hardware: Name, platform and IP address
- **Software**

  Information about the operating system version

Table 9–95: System information tab

Element	Description
Refresh	Updates the display of the entries.

9.9.2 Event viewer

Diagnosis → **Event viewer**

Under this menu item, the entries of the system-internal logging mechanism are displayed.

Table 9–96: Event viewer tab

Element	Description
Refresh	Updates the display of the entries.

9.9.3 Log book

Diagnosis → Log book

With this menu item the latest changes to the operating system can be displayed. This display is limited to 500 entries. The log book is set up as a ring memory, a new entry always overwrites the oldest one.

Table 9–97: Log book tab

Element	Description
Refresh	Updates the display of the entries.
Clear all	Deletes all entries.

9.9.4 Status

Diagnosis → Status

Here, the states of all critical system components are displayed. If the values of **Requested** and **Current** are set to “1”, no check is required. If the value in **Current** is “0”, the component has to be checked and the system is not ready. In this case, the PLC signal ***Rdy*** is “0”. If all target states are met, the PLC signal ***Rdy*** is “1”.

Table 9–98: Status tab

Element	Description
Request	Click **Request** to update the error list, which requires a connection to the operating system (there is no permanent automatic update function).

9.9.5 System errors

Diagnosis → System errors

Use this menu item to display the error list.

- **Error list** tab

  List of errors that occurred
- **Statistics** tab

  List of all errors of the error list concerned, sorted by their frequency

The **Error list** tab provides the following information:

Table 9–99: Error list tab

Element	Description
ID	Consecutive number of the error
Date	Date and time of the error
Code	Error code (internal)
Description	Describes the error type, see (page 254).
Class	Error class
Ack	With class 1 and 4 errors, this indicates whether the error still exists (0 = errors exists, not acknowledged). With class 3 and 5 errors, this indicates whether an error was confirmed (= acknowledged) (1 = acknowledged, 0 = not acknowledged).
Refresh	Click **Request** to update the error list, which requires a connection to the operating system (there is no permanent automatic update function).
Clear all	Click **Delete** to delete the error list.
Acknowledge	Click **Acknowledge** to confirm that you have noted an error of error class 3.

The **Statistics** tab provides the following information:

Table 9–100: Statistics tab

Element	Description
Quote	Frequency of errors that occurred
Code	Error code (internal)
Description	Describes the error type

9.9.6 Web server log

Diagnosis → Web server log

Use this menu item to display errors of the NEXO-OS web browser.

Table 9–101: Web server log tab

Element	Description
Detail	Displays detailed information on the error.
Refresh	Updates the display of the entries.
Clear all	Deletes all entries.

9.9.7 Screenshot

Diagnosis → Screenshot

Use this menu item to create a screenshot of the tool display.

Table 9–102: Screenshot tab

Element	Description
Refresh	Updates the tool display in the NEXO-OS.
Save	Click this button to save the screenshot of the tool display.

9.9.8 Network

Using the following menu items, you can carry out network diagnosis:

- WLAN (page 243)
- Ping (page 244)
- TCP data (page 244)
- Find clients (page 244)

9.9.8.1 WLAN

Diagnosis → Network → WLAN

If errors in the WLAN area are suspected, this menu item shows the respective information.

Table 9–103: WLAN tab

Element	Description
Refresh	Updates the display.

9.9.8.2 Ping

Diagnosis → Network → Ping

Under this menu item, the availability of specific clients in the IP network can be checked.

Table 9–104: Ping index card

Element	Description
Ping	Under **Ping**, enter the IP address of the client the availability of which is to be checked.
Display output	Enable the check box to display the data packages transmitted between the target address and the sender.
Start	Click **Start** to start the test.
Stop	Click **Stop** to stop the test.
Delete	Click **Delete** to delete the test.

9.9.8.3 TCP data

Diagnosis → Network → TCP data

Under this menu item, the network traffic of Open Protocol can be analyzed.

Table 9–105: TCP data index card

Element	Description
TCP data	Under TCP data, select the entry **Open Protocol**.
Recording time	Select a time period for evaluation of network traffic.
Start	Click **Start** to start the evaluation.
Stop	Click **Stop** to stop the evaluation.
Delete	Click **Delete** to delete the evaluation.
Export	Click **Export** to export the result of the evaluation to the download panel (file ***.cap**). For example, the evaluation may be analyzed with Wireshark.

9.9.8.4 Find clients

Diagnosis → Network → Search clients

Under this menu item, additional clients in the same subnetwork can be searched.

