SU-A SA-C

SF

SFB

SFC

SAB

Travel Drives

Operation & Service Manual

en-US

Before installing hoist, fill in the information below.
Refer to the Hoist and Motor data plates.

Model No. _____

Serial No. _____

Purchase Date _____

Voltage _____

Rated Load _____

Follow all instructions and warnings for inspecting, maintaining and operating this product.
The use of any hoist presents some risk of personal injury or property damage. That risk is greatly increased if proper instructions and warnings are not followed. Before using this hoist, each operator should become thoroughly familiar with all warnings, **instructions and recommendations in this manual. Retain this manual for future reference and use.**
Forward this manual to operator. Failure to operate equipment as directed in manual may cause injury.

Yale® HOISTS

SHAW-BOX®

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YALE/SHAWBOX HOIST PARTS AND SERVICES ARE AVAILABLE IN THE UNITED STATES AND IN CANADA

As a Yale/Shawbox Hoist and Trolley user you are assured of reliable repair and parts services through a network of Master Parts Depots and Service Centers that are strategically located in the United States and Canada. These facilities have been selected on the basis of their demonstrated ability to handle all parts and repair requirements promptly and efficiently. To quickly obtain the name of the Master Parts Depot or Service Center located nearest you, call (800) 888-0985, Fax: (716) 689-5644, visit www.cmworks.com

LAS PIEZAS Y REPARACIONES DE LOS POLIPASTOS DE YALE/SHAWBOX ESTÁN ASEGURADAS EN ESTADOS UNIDOS Y CANADÁ

Como usuario de un polipasto y carro de Yale/Shawbox le aseguramos cualquier reparación o la disponibilidad de cualquier pieza de repuesto a través de una red de almacenes de piezas de repuesto y centros de servicio situados estratégicamente en Estados Unidos y Canadá. Estas instalaciones se han seleccionado en base a su capacidad demostrada en la reparación de equipos y suminstro de piezas de repuesto de forma rápida y eficaz. Para obtener la dirección del almacén de piezas de repuesto o del centro de servicio más cercano, llame al teléfono (800) 888-0985. Fax: (716) 689-5644, visite www.cmworks.com (sólo en Estados Unidos y Canadá).

LE SERVICE DE RÉPARATION ET DE PIÈCES POUR PALANS YALE/SHAWBOX EST DISPONIBLE AUX ÉTATS-UNIS ET AU CANADA

Soyez assurés qu'en temps d'utilisateur de palan et treuil Yale/Shawbox, d'un service de réparation et de pièces fiable par l'entremise d'un réseau de Centres de service et de Dépôts de pièces maîtresses qui sont stratégiquement situés aux États-Unis et au Canada. Ces établissements ont été sélectionnés sur une base de leur habileté démontrée à s'occuper promptement et efficacement des besoins de réparation de pièces. Appelez le (800) 888-0985, Fax: (716) 689-5644, visite www.cmworks.com pour obtenir rapidement le nom du dépôt de pièces maîtresses ou du centre de service situé le plus près.

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1 General notes

1.1 Using these instructions

These instructions are part of the product and contain important information on proper and safe assembly, electrical installation, commissioning, testing, troubleshooting and maintenance. It is essential to observe the listed information, safety notes and warning messages, as well as required actions. The owner must ensure that all persons who work on or with the product have fully read and understood these instructions.

The additional information in the enclosed technical documentation must be observed.

These instructions and all further applicable documents must be kept to hand and accessible at all times for later use.

1.2 Copyright notice

The contents of these instructions must be treated as confidential and are intended exclusively for personnel working with the product. It is impermissible to pass these instructions on to third parties without the written consent of the manufacturer.
The information, texts, drawings, figures and other representations contained within them are copyright protected and subject to industrial property rights.

It is prohibited to produce any form of duplicate copy, including excerpts, and to exploit and/or disclose the contents without the written consent of the manufacturer. Infringements will be subject to compensation for damages. Further rights reserved.

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1.3 Target audience and responsibilities

These instructions are intended for owners, qualified specialist personnel and persons who are competent.

People under the influence of drugs, alcohol or medication that could impair reaction times are not permitted to work on or with the product.

Owner
The owner is anyone who operates the product and uses it, or who allows suitable and instructed personnel to operate it.

Qualified specialist personnel
The product must be operated exclusively by qualified specialist personnel. Persons who work on or with the product must have read and understood these instructions before commencing the work.

