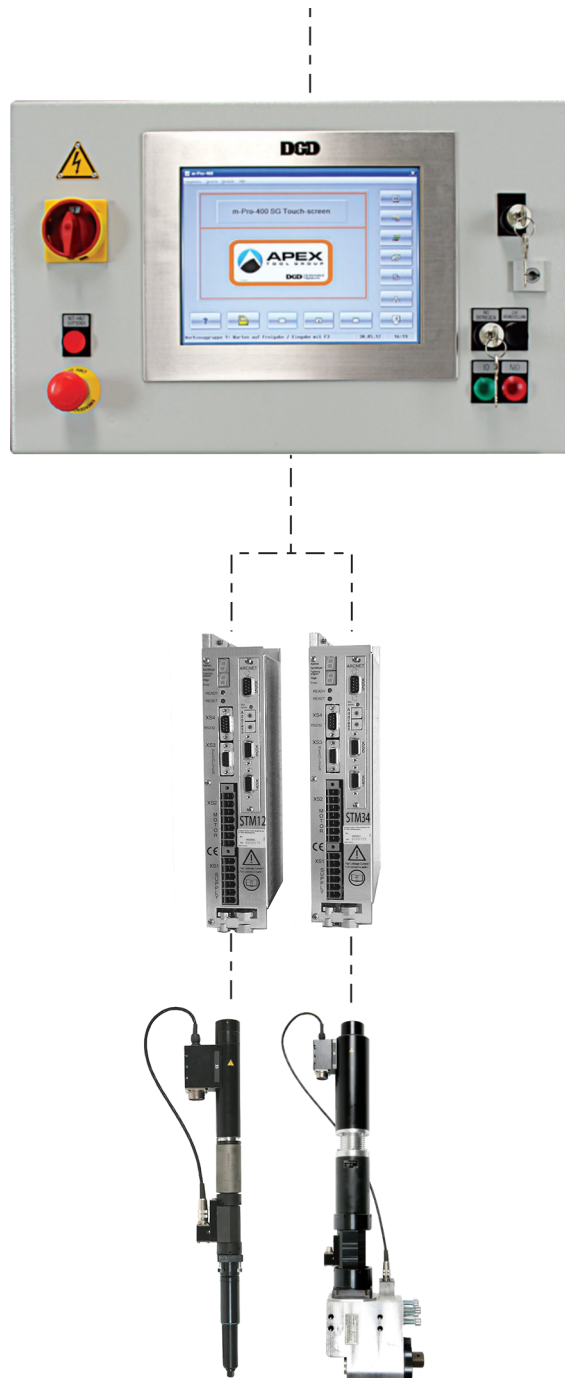


Modular Fastening System

Serie BB



About this system handbook

This is the – translation of the original system handbook – and

- provides important information on safe, correct and efficient operation of the system.
- describes the function and operation of the components.
- serves as a lexicon for technical data.
- It points out options.

Secondary information

| | |
|------------------------|--|
| P1672E | Spare parts sheet Tightening module |
| P1709K | Spare parts sheet Transducer |
| P1710A, P1911E, P1912E | Spare parts sheet Attachment |
| P1731GE | Spare parts sheet Gearing |
| P1758M | Spare parts sheet Motor |
| P1792E | Operator information Nutsetter control unit mPro400... |
| P2055MA | Assembly instructions DGD-Built-in-nutrunner |
| P2090WA | Service manual DGD-Built-in-nutrunner |
| P2102JH | Cable Management Reference Guide |

Symbols in text

| | |
|----------------|---|
| → | Identifies instructions to be followed. |
| • | Identifies lists. |
| <i>italics</i> | Indicates menu items such as <i>Diagnostics</i> in software descriptions |
| <...> | Identifies elements that have to be selected or deselected, such as buttons or control boxes, e.g. <F5> |
| Courier | Indicates the name of paths and files, e.g. setup.exe |
| \ | A backslash between two names indicates the selection of an item from the menu, e.g. file \ print |

Symbols in graphics

| | |
|---|-------------------------------------|
| ← | Identifies movement in a direction. |
| ↓ | Identifies function and force. |

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1 Safety

1.1 Warnings and notes

DANGER!



A symbol combined with the word **DANGER** warns of an **impending health risk** or risk of fatal injury to personnel. If this danger note is not adhered to, severest injury that may lead to the death of people, is the consequence.

WARNING!



A symbol combined with the word **WARNING** warns of a **potentially dangerous** situation for the health of personnel, which could result in death or serious injury if not avoided.

CAUTION!



A symbol combined with the word **CAUTION** warns of a **potentially harmful** situation for the health of personnel or damage to property or the environment. If this warning is not observed, injuries, property or environmental damage may occur.

ATTENTION!

This sign warns of a possibly damaging situation. If the note is not adhered to, the product or parts of it may be damaged.



This symbol indicates a **general** instruction. General instructions include application tips and special useful information, but no warnings against dangers.

1.2 Basic requirements for safe working practices

Take the fastening system into service only after you have read and completely understood the following safety instructions and this document. Failure to observe the instructions below may result in electric shock, fire and serious injuries.

WARNING!



High leakage current –
Fatal electric shock could occur!

- Always disconnect the power supply before performing maintenance work on the built-in nutrunner and the nutsetter control.
- Always disconnect the system cable, motor or motor cable from the nutsetter control or built-in nutrunner before making throughput, resistance and short circuit measurements.
- Do not attempt to repair possible faults on the fastening system by yourself if you do not have the required knowledge! Inform the local repair center or your Sales & Service Center.
- Establish a grounding connection (PE) to the nutrunner control before taking into operation!

CAUTION!



High temperature –
the motor on the built-in nutrunner may heat up and cause burns during removal.
(max. engine temperature 90 °C).

- Wear gloves.

WARNING!

Risk of flying parts.
 Components of the spindle may rotate, come loose and cause injury.
 → Avoid speed increases of over 328 ft/s² (100 m/s²) on all axes.

CAUTION! Work area

- Close all safety devices.
- Ensure that there is enough space in the work area.
- Keep the work area clean.

Electrical safety

- Do not operate the fastening system outdoors.
- Observe the safety notes on the built-in nutrunner.

Safe working with and around fastening tools

- Inspect screw bits and retaining ring for visible damage and cracks.
 Replace damaged parts immediately.
- Always disconnect the power supply to the built-in nutrunner before changing screw bits.
- Only use screw bits for machine-controlled fastening tools.
- Make sure that the screw bits are retained securely.

- ➡ We do not claim that these safety notes are complete. Read and observe all applicable, general and local safety and accident prevention rules.
- ➡ Follow a safety-conscious maintenance program which takes into account the local regulations for maintenance and servicing in all phases of operation of the fastening electronics.

1.3 Operator training

- The fastening system may only be operated by personnel that have been trained and instructed correspondingly and authorized by the operator.
- The fastening system may only be maintained and serviced by personnel instructed by qualified staff from Apex Tool Group.
- The operator must make sure that all new operating and maintenance personnel are instructed in the operation and maintenance of the fastening system to the same extent and with the same care and attention.
- Personnel who are being trained may work on the fastening system only under the supervision of an experienced operator.

1.4 Personal protective equipment

When working



Danger of injury by being wound up in and caught by machinery

- Do not wear gloves.
- Wear close-fitting clothing.
- Wear a hairnet, if necessary.
- Do not wear jewelry.



Risk of injury due to metal splinters flying around

- Wear protective goggles.

1.5 Intended use

The owner is responsible for using the machine according to its designated use.

The fastening system may be used only under the following conditions:

- Do not operate the fastening system outdoors.
- Industrial environment EMC limit class value A, DIN EN 550081-2.
- The built-in nutrunner is designed for stationary operation only and is intended exclusively for fastening and loosening thread connections. Do not use as a hand-held tool.
- Use the built-in nutrunner only in combination with a nutsetter control unit from Apex Tool Group.
- The built-in nutrunner must be fully assembled. Insert and lock all connecting cables.
- Secure the built-in nutrunner to an electro conductive mounting plate.
- Only cable types and accessory parts approved by Apex Tool Group may be used.
- Unauthorized alterations, repairs and modifications are prohibited for reasons of safety and product liability.

1.6 Ambient conditions

Do not operate the fastening system in an explosive atmosphere

| System components | Enclosure type according to DIN 40050 | Ambient temperature | Relative humidity | Working height |
|-------------------------------|---------------------------------------|-----------------------------|---------------------------|------------------------------|
| Built-in nutsetter | IP40 | 32 to 113 °F (0...45 °C) | 0 to 90 % no condensation | Up to 3000 m above sea level |
| Motor | IP54 | | | |
| Gear | IP40 | | | |
| Transducer | IP40 | | | |
| Attachment | IP40 | | | |
| Nutrunner control | IP54 | 32 to 158 °F 0...70 °C | | |
| Station controller mPro400... | IP54 ¹⁾ | | | |
| STM12/34 | IP20 | | | |

1) Observe Derating

1.7 EMC

- The tool complies with the following applicable EMC standards:
 - DIN EN 61 000-3-2
 - DIN EN 61 000-3-3
 - DIN EN 61 000-6-2
 - DIN EN 61 000-6-4
- The filters required to fulfill the EMC standards are integrated in the system components.
- Shielded cables offer protection against irradiating and radiating interference.
- All cable shields are connected to the shield terminals on the nutsetter control unit and the plug casing on the built-in nutrunner.



Equipment from EMC limit class value A, DIN EN 550081-2.

This equipment may cause radio interference in residential areas. Should this occur, you may request that the operator pay for and implement relevant EMC measures.

1.8 Noise

| Built-in nutrunner | dB(A) |
|--------------------|-------|
| 1BB... | 51 |
| 2BB... | 60 |
| 3BB... | 56 |
| 4BB... | 60 |

Measured sound pressure level at idling speed (no load) / clockwise rotation in accordance with ISO 3744.

2 Transport / Storage

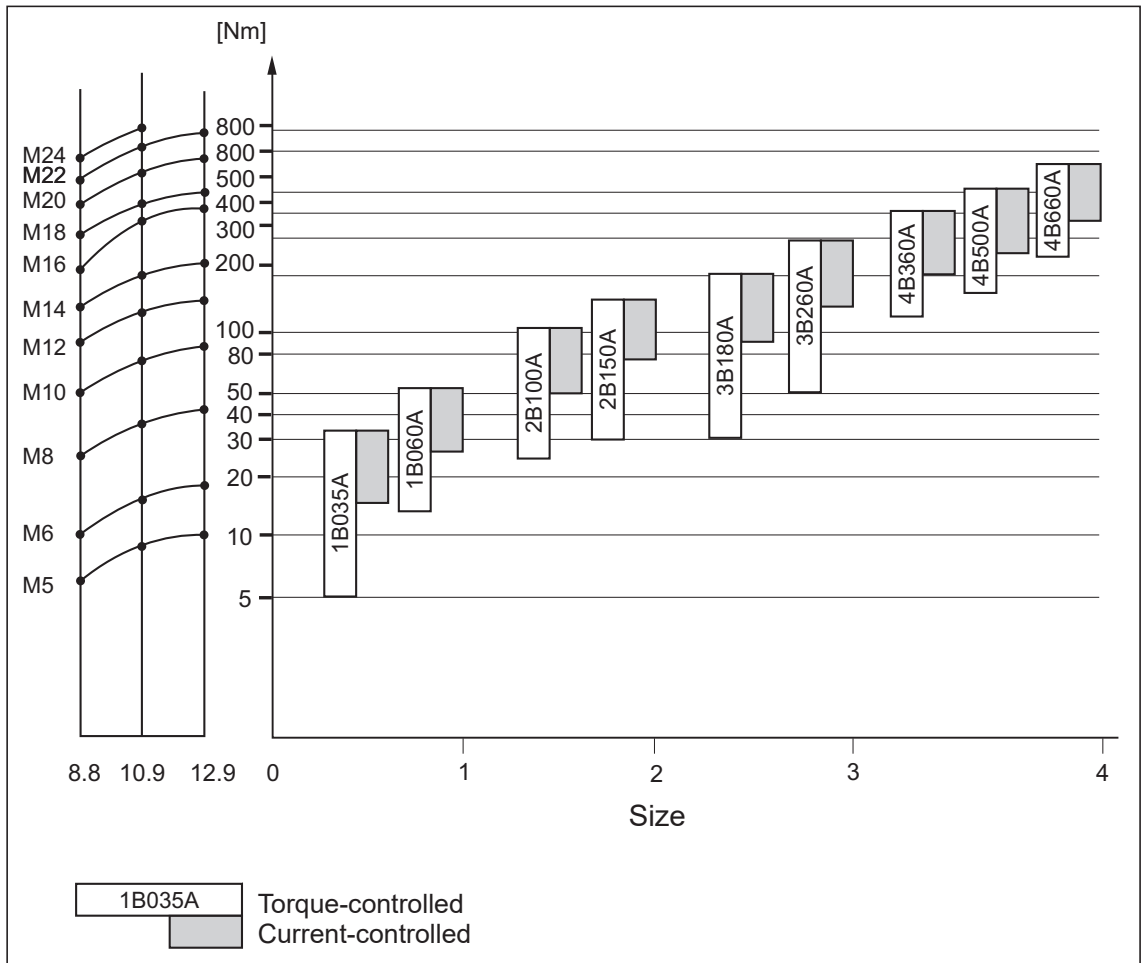
Transport only in the original packing. If the package is damaged, check the part for visible damage. Inform the carrier or Sales & Service Center, if necessary.

| System components | Storage temperature | Relative humidity |
|--------------------|---------------------|---------------------------|
| Built-in nutrunner | -20 to 70 °C | 0 to 90 % no condensation |
| Nutrunner control | -20 to 70 °C | 0 to 90 % no condensation |
| STM12/34 | -20 to 70 °C | 0 to 90 % no condensation |
| Motor | -20 to 70 °C | 0 to 90 % no condensation |