The found clients are displayed in the bottom panel of the index card.

Table 9–106: Search clients index card

Element	Description
Network	Under **Network**, enter the first three bytes of the network, i.e. xxx.xxx.xxx, (xxx = 0 - 255).
Start address / Stop address	Last byte for the search range. The clients in the address range between **Start address** and **Stop address** are searched.
Start	Click **Start** to start the search.
Stop	Click **Stop** to stop the search.

9.9.9 Export logs

Diagnosis → Export log

Use this menu item to generate a diagnostic report and save it to a data carrier or to the NX-SD Micro SD card inserted in the nutrunner. In case of an error, send this diagnostic report to the Rexroth service.

Table 9–107: Export tab

Element	Description
Export to file	Use this button to save data to a data carrier. The *.zip file extension cannot be changed. Assign a unique file name to be able to distinguish the files.
Export to NX-SD card	Save data to the NX-SD Micro SD card inserted in the nutrunner. Only possible if a NX-SD Micro SD card is inserted in the nutrunner.

9.10 Help menu

If a NX-SD Micro SD card is inserted into the Nexo cordless Wi-Fi nutrunner, use the **Help** menu to access the Micro SD card as well as documentations and license information.

Help → Access to NX-SD card

Table 9–108: Help menu - access to NX-SD card

Element	Description
Screen	Use this button to open the selected folder or data.
Download	With this button you can download the selected data.
Upload	Use this button to save data to the NX-SD Micro SD card.
Refresh	With this button, the screen is refreshed.

Help → Documentation

Table 9–109: Help menu - documentation

Element	Description
Screen	Use this button to open the selected document.
Download	Use this button to download the selected document.

10 Tightening processes

This chapter describes the tightening processes for the Nexo cordless Wi-Fi nutrunner that are the most essential ones in tightening technology.

10.1 Overview

The sections below describe the tightening processes that are presently the most essential ones in tightening technology. The tightening program steps described in chapter Operating system NEXO-OS (see page 173) are used to program all standard tightening processes as well as special tightening processes.

Standard tightening processes include:

- Torque-controlled tightening process (see page 249)
- Angle-of-turn-controlled tightening process (see page 250)

In addition to standard tightening processes, it is also possible to program special tightening processes. They are characterized by:

- A combination of various standard processes
- Execution of defined tightening cycles (multi-step tightening processes) to adjust the tightening process to the tightening operation (e.g. speed adjustment)

Special tightening processes include:

- Loosening/retightening processes
- Self-tapping tightening processes
- Tightening of stop nuts/squeeze lock nuts

10.2 Torque-controlled tightening process

Torque is the most easily accessible measured variable in tightening technology, which is why this tightening process is easy to handle. It controls the torque and monitors the angle of turn.

The torque-controlled tightening process offers the following advantages:

- Easily accessible measurement variable (= torque)
- Use of standard bolts
- Reusability of bolts (bolts are only deformed in the elastic range)

The torque is directly measured at the bolt while the tightening process is in progress and recorded by the measurement transducer on the tightening spindle.

Function

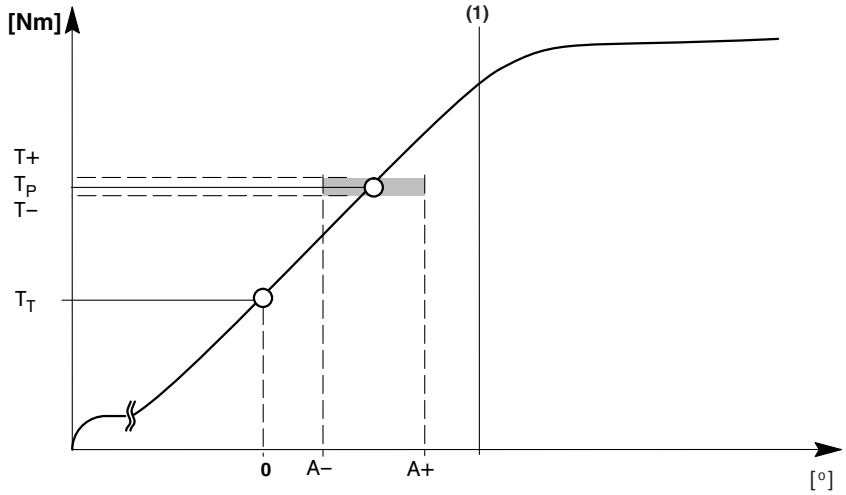


Fig. 10–1: T = f (A), torque-controlled, angle of turn-monitored tightening process

(1) Angle safety limit

Once the bolt head is flush, the torque increases, exceeds the torque threshold TT which starts counting of the angle of turn, and reaches the target parameter TP which is the point when the tightening process is ended. The torque threshold TT should be at the beginning of the linear increase of the tightening graph (as the joining processes of the tightening parts are almost complete here).