Competent person
A competent person is anyone who, due to their professional training, professional experience and recent professional activity, possesses the requisite skills and expertise to test equipment. Competent persons with the authority to undertake work on our products are service technicians of the manufacturer and trained, certified service technicians.

Competent person authorized to test cranes
A competent person qualified to test cranes is a person who, as a result of their professional training, professional experience and recent professional activity has the required specialist knowledge for handling and using cranes and is permitted to release cranes or hoists for operation on the basis of national and local regulations.

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2 Safety-related information

2.1 Layout of the warning messages

2.1.1 Section warning messages

Section warning messages relate to an entire chapter or a section and are structured as follows.

⚠ SIGNAL WORD

Type and source of danger
Possible consequences if disregarded
➢ Measures to prevent the danger

2.1.2 Embedded warning messages

Embedded warning messages are placed directly before or after a required action and are structured as follows.

⚠ SIGNAL WORD Type and source of danger, possible consequences if disregarded.
➢ Measures to prevent the danger.

2.1.3 Signal words

The following signal words are used in warning messages.

Signal word	Meaning
⚠ DANGER	Indicates a hazardous situation which, if not avoided, will result in death or serious injury.
⚠ WARNING	Indicates a hazardous situation which, if not avoided, could result in death or serious injury.
⚠ CAUTION	Indicates a hazardous situation which, if not avoided, could result in minor or moderate injury.
ATTENTION	Indicates possible material or environmental damage.

2.1.4 Safety alert symbols

Symbol	Meaning
	General hazard
	Risk of electric shock

2.1.5 Mandatory action signs

Symbol	Meaning
	General mandatory action sign
	The information in the enclosed technical documentation must be observed.
	Work must be carried out by a competent person
	Work must be carried out by a competent person (qualified electrician)
	Bolted connections must be tightened to the prescribed tightening torques

2.2 Further symbols

Symbol	Meaning
	Important notice
➢	Required action
1. 2.	Required actions must be performed in the indicated sequence
→	Result of a required action
•	List
–	List (2nd level)

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2.3 Safety notes

All products are constructed in accordance with state of the art engineering and the recognized safety rules. However, during use danger to the life and limb of the owner or a third party can arise, or adverse effects can affect the product and other property.

Observe the following:

- The permissible environmental conditions must be observed.
- The work performed must be carried out by authorized personnel only.
- The information in the enclosed technical documentation must be observed.
- The product must only be operated in a satisfactory condition.
- The national and local safety and accident prevention regulations, the occupational safety acts and environmental provisions must be observed.
- All damage and defects on the product must be reported to the supervisor responsible immediately. The product must not be used until the defects have been remedied.
- Signs, labels, or pictograms that are applied to the product must be observed and must not be removed.
- Damaged signs, labels or pictograms must be replaced by new signs, labels or pictograms.

2.3.1 Intended use

The product may only be used for the intended application in accordance with the technical documentation and the information on the rating plate, and any additional stickers present. Intended use also includes proper assembly, electrical installation and maintenance.

For products that are declared as partly completed machinery, commissioning is forbidden until it is determined that the machinery into which this product is installed complies with the provisions of the EC Directives or other national and local regulations.

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2.3.2 Prohibited use

The owner, and not the manufacturer, is liable for all personal injury and material damage that arises due to prohibited use. Liability on the part of the manufacturer is excluded in this case.

Prohibited uses are:

- A failure to follow the specifications and notes provided in these instructions.
- A failure to follow information on the rating plate, the additional stickers and warning signs that are applied to the product.
- Use of the product in applications for which it is not intended.
- Exceeding the permissible load
- Jog mode, i.e. brief actuation of a button on the control pendant multiple times in succession.
- Impermissible changes and modifications.
- Operation in a damaged condition.
- Improperly performed repairs.

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2.3.3 Owner obligations

The owner must ensure the following:

- Personnel are qualified and trained regularly.
- All persons who work on or with the product have read and understood the associated instructions.
- Planning, assembly and electrical installation are performed correctly.
- A test is carried out prior to commissioning.
- The satisfactory condition of the product is maintained through maintenance measures.
- In the event of defects relevant to safety, operation is discontinued immediately.
- Only spare parts that are approved by the manufacturer are used.
- Personnel are provided with the prescribed personal protective equipment.