3 System and Nutsetter Overview

3.1 Overview

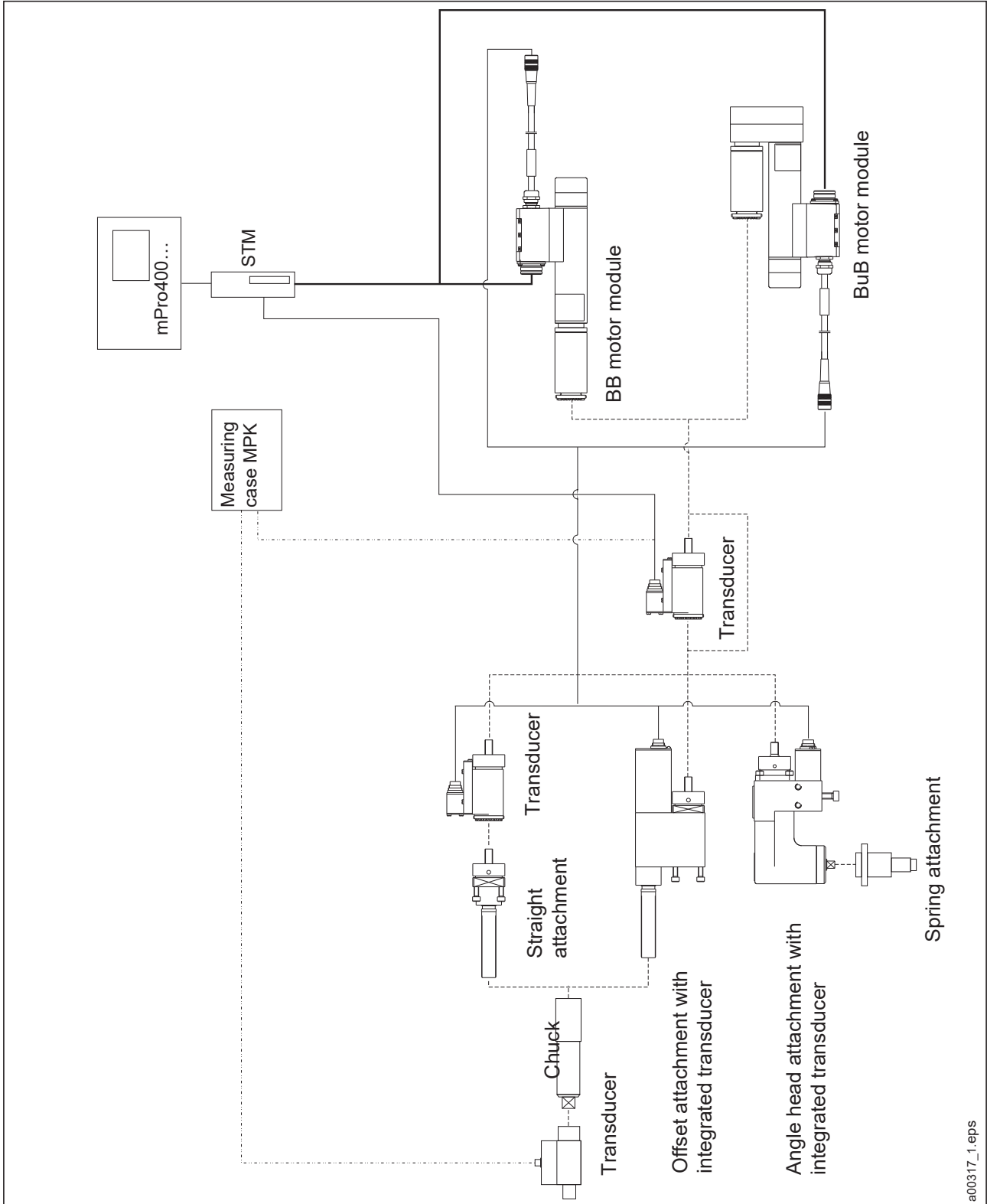
3.1.1 Nutsetter Selection Help



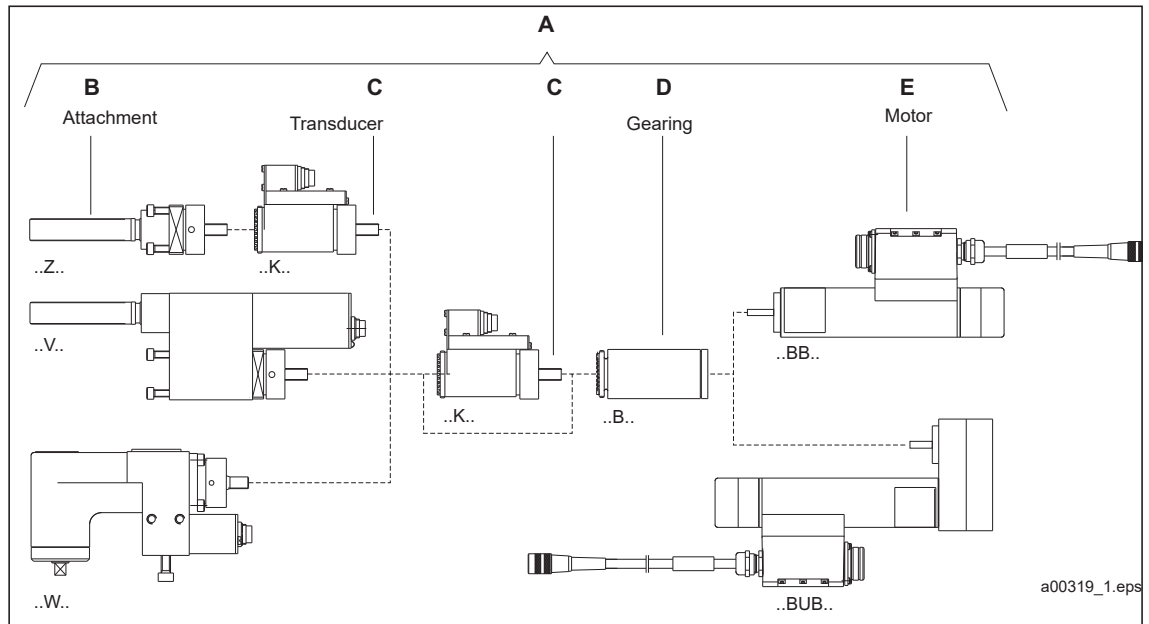
3.1.2 Torque-Controlled

System Overview

Built-in nutsetter BB / BUB size 1 - 4
Torque range 5 ... 1100 Nm



Nutsetter Overview



a00319_1.eps

Size 1

| A | | B | | C | | D | | E | | D+E | |
|------------------------|----------|-------|--------|------|-----------|--------|--------|------|--------|-------------|--------|
| ① | ② | ① | ② | ① | ② | ① | ② | ① | ② | ① | ② |
| 1BB-1B030A-1K1M-1ZA | 946775C8 | 1ZB | 927222 | 1K1B | 934283 | 1B035A | 927344 | 1BB | 933871 | 1BB-1B035A | 934240 |
| 1BB-1B030A-2/1K1M-1ZA | 946776C7 | | | | 934283(2) | | | | | | |
| 1BB-1B030A-1VK1M | 946777C6 | 1VK1B | 935862 | - | - | 1B060A | 927345 | 1BB | 933871 | 1BB-1B060A | 934241 |
| 1BB-1B030A-1K1M-1VK1M | 946778D3 | | | 1K1B | 934283 | | | | | | |
| 1BB-1B050A-1K2M-1ZA | 946779C4 | 1ZB | 927222 | 1K2B | 934284 | 1B060A | 927345 | 1BB | 933871 | 1BB-1B060A | 934241 |
| 1BB-1B050A-2/1K2M-1ZA | 946780C1 | | | | 934284(2) | | | | | | |
| 1BB-1B050A-1VK2M | 946781C0 | 1VK2B | 935861 | - | - | 1B060A | 927345 | 1BB | 933871 | 1BB-1B060A | 934241 |
| 1BB-1B050A-1K2M-1VK2M | 946782D7 | | | 1K2B | 934284 | | | | | | |
| 1BB-1B030A-1WK1M | 946884C6 | 1WK1B | 934364 | - | - | 1B035A | 927344 | 1BB | 933871 | 1BB-1B035A | 934240 |
| 1BB-1B030A-1K1M-1WK1M | 946885D3 | | | 1K1B | 934283 | | | | | | |
| 1BB-1B050A-1WK2M | 946888C2 | 1WK2B | 934365 | - | - | 1B060A | 927345 | 1BB | 933871 | 1BB-1B060A | 934241 |
| 1BB-1B050A-1K2M-1WK2M | 946889D9 | | | 1K2B | 934284 | | | | | | |
| 1BUB-1B030A-1K1M-1ZA | 946840C8 | 1ZB | 927222 | 1K1B | 934283 | 1B035A | 927344 | 1BUB | 934260 | 1BUB-1B035A | 934250 |
| 1BUB-1B030A-2/1K1M-1ZA | 946841C7 | | | | 934283(2) | | | | | | |
| 1BUB-1B030A-1VK1M | 946842C6 | 1VK1B | 935862 | - | - | 1B060A | 927345 | 1BUB | 934260 | 1BUB-1B060A | 934251 |
| 1BUB-1B030A-1K1M-1VK1M | 946843D3 | | | 1K1B | 934283 | | | | | | |
| 1BUB-1B050A-1K2M-1ZA | 946844C4 | 1ZB | 927222 | 1K2B | 934284 | 1B060A | 927345 | 1BUB | 934260 | 1BUB-1B060A | 934251 |
| 1BUB-1B050A-2/1K2M-1ZA | 946845C3 | | | | 934284(2) | | | | | | |
| 1BUB-1B050A-1VK2M | 946846C2 | 1VK2B | 935861 | - | - | 1B060A | 927345 | 1BUB | 934260 | 1BUB-1B060A | 934251 |
| 1BUB-1B050A-1K2M-1VK2M | 946847D9 | | | 1K2B | 934284 | | | | | | |
| 1BUB-1B030A-1WK1M | 946886C4 | 1WK1B | 934364 | - | - | 1B035A | 927344 | 1BUB | 934260 | 1BUB-1B035A | 934250 |
| 1BUB-1B030A-1K1M-1WK1M | 946887D1 | | | 1K1B | 934283 | | | | | | |
| 1BUB-1B050A-1WK2M | 946890C8 | 1WK2B | 934365 | - | - | 1B060A | 927345 | 1BUB | 934260 | 1BUB-1B060A | 934251 |
| 1BUB-1B050A-1K2M-1WK2M | 946891D5 | | | 1K2B | 934284 | | | | | | |

① Description ② Part no.

Size 2

| A | | B | | C | | D | | E | | D+E | |
|------------------------|----------|-------|--------|------|-----------|--------|--------|------|--------|-------------|--------|
| ① | ② | ① | ② | ① | ② | ① | ② | ① | ② | ① | ② |
| 2BB-2B100A-2K1M-2ZA | 946783C8 | 2ZB | 927227 | 2K1B | 934293 | 2B100A | 927861 | | | | |
| 2BB-2B100A-2/2K1M-2ZA | 946784C7 | | | | 934293(2) | | | | | | |
| 2BB-2B100A-2VK1M | 946785C6 | 2VK1B | 934334 | 2K1B | - | 2B100A | 927861 | | | 2BB-2B100A | 934400 |
| 2BB-2B100A-2K1M-2VK1M | 946786D3 | | | | 934293 | | | | | | |
| 2BB-2B100A-2WK1M | 946900C5 | 2WK1B | 934372 | 2K1B | - | 2B100A | 927861 | 2BB | 933872 | | |
| 2BB-2B100A-2K1M-2WK1M | 946901D2 | | | | 934293 | | | | | | |
| 2BB-2B150A-2K2M-2ZA | 946787C4 | 2ZB | 927227 | 2K2M | 934291 | 2B150A | 927862 | | | | |
| 2BB-2B150A-2/2K2M-2ZA | 946788C3 | | | | 934291(2) | | | | | | |
| 2BB-2B150A-2VK2M | 946789C2 | 2VK2M | 934331 | 2K2M | - | 2B150A | 927862 | | | 2BB-2B150A | 934401 |
| 2BB-2B150A-2K2M-2VK2M | 946790D7 | | | | 934291 | | | | | | |
| 2BB-2B150A-2WK2M | 946904C1 | 2WK2M | 934371 | 2K2M | - | 2B150A | 927862 | | | | |
| 2BB-2B150A-2K2M-2WK2M | 946905D8 | | | | 934291 | | | | | | |
| 2BUB-2B100A-2K1M-2ZA | 946832C8 | 2ZB | 927227 | 2K1B | 934293 | 2B100A | 927861 | | | | |
| 2BUB-2B100A-2/2K1M-2ZA | 946833C7 | | | | 934293(2) | | | | | | |
| 2BUB-2B100A-2VK1M | 946834C6 | 2VK1B | 934334 | 2K1B | - | 2B100A | 927861 | | | 2BUB-2B100A | 934410 |
| 2BUB-2B100A-2K1M-2VK1M | 946835D3 | | | | 934293 | | | | | | |
| 2BUB-2B100A-2WK1M | 946902C3 | 2WK1B | 934372 | 2K1B | - | 2B100A | 927861 | 2BUB | 934261 | | |
| 2BUB-2B100A-2K1M-2WK1M | 946903D0 | | | | 934293 | | | | | | |
| 2BUB-2B150A-2K2M-2ZA | 946836C4 | 2ZB | 927227 | 2K2M | 934291 | 2B150A | 927862 | | | | |
| 2BUB-2B150A-2/2K2M-2ZA | 946837C3 | | | | 934291(2) | | | | | | |
| 2BUB-2B150A-2VK2M | 946838C2 | 2VK2M | 934331 | 2K2M | - | 2B150A | 927862 | | | 2BUB-2B150A | 934411 |
| 2BUB-2B150A-2K2M-2VK2M | 946839D9 | | | | 934291 | | | | | | |
| 2BUB-2B150A-2WK2M | 946906C9 | 2WK2M | 934371 | 2K2M | - | 2B150A | 927862 | | | | |
| 2BUB-2B150A-2K2M-2WK2M | 946907D6 | | | | 934291 | | | | | | |

① Description ②Part no.

Size 3

| A | | B | | C | | D | | E | | D+E | |
|------------------------|----------|-------|--------|------|-----------|--------|--------|------|--------|-------------|--------|
| ① | ② | ① | ② | ① | ② | ① | ② | ① | ② | ① | ② |
| 3BB-3B180A-3K1M-3ZA | 946816C8 | 3ZB | 927233 | 3K1M | 934300 | 3B180A | 927809 | | | 3BB-3B180A | 934420 |
| 3BB-3B180A-2/3K1M-3ZA | 946817C7 | | | | 934300(2) | | | | | | |
| 3BB-3B180A-3VK1M | 946820C2 | 3VK1M | 934340 | - | - | 3B180A | 927809 | | | 3BB-3B180A | 934420 |
| 3BB-3B180A-3K1M-3VK1M | 946821D9 | | | 3K1M | 934300 | | | | | | |
| 3BB-3B180A-3WK1M | 946916C7 | 3WK1M | 934380 | - | - | 3B180A | 927809 | 3BB | 933873 | 3BB-3B180A | 934420 |
| 3BB-3B180A-3K1M-3WK1M | 946917D4 | | | 3K1M | 934300 | | | | | | |
| 3BB-3B260A-3K2M-3ZA | 946818C6 | 3ZB | 927233 | 3K2B | 934302 | 3B260A | 927810 | | | 3BB-3B260A | 934421 |
| 3BB-3B260A-2/3K2M-3ZA | 946819C5 | | | | 934302(2) | | | | | | |
| 3BB-3B260A-3VK2M | 946822C0 | 3VK2B | 934342 | - | - | 3B260A | 927810 | | | 3BB-3B260A | 934421 |
| 3BB-3B260A-3K2M-3VK2M | 946823D7 | | | 3K2B | 934302 | | | | | | |
| 3BB-3B260A-3WK2M | 946920C1 | 3WK2B | 934382 | - | - | 3B260A | 927810 | | | 3BB-3B260A | 934421 |
| 3BB-3B260A-3K2M-3WK2M | 946921D8 | | | 3K2B | 934302 | | | | | | |
| 3BUB-3B180A-3K1M-3ZA | 946824C8 | 3ZB | 927233 | 3K1M | 934300 | 3B180A | 927809 | | | 3BUB-3B180A | 934430 |
| 3BUB-3B180A-2/3K1M-3ZA | 946825C7 | | | | 934300(2) | | | | | | |
| 3BUB-3B180A-3VK1M | 946828C4 | 3VK1M | 934340 | - | - | 3B180A | 927809 | | | 3BUB-3B180A | 934430 |
| 3BUB-3B180A-3K1M-3VK1M | 946829D1 | | | 3K1M | 934300 | | | | | | |
| 3BUB-3B180A-3WK1M | 946918C5 | 3WK1M | 934380 | - | - | 3B180A | 927809 | 3BUB | 934262 | 3BUB-3B180A | 934430 |
| 3BUB-3B180A-3K1M-3WK1M | 946919D2 | | | 3K1M | 934300 | | | | | | |
| 3BUB-3B260A-3K2M-3ZA | 946826C6 | 3ZB | 927233 | 3K2B | 934302 | 3B260A | 927810 | | | 3BUB-3B260A | 934431 |
| 3BUB-3B260A-2/3K2M-3ZA | 946827C5 | | | | 934302(2) | | | | | | |
| 3BUB-3B260A-3VK2M | 946830C0 | 3VK2B | 934342 | - | - | 3B260A | 927810 | | | 3BUB-3B260A | 934431 |
| 3BUB-3B260A-3K2M-3VK2M | 946831D7 | | | 3K2B | 934302 | | | | | | |
| 3BUB-3B260A-3WK2M | 946922C9 | 3WK2B | 934382 | - | - | 3B260A | 927810 | | | 3BUB-3B260A | 934431 |
| 3BUB-3B260A-3K2M-3WK2M | 946923D6 | | | 3K2B | 934302 | | | | | | |

① Description ② Part no.

Size 4

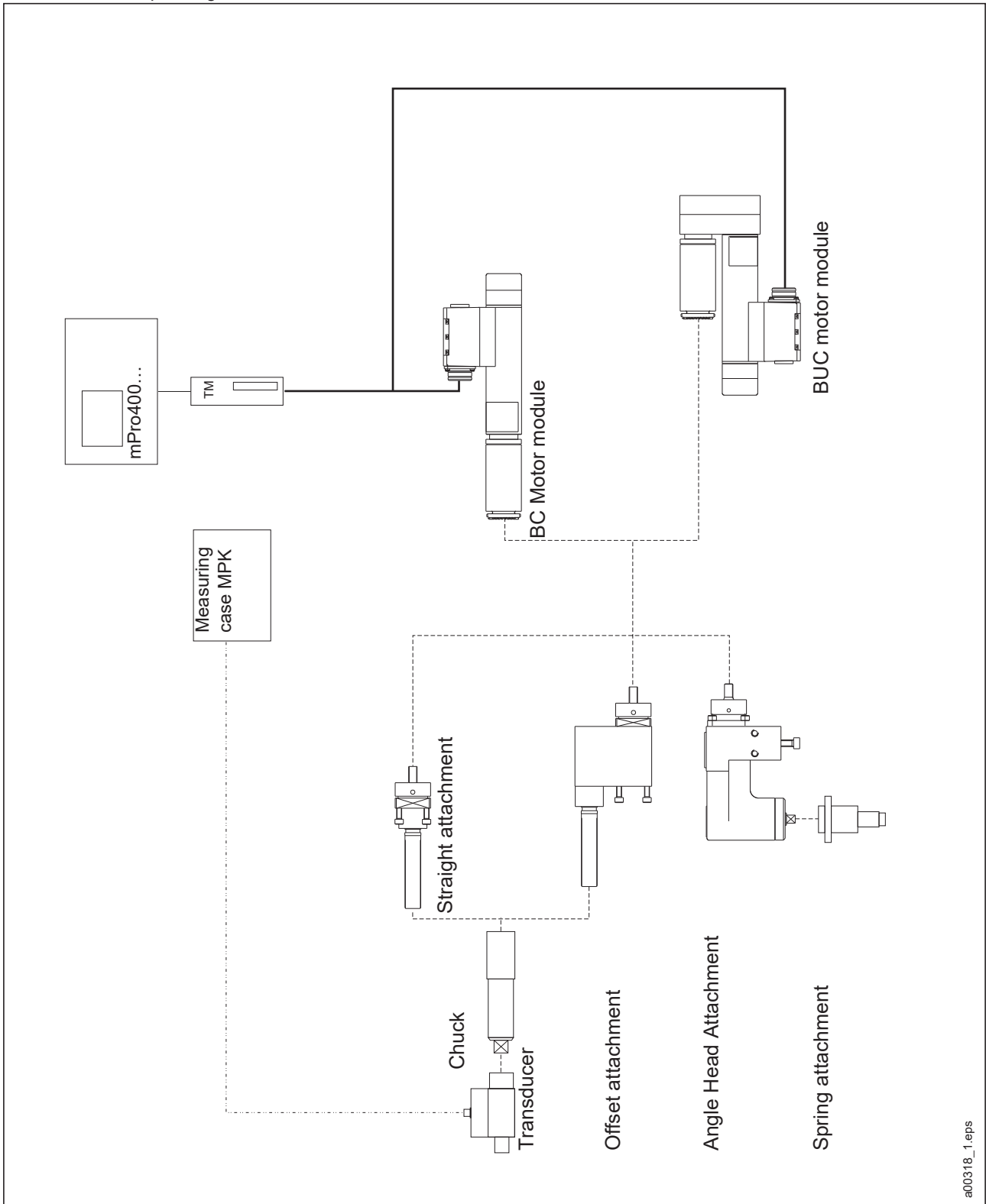
| A | | B | | C | | D | | E | | D+E | |
|------------------------|----------|-------|--------|------|-----------|--------|--------|------|--------|-------------|--------|
| ① | ② | ① | ② | ① | ② | ① | ② | ① | ② | ① | ② |
| 4BB-4B360A-4K1M-4ZA | 947006C6 | 4ZA | 927236 | 4K1B | 934314 | | | | | | |
| 4BB-4B360A-2/4K1M-4ZA | 947007C5 | | | | 934314(2) | | | | | | |
| 4BB-4B360A-4VK1M | 947012C8 | 4VK1M | 934350 | - | - | 4B360A | 929541 | | | 4BB-4B360A | 934440 |
| 4BB-4B360A-4K1M-4VK1M | 947013D5 | | | 4K1B | 934314 | | | | | | |
| 4BB-4B360A-4WK1M | 947036C0 | 4WK1M | 934390 | - | - | | | | | | |
| 4BB-4B360A-4K1M-4WK1M | 947037D7 | | | 4K1B | 934314 | | | | | | |
| 4BB-4B460A-4K2M-4ZA | 947008C4 | 4ZA | 927236 | 4K2B | 934315 | | | | | | |
| 4BB-4B460A-2/4K2M-4ZA | 947009C3 | | | | 934315(2) | | | | | | |
| 4BB-4B460A-4VK2M | 947014C6 | 4VK2B | 934353 | - | - | 4B500A | 935780 | 4BB | 933874 | 4BB-4B460A | 934441 |
| 4BB-4B260A-4K2M-4VK2M | 947015D3 | | | 4K2B | 934315 | | | | | | |
| 4BB-4B460A-4WK2M | 947038C8 | 4WK2B | 934393 | - | - | | | | | | |
| 4BB-4B460A-4K2M-4WK2M | 947039D5 | | | 4K2B | 934315 | | | | | | |
| 4BB-4B630A-4K3M-4ZA | 947010C0 | 4ZA | 927236 | 4K3B | 934316 | | | | | | |
| 4BB-4B630A-2/4K3M-4ZA | 947011C9 | | | | 934316(2) | | | | | | |
| 4BB-4B630A-4VK3M | 947016C4 | 4VK3B | 934354 | - | - | 4B660A | 935781 | | | 4BB-4B630A | 934442 |
| 4BB-4B630A-4K3M-4VK3M | 947017D1 | | | 4K3B | 934316 | | | | | | |
| 4BB-4B630A-4WK3M | 947040C4 | 4WK3B | 934394 | - | - | | | | | | |
| 4BB-4B630A-4K3M-4WK3M | 947041D1 | | | 4K3B | 934316 | | | | | | |
| 4BUB-4B360A-4K1M-4ZA | 947018C2 | 4ZA | 927236 | 4K1B | 934314 | | | | | | |
| 4BUB-4B360A-2/4K1M-4ZA | 947019C1 | | | | 934314(2) | | | | | | |
| 4BUB-4B360A-4VK1M | 947024C4 | 4VK1M | 934350 | - | - | 4B360A | 929541 | | | 4BUB-4B360A | 934450 |
| 4BUB-4B360A-4K1M-4VK1M | 947025D1 | | | 4K1B | 934314 | | | | | | |
| 4BUB-4B360A-4WK1M | 947042C2 | 4WK1M | 934390 | - | - | | | | | | |
| 4BUB-4B360A-4K1M-4WK1M | 947043D9 | | | 4K1B | 934314 | | | | | | |
| 4BUB-4B460A-4K2M-4ZA | 947020C8 | 4ZA | 927236 | 4K2B | 934315 | | | | | | |
| 4BUB-4B460A-2/4K2M-4ZA | 947021C7 | | | | 934315(2) | | | | | | |
| 4BUB-4B460A-4VK2M | 947026C2 | 4VK2B | 934353 | - | - | 4B500A | 935780 | 4BUB | 934263 | 4BUB-4B460A | 934451 |
| 4BUB-4B460A-4K2M-4VK2M | 947027D9 | | | 4K2B | 934315 | | | | | | |
| 4BUB-4B460A-4WK2M | 947044C0 | 4WK2B | 934393 | - | - | | | | | | |
| 4BUB-4B460A-4K2M-4WK2M | 947045D7 | | | 4K2B | 934315 | | | | | | |
| 4BUB-4B630A-4K3M-4ZA | 947022C6 | 4ZA | 927236 | 4K3B | 934316 | | | | | | |
| 4BUB-4B630A-2/4K3M-4ZA | 947023C5 | | | | 934316(2) | | | | | | |
| 4BUB-4B630A-4VK3M | 947028C0 | 4VK3B | 934354 | - | - | 4B660A | 935781 | | | 4BUB-4B630A | 934452 |
| 4BUB-4B630A-4K3M-4VK3M | 947029D7 | | | 4K3B | 934316 | | | | | | |
| 4BUB-4B630A-4WK3M | 947046C8 | 4WK3B | 934394 | - | - | | | | | | |
| 4BUB-4B630A-4K3M-4WK3M | 947047D5 | | | 4K3B | 934316 | | | | | | |