Angle of turn monitoring (A–, A+)[1] is used for error recognition. Angle of turn monitoring is to advantage in that it helps to detect:

- Batch jumps in bolts and components
- Over-twisting of threads via a measurable increase in the angle of turn
- Incompletely cut threads

Application

The torque-controlled tightening process is mainly used for:

- Transmission assembly
- Wheel assembly
- Exhaust manifold assembly

1. The limit values (A–, A+) should be defined by statistical evaluation (≥ 50 tightening operations). Too small tolerance limits result in a high number of NOK tightening cases; too large tolerance limits impair fault recognition.

10.3 Angle-of-turn-controlled tightening process

This process controls the angle of turn and monitors the torque. It permanently deforms the bolt.

The angle-of-turn-controlled tightening process offers the following advantages:

- Minimization of the dispersion of the mounting clamp force, i.e. the tightening factor is[1] close to 1
- A particularly high bolted connection strength can be attained

The angle of turn is registered in the measurement transducer.

Function

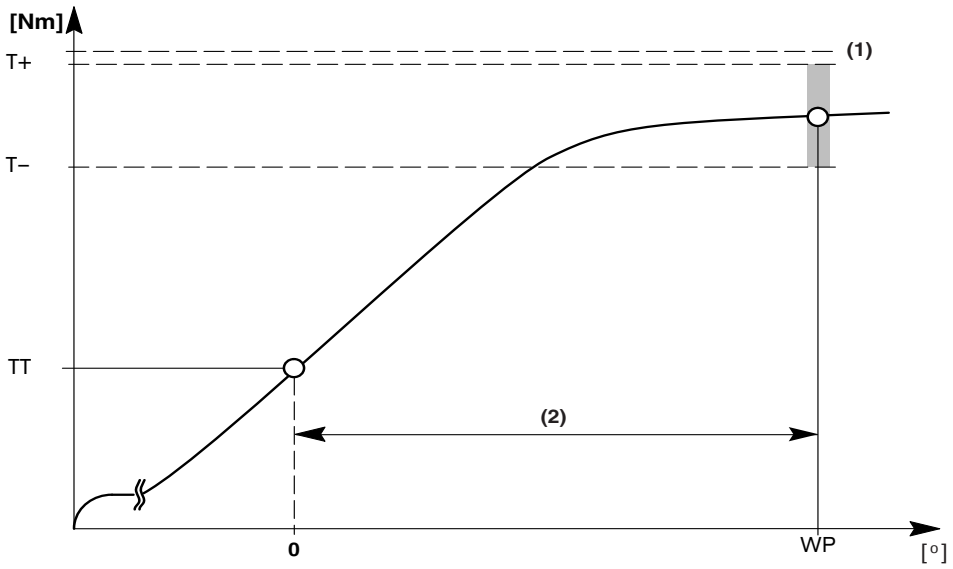


Fig. 10–2: T = f (A), angle-of-turn-controlled, torque-monitored tightening process

(1) Angle safety limit
(2) Tightening angle

Once the bolt head is flush, the torque increases until it reaches the torque threshold TT (torque-controlled). TT should be at the beginning of the linear increase of the tightening graph (as the joining processes of the tightening parts are almost complete here). From the torque threshold TT, rotation continues at a defined angle of turn (tightening angle) until the target parameter AP is reached.

Torque monitoring (T–, T+)[2] is used for error recognition. It is to advantage in that it detects:

- Batch jumps in bolts and components
- Defective bolts and components

In this process, the bolt is stretched beyond its yield point and into the range of elastic deformation. Since the constriction of the cross-section is permanent, the bolts can be reused to a limited degree only. This is why special bolts with sufficient deformation characteristics (e.g. stretch-shank bolts) should be used in this process.

1. Tightening factor = F_{Mmax} / F_{Mmin} = dispersion of the mounting clamp force (clamp force).
2. Limit values (T–, T+) should be defined via statistical evaluation (50 tightening operations). Tolerance limits that are too low result in a high number of NOK tightening cases; tolerance limits that are too high impair error recognition.