2.3.4 Personal protective equipment

Personal protective equipment must be worn at all times during activities that can cause injuries or endanger health.

To be worn at all times	
	**Work protective clothing** Work clothing with low tear resistance, with narrow sleeves and no protruding parts, to protect against being caught by moving machine parts. Do not wear rings, chains or other jewelry.
	**Safety shoes** For protection against heavy falling parts and slipping on slippery surfaces.
Wear in unusual environmental conditions	
	**Safety eyewear** To protect the eyes from any stray flying parts and splashes of liquid.
	**Hearing protection** To protect against hearing damage.
	**Safety helmet** For protection from falling parts.
	**Safety gloves (only if there is no entanglement hazard)** To protect hands from friction, abrasions, punctures or deep injuries as well as from contact with hot surfaces.
	**Safety harness** It is necessary to provide work rigs or lifting platforms for any maintenance and repair work that cannot be carried out from floor level. Service technicians who work outside lifting platforms must be safeguarded with a safety harness.

2.3.5 Changes and modifications

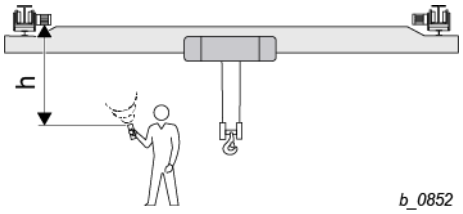
Only carry out changes and modifications to the product with written approval from the manufacturer.

2.3.6 Mounting accessories and spare parts

Impermissible mounting accessories and inadmissible spare parts may impair safety.
Only use original mounting accessories and original spare parts from the manufacturer.

2.3.7 Noise emissions

For the averaged sound pressure level measured at a distance of 1 meter / 3 feet from the product, see the table.



h = 1 m / 3 ft

In the hall

Type	[db (A)] ± 3				
	h [ft]				
	1 m / 3 ft	2 m / 7 ft	4 m / 13 ft	8 m / 26 ft	16 m / 52 ft
SU-A	78	75	72	69	66
SF/SFB..2.. /SFC..1..	72	69	66	66	63
SF/SFB..8..	78	75	72	69	66
SA-C/SAB	72	69	66	66	63

Outdoors

Type	[db (A)] ± 3				
	h [ft]				
	1 m / 3 ft	2 m / 7 ft	4 m / 13 ft	8 m / 26 ft	16 m / 52 ft
SU-A	78	72	66	60	54
SF/SFB..2.. /SFC..1..	72	66	60	54	48
SF/SFB..8..	78	72	66	60	54
SA-C/SAB	72	66	60	54	48

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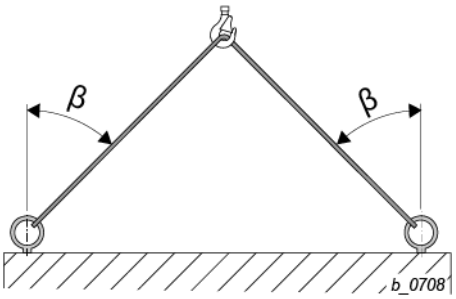

2.3.8 Transport and storage

Inspect the delivery immediately upon receipt for completeness and any transport damage. Report any transport damage to the transport company immediately.

The product is delivered on a pallet. A forklift or a lift truck can be used for transport.
If the product is suspended during transport, use the lifting points provided. The inclination angle “β” during transport must not exceed 45°.

During transport, observe the following:

- Secure the danger zone.
- Only use suitable means of transport with adequate load capacity.
- Secure the product during transport.
- Do not stand under suspended loads.

The product must be stored as follows until assembly:

- Store in a dry, dust-free environment.
- Do not expose to aggressive media.
- Store within the approved service temperature range.
- Protect from direct sunlight.
- Avoid mechanical vibrations.
- Support the product against tipping and toppling.
- Observe additional information on the product or packaging.

2.3.9 Cleaning

Clean the product as follows:

- Only clean the product with a damp cloth.
- Only use water or mild, non-abrasive and non-scratching cleaners.
- Do not use solvent-based cleaners.
- Do not use a high-pressure cleaner or compressed air.

2.3.10 Decommissioning

1. Disconnect the product from the power supply.
2. Disassemble the product in reverse order to assembly.

2.3.11 Disposal

Following correct disassembly, the disassembled components of the product must be submitted for recycling in accordance with the locally applicable regulations.