① Description ②Part no.

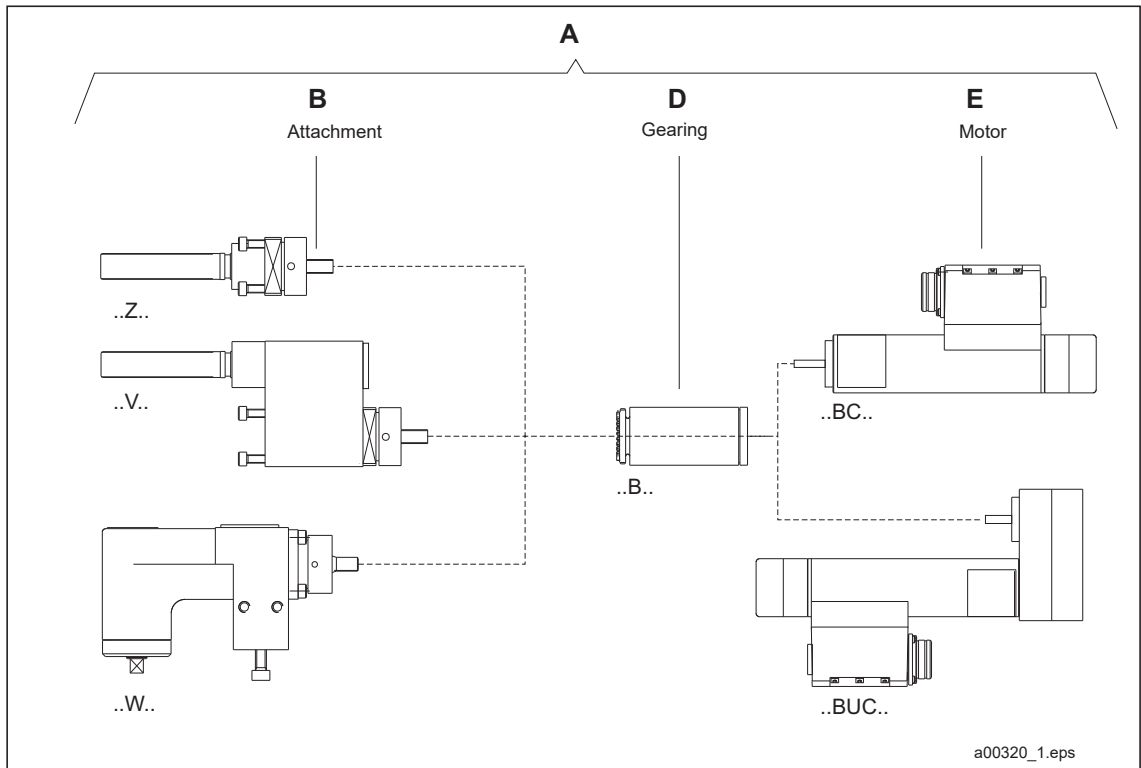
3.1.3 Current-Controlled

System Overview

Built-in nutsetter BC / BUC size 1 - 4
Torque range 16 ... 1100 Nm



Nutsetter Overview



Size 1

| A | | B | | D | | E | | D + E | |
|-----------------|----------|-----|--------|--------|--------|------|--------|------------|--------|
| ① | ② | ① | ② | ① | ② | ① | ② | ① | ② |
| 1BC-1B030A-1ZA | 947455A3 | 1ZB | 927222 | 1B035A | 927344 | 1BC | 934061 | 1BC-1B035A | 934242 |
| 1BC-1B050A-1ZA | 947458A0 | | | 1B060A | 927345 | | | 1BC-1B060A | 934243 |
| 1BC-1B030A-1VA | 947456A2 | 1VA | 930381 | 1B035A | 927344 | | | 1BC-1B035A | 934242 |
| 1BC-1B050A-1VA | 947459A9 | | | 1B060A | 927345 | | | 1BC-1B060A | 934243 |
| 1BC-1B030A-1WA | 947457A1 | 1WA | 930501 | 1B035A | 927344 | | | 1BC-1B035A | 934242 |
| 1BC-1B050A-1WA | 947460A6 | | | 1B060A | 927345 | | | 1BC-1B060A | 934243 |
| 1BUC-1B030A-1ZA | 947461A5 | 1ZB | 927222 | 1B035A | 927344 | 1BUC | 934264 | 1BC-1B035A | 934242 |
| 1BUC-1B050A-1ZA | 947464A2 | | | 1B060A | 927345 | | | 1BC-1B060A | 934243 |
| 1BUC-1B030A-1VA | 947462A4 | 1VA | 930381 | 1B035A | 927344 | | | 1BC-1B035A | 934242 |
| 1BUC-1B050A-1VA | 947465A1 | | | 1B060A | 927345 | | | 1BC-1B060A | 934243 |
| 1BUC-1B030A-1WA | 947463A3 | 1WA | 930501 | 1B035A | 927344 | | | 1BC-1B035A | 934242 |
| 1BUC-1B050A-1WA | 947466A0 | | | 1B060A | 927345 | | | 1BC-1B060A | 934243 |

① Description ② Part no.

Size 2

| A | | B | | D | | E | | D + E | |
|-----------------|----------|-----|--------|--------|--------|------|--------|-------------|--------|
| ① | ② | ① | ② | ① | ② | ① | ② | ① | ② |
| 2BC-2B100A-2ZA | 947467A9 | 2ZB | 927227 | 2B100A | 927861 | 2BC | 934062 | 2BC-2B100A | 934402 |
| 2BC-2B150A-2ZA | 947470A4 | | | 2B150A | 927862 | | | 2BC-2B150A | 934403 |
| 2BC-2B100A-2VA | 947468A8 | 2VA | 930388 | 2B100A | 927861 | | | 2BC-2B100A | 934402 |
| 2BC-2B150A-2VA | 947471A3 | | | 2B150A | 927862 | | | 2BC-2B150A | 934403 |
| 2BC-2B100A-2WA | 947469A7 | 2WA | 930502 | 2B100A | 927861 | | | 2BC-2B100A | 934402 |
| 2BC-2B150A-2WA | 947472A2 | | | 2B150A | 927862 | | | 2BC-2B150A | 934403 |
| 2BUC-2B100A-2ZA | 947473A1 | 2ZB | 927227 | 2B100A | 927861 | 2BUC | 934265 | 2BUC-2B100A | 934412 |
| 2BUC-2B150A-2ZA | 947476A8 | | | 2B150A | 927862 | | | 2BUC-2B150A | 934413 |
| 2BUC-2B100A-2VA | 947474A0 | 2VA | 930388 | 2B100A | 927861 | | | 2BUC-2B100A | 934412 |
| 2BUC-2B150A-2VA | 947477A7 | | | 2B150A | 927862 | | | 2BUC-2B150A | 934413 |
| 2BUC-2B100A-2WA | 947475A9 | 2WA | 930502 | 2B100A | 927861 | | | 2BUC-2B100A | 934412 |
| 2BUC-2B150A-2WA | 947478A6 | | | 2B150A | 927862 | | | 2BUC-2B150A | 934413 |

① Description ②Part no.

Size 3

| A | | B | | D | | E | | D + E | |
|-----------------|----------|-----|---------|--------|--------|------|--------|-------------|--------|
| ① | ② | ① | ② | ① | ② | ① | ② | ① | ② |
| 3BC-3B180A-3ZA | 947479A5 | 3ZB | 927233 | 3B180A | 927809 | 3BC | 934063 | 3BC-3B180A | 934422 |
| 3BC-3B260A-3ZA | 947482A0 | | | 3B260A | 927810 | | | 3BC-3B260A | 934423 |
| 3BC-3B180A-3VA | 947480A2 | 3VA | 930395 | 3B180A | 927809 | | | 3BC-3B180A | 934422 |
| 3BC-3B260A-3VA | 947483A9 | | | 3B260A | 927810 | | | 3BC-3B260A | 934423 |
| 3BC-3B180A-3WA | 947481A1 | 3WA | S975126 | 3B180A | 927809 | | | 3BC-3B180A | 934422 |
| 3BC-3B260A-3WA | 947484A8 | | | 3B260A | 927810 | | | 3BC-3B260A | 934423 |
| 3BUC-3B180A-3ZA | 947485A7 | 3ZB | 927233 | 3B180A | 927809 | 3BUC | 934266 | 3BUC-3B180A | 934432 |
| 3BUC-3B260A-3ZA | 947488A4 | | | 3B260A | 927810 | | | 3BUC-3B260A | 934433 |
| 3BUC-3B180A-3VA | 947486A6 | 3VA | 930395 | 3B180A | 927809 | | | 3BUC-3B180A | 934432 |
| 3BUC-3B260A-3VA | 947489A3 | | | 3B260A | 927810 | | | 3BUC-3B260A | 934433 |
| 3BUC-3B180A-3WA | 947487A5 | 3WA | S975126 | 3B180A | 927809 | | | 3BUC-3B180A | 934432 |
| 3BUC-3B260A-3WA | 947490A0 | | | 3B260A | 927810 | | | 3BUC-3B260A | 934433 |

① Description ②Part no.

Size 4

| A | | B | | D | | E | | D + E | | | |
|-------------------|----------|--------|---------|--------|--------|-------------|--------|-------------|--------|------------|--------|
| ① | ② | ① | ② | ① | ② | ① | ② | ① | ② | | |
| 4BC-4B360A-4ZA | 947491A9 | 4ZA | 927236 | 4B360A | 929541 | 4BC | 934064 | 4BC-4B360A | 934443 | | |
| 4BC-4B460A-4ZA | 947492A8 | | | 4B500A | 935780 | | | 4BC-4B460A | 934444 | | |
| 4BC-4B630A-4ZA | 947493A7 | | | 4B660A | 935781 | | | 4BC-4B630A | 934445 | | |
| 4BC-4B360A-4VA | 947494A6 | 4VA | 932754 | 4B360A | 929541 | | | 4BC-4B360A | 934443 | | |
| 4BC-4B460A-4VA | 947495A5 | | | 4B500A | 935780 | | | 4BC-4B460A | 934444 | | |
| 4BC-4B630A-4VA | 947496A4 | | | 4B660A | 935781 | | | 4BC-4B630A | 934445 | | |
| 4BC-4B360A-4WA34 | 947497A3 | 4WA34 | S976636 | 4B360A | 929541 | | | | | 4BC-4B360A | 934443 |
| 4BC-4B460A-4WA1 | 947498A2 | 4WA1 | S976637 | 4B500A | 935780 | | | | | 4BC-4B460A | 934444 |
| 4BC-4B630A-4WA1 | 947499A1 | | | 4B660A | 935781 | | | 4BC-4B630A | 934445 | | |
| 4BUC-4B360A-4ZA | 947500A7 | | | 4ZA | 927236 | | | 4B360A | 929541 | 4BUC | 934267 |
| 4BUC-4B460A-4ZA | 947501A6 | 4B500A | 935780 | | | | | 4BUC-3B460A | 934454 | | |
| 4BUC-4B630A-4ZA | 947502A5 | 4B660A | 935781 | | | | | 4BUC-3B630A | 934455 | | |
| 4BUC-4B360A-4VA | 947503A4 | 4VA | 932754 | 4B360A | 929541 | 4BUC-4B360A | 934453 | | | | |
| 4BUC-4B460A-4VA | 947504A3 | | | 4B500A | 935780 | 4BUC-3B460A | 934454 | | | | |
| 4BUC-4B630A-4VA | 947505A2 | | | 4B660A | 935781 | 4BUC-3B630A | 934455 | | | | |
| 4BUC-4B360A-4WA34 | 947506A1 | 4WA34 | S976636 | 4B360A | 929541 | | | 4BUC-4B360A | 934453 | | |
| 4BUC-4B460A-4WA1 | 947507A0 | 4WA1 | S976637 | 4B500A | 935780 | | | 4BUC-3B460A | 934454 | | |
| 4BUC-4B630A-4WA1 | 947508A9 | | | 4B660A | 935781 | 4BUC-3B630A | 934455 | | | | |

① Description ② Part no.