11 Troubleshooting

This chapter describes errors which can occur when working with the Nexo cordless Wi-Fi nutrunner and provides troubleshooting advice.

11.1 Error codes and classes

11.1.1 Overview

Errors in the Nexo cordless Wi-Fi nutrunner are displayed via:

- The graphical display on the Nexo cordless Wi-Fi nutrunner
- The NEXO-OS operating system of the Nexo cordless Wi-Fi nutrunner
- PLC control signals

All errors that have occurred must always be acknowledged after their cause has been remedied, in order to bring the nutrunner back into working order. Errors are acknowledged via:

- Error list in the NEXO-OS operating system (see page 253)
- Switching the nutrunner off/on (note: after having removed the slide-in battery pack, wait for approx. 20 seconds before reinserting the pack)
- Control signals
- Self-acknowledgement (applies only to error class 4)

For a detailed description of the control signals, refer to chapter Control signals from page 73.

11.1.2 Error code assignment table

A list with error codes and the relevant error texts are supplied in PDF format. All error codes can also be found in the error list (see Complete error list from page 254).

The error code assignment table has the following structure:

Table 11–1: Description of the error code assignment table

Column heading	Description
Error code	Unique error number
Description	Error text, some entries with information on the components affected, e.g.:

11.1.3 Error classes

Errors in the Nexo cordless Wi-Fi nutrunner are classified as follows:

Table 11–2: Error classes

Error class	Error type	Remedy
0*	System message (no error), e.g. test interval reached.	Remedy not required
1	This error class signals that a serious error has occurred; the nutrunner is no longer ready for operation, i.e. a tightening operation is not possible. This error can be caused by, e.g.: – Missing configuration – Failure of hardware components	The nutrunner can only be made ready for operation with the help of the user, e.g. by: – Sending the correct configuration – Removing the slide-in battery pack, waiting for 20 seconds, inserting the slide-in battery pack – Reset – Replacement of hardware components
3	This error class signals a malfunction in the nutrunner. The nutrunner is temporarily not ready for operation until the error is acknowledged.	Acknowledgement of the error via the electronic interfaces: – PLC signals – Error list in the NEXO-OS operating system of the cordless Wi-Fi nutrunner
4	This error class signals a malfunction in the nutrunner; however, the error is acknowledged by the nutrunner itself after the cause has been remedied, e.g. temperature error.	Self-acknowledgement of the error by the nutrunner

*. Errors of class 0 are not displayed by the communication partner for the Open Protocol (see „Rexroth Open Protocol" ab Seite 93), which is called "Open Interface".

11.2 Detecting and acknowledging errors with the NEXO-OS operating system

The **Diagnosis** menu of the NEXO-OS operating system features a number of diagnostic options.

11.2.1 Error lists

In order to quickly and easily pinpoint the cause of an error, the respective data from the tightening system are written to error lists. The tightening system thus demonstrably logs hardware and software errors, configuration errors, malfunctions etc.

This display is limited to 512 entries. The error list is set up as a ring memory, a new entry always overwrites the oldest one.

The **Diagnosis** → **System errors** menu item shows information on error states on the **Error list** tab, see section System errors on page 242.

The **Statistics** tab outputs all errors of the particular error list sorted by their frequency, see section System errors on page 242.

11.2.2 WLAN errors

If errors in the WLAN area are suspected, the **Settings** → **WLAN** menu item shows information about the hardware and the connections of the access point.

Please also note the LEDs at the access point, see operating instructions.

11.3 Complete error list

If no improvement is achieved after the recommended solutions, the nutrunner is to be returned with exact information for repair to Rexroth Service. Before dispatch, contact Rexroth Service (see page 261).