- Metallic parts for scrap metal
- Electronic components for electrical/electronic scrap
- Plastic parts for recycling

Electronic components, lubricants and other auxiliary substances are subject to special waste treatment and shall only be disposed of by approved specialist companies.

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3 Product description

The travel drives are intended for driving cranes, crane-like equipment or trolleys in conventional industrial environments.

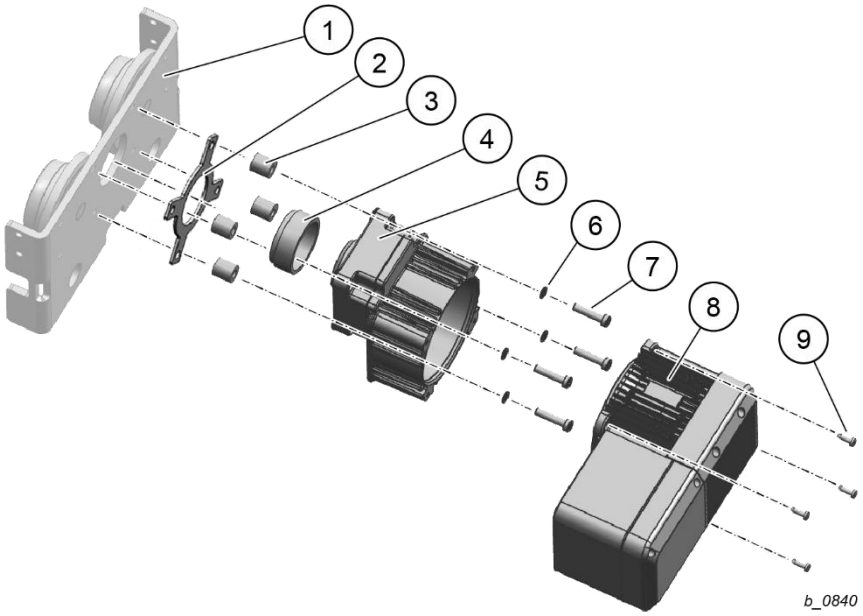
With special application cases, e.g. use outdoors, offshore or in an environment with high exposure to chemicals, special measures, which must be clarified with the manufacturer, must be implemented.

3.1 Standards and directives

The conformity to the standards and directives can be found in the accompanying technical documentation.

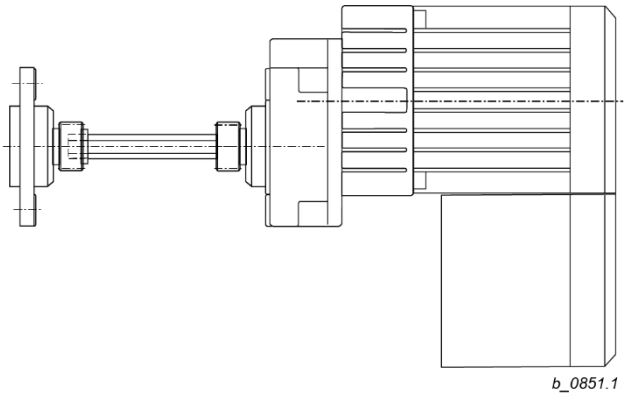
3.2 Design overview

3.2.1 Travel drive SU-A



(1) Trolley side cheek (not in scope of delivery)
(2) Plate (optional)
(3) Bushing (optional)
(4) Bushing (optional)
(5) Gears
(6) Washer
(7) Screw
(8) Travel motor
(9) Screw

The drive shaft is optionally designed with a pinion or with a cylindrical shaft with parallel key groove.
The SU-A 11 travel drive can be expanded with flange bearings, pinion and a through drive (not included in the scope of delivery).