3.1.4 Torques / Speeds / Calibration Data

Straight attachment

| Size | Gearing Code | Torque-controlled [Nm] | Current-controlled [Nm] | Calibration data | | | | | |
|------|--------------|------------------------|-------------------------|--------------------|-------------------------|-----|-----------------------------|-----|----------|
| | | | | Max. speed [1/min] | Torque calibration [Nm] | | Angle calibration [pul/deg] | | Resolver |
| | | | | | Md1 | Md2 | Wi1 | Wi2 | |
| 1 | B035A | 5 - 32 | 16 - 32 | 462 | 35 | 35 | 1 | 1 | 43,0545 |
| | B060A | 15 - 53 | 26 - 53 | 272 | 60 | 60 | | | 73,3091 |
| 2 | B100A | 25 - 102 | 51 - 102 | 329 | 110 | 110 | | | 43,2459 |
| | B150A | 30 - 153 | 76 - 153 | 219 | 170 | 170 | | | 64,9409 |
| 3 | B180A | 30 - 180 | 90 - 180 | 339 | 200 | 200 | | | 41,9181 |
| | B260A | 50 - 260 | 130 - 260 | 220 | 300 | 300 | | | 64,7658 |
| 4 | B360A | 120 - 360 | 180 - 360 | 266 | 400 | 400 | 74,8424 | | |
| | B500A | 160 - 460 | 230 - 460 | 209 | 500 | 500 | 95,0667 | | |
| | B660A | 220 - 630 | 315 - 630 | 143 | 660 | 660 | 139,1914 | | |

Offset attachment

| Size | Gearing Code | Torque-controlled [Nm] | Current-controlled [Nm] | Calibration data | | | | | |
|------|--------------|------------------------|-------------------------|--------------------|-------------------------|------|-----------------------------|--------|----------|
| | | | | Max. speed [1/min] | Torque calibration [Nm] | | Angle calibration [pul/deg] | | |
| | | | | | Md1 | Md2* | Wi1 | Wi2 | Resolver |
| 1 | B035A | 5 - 32 | 16 - 32 | 439 | 35 | 35 | 1 | 1,0526 | 45,3206 |
| | B060A | 15 - 53 | 26 - 53 | 258 | 60 | 60 | | | 77,1675 |
| 2 | B100A | 25 - 102 | 51 - 102 | 307 | 110 | 110 | | 1,0714 | 46,3348 |
| | B150A | 30 - 153 | 76 - 153 | 204 | 170 | 170 | | | 69,5795 |
| 3 | B180A | 30 - 180 | 90 - 180 | 315 | 200 | 200 | | 1,0769 | 45,1426 |
| | B260A | 50 - 260 | 130 - 260 | 204 | 300 | 300 | | | 69,7478 |
| 4 | B360A | 120 - 360 | 180 - 360 | 249 | 400 | 400 | | 1,0667 | 79,8318 |
| | B500A | 160 - 460 | 230 - 460 | 196 | 500 | 500 | | | 101,4044 |
| | B660A | 220 - 630 | 315 - 630 | 134 | 660 | 660 | | | 148,4709 |

Angle head attachment

| Size | Gearing Code | Torque-controlled [Nm] | Current-controlled [Nm] | Calibration data | | | | | |
|------|--------------|------------------------|-------------------------|--------------------|-------------------------|------|-----------------------------|--------|----------|
| | | | | Max. speed [1/min] | Torque calibration [Nm] | | Angle calibration [pul/deg] | | |
| | | | | | Md1 | Md2* | Wi1 | Wi2 | Resolver |
| 1 | B035A | 5 - 32 | 16 - 32 | 434 | 35 | 35 | 1,0667 | 1,0667 | 45,9248 |
| | B060A | 15 - 53 | 26 - 53 | 255 | 60 | 60 | | | 78,1964 |
| 2 | B100A | 25 - 102 | 51 - 102 | 310 | 110 | 110 | 1,0625 | 1,0625 | 45,9487 |
| | B150A | 30 - 153 | 76 - 153 | 206 | 170 | 170 | | | 68,9997 |
| 3 | B180A | 30 - 180 | 90 - 180 | 327 | 200 | 200 | 1,0385 | 1,0385 | 43,5304 |
| | B260A | 50 - 260 | 130 - 260 | 211 | 300 | 300 | | | 67,2568 |
| 4 | B360A | 120 - 360 | 180 - 360 | 257 | 400 | 400 | 1,037 | 1,037 | 77,6143 |
| | B500A | 160 - 460 | 230 - 460 | 202 | 500 | 500 | | | 98,5877 |
| | B660A | 220 - 630 | 315 - 630 | 138 | 660 | 660 | | | 144,3467 |

* see Calibration notes on page 35

3.1.5 Weights of All Modules

in [kg]

| Size | Motor | | Gearing | Built-in transducer | Attachment ¹⁾ | | | | |
|------|-------|--------|---------|---------------------|--------------------------|--------|-------------|---------|---------|
| | ..B.. | ..BU.. | | | ..B.. | ..K..M | ...ZA ...ZB | ..VK..M | ..WK..M |
| 1 | 1,66 | 2,17 | 0,70 | 0,56 | 0,58 | 1,68 | 2,01 | 1,45 | 1,94 |
| 2 | 3,22 | 4,22 | 1,15 | 1,11 | 1,06 | 3,70 | 3,20 | 3,47 | 3,13 |
| 3 | 6,35 | 8,30 | 2,74 | 2,10 | 1,95 | 5,09 | 7,75 | 4,70 | 7,68 |
| 4 | 6,35 | 7,90 | 5,25 | 3,03 | 5,35 | 9,90 | 14,50 | 9,73 | 14,44 |

1) Weight for the individual chucks see "Chuck for Straight and Offset Attachment" on page39

3.1.6 Feasible Scribed Circle Diameter

Size 1

| Number of nutsetters | Smallest scribed circle in [mm] | | |
|----------------------|---------------------------------|--------|------------|
| | Type of attachment | | |
| | Straight | Offset | Angle head |
| 2 | 43 | 35 | 52 |
| 3 | 54 | 40 | 60 |
| 4 | 61 | 50 | 74 |
| 5 | 81 | 58 | 89 |
| 6 | 99 | 70 | 105 |
| 7 | 116 | 85 | 120 |

Size 2

| Number of nutsetters | Smallest scribed circle in [mm] | | |
|----------------------|---------------------------------|--------|------------|
| | Type of attachment | | |
| | Straight | Offset | Angle head |
| 2 | 56 | 44 | 59 |
| 3 | 75 | 50 | 68 |
| 4 | 80 | 62 | 86 |
| 5 | 106 | 74 | 101 |
| 6 | 130 | 89 | 118 |
| 7 | 151 | 102 | 137 |

Size 3

| Number of nutsetters | Smallest scribed circle in [mm] | | |
|----------------------|---------------------------------|--------|------------|
| | Type of attachment | | |
| | Straight | Offset | Angle head |
| 2 | 81 | 59 | 81 |
| 3 | 94 | 69 | 94 |
| 4 | 116 | 84 | 116 |
| 5 | 139 | 102 | 139 |
| 6 | 164 | 122 | 164 |
| 7 | 189 | 138 | 189 |

Size 4

| Number of nutsetters | Smallest scribed circle in [mm] | | |
|----------------------|---------------------------------|--------|------------|
| | Type of attachment | | |
| | Straight | Offset | Angle head |
| 2 | 91 | 76 | 112 |
| 3 | 122 | 88 | 130 |
| 4 | 130 | 108 | 160 |
| 5 | 174 | 130 | 192 |
| 6 | 217 | 153 | 224 |
| 7 | 246 | 180 | 263 |

3.2 First Operation

3.2.1 Note

When operating for the first time, observe and comply with the Operator information mPro400... as well. Connect the built-in nutsetter to the nutsetter control unit mPro400....

The maximum cable length is 50 m.

The built-in nutsetter can be equipped with a straight, offset, or angle attachment. The offset attachments / angle attachments can include an integrated transducer, depending on whether it is needed.

The assemblies are positioned via crown geared interfaces. The assemblies of size 1 can be rotated in 15° steps, and sizes 2 to 4 in 10° steps.

3.2.2 Torque / Angle Setting

Parameters are entered via the nutsetter control unit mPro400....

4 Electric Motor

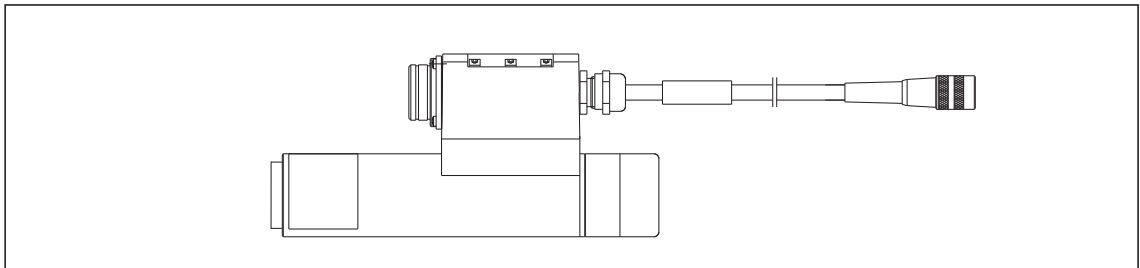
4.1 Description

Brushless motors are practically maintenance-free. The service life of the motors is normally dependent on the rotor bearings installed. The bearings are lubricated for their entire service life. A resolver is attached to the motor for electronic commutation.

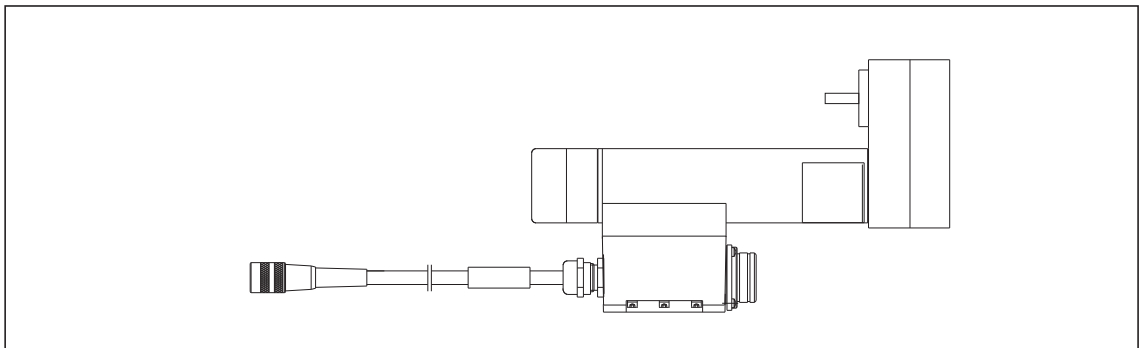
4.2 Motor for Torque-Controlled Built-In Nutsetter

| Motor Code | Part no. |
|-------------|----------|
| 1BB | 933871 |
| 1BUB | 934260 |
| 2BB | 933872 |
| 2BUB | 934261 |
| 3BB | 933873 |
| 3BUB | 934262 |
| 4BB | 933874 |
| 4BUB | 934263 |

..BB..



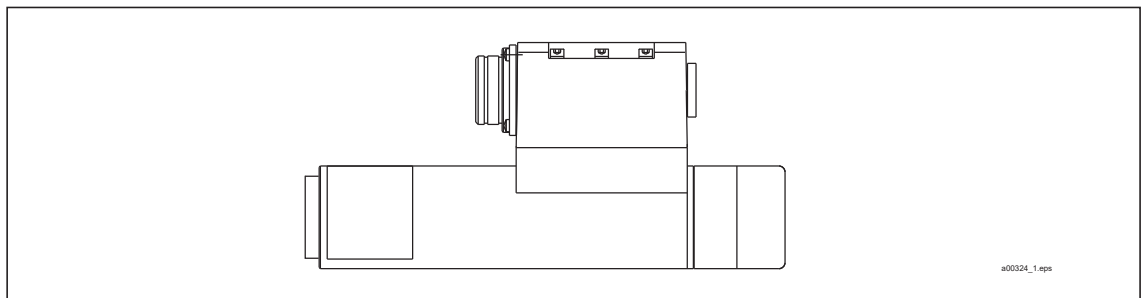
..BUB..



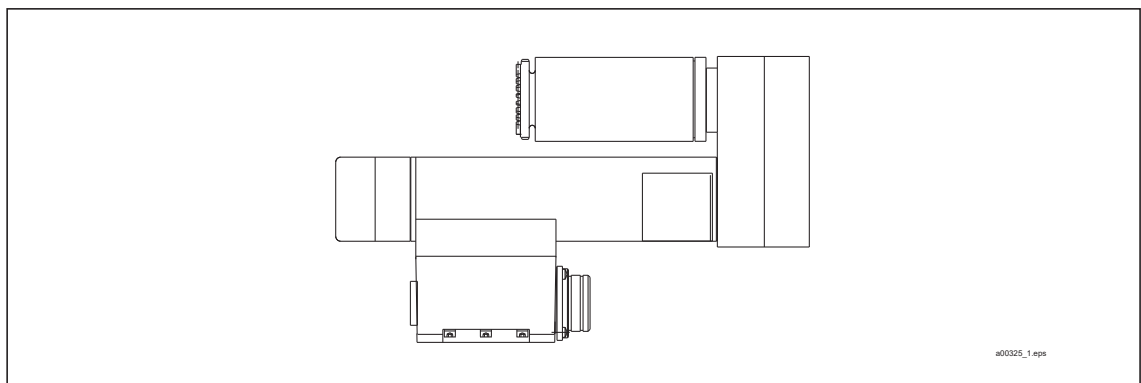
4.3 Motor for Current-Controlled Built-In Nutsetter

| Motor Code | Part no. |
|------------|----------|
| 1BC | 934061 |
| 1BUC | 934264 |
| 2BC | 934062 |
| 2BUC | 934265 |
| 3BC | 934063 |
| 3BUC | 934266 |
| 4BC | 934064 |
| 4BUC | 934267 |

..BC..



..BUC.



4.4 Technical Data

Motor data

| Motor code | | 1B.. | 2B.. | 3B.. | 4B.. |
|--------------------------------------|-----------------------|------------|------------|-----------------|------------|
| Intermediate circuit voltage | [V] | 320 | 320 | 320 | 320 |
| Max. speed | [min ⁻¹] | 7000 | 5000 | 5000 | 7000 |
| Rated speed | [min ⁻¹] | 3000 | 3000 | 3000 | 3000 |
| Rated current ¹⁾ | [A] | 1.6 | 2.8 | 4.8 | 7.3 |
| Rated output ²⁾ | [W] | 140 | 370 | 630 | 630 |
| Operating mode according to VDE 0530 | | S 1 | S 1 | S 1 | S1 |
| Sense of rotation | | Reversible | Reversible | Reversible | Reversible |
| Design | | B14 | B14 | B14 | B14 |
| Flange | DIN 42948 | - | - | C80 | C80 |
| Type of connection | | | | Plug connection | |

1) Sine peak value

2) These values apply to motor assembly on contact surfaces made of aluminium of min. 0.15m² with a minimum thickness of 10 mm or a equivalent metal surface

Mechanical data

| Motor code | | 1B.. | 2B.. | 3B.. | 4B.. |
|--|---|--------------------------|--------------------------|-------------------------|-------------------------|
| Mass moment of inertia | [kgm ²] | 0.012 - 10 ⁻³ | 0.056 - 10 ⁻³ | 0.27 - 10 ⁻³ | 0.27 - 10 ⁻³ |
| Rated torque ¹⁾ | [Nm] | 0.45 | 1.35 | 2 | 2 |
| Max. continuous torque at a standstill ¹⁾ | [Nm] | 0.51 | 1.45 | 3.5 | 3.5 |
| Peak torque | [Nm] | 2.5 | 7.5 | 12.5 | 16 |
| Speed change per torque | [min ⁻¹ x Ncm ⁻¹] ¹⁾ | 16.3 | 3 | 0.77 | 0.97 |
| Mechanical time constants | [ms] | 2.5 | 2 | 2.52 | 3.2 |
| Friction torque | [Nm] | 0.08 | 0.1 | 0.2 | 0.2 |
| Rotor weight | [kg] | 0.35 | 0.76 | 1.65 | 1.65 |
| Motor weight | [kg] | 1.2 | 3.1 | 6.5 | 6.5 |
| Motor weight with rotary encoder | [kg] | 1.6 | 3.5 | 6.9 | 6.9 |
| Ball bearing | | 608/6000 | 6200 | 6201 | 6201 |
| F _r (permissible radial bearing load) ²⁾ | [N] | 50 | 120 | 200 | 200 |

1) These values apply to motor assembly on contact surfaces made of aluminium of min. 0.15m² with a minimum thickness of 10 mm or a equivalent metal surface

2) Center of the shaft journal: F_{A máx.} -0.3 x F_R

Electrical data

| Motor code | | 1B.. | 2B.. | 3B.. | 4B.. |
|------------------------------------|--------------------------|------|-------|-------|-------|
| Number of phases | | 3 | 3 | 3 | 3 |
| Connection impedance ¹⁾ | [Ohm] | 24 | 7.7 | 2 | 1.1 |
| Inductance ¹⁾ | [mH] | 20 | 14.7 | 6 | 3.1 |
| Voltage constants ²⁾³⁾ | [mV/min ⁻¹] | - | 56 | 56 | 37 |
| Torque constants ²⁾ | [Nm/A] | 0.35 | 0.463 | 0.463 | 0.306 |
| Current at ²⁾ | [A] | 9 | 20.5 | 34 | 65 |
| Max. peak current ²⁾⁴⁾ | [A] | 12 | 25 | 50 | 75 |
| Electrical time constants | [ms] | 0.83 | 1.9 | 3 | 2.8 |

1) Measured between two phases

2) Sine peak value

3) -10 %

4) The values specified apply to operation within the temperature range of 0 - 40° C. They may not be exceeded, even for a short period of time, since this would lead to the risk of a magnetic weakening.

Thermal data

| Motor code | | 1B.. | 2B.. | 3B.. | 4B.. |
|--|---------|------|------|------|------|
| Max. ambient temperature | [° C] | 40 | 40 | 40 | 40 |
| Insulation class according to VDE 0530 | | F | F | F | F |
| Thermal time constants | min | 16 | 20 | 35 | 35 |
| Temperature rise without cooling | K/W | 1.25 | 1.15 | 0.73 | 0.70 |

4.5 Pin-Out

Pin-out motor and transducer plug

| Pin on 29 pin plug | Signal designation | Conductor colours (in the motor) | | Pin on 12 pin plug to the transducer ¹⁾ |
|--------------------|-----------------------|----------------------------------|--------------------|--|
| | | Motor type BB/BC | Motor type BUB/BUC | |
| GND | PE | Green/yellow | | - |
| 1 | Phase A (U) | Red | Green | - |
| 2 | Phase B (V) | Green | Red | - |
| 3 | Phase C (W) | Black | | - |
| H | Resolver S1 | Yellow | Blue | - |
| G | Resolver S3 | Blue | Yellow | - |
| K | Resolver S2 | Red | | - |
| J | Resolver S4 | Black | | - |
| S | Resolver R1 | Red/white | | - |
| T | Resolver R2 | Yellow/white | | - |
| N | Thermal sensor signal | Green + black | | - |
| M | Thermal switch signal | White | | - |
| Y | Supply -12V | Violet ¹⁾ | | A |
| B | Angle track A | White ¹⁾ | | B |
| E | Torque signal | Green ¹⁾ | | C |
| R | Torque signal 0 V | Yellow ¹⁾ | | D |
| X | Supply 0 V | Pink ¹⁾ | | E |
| Q | Supply +12 V | Brown ¹⁾ | | F |
| P | Angle track B | Blue ¹⁾ | | G |
| C | RxD+ (Tool) | Red ¹⁾ | | H |

| Pin on 29 pin plug | Signal designation | Conductor colours (in the motor) | | Pin on 12 pin plug to the transducer ¹⁾ |
|-----------------------|--------------------|----------------------------------|-------------------------|---|
| | | Motor type BB/BC | Motor type BUB/BUC | |
| D | RxD- (Tool) | | Black ¹⁾ | J |
| F | Calibration | | Gray ¹⁾ | K |
| O | TxD- (Tool) | | Gray/pink ¹⁾ | L |
| A | TxD+ (Tool) | | Red/blue ¹⁾ | M |