Table 11–3: Error description

Error code	Error class	Description	Possible cause/consequence	Suggested solution
1	3	Timeout in tightening mode	Communication via integrated controller to the servo amplifier is outside the admissible time window during the tightening. – System is overloaded by other processes (results output, ...) – Servo amplifier defective	⇒ Repeat tightening ⇒ Update firmware
2	4	Timeout in service mode	Communication via integrated controller to the servo amplifier is outside the admissible time window outside of tightening. – System is overloaded by other processes (results output, ...) – Servo amplifier defective	⇒ Reboot nutrunner ⇒ Update firmware
10	3	Servo amplifier hardware fault	Servo amplifier defective	
11	4	Battery overtemperature	Temperature of the battery pack slide-in module	⇒ Let slide-in battery pack cool down or replace it ⇒ Adjust tightening and break time (cycle time) ⇒ Check ambient temperature
12	4	Overtemperature at the servo amplifier	Servo amplifier temperature	⇒ Let servo amplifier cool down ⇒ Adjust tightening and break time (cycle time) ⇒ Check ambient temperature
13	4	Servo amplifier – communication error		⇒ Reboot nutrunner
14	4	Servo amplifier – service error	Start and R/L switch state cannot be read	⇒ Reboot nutrunner
15	4	Servo amplifier – incorrect input voltage	Slide-in battery pack defective	⇒ Replace slide-in battery pack
100	0	Tightening program not available	A tightening program selected for execution cannot be found in the nutrunner memory.	⇒ Generate tightening program ⇒ Check tightening program selection
101	1	Gauge bar type label cannot be read – check plug-in connection	The gauge bar type label cannot be read.	⇒ Reboot nutrunner
102	1	Gauge bar type label check sum error	The electronic type label read by the gauge bar does not comply with the value stored in the check sum.	⇒ Reboot nutrunner ⇒ Update firmware
103	1	Results management access error	The internal database is not ready for access.	⇒ Reboot nutrunner ⇒ Update firmware
104	1	No communication with measuring unit	Communication for measurement recognition not possible.	⇒ Reboot nutrunner ⇒ Update firmware
105	1	The gauge bar calibration table cannot be read	The gauge bar calibration table cannot be read.	⇒ Reboot nutrunner
106	1	Cycle counter cannot be read	The cycle counter cannot be read by the internal memory.	⇒ Reboot nutrunner ⇒ Update firmware
107	3	Invalid tightening program	The program file loaded from the internal memory cannot be read.	⇒ Create new or import tightening program again
108	3	Timeout in tightening mode	No measurement was received in the admissible time window. – System is overloaded by other processes (results output, ...)	⇒ Repeat tightening ⇒ Update firmware

Table 11–3: Error description

Error code	Error class	Description	Possible cause/consequence	Suggested solution
109	3	Gauge bar status error	Too many incorrect measurements received from gauge bar.	⇒ Repeat tightening ⇒ Update firmware
110	3	Battery was disconnected during tightening process	The nutrunner detects the loss of supply voltage during tightening.	⇒ Replace slide-in battery pack ⇒ Check the tightening case: The power consumption may be too high ⇒ Reboot nutrunner
111	3	Spindle overload	The recorded torque exceeds the maximum admissible torque (Nominal torque +10%).	⇒ Analyze the tightening case and check the tightening program
112	3	Measurement reading timeout	No valid measurement was received in the admissible time window.	
113	4	Servo amplifier offline	Communication with servo amplifier not possible.	⇒ Reboot nutrunner ⇒ Update firmware
200	1	PLC table could not be read	The PLC table cannot be read by the internal memory.	⇒ Reboot nutrunner ⇒ Update firmware
201	1	Initialization of PLC interface failed	The PLC table cannot be read by the internal memory.	⇒ Reboot nutrunner ⇒ Update firmware
202	1	PLC interface data error	The PLC table cannot be read by the internal memory.	⇒ Reboot nutrunner ⇒ Update firmware
300	4	NX-SD card was removed	The NX-SD card was removed while data output configured to NX-SD card or is not available.	⇒ Insert the NX-SD card again or deactivate the function accessing it (e.g. results output) ⇒ Reboot nutrunner
301	1	Initialization of results data failed	The results database in the internal memory could not be initialized.	⇒ Reboot nutrunner ⇒ Rollback to previous firmware version or delete database (as of V1100)
303	4	Result storage full	The internal result storage is full. No more results can be stored. This may be the case if the data of data services like FTP is not removed.	⇒ Activate ring memory, increase admissible results data records or delete database (as of V1100)
304	4	NX-SD card memory full	The memory of the NX-SD card is full. No more results can be stored.	⇒ Replace the NX-SD card ⇒ Reboot nutrunner
307	1	Faulty results data storage	The result storage cannot be read.	⇒ Delete database (as of V1100)
400	1	Type label check sum error	The electronic type label read by the internal nutrunner memory does not comply with the value stored in the check sum.	⇒ Reboot nutrunner ⇒ Update firmware
401	4	Motor overtemperature	Too high motor temperature or faulty reading process.	⇒ Let motor cool down ⇒ Update firmware
402	0	Nexo test interval reached	The internally set test interval was reached.	⇒ Set the test interval
403	4	Critical battery capacity	Insufficient battery capacity or faulty reading process.	⇒ Replace slide-in battery pack ⇒ Update firmware
404	1	File system error	The internal file system has detected a memory error. This may be the case after a firmware update.	⇒ Reboot nutrunner ⇒ Update firmware
405	3	Firmware update error	An error occurred during a firmware update.	⇒ Update firmware or execute rollback from V1100 to the previous version. If necessary, update the servo amplifier individually in service mode.
406	4	Control unit overtemperature		
407	3	Servo amplifier – update error		
600	1	Initialization of WLAN interface failed	An error occurred during initialization of the WLAN configuration at the Nexo.	⇒ Repeat WLAN configuration ⇒ Reboot nutrunner