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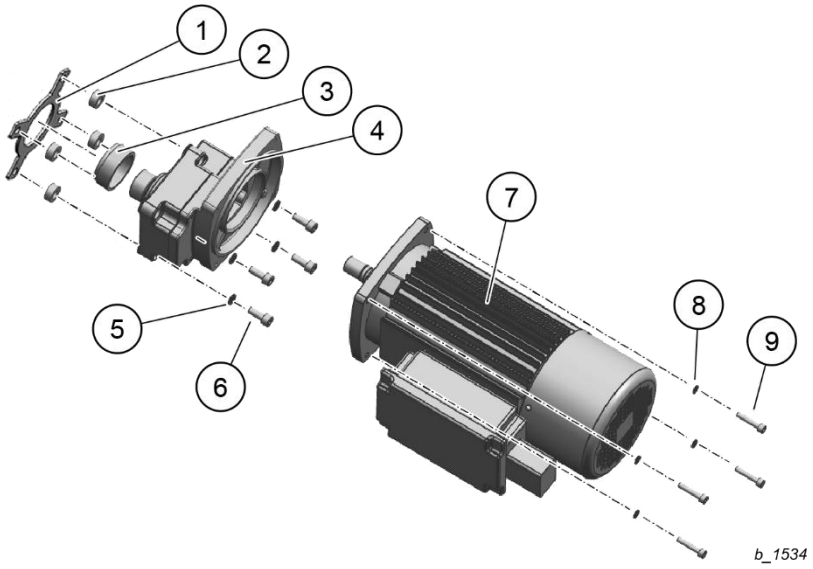
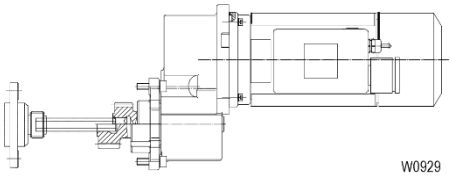
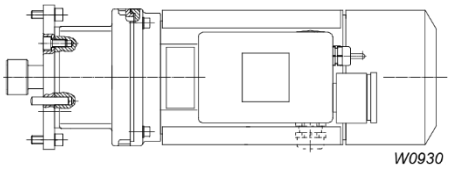
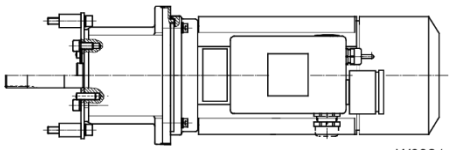
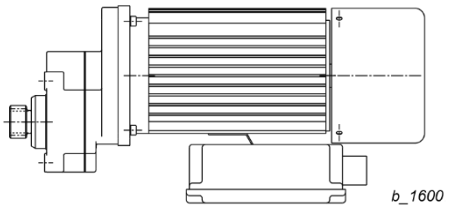