1) Not for motor types BC and BUC

5 Gearing

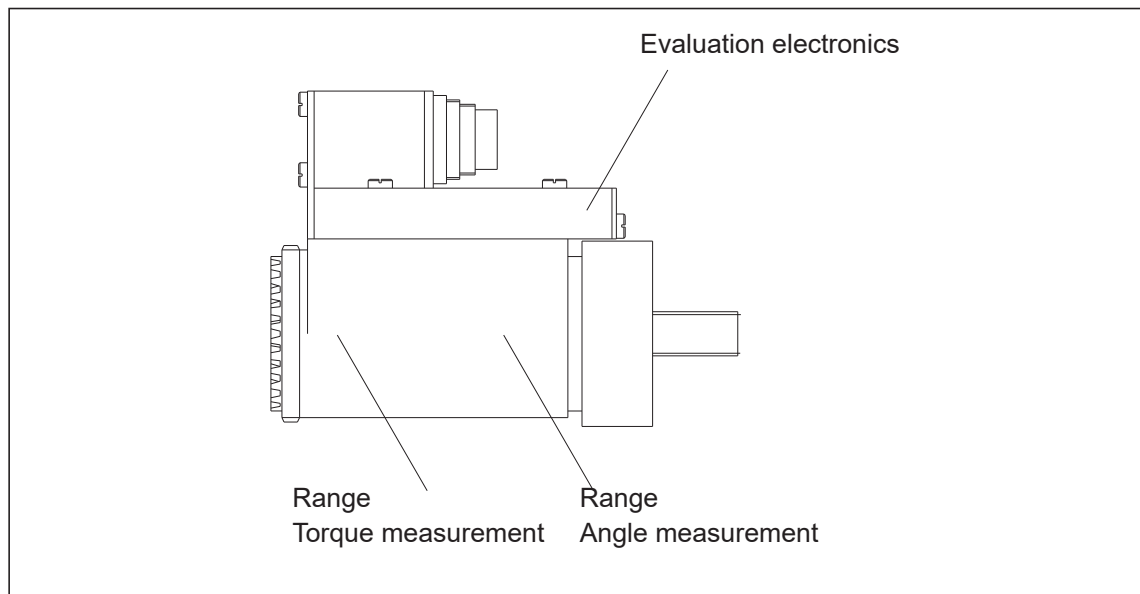
5.1 Assemblies

| Code | Part no. | Ratio i |
|--------|----------|------------|
| 1B035A | 927344 | 15,1364 |
| 1B060A | 927345 | 25,7727 |
| 2B100A | 927861 | 15,2036 |
| 2B150A | 927862 | 22,8308 |
| 3B180A | 927809 | 14,7368 |
| 3B260A | 927810 | 22,7692 |
| 4B360A | 929541 | 26,3118 |
| 4B500A | 935780 | 33,4219 |
| 4B660A | 935781 | 48,9345 |

6 Transducer

6.1 Assemblies

| Code | Part no. | Capacity level [Nm] |
|------|----------|---------------------|
| 1K1B | 934283 | 35 |
| 1K2B | 934284 | 60 |
| 2K1B | 934293 | 110 |
| 2K2M | 934291 | 170 |
| 3K1M | 934300 | 200 |
| 3K2B | 934302 | 300 |
| 4K1B | 934314 | 400 |
| 4K2B | 934315 | 500 |
| 4K3B | 934316 | 660 |



6.2 Technical Data

General technical specifications

- torque measurement with integrated pre-amplifier, resulting in greater signal noise spacing
- fault-resistant, magnetic field sensor angle measuring system
- reverse voltage protected supply
- short-circuit protected outputs
- undervoltage monitoring
- watchdog for processor
- noise-protected input and output circuit

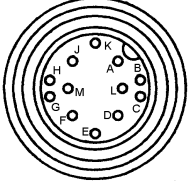
| Feature | Data |
|---|------------------------------|
| Storage temperature | -20...75 °C |
| Servicelife, operating | 20,000 h |
| Load cycles (min. at maximum torque) | 1.000.000 |
| Usability period if stored | 100,000 h (approx. 11 years) |
| Mechanical overload capacity of the measuring shaft | 100 % |
| Maximum speed | 1500 1/min |

Electric data

| Feature | Data |
|---|---|
| Supply voltage rated value | +12 V |
| Supply voltage limit values | +10,75...+12,5 V |
| Supply current | 80 mA |
| Measurement output voltage at rated torque U_k | $\pm(5,000 \text{ V} \pm 0.5 \%) + U_0$ |
| Permissible measuring range | $\pm(10...125 \%)$ of rated torque |
| Zero-signal limit value U_0 | -100 mV...+100 mV |
| Max. non-linearity of the torque measurement | $\pm 0.25 \%$ of U_n |
| Imprecision | $\pm 0.5 \%$ of rated torque |
| Max. output current | 5 mA |
| Internal impedance (R_i) of the torque output | $< 10 \Omega$ |
| Limit frequency of the torque measurement (-3dB) | 2 KHz |
| Measurement output voltage for calibration ON U_k | $U_n (\pm 0.25\%)$ |
| Calibration signal (input) ON | $> 3.5 \text{ V}$ |
| Calibration signal (input) OFF | $< 2.0 \text{ V}$ |
| Max. input voltage of the calibration signal | 35 V |
| Input impedance of the calibration input | 5 K Ω |
| Angle - resolution | 1 pulse/°, 360 pulse/revolutions |
| Angle signals | 2 |
| Direction-dependent phase shifting of the angle signals | $90^\circ \pm 30^\circ$ |
| Output circuit of the angle signals | Open collector with 10 k Ω on +12 V supply |
| Max. output current of the angle signals | 50 mA |
| Voltage endurance of the angle output | +20 V |

6.3 Pin-Out

| Pin | Cable colour | Signal | Description |
|---------|--------------|--------|---------------------------------|
| A | - | - | nc |
| B | Brown | ANGA | Angle output A |
| C | Green | TQ | Torque output |
| D | Yellow | 0 VA | 0 V torque reference connection |
| E | Gray | 0 V | 0 V supply |
| F | Pink | +12 V | Supply |
| G | Blue | ANGB | Angle output B |
| H | Red | RxD+ | Interface |
| J | Black | RxD- | Interface |
| K | Violet | CAL | Calibration signal |
| L | Gray / pink | TxD- | Interface |
| M | Red / blue | TxD+ | Interface |
| Housing | | PE | Shield connection |



12 pin round connector
Lumberg SGR 120,
Binder Series 680
no. 09-0331-90-12
with screw cap according to DIN 45
321

6.4 Description Torque / Angle Measuring System

- The transducer is equipped with a telemetry system and therefore it has no slip rings.
- The transducers can be installed as components in built-in nutsetters and optionally in offset attachments and angle attachments.
- The transducer is to be viewed as a complete unit. The transducer assembly (measuring shaft, antenna system, rotor electronics and stator electronics) is a unified assembly whose components may not be replaced individually.

The rotor electronics assembly is mounted on the measuring shaft. It is connected to the strain gage bridge and the rotor antenna system.

The stator electronics assembly is located in the transducer housing. It contains the evaluation circuit, the stator antenna system and the 12-pin system connector.

Torque and angle are measured directly in the nutsetter attachment, that is, in the parts conducting the force to the fastener. The angle is measured with the drive wheel in the angle head attachment.

Only measuring devices which are galvanically separated from the protective earth conductor are permissible for measuring the torque / angle encoder signals directly on the transducer (e. g. oscilloscope with isolation transformer). When measuring, ensure that both 0 V reference connections of the transducer (0 V-torque/Pin D and 0 V-supply/Pin E) cannot be short-circuited.

ATTENTION!

If this is not observed failures or measuring error by potential equalization currents (between PE, 0 V TQ and 0 V supply) in the torque measuring circuit may result.

Angle measurement

The integrated incremental angle encoder traces the angle with two angle tracks. The phase shift between these depends on the sense of rotation. The angle signals are read by query of the 360 magnetic poles of the pole wheel and are then transferred to the measuring electronics at amplified voltage/voltage increase of 12 V.

Torque measurement and calibration

Transducer with torque measurement on the shaft.

Torque measurement is made symmetrically for right and left-rotating torques (tightening and loosening direction).

The torque is measured by a full-bridge strain-gage circuit installed on the rotating output shaft in realtime and is then telemetrically transferred to the stator electronics.

The transmission from the output shaft to the stationary transducer electronics is made telemetrically, that is, without slip rings. The transmission system comprises an HF antenna transmitter. It transmits the energy to the rotor electronics using an HF carrier signal. At the same time the measured torque values are transferred to the stator electronics using frequency modulation.

The measured values of the torques are transferred from the transducer to the measuring electronics using an increased analogue voltage (0...±5 V).

The computer-controlled calibration is carried out via the RS422 interface without manual calibration work such as solder resistors, calibration of potentiometers, etc. Calibration is carried out at Apex Tool Group.

The transducer circuit comprises a processor. The transducer is in the operating mode "measure" after switching on the operating voltage.

The integrated memory chip EEPROM (capacity of 4 kByte) stores the transducer, calibration, identification and operating data.

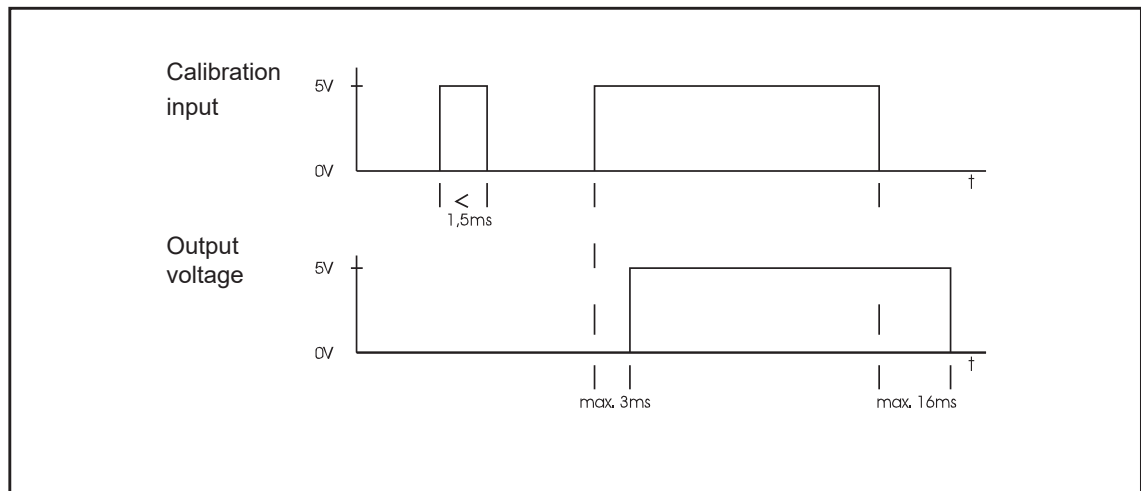
6.4.1 Torque Measurement

The torque is measured by a DMS full-bridge strain-gage circuit installed on the rotating output shaft and is then telemetrically (i.e. without slip rings) transferred to the stator electronics.

Calibration takes place in the rotor unit by means of a switched shunt resistor parallel to a strain gage measuring bridge section.

The calibration signal has the following time behaviour:

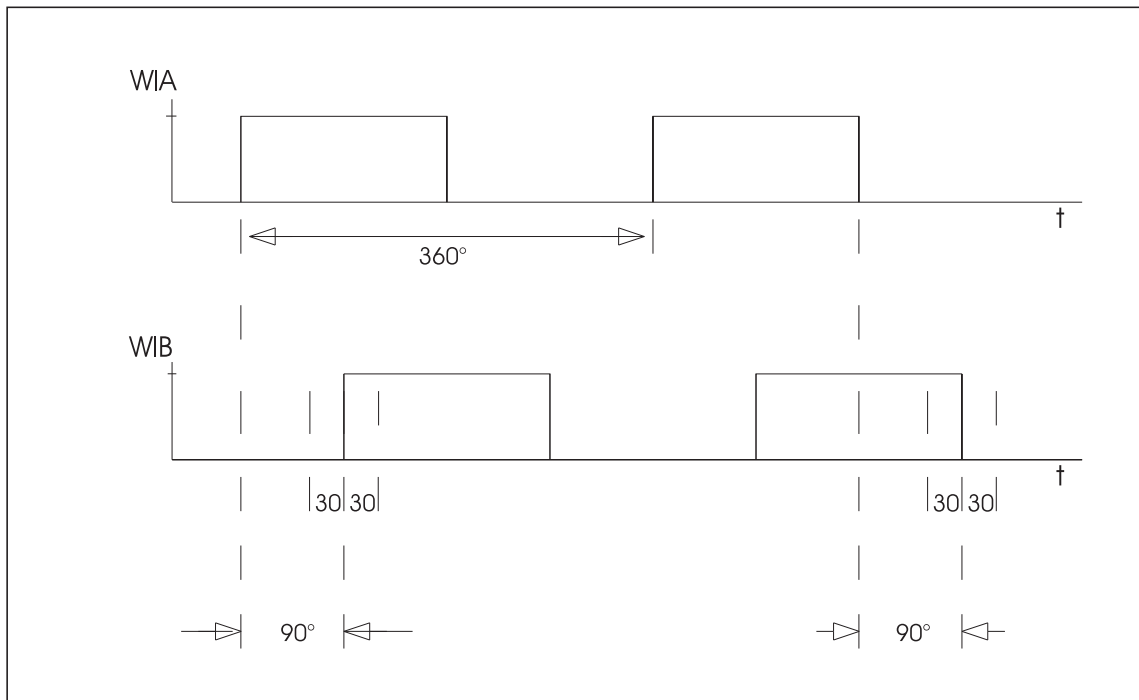
| Input pulse duration (pin K) | Output signal delay (pin C) |
|------------------------------|---|
| 0 ... 1.5 ms | No output signal |
| 1.5 ms ... random | Max. rise delay < 3 ms Max. drop delay < 16 ms |



6.4.2 Angle Tracing

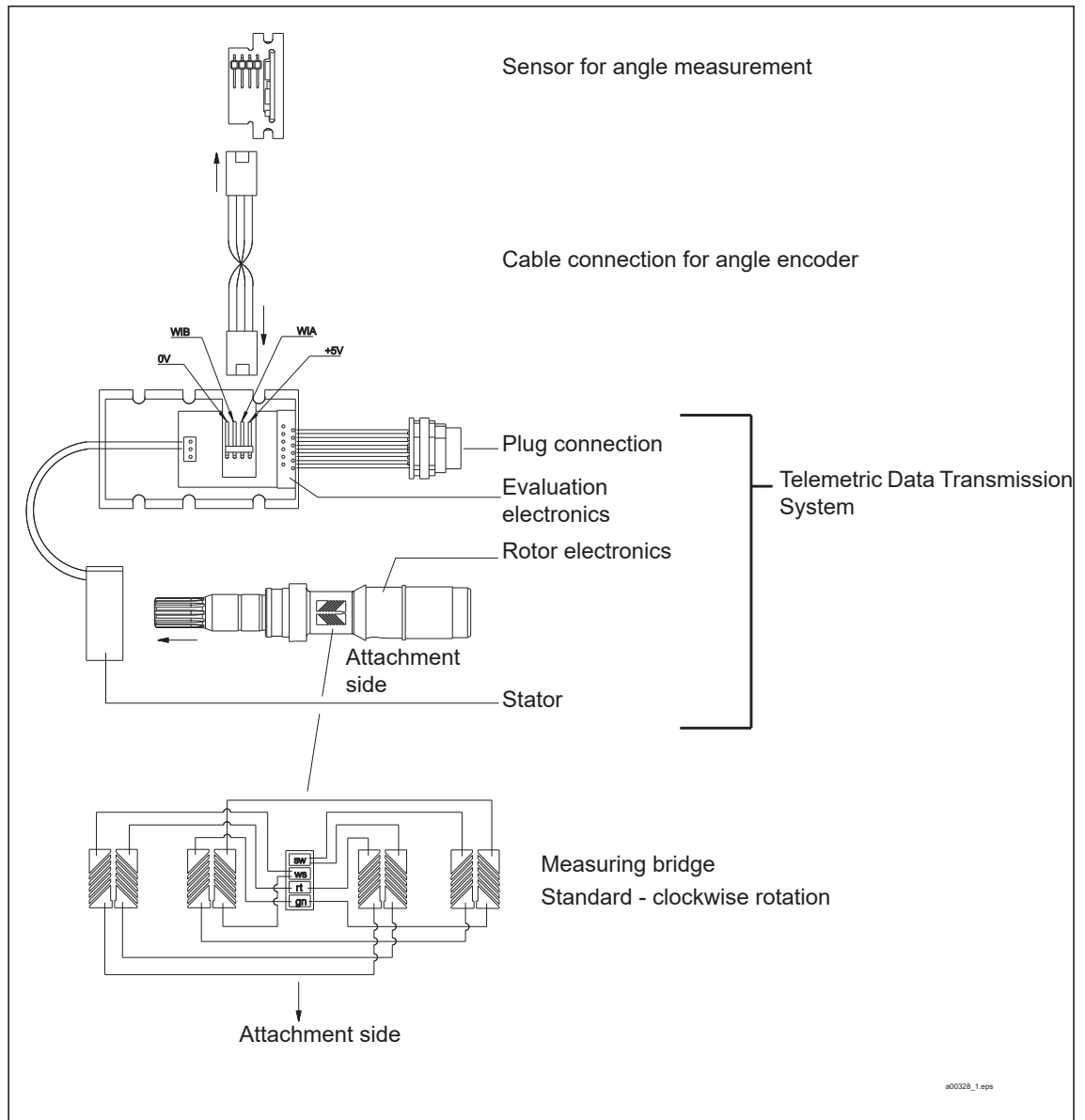
The angle measuring system traces the angle in incremental angle steps.

The system issues 2 angle signals, WIA and WIB. They are phase shifted for detecting the sense of rotation.