Table 11–3: Error description

Error code	Error class	Description	Possible cause/consequence	Suggested solution
601	4	WLAN configuration read error	The WLAN configuration cannot be read by the internal memory.	⇒ Reboot nutrunner ⇒ Repeat WLAN configuration ⇒ Reset the WLAN settings to default in NEXO-OS ⇒ Update firmware
700	1	Open Protocol: Incomplete program selection	Incorrect initialization of program selection bits.	⇒ Apply all program selection bits to the Open Protocol PLC interface or remove them
701	3	Open Protocol: Incorrect configuration	The Open Protocol configuration cannot be read by the internal memory.	⇒ Reboot nutrunner ⇒ Repeat Open Protocol configuration in NEXO-OS ⇒ Reset the Open Protocol settings to default in NEXO-OS ⇒ Update firmware
702	0	Open Protocol: Blocking failed		
800	1	Job: Initialization error	The mode file read by the internal memory cannot be read.	⇒ Create or import the mode again ⇒ Use backup
801	3	Job: Job number not available	A job selected for execution cannot be found in the nutrunner memory.	⇒ Create the job again or check job selection
802	1	Job: Execution error	The job file read by the internal memory cannot be read.	⇒ Create or import the job again ⇒ Use backup

11.4 Replacing defective components

⚠ WARNING

Improper performance of service work

Improper performance of service work may result in personal injury, damage to components and jeopardization of the tightening system.

- ▶ Ensure that service work is always carried out by qualified personnel having the required expert knowledge and tools to implement the work required. Rexroth recommends that you call the Rexroth Service if service work is required. Service by qualified personnel is particularly essential with safety-relevant works and works on safety-relevant systems.

Components and cables may only be replaced in de-energized condition.

11.5 Shortening of power supply on battery change

In case of battery change, the power supply of the integrated controller is maintained for 20 seconds. This is shortened (< 20 seconds) in the following cases:

- High data traffic via WLAN (< 10 seconds).
- Slide-in battery pack has been disconnected several times in succession.
- Increased operating time of integrated power supply.
- Defective internal power supply.

12 License agreement

The software of the Nexo cordless Wi-Fi nutrunner contains third party software. For the license conditions of the used software, click on the ? symbol in the navigation panel of the NEXO-OS.

Use the “Access to NX-SD card” menu item to open an Explorer window. The licenses can be found in the directories “licenses” and “sourcecode”.

13 Service and sales

13.1 Service

We are always the right partner when it comes to system know-how.

For any problem: Service from Rexroth

- You can reach us around the clock at:
  +49 9352 40 50 60
- Or contact us by email:
  service.svc@boschrexroth.de

Worldwide service

Our global service network can be reached at any time in over 40 countries. You can find detailed information on our service locations in Germany and worldwide on the Internet at:

www.boschrexroth.com/service-405060

Information preparation

We will be able to help you quickly and efficiently if you have the following information ready:

- Detailed description of the malfunction and conditions
- Information on the name plate of the affected product, particularly the material and serial numbers
- Telephone/fax numbers and email address where we can reach you if we have any questions.

13.2 Sales

Bosch Rexroth AG
Electric Drives and Controls

Post box 13 57
97803 Lohr, Germany

Bgm.-Dr.-Nebel-Str. 2
97816 Lohr, Germany

You can contact us

- By telephone
  +49 9352 18 0
- By fax
  +49 9352 18 8400
- By email
  schraubtechnik@boschrexroth.de

13.3 Internet

Information on Rexroth tightening technology can be found at

www.boschrexroth.com/electrics

Additional information on service, repair and training, as well as the current addresses of our sales offices can be found at

www.boschrexroth.com

If you are located outside of Germany, please contact your nearest Rexroth partner.

The Drive & Control Company

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Bosch Group

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