3.2.2 Travel drive SF 1. / SFB1. / SFC1.



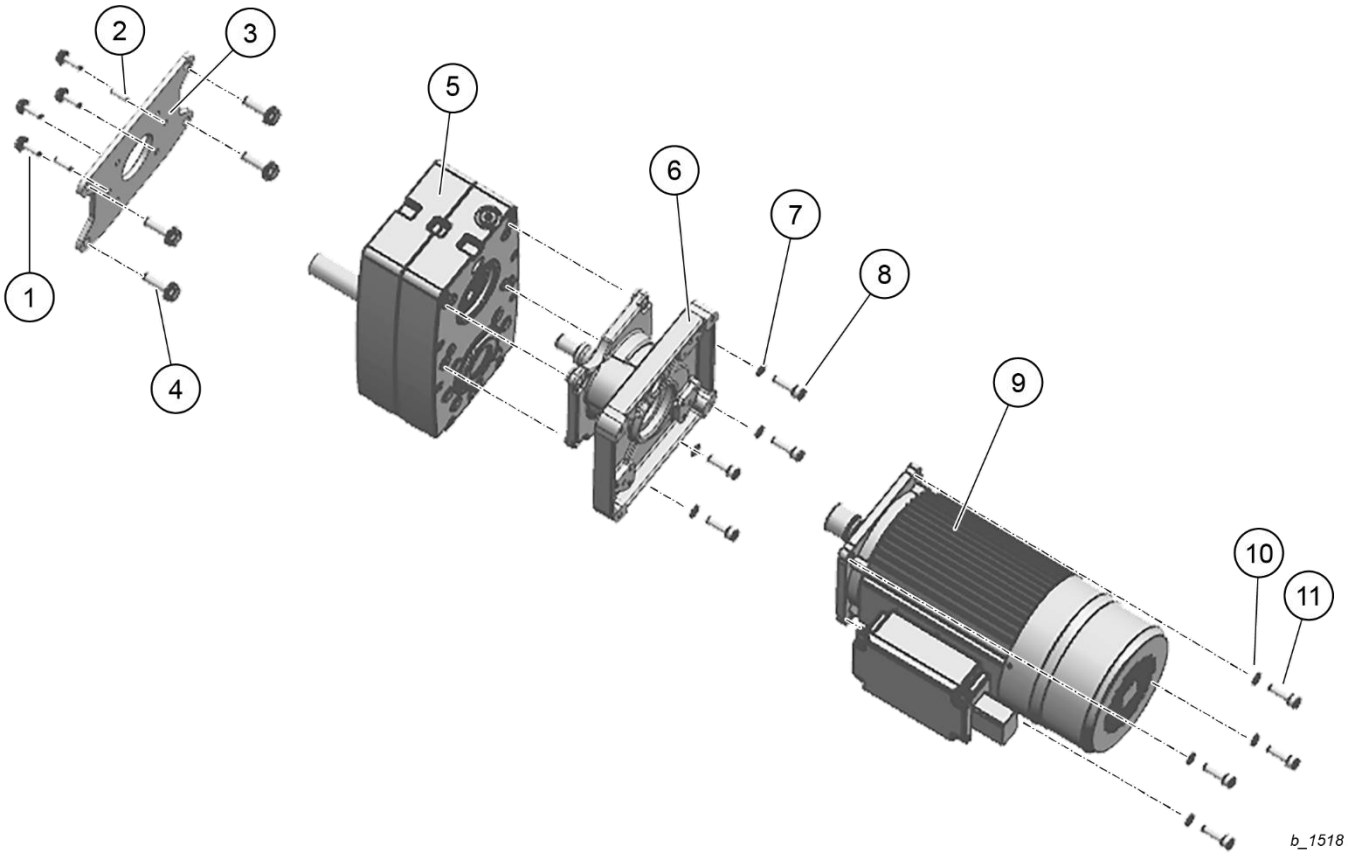
(1) Plate (optional)
(2) Bushing (optional)
(3) Bushing (optional)
(4) Gears
(5) Washer
(6) Screw
(7) Travel motor
(8) Washer
(9) Screw