6.5 Wiring Plan ..K..

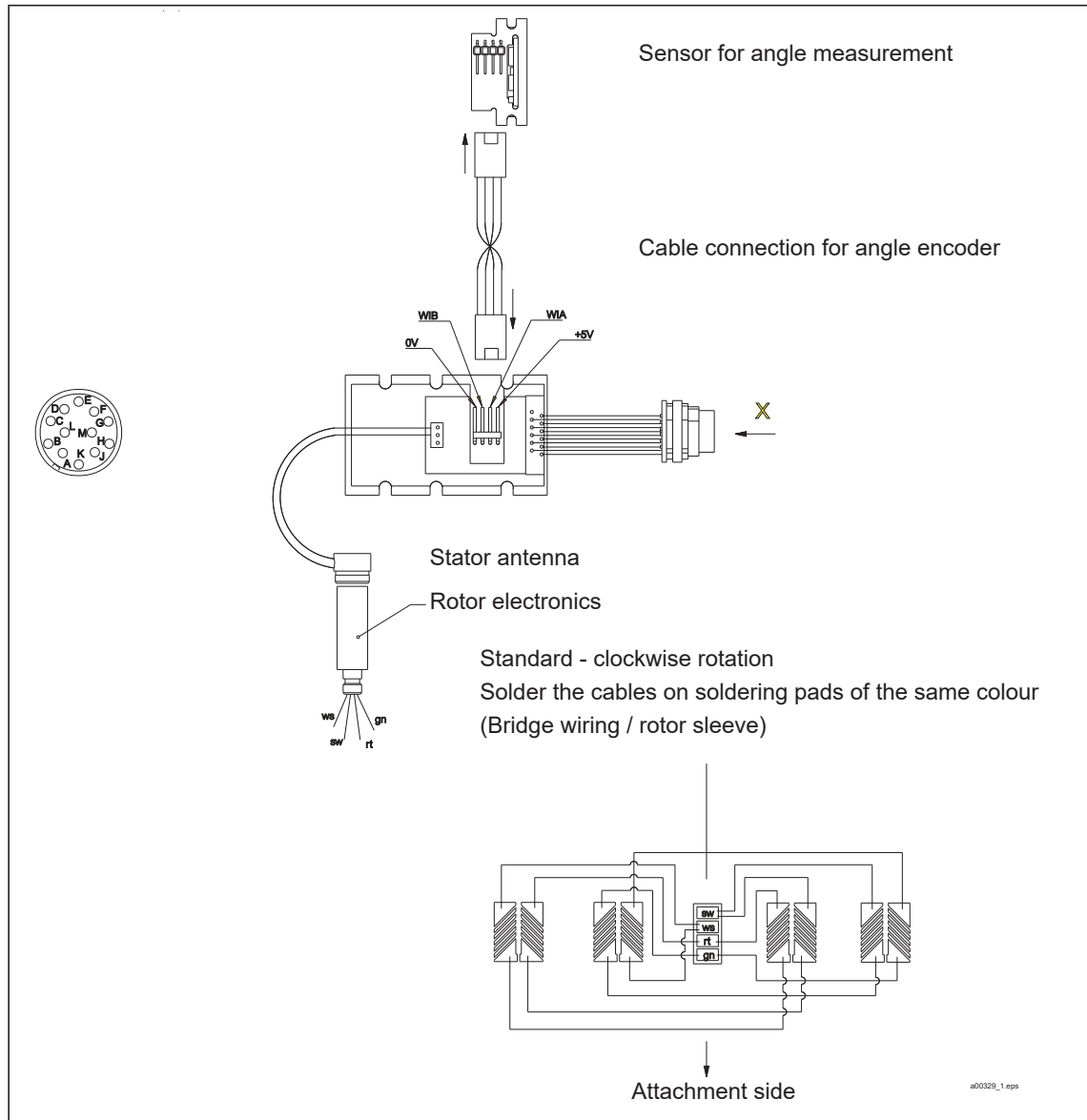
..K..M



6.6 Wiring Plan ..VK.., ..WK..

..VK..T/ ..M

..WK..T/..M

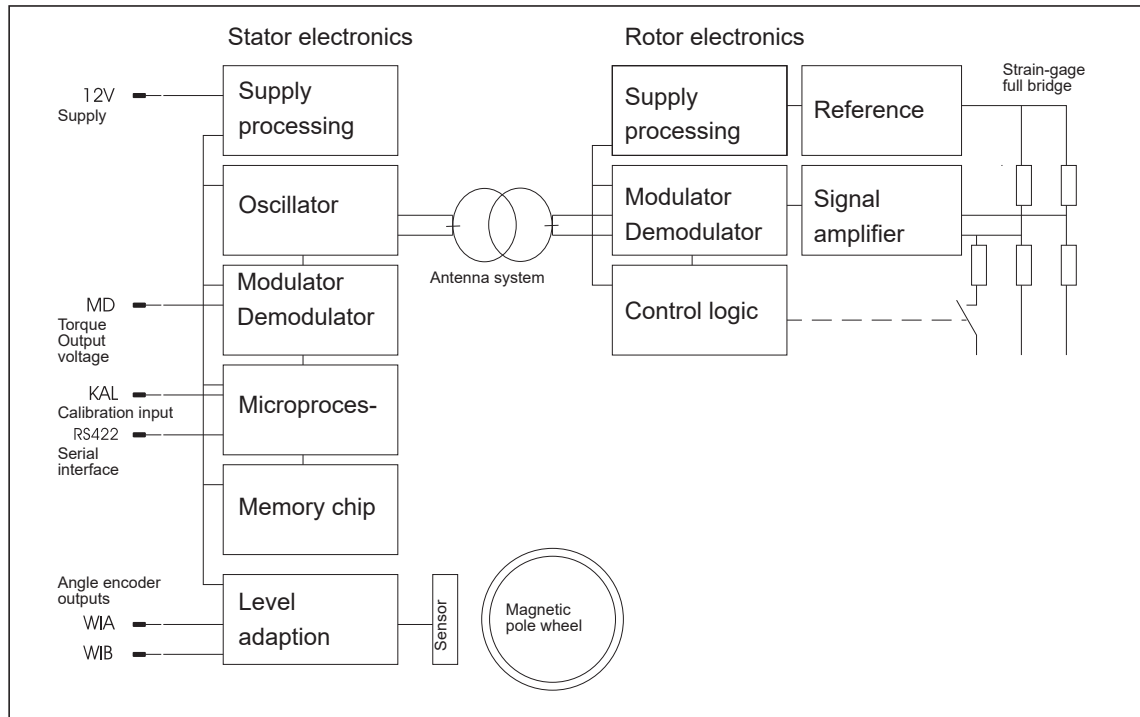


6.7 Connection of Measuring Devices

ATTENTION!

Only measuring devices which are galvanically separated from the protective earth conductor are permissible for measuring the torque / angle encoder signals directly on the transducer (e.g. oscilloscope with isolation transformer, etc.).

6.8 Block Diagram



6.9 Nutsetter Data in the Service Memory

ATTENTION!

If a transducer is supplied as a spare part, there is no data stored in the service memory, see 6.5.1 Service Memory of Replacement Transducers, page 57.

6.10 Redundant Design of a Sensor System (according to VDI 2862)

Calibration notes

If the built-in transducer is operated via offset or angle head attachments, the dynamic efficiency factor must be taken into account accordingly.

- Torque calibration

Variations in efficiency arising from manufacturing conditions make it necessary to take the calibration factors into account. They can be ascertained only with additional measuring systems, and they have to be considered as dynamic calibration factors (mk).

Example:

Spindle with transducer 1K2M
and offset attachment 1VK2M
with dynamic calibration factor $mk = 1.035^1$
Rated torque = 60 Nm bei 5 VDC

Corrected calibration value

Rated torque x mk

-> 60 Nm x 1.035 = 62.11 Nm

- Angle measurement calibration

The output ratio causes also the angle measurement to change; it is corrected with the angle calibration factor (WZ).

The angle calibration factor (WR) corresponds to the output ratio (*Torques / Speeds / Calibration Data* on page 18).

Example for a standard spindle combination

- Straight version

1BB-1B050A-2/1K2M-1ZA

ID no.946780C1

Speed: 272 1/min

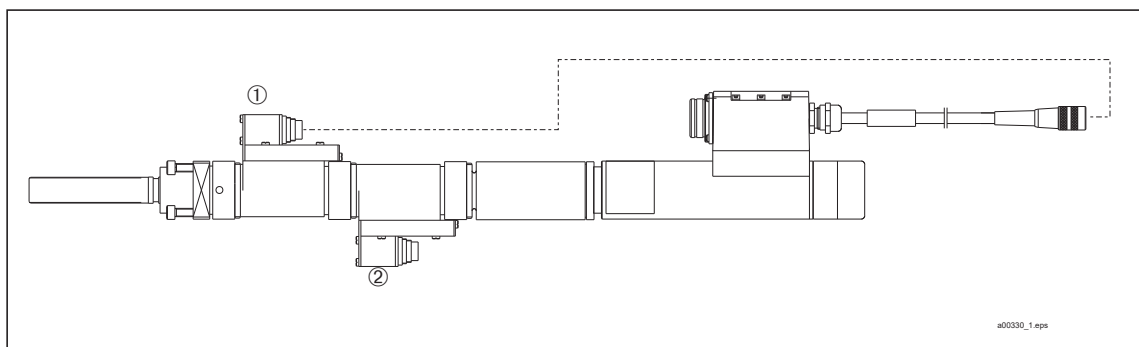
Max. torque 53 Nm

Calibration Md1: 60Nm 5V DC

Calibration Md2: 60Nm 5V DC

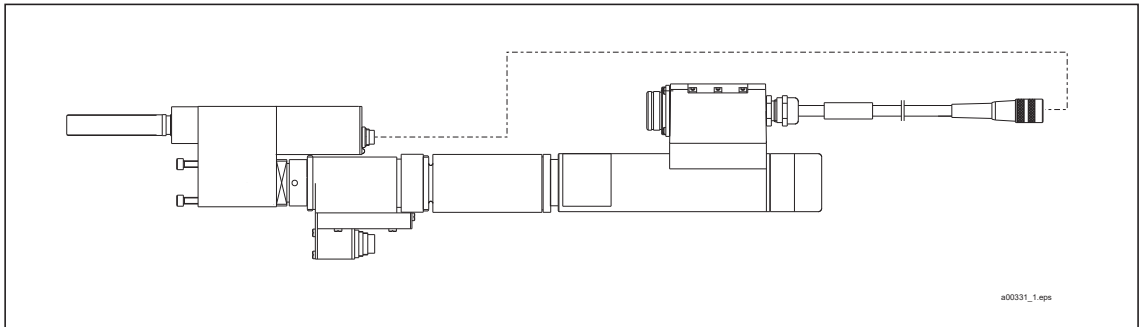
Angle calibrationW1: 1.000 1/degree

Angle calibrationW2: 1.000 1/degree



1. is ascertained with attachment transducer and measuring case MPK
(see System Overview *Torque-Controlled* on page 10 and *Current-Controlled* on page 15)

- Offset version
1BB-1B050A-1K2M-1VK2M
ID no.946782D7
Speed: 258 1/min
Max. torque 53Nm
Calibration Md1:60Nm 5V DC
Kal Md2:60Nm x mk 5V DC
Angle calibrationW1: 1.000 1/degree
Angle calibrationW2: 1.053 1/Grad

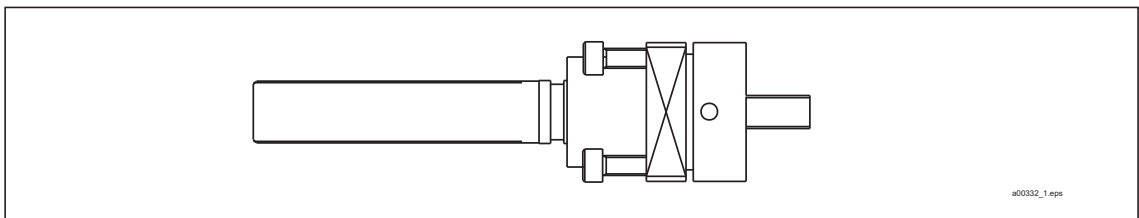


7 Straight Attachment

7.1 Assemblies

| Code | Part no. | Permissible load on output shaft | | | Lateral force on the chuck ¹⁾ | | |
|------------|----------|----------------------------------|------------------------|-----------------------|--|----------------|----------------|
| | | TQ | Pressure ¹⁾ | Tension ¹⁾ | Extended | 25mm Retracted | 50mm Retracted |
| | | [Nm] | [N] | [N] | [N] | [N] | [N] |
| | | [Nm] | [N] | [N] | [N] | [N] | [N] |
| 1ZB | 927222 | 53 | 1900 | 1500 | 1150 | 1350 | 1600 |
| 2ZB | 927227 | 153 | 4500 | 3200 | 2450 | 2700 | 3250 |
| 3ZB | 927233 | 260 | 6500 | 5000 | 3000 | 3500 | 4100 |
| 4ZA | 927236 | 630 | 9000 | 8800 | 4300 | 4800 | 5400 |

1) In the event of continuous load, the specified values should be multiplied by the factor 0.3.

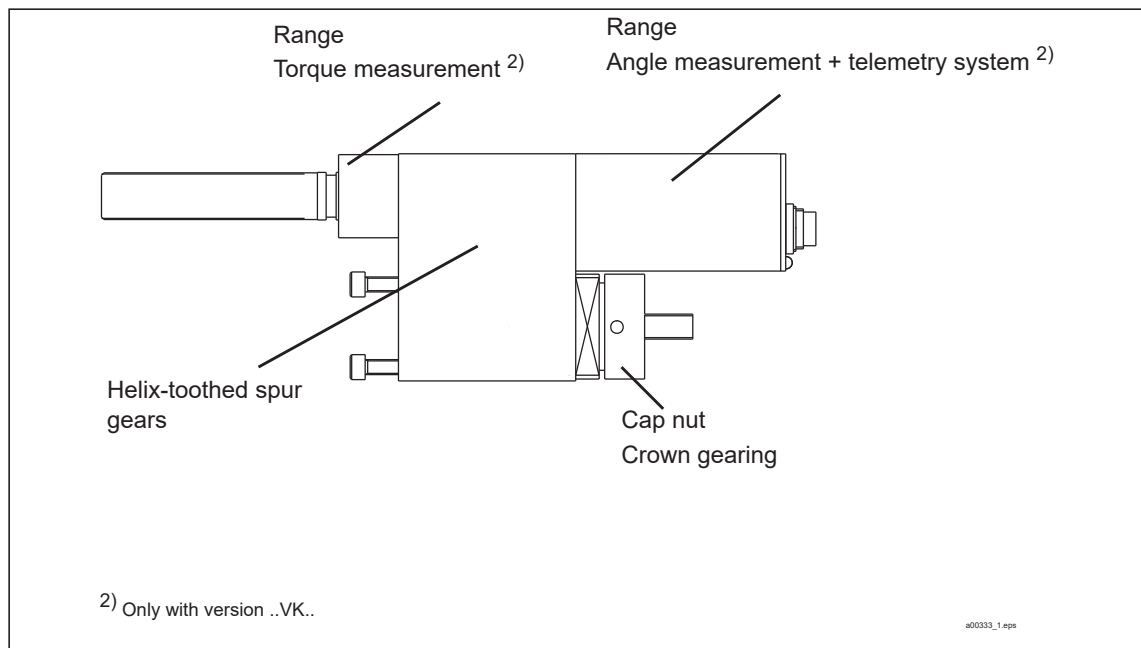


8 Offset Attachment

8.1 Assemblies

| Code | Part no. | Torque Calibration [Nm] | Ratio i | Permissible load | | | Lateral force on the Chuck attachment ¹⁾ | | |
|-------|----------|----------------------------|------------|------------------|-------------------------------|------------------------------|---|-----------------------|-----------------------|
| | | | | TQ [Nm] | Pressure ¹⁾ [N] | Tension ¹⁾ [N] | Extended [N] | 25mm Retracted [N] | 50mm Retracted [N] |
| 1VK1B | 935862 | 35 | 1.0526 | 53 | 2300 | 2300 | 1510 | 1720 | 2000 |
| 1VK2B | 935861 | 60 | | | | | | | |
| 1VA | 930381 | - | | | | | | | |
| 2VK1B | 934334 | 110 | 1.0714 | 160 | 2500 | 2500 | 2300 | 2600 | 3100 |
| 2VK2M | 934331 | 170 | | | | | | | |
| 2VA | 930388 | - | | | | | | | |
| 3VK1M | 933340 | 200 | 1.0769 | 260 | 3600 | 3600 | 2850 | 3250 | 3750 |
| 3VK2B | 934342 | 300 | | | | | | | |
| 3VA | 930395 | - | | | | | | | |
| 4VK1M | 934350 | 400 | 1.0667 | 650 | 6300 | 2100 | 4300 | 4800 | 5400 |
| 4VK2B | 934353 | 500 | | | | | | | |
| 4VK3B | 934354 | 660 | | | | | | | |
| 4VA | 932754 | - | | | | | | | |

1) In the event of continuous load, the specified values should be multiplied by the factor 0.3.

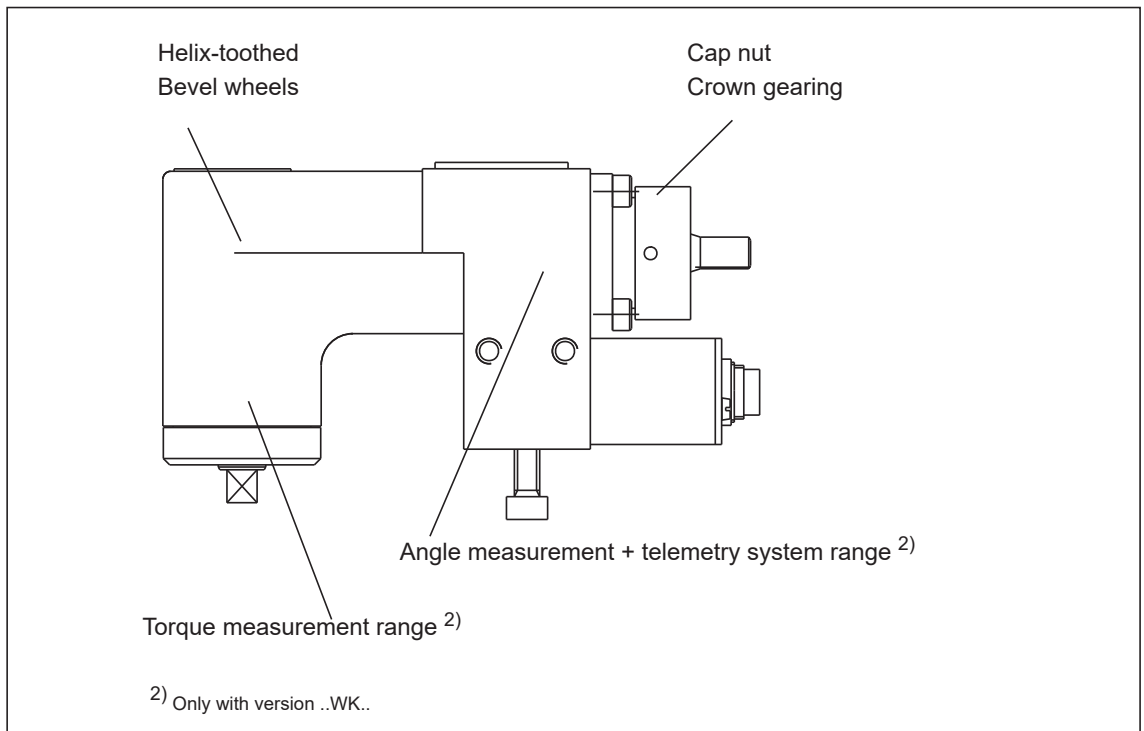


9 Angle Head Attachment

9.1 Assemblies

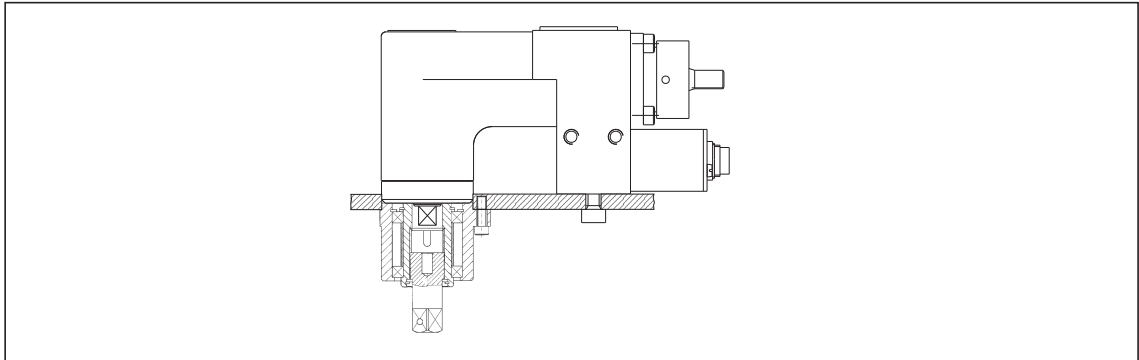
| Code | Part no. | Torque Calibration [Nm] | Ratio i | Permissible load | | | Lateral force on the shank ¹⁾ [N] |
|-------|----------|-------------------------|---------|------------------|----------------------------|---------------------------|--|
| | | | | TQ [Nm] | Pressure ¹⁾ [N] | Tension ¹⁾ [N] | |
| 1WK1B | 934364 | 35 | 1.0667 | 53 | 1700 | 3400 | 3100 |
| 1WK2B | 934365 | 60 | | | | | |
| 1WA | 930501 | - | | | | | |
| 2WK1B | 934372 | 110 | 1.0625 | 160 | 1850 | 3900 | 4200 |
| 2WK2M | 934371 | 170 | | | | | |
| 2WA | 930502 | - | | | | | |
| 3WK1M | 934380 | 200 | 1.0385 | 260 | 3800 | 4800 | 5100 |
| 3WK2B | 934382 | 300 | | | | | |
| 3WA | S975126 | - | | | | | |
| 4WK1M | 934390 | 400 | 1.0370 | 380 | 12000 | 6500 | 5900 |
| 4WA34 | S976636 | - | | | | | |
| 4WK2B | 934393 | 500 | | 650 | | | |
| 4WK3B | 934394 | 660 | | | | | |
| 4WA1 | S976637 | - | | | | | |

1) In the event of continuous load, the specified values should be multiplied by the factor 0.3.



9.2 Spring Attachment for Angle Head

Stroke of spring: 25 mm

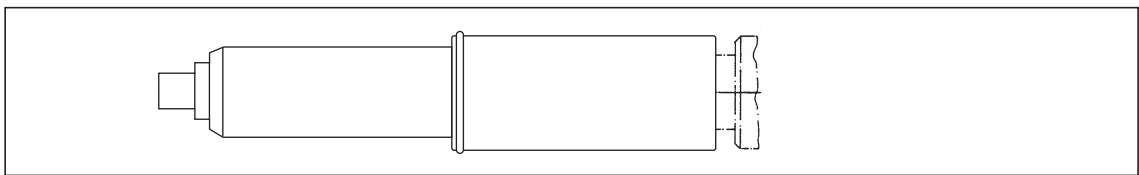


| For angle head attachment | Part no. | Square drive | Permissible load | | | Lateral force on the shaft ¹⁾ | |
|---------------------------|----------|--------------|------------------|----------------------------|---------------------------|--|---------------------|
| | | | TQ [Nm] | Pressure ¹⁾ [N] | Tension ¹⁾ [N] | Extended [N] | 25 mm Retracted [N] |
| 1W.. | 929041 | 3/8" | 53 | 1700 | 6800 | 1800 | 2100 |
| 2W.. | 929053 | 1/2" | 160 | 1850 | 6800 | 2500 | 3000 |
| 3W.. | 929065 | 3/4" | 260 | 3800 | 7800 | 3000 | 3450 |
| 4W.. | 929077 | 3/4" | 380 | 12000 | 13000 | 4300 | 5050 |
| | 929089 | 1" | 650 | | | | |

1) In the event of continuous load, the specified values should be multiplied by the factor 0.3.

9.3 Chuck for Straight and Offset Attachment

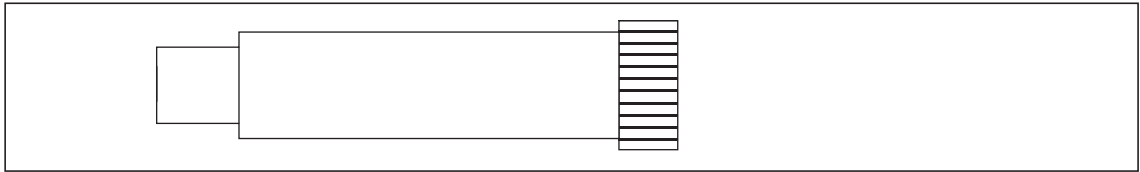
Chuck for size 1 - 3



| for size | Part no. | Square drive | Permissible load | | | Lateral force on the shaft ¹⁾ | | | Weight [kg] |
|-------------|----------|--------------|------------------|----------------------------|---------------------------|--|---------------------|---------------------|-------------|
| | | | TQ [Nm] | Pressure ¹⁾ [N] | Tension ¹⁾ [N] | Extended [N] | 25 mm Retracted [N] | 50 mm Retracted [N] | |
| 1Z.. / 1V.. | 922325 | 3/8" | 53 | 2300 | 1500 | 1510 | 1720 | 2000 | 0,33 |
| 2Z.. / 2V.. | 910609 | 1/2" | 160 | 4500 | 3200 | 2300 | 2600 | 3100 | 0,45 |
| 3Z.. / 3V.. | 910613 | 3/4" | 260 | 6500 | 5000 | 2850 | 3250 | 3750 | 0,67 |
| 4V.. | 912106 | 3/4" | 460 | 9000 | 8800 | 4300 | 4800 | 5400 | 0,87 |
| 4V.. | 912147 | 1" | 1000 | 9000 | 8800 | 4300 | 4800 | 5400 | 0,90 |

1) In the event of continuous load, the specified values should be multiplied by the factor 0.3.

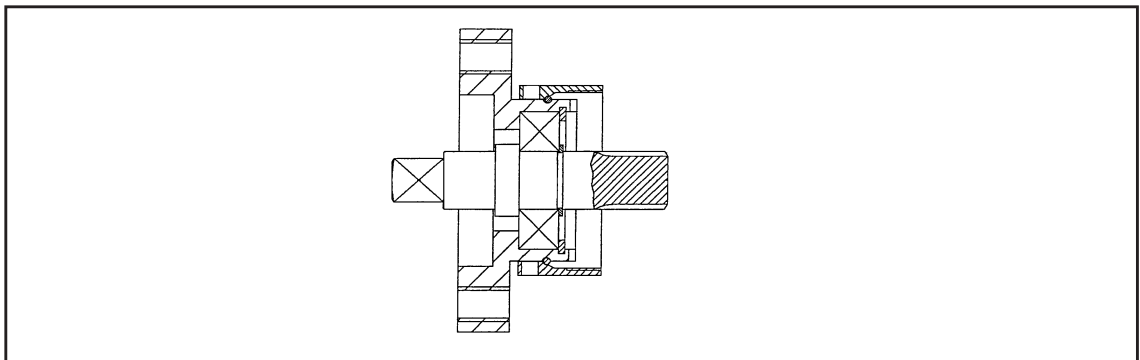
Attachment spindle for size 4Z..



| for Size | Part no. | Square drive | Permissible load | | | Lateral force on the shaft ¹⁾ | | | Weight [kg] |
|----------|----------|--------------|------------------|----------------------------|---------------------------|--|---------------------|---------------------|-------------|
| | | | TQ [Nm] | Pressure ¹⁾ [N] | Tension ¹⁾ [N] | Extended [N] | 25 mm Retracted [N] | 50 mm Retracted [N] | |
| 4Z.. | 916643 | 3/4" | 460 | 9000 | 8800 | 4300 | 4800 | 5400 | 1,21 |
| 4Z.. | 916642 | 1" | 630 | 9000 | 8800 | 4300 | 4800 | 5400 | 1,24 |

1) In the event of continuous load, the specified values should be multiplied by the factor 0.3.

9.4 Attachment for Customer-Specific Adaptation



| for Size | Part no. | Square drive | Permissible load | | | Lateral force on the shank ¹⁾ |
|----------|----------|--------------|------------------|----------------------------|---------------------------|--|
| | | | TQ [Nm] | Pressure ¹⁾ [N] | Tension ¹⁾ [N] | [N] |
| 1 | 927541 | 3/8" | 53 | 1900 | 1500 | 2200 |
| 2 | 927542 | 1/2" | 160 | 4500 | 3200 | 3800 |

1) In the event of continuous load, the specified values should be multiplied by the factor 0.3.

10 Troubleshooting

DANGER!



High leakage current / high voltage – fatal electric shock could occur!

→ When measuring breaks, resistance and short circuits of the motor or motor cable, it is imperative that they be disconnected from the [STM12.3/STM34.3](#).




For quick differentiated diagnostics in the event of a malfunction, there are light-emitting diodes on the front plate and a two-digit 7-segment display.

10.1 Display of errors

- The errors are displayed as codes: 00 - 99. The display blinks at about 1 Hz.
- In the event of an error in the [STM12.3/STM34.3](#), mains, motor, transducer or ARCNET, the actions described in the following table are immediately triggered in the servo.

If several errors occur at the same time, the failure with the highest priority, that is the lowest number, is displayed.

Exceptions:

- Error **64** "MB- +12 V NOK" has priority over **15, 16, 17, 21, 22, 28, 40** and **41** (see table for description).
- Error **65** "MK- -12V NOK" has priority over **15, 16, 17, 28** and **40** (see table for description).
- The failure **40** "MK is not ready" has the lowest priority, since the errors 41 to FF cannot be described as a common error (40) to simplify error diagnosis.
- All errors are signaled to the station controller via ARCNET and are displayed on its monitor.
- ➔ See  *Rundown data table*>*ERROR*. The abbreviations are displayed here.
- ➔ See  *Spindle monitor*>  > *Error table*. Here all current errors are displayed in text.

Acknowledgment of errors

- After troubleshooting the error and pressing the RESET button, the [STM12.3/STM34.3](#) is ready again.
- With every nutrunner start, the measuring board sends the acknowledgment signal to the output section. If the failure is brief (i.e. undervoltage), the [STM12.3/STM34.3](#) becomes ready to operate automatically after the next acknowledgment signal.
All Errors are archived in the station controller. When troubleshooting, the error information can be displayed in the *Rundown data archive*. On the [STM12.3/STM34.3](#), however, there is no more blinking display after the acknowledgment.
- If an error is permanent, the error mode cannot be acknowledged and quit.

| DI S P L A Y | Upper display Lower display Error Explanation | Consequence | | | | Measures, remedy |
|-----------------------------|--|---------------|-----------------------------|--------------------|--------------------------------------|---|
| | | LED-READY Off | Main and start-up relay Off | Output section Off | Braking of motor, Output section Off | |
| 0 8 8 | DC/DC converter supply under-voltage The voltage of the logic DC link is < 150 VAC | X | X | X | | → Measure supply voltage. If < 200 VAC, increase to 230 VAC → If errors occur sporadically, check the supply for voltage drops → Internal error, replace STM12.3/STM34.3 |
| 0 1 | DC/DC converter supply overvoltage The voltage of the logic DC link is > 440 VDC | X | | X | | → Measure supply voltage. If > 255 VAC, reduce to 230 VAC → If errors occur sporadically, check the supply for voltage spikes → Internal error, replace STM12.3/STM34.3 |
| 0 2 | Intermediate circuit of the power section is not supplied | X | X | | X | → Check supply (fuses before the STM12.3/STM34.3, isolating transformer, EMERGENCY STOP protection, etc.) → Internal error, replace STM12.3/STM34.3 |
| 1 1 | Motor cable defective <ul style="list-style-type: none"> • Cable break in motor wires • Interruption in connector board • Motor phases interrupted • Test current for cable monitoring is misdirected | X | X | X | | → Check the tool cables and connector board for breaks and short circuits → Check motor cable for breaks and short circuits → Check motor for short circuit for PE and phase impedances (17E... approx. 7 Ω, 18E... approx. 2.5 Ω, 47E... approx. 4 Ω, 48E... approx. 1.5 Ω, 67E... approx. 2 Ω) → Replace handheld nutrunner → Internal error, replace STM12.3/STM34.3 |
| 1 2 | Short-circuit in the motor circuit <ul style="list-style-type: none"> • In the cable • In the motor • In the STM12.3/STM34.3 | X | X | X | | → Check tool cables for short circuit, → Check the motor for short circuits (for phase impedances, see error 11) → Internal error, replace STM12.3/STM34.3 |

| DI S P L AY | Upper display Lower display Error Explanation | Consequence | | | | Measures, remedy |
|-------------------------|---|---------------|-----------------------------|--------------------|---|---|
| | | LED-READY Off | Main and start-up relay Off | Output section Off | Braking of motor, Output section Off | |
| 8 8 | | | | | | |
| 1 3 | (Motor temperature too high*) <ul style="list-style-type: none"> Measuring line is interrupted Measuring current is misdirected * Not used in this application | X | X | X | | → Check XS2 , pin 1 - 2 for connection → Internal error, replace STM12.3/STM34.3 |
| 1 4 | I²t monitoring <ul style="list-style-type: none"> Motor power required is too high Handheld nutrunner is defective (i.e. gearing, bearings, motor) | X | | X | | → Check temperature of handheld nutrunner. If > 60 °C, shorten fastening time by increasing speed → Replace handheld nutrunner → Internal error, replace STM12.3/STM34.3 |
| 1 5 | Resolver error The resolver signals are <ul style="list-style-type: none"> interrupted short-circuited unavailable The internal ±12 V power adapter is <ul style="list-style-type: none"> short-circuited | X | | X | | → Handheld nutrunner connected? → Check the tool cables for breaks and short circuits, particularly the +/-12 V and 0 V wires → Replace handheld nutrunner → Internal defect, replace STM12.3/STM34.3 |
| 1 6 | Intermediate circuit voltage too high The voltage of the intermediate power circuit is > 400 VDC | X | X | X | | Permanent error: → Measure supply voltage. If > 255 VAC, reduce to 230 VAC When braking: → Condensers in intermediate circuit are "deaf" → Braking chopper is defective, replace STM12.3/STM34.3 Sporadic: → The voltage supply is periodically too high; connect the next-highest tap to the primary side of the transformer (with 3-phase isolating transformer) → Internal error, replace STM12.3/STM34.3 |

| DI S P L AY | Upper display Lower display Error Explanation | Consequence | | | | Measures, remedy |
|-------------------------|--|---------------|-----------------------------|--------------------|--------------------------------------|---|
| | | LED-READY Off | Main and start-up relay Off | Output section Off | Braking of motor, Output section Off | |
| 8 8 | | | | | | |
| 1 7 | Intermediate circuit voltage too low The voltage of the intermediate power circuit is < 150 VDC | X | X | | X | Permanent error: → Measure supply voltage. If < 200 VAC, increase to 230 VAC During fastening: → The supply is too "soft" or overloaded. Provide for more stable supply (e.g. larger isolating transformer) → Condensers in intermediate circuit are "deaf", replace STM12.3/STM34.3 → Internal error, replace STM12.3/STM34.3 |
| 2 0 | Temperature in the power unit too high The temperature in the STM12.3/STM34.3 is > 80 °C | X | X | X | | → Measure control cabinet inside temperature under the STM12.3/STM34.3; if $\vartheta > 50\text{ °C}$ additional cooling measures are necessary (e.g. A/C unit) → Cooling vents on the STM12.3/STM34.3 must not be covered with a cable or the like. → Internal error, replace STM12.3/STM34.3 |
| 2 1 | Start-up relay does not open Due to an internal error, the contact in the start-up relay is stuck. | X | X | X | | → Internal error, replace STM12.3/STM34.3 |
| 2 2 | Main relay does not open Due to an internal error, the contact in the main relay is stuck. | X | X | X | | → Internal error, replace STM12.3/STM34.3 |
| 2 3 | DC/DC converter supply under-voltage | X | X | X | | → Internal error, replace STM12.3/STM34.3 |
| 2 4 | DC/DC converter supply under-voltage | X | X | X | | → Internal error, replace STM12.3/STM34.3 |
| 2 5 | 5 V supply in servo too low The 5 V power adapter for the internal supply to the servo amplifier is overloaded. U < 4.8 VDC | X | X | X | | → Internal error, replace STM12.3/STM34.3 |
| 2 6 | 5 V supply in servo too high The 5 V power adapter for the internal supply to the servo amplifier is defective. U > 5.2 VDC | X | X | X | | → Internal error, replace STM12.3/STM34.3 |

| DI S P L A Y | Upper display Lower display Error Explanation | Consequence | | | | Measures, remedy |
|-----------------------------|---|---------------|-----------------------------|--------------------|--------------------------------------|--|
| | | LED-READY Off | Main and start-up relay Off | Output section Off | Braking of motor, Output section Off | |
| 8 8 | | | | | | |
| 2 7 | End stage driver supply too low The power adapter for the internal supply to the output section is overloaded or defective. | X | X | X | | → Internal error, replace STM12.3/ STM34.3 |
| 2 8 | Offset of the current measurement too large The zero point of the integrated motor current measurement has moved | X | X | X | | → Internal error, replace STM12.3/ STM34.3 |
| 3 0 | 5 V supply in measuring board too low The power adapter for the internal supply to the measuring board is overloaded or defective. U < 4.8 VDC | X | | | X | → Internal error, replace STM12.3/ STM34.3 |
| 3 1 | 5 V supply in measuring board too high The 5 V power adapter for internal supply of the measuring board is defective. U > 5.2 VDC | X | | | X | → Internal error, replace STM12.3/ STM34.3 |
| 3 2 | Servo DPR error The dual port RAM for communication between servo and measuring board is defective. | X | | | X | → Internal error, replace STM12.3/ STM34.3 |
| 3 3 | Servo flash error The flash memory is defective | X | X | X | | → Internal error, replace STM12.3/ STM34.3 |
| 3 4 | DPR communication to MK interrupted The communication between servo and measuring board, via the dual port RAM, is impaired | X | | | X | → Internal error, replace STM12.3/ STM34.3 |
| 3 5 | Error in order of start signals Communication error between measuring board and servo amplifier | X | | | X | → Internal error, replace STM12.3/ STM34.3 → Inform Sales & Service Center |
| 3 8 | MOTID error Error in motor identification mode | X | | X | | → Internal error, replace STM12.3/ STM34.3 |
| 3 9 | Mathematical error, illegal command etc. Error in the program execution | X | | X | | → Internal error, replace STM12.3/ STM34.3 → Inform Sales & Service Center |