The drive shaft is optionally designed with a pinion or with a cylindrical shaft with parallel key groove.
The SF-1 travel drive can be expanded with flange bearings, pinion and a through drive (not included in the scope of delivery).

SF 11 / SF 18	SF 14
	

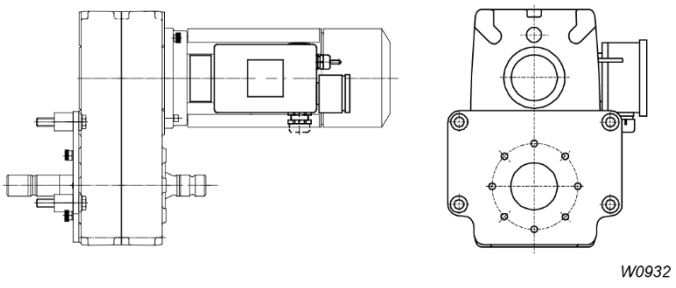
SF 17 / SFB13 / SFB14 / SF 15	SFC12
	

3.2.3 Travel drive SF 25, 35 / SFB23, 32

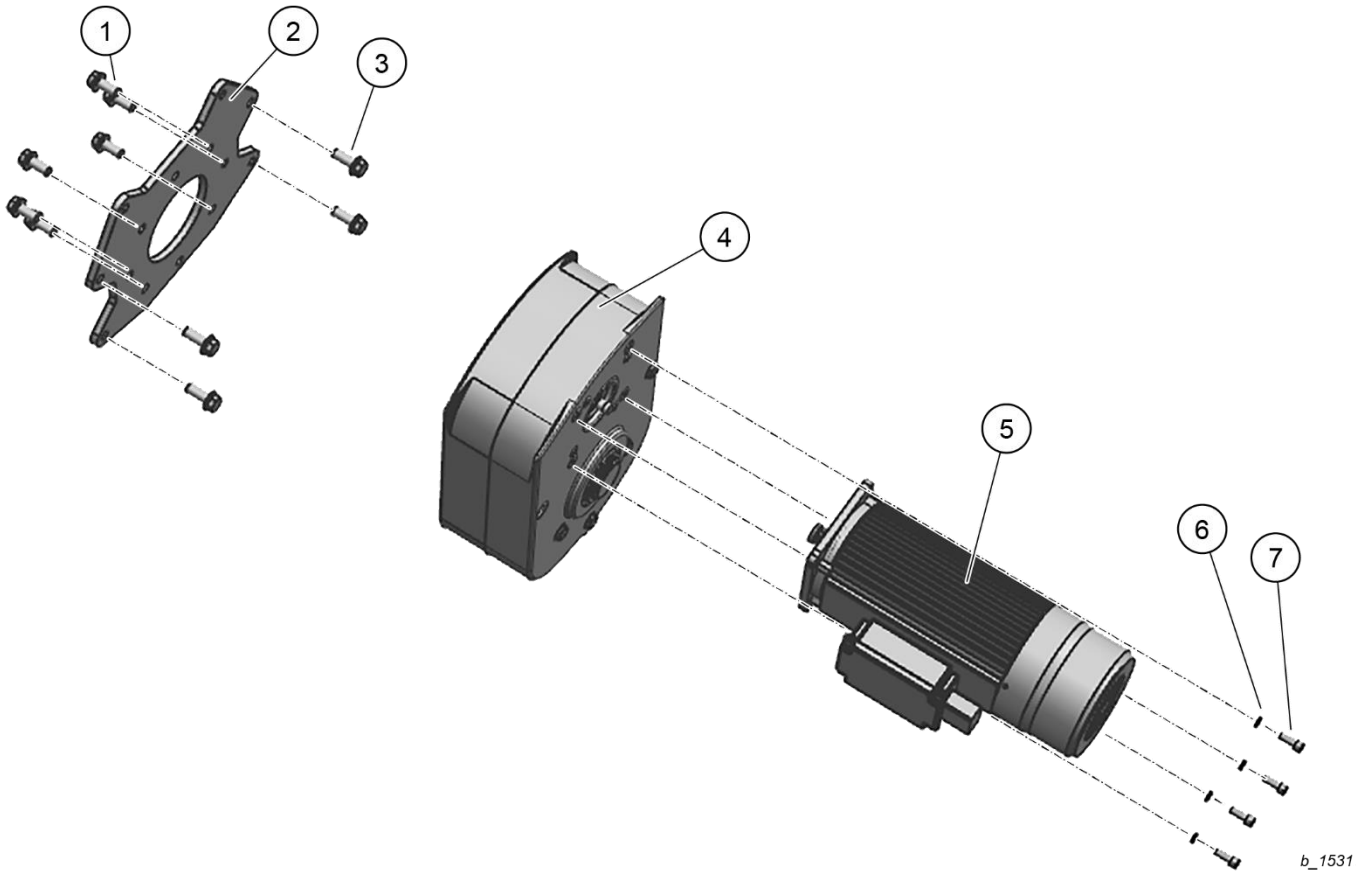


(1) Screw
(2) Cylinder pin
(3) Torque arm
(4) Screw
(5) Gears
(6) Intermediate gear (optional)
(7) Washer (optional)
(8) Screw (optional)
(9) Travel motor
(10) Washer
(11) Screw

SF 25, 35 / SFB23, 32

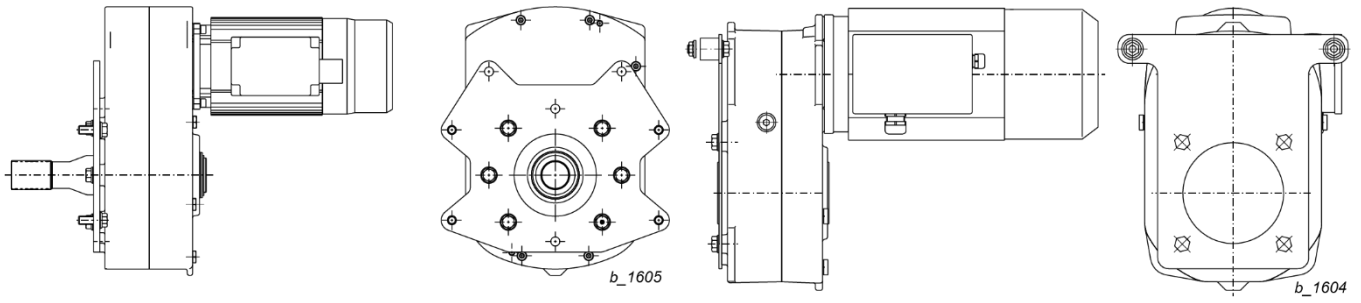


3.2.4 Travel drive SAB / SA-C



(1) Screw
(2) Torque arm
(3) Screw
(4) Gears
(5) Travel motor
(6) Washer
(7) Screw