| DI S P L AY | Upper display Lower display Error Explanation | Consequence | | | | Measures, remedy |
|-------------------------|---|---------------|-----------------------------|--------------------|--------------------------------------|--|
| | | LED-READY Off | Main and start-up relay Off | Output section Off | Braking of motor, Output section Off | |
| 8 8 | | | | | | |
| 4 0 | Measuring board not ready The signal "Measuring board OK" isn't received by the servo | X | | | X | → Measuring board connected? → Measuring board screwed tight in STM12.3/STM34.3? → Internal error, replace STM12.3/STM34.3 |
| 5 0 | ARCNET multiple address The address set for this STM12.3/STM34.3 already exists | | | | | → Check addresses, i.e. switch settings of the ARCNET; each networked device must possess a unique address. → Internal error, replace STM12.3/STM34.3 |
| 5 1 | ARCNET address incorrect The address set is not within the permissible range | | | | | → Change address so that it is between 01 and 32 → Internal error, replace STM12.3/STM34.3 |
| 5 2 | ARCNET - error Communication error | | | | | Check the ARCNET: → Are there bus terminations? → Are all networked devices with bus terminations turned on? → All cables connected? → Check address, i.e. switch settings, of the ARCNET. → Internal error, replace STM12.3/STM34.3 → Inform Sales & Service Center |
| 5 3 | ARCNET - Recon Too many reconfigurations; network is unstable | | | | | Check the ARCNET: → Are there bus terminations? → All ARCNET cables connected? → Check address, i.e. switch settings, of the ARCNET. → Are the networked devices with bus terminations turned on? |
| 5 4 | ARCNET - no network connection The STM12.3/STM34.3 is not connected with the ARCNET. | | | | X | Check the ARCNET: → Are there bus terminations? → Are the networked devices with bus terminations turned on? → All cables connected? → Internal error, replace STM12.3/STM34.3 |
| 5 5 | ARCNET revision error Hardware error | | | | | → Internal error, replace STM12.3/STM34.3 |

| DI S P L AY | Upper display Lower display Error Explanation | Consequence | | | | Measures, remedy |
|-------------------------|---|---------------|-----------------------------|--------------------|---|---|
| | | LED-READY Off | Main and start-up relay Off | Output section Off | Braking of motor, Output section Off | |
| 8 8 | | | | | | |
| 5 6 | ARCNET initialization error Hardware error | | | | | → Internal error, replace STM12.3/ STM34.3 |
| 6 1 | MK - parameters are wrong Fastening parameters in the measuring board are NOK | | | | | Check programming in the station controller: → Spindle constants → Calibration values → Fastening sequence (SEQ) → Stage → Parameter set |
| 6 2 | MK - memory overflow Too little RAM available | | | | | → Inform Sales & Service Center → Internal defect, replace STM12.3/ STM34.3 |
| 6 4 | MK- +12 V NOK The +12 V supply to the measuring board is outside the limits of +11.8 V... +12.2 V | X | | X | | Inspection of station controller in test mode – value outside the permissible limits: → Check tool cables, particularly the +12 V, 0 V and resolver wires → Replace handheld nutrunner → Internal error, replace STM12.3/ STM34.3 |
| 6 5 | MK- -12 V The -12 V supply to the measuring board is outside the limits of -11.8 V... -12.2 V | X | | X | | Inspection of station controller in test mode – value outside the permissible limits: → Check tool cables, particularly the -12 V, 0 V and resolver wires → Replace handheld nutrunner → Internal error, replace STM12.3/ STM34.3 |
| 6 6 | MK - sequence control Sequence • Start stage • Graphs wasn't respected | | | | | → Inform Sales & Service Center → Internal defect, replace STM12.3/ STM34.3 |
| 6 8 | MK initialization NOK Initialization error in measuring board | | | | | → Inform Sales & Service Center → Internal defect, replace STM12.3/ STM34.3 |
| 6 9 | MK access to DPR NOK The measuring board cannot access the DPR in the servo | | | | | → Measuring board screwed tight in STM12.3/STM34.3 ? → Internal defect, replace STM12.3/ STM34.3 |

| DI S P L AY | Upper display Lower display Error Explanation | Consequence | | | | Measures, remedy |
|-------------------------|---|---------------|-----------------------------|--------------------|--------------------------------------|--|
| | | LED-READY Off | Main and start-up relay Off | Output section Off | Braking of motor, Output section Off | |
| 8 8 | | | | X | | |
| 6 A | MK - servo type is not STM12.3/STM34.3 The STM12.3/STM34.3 type read out by the measuring board is unknown | | | X | | → Internal error, replace STM12.3/STM34.3 |
| 6 C | MK - no pulse signal from servo There is no synchronization signal between servo and measuring board | | | X | | → Measuring board screwed tight in STM12.3/STM34.3? → Internal error, replace STM12.3/STM34.3 |
| 6 E | MK - servo parameter set doesn't match with servo The parameter set selected by the measuring board isn't found in the STM12.3/STM34.3 | | | X | | → Check system programming → Internal error, replace STM12.3/STM34.3 |
| 7 1 | Transducer 1 missing The transducer signals are <ul style="list-style-type: none"> • interrupted • short-circuited • unavailable | | | | | → Handheld nutrunner connected? → Check the tool cables for breaks and short circuits → Replace handheld nutrunner → Internal error, replace STM12.3/STM34.3 |
| 7 2 | Transducer 1 Offset NOK The zero-point voltage is outside the permissible range of -200 mV...+200 mV | | | | | → Transducer defective or improperly installed → Inspection of station controller in test mode; if value outside the permissible limits, replace handheld nutrunner → Internal error, replace STM12.3/STM34.3 |
| 7 3 | Transducer 1 Calibration voltage NOK The calibration voltage is outside the permissible range of +4.85 V...+5.15 V | | | | | → Transducer defective or improperly installed → Inspection of station controller in test mode; if value outside the permissible limits, replace handheld nutrunner → In case of an extreme deviation, check tool cables, particularly the calibration wire → Internal error, replace STM12.3/STM34.3 |

| DI S P L AY | Upper display Lower display Error Explanation | Consequence | | | | Measures, remedy |
|-------------------------|---|---------------|-----------------------------|--------------------|---|---|
| | | LED-READY Off | Main and start-up relay Off | Output section Off | Braking of motor, Output section Off | |
| 8 8 | | | | | | |
| 7 4 | Transducer 1 Angle tracing NOK The angle signals are <ul style="list-style-type: none"> • interrupted • short-circuited • unavailable • temporarily unavailable | | | | | Check station controller in test mode No angle signals: → Check transducer wiring, particularly the angle signal wires Nutrunner turns beyond 360°: → Check angle factor → Replace the transducer → Internal error, replace STM12.3/STM34.3 |
| 8 1 | Transducer 2 missing The transducer signals are <ul style="list-style-type: none"> • interrupted • short-circuited • unavailable | | | | | → Transducer connected? → Check the transducer wiring for breaks and short circuits → Replace the transducer → Internal error, replace STM12.3/STM34.3 |
| 8 2 | Transducer 2 Offset NOK The zero-point voltage is outside the permissible range of -200 mV...+200 mV | | | | | → Transducer improperly installed → Inspection of station controller in test mode; if value outside the permissible limits, replace transducer → Internal error, replace STM12.3/STM34.3 |
| 8 3 | Transducer 2 Calibration voltage NOK The calibration voltage is outside the permissible range of + 4.85 V...+ 5.15 V | | | | | → Transducer improperly installed → Inspection of station controller in test mode; if value outside the permissible limits, replace transducer → In case of an extreme deviation, check transducer wiring, particularly the calibration wire → Internal error, replace STM12.3/STM34.3 |
| 8 4 | Transducer 2 Angle tracing NOK The angle signals are <ul style="list-style-type: none"> • interrupted • short-circuited • unavailable • temporarily unavailable | | | | | Check station controller in test mode No angle signals: → Check transducer wiring, particularly the angle signal wires Handheld nutrunner turns beyond 360°: → Check angle factor → Replace the transducer → Internal error, replace STM12.3/STM34.3 |

| DI S P L AY | Upper display Lower display Error Explanation | Consequence | | | | Measures, remedy |
|-------------------------|--|---------------|-----------------------------|--------------------|---|--|
| | | LED-READY Off | Main and start-up relay Off | Output section Off | Braking of motor, Output section Off | |
| 8 8 | | | | | | |
| 9 0 | MK - exception Error in the program execution | | | | | → Internal error, replace STM12.3/ STM34.3 → Inform Sales & Service Center |
| 9 1 | UART error Hardware error | | | | | → Internal error, replace STM12.3/ STM34.3 |
| 9 2 | MK-general initialization error Initialization of the internal communication interfaces is NOK | | | | | → Internal error, replace STM12.3/ STM34.3 → Inform Sales & Service Center |
| 9 3 | MK - communication error Communication interfaces are NOK | | | | | → Internal error, replace STM12.3/ STM34.3 → Inform Sales & Service Center |
| 9 6 | Servo not OK No ready signal from servo | | | | | → Measuring board screwed tight in STM12.3/STM34.3? → Internal error, replace STM12.3/ STM34.3 |
| 9 8 | Flash error Program update not possible Station controller is to transfer the incorrect program | | | | | → Check program selection → Internal error, replace STM12.3/ STM34.3 → Inform Sales & Service Center |
| 9 9 | Task ID error Software monitoring | | | | | → Internal error, replace STM12.3/ STM34.3 → Inform Sales & Service Center |
| I P | Overload (not blinking) If a current above the admissible maximum current is drawn during fastening, the servo amplifier shuts off automatically. • Error in motor position tracing, i.e. resolver, cable • Error in the motor circuit, i.e. motor does not attain the required torque | | | | | Check system programming: → handheld nutrunner selection → required torque Check motor position tracing: → Check tool cables and replace if necessary → Replace handheld nutrunner → Internal defect, replace STM12.3/ STM34.3 → Check tool cables → Replace handheld nutrunner |

10.2 LED: READY, ARCNET active

| Error | Measure, remedy |
|---|--|
| READY LED does not light up <ul style="list-style-type: none"> • The STM12.3/STM34.3 is not ready • 7-segment display blinks | → Check supply voltages → Internal defect, replace STM12.3/STM34.3 → → see 10.1 Display of errors, page 41 |
| LED ARCNET active blinks at approx. 1 Hz <ul style="list-style-type: none"> • ARCNET - communication interrupted | Check ARCNET connection: → Check lock cable plugs everywhere → Check the ARCNET wiring for breaks and short circuits |
| LED ARCNET active does not light up <ul style="list-style-type: none"> • State and diagnostic display blinks | → Internal defect, replace STM12.3/STM34.3 → see 10.1 Display of errors, page 41 |

11 Maintenance / Service

WARNING! High leakage current –
 Fatal electric shock could occur!



- Always disconnect the power supply before performing maintenance work on the built-in nutrunner and the nutrunner control.
- Always disconnect the system cable, motor or motor cable from the nutrunner control or built-in nutrunner before making throughput, resistance and short circuit measurements.
- Do not attempt to repair possible faults on the fastening system by yourself if you do not have the required knowledge! Inform the local repair center or your Sales & Service Center.
- Establish a grounding connection (PE) to the nutrunner control before taking into operation!

CAUTION!



High temperature –
 the motor on the built-in nutrunner may heat up and cause burns during removal.
 (max. engine temperature 90 °C).

- Wear gloves.

Regular maintenance reduces operating faults, repair costs and downtime. Implement a safety-related maintenance program that takes the local regulations for repair and maintenance for all operating phases of the tool into account.



- Always remove the complete built-in nutrunner from a unit.
- A repair is only permitted by Apex Tool Group authorized personnel. If repair is required, send the complete component to Sales & Service Center.
- Whenever a component is replaced, a machine capability test must be carried out
- Do not open the transducer, motor, offset attachment, angle head attachment or STM12/34 as this will void the warranty.
- Read the following documents when replacing the built-in nutrunner
 - this system manual
 - built-in nutrunner Assembly instructions
 - built-in nutrunner Service manual
 - Spare part sheets

Electric motors

Brushless motors are maintenance-free. The service life of the motors is normally dependent on the rotor bearings installed.

Gearing

See Service manual built-in nutrunner

Transducer

The transducers are metrological assemblies, and they therefore must be handled accordingly.

Handle the transducers both at the workplace and in storekeeping so that the front-side crown gearing is not damaged. Slight damage to the crown gearing could impair operation safety.

Causes of Error

| | |
|-----------------------------|--|
| Output signal is not linear | → Measuring hub has been stretched too far |
| Offset voltage is too high | → Measuring hub has been stretched too far |
| No output signal | → Pre-amplifier is defective |

Attachments



Service Memory of Replacement Transducers

When a transducer is replaced, the following must be adhered to:

The replacement transducers come with out nutsetter characteristics values in the service memory, (since the customer can install them in different built-in nutsetter types). That means, the replacement transducer is not suitable for self identification by the nutsetter controller. The measuring functions for torque and angle are available without limitations => the remaining transducer and nutsetter data, however, must be manually entered at the nutsetter controller.

Straight attachments are designed so that they require little maintenance.

Offset attachments, like other gearing components, require little maintenance. Electronic components are integrated into the offset attachments, and they therefore must be handled with special care.

ATTENTION!

The sensor must not be damaged.

→ Do not bring any shock on the attachment.

12 Disposal

CAUTION!



Injuries and environmental damage from improper disposal.

Components of the built-in nutrunner pose risks to the health and the environment.

- The built-in nutrunner contains components that can be reused as well as components that require special disposal. Separate the components and dispose of them by segregating them clearly.
- Catch auxiliary materials (oils, greases) when drained and dispose of them properly.
- Separate the components of the packing and dispose of them by segregating them clearly.
- Follow the locally applicable regulations.





Observe generally valid disposal guidelines such as, in Germany, the Electrical and Electronic Equipment Act (ElektroG):

- Hand in the built-in nutrunner at your company collection point or return to Sales & Service Center.

POWER TOOLS SALES & SERVICE CENTERS

Please note that all locations may not service all products.
Contact the nearest Cleco® Sales & Service Center for the appropriate facility to handle your service requirements.

 Sales Center

 Service Center

NORTH AMERICA | SOUTH AMERICA

Detroit, Michigan

Apex Tool Group
2630 Superior Court
Auburn Hills, MI 48236
Phone: +1 (248) 393-5644
Fax: +1 (248) 391-6295

Lexington, South Carolina

Apex Tool Group
670 Industrial Drive
Lexington, SC 29072
Phone: +1 (800) 845-5629
Phone: +1 (919) 387-0099
Fax: +1 (803) 358-7681

Canada

Apex Tool Canada, Ltd.
7631 Bath Road
Mississauga, Ontario L4T 3T1
Canada
Phone: (866) 691-6212
Fax: (905) 673-4400

Mexico

Apex Tool Group
Vialidad El Pueblito #103
Parque Industrial Querétaro
Querétaro, QRO 76220
Mexico
Phone: +52 (442) 211 3800
Fax: +52 (800) 685 5560

Brazil

Apex Tool Group
Av. Liberdade, 4055
Zona Industrial Iporanga
Sorocaba, São Paulo
CEP# 18087-170
Brazil
Phone: +55 15 3238 3870
Fax: +55 15 3238 3938

EUROPE | MIDDLE EAST | AFRICA

England

Apex Tool Group GmbH
C/O Spline Gauges
Piccadilly, Tamworth
Staffordshire B78 2ER
United Kingdom
Phone: +44 1827 8727 71
Fax: +44 1827 8741 28

France

Apex Tool Group SAS
25 Avenue Maurice Chevalier - ZI
77330 Ozoir-La-Ferrière
France
Phone: +33 1 64 43 22 00
Fax: +33 1 64 43 17 17

Germany

Apex Tool Group GmbH
Industriestraße 1
73463 Westhausen
Germany
Phone: +49 (0) 73 63 81 0
Fax: +49 (0) 73 63 81 222

Hungary

Apex Tool Group
Hungária Kft.
Platánfa u. 2
9027 Győr
Hungary
Phone: +36 96 66 1383
Fax: +36 96 66 1135

ASIA PACIFIC

Australia

Apex Tool Group
519 Nungong Street, Albury
NSW 2640
Australia
Phone: +61 2 6058 0300

China

Apex Power Tool Trading
(Shanghai) Co., Ltd.
2nd Floor, Area C
177 Bi Bo Road
Pu Dong New Area, Shanghai
China 201203 P.R.C.
Phone: +86 21 60880320
Fax: +86 21 60880298

India

Apex Power Tool India
Private Limited
Gala No. 1, Plot No. 5
S. No. 234, 235 & 245
Indialand Global
Industrial Park
Taluka-Mulsi, Phase I
Hinjawadi, Pune 411057
Maharashtra, India
Phone: +91 020 66761111

Japan

Apex Tool Group Japan
Korin-Kaikan 5F,
3-6-23 Shibakoen, Minato-Ku,
Tokyo 105-0011, JAPAN
Phone: +81-3-6450-1840
Fax: +81-3-6450-1841

Korea

Apex Tool Group Korea
#1503, Hibrand Living Bldg.,
215 Yangjae-dong,
Seocho-gu, Seoul 137-924,
Korea
Phone: +82-2-2155-0250
Fax: +82-2-2155-0252

Cleco®
Production Tools

Apex Tool Group, LLC

Phone: +1 (800) 845-5629
Phone: +1 (919) 387-0099
Fax: +1 (803) 358-7681
www.ClecoTools.com
www.ClecoTools.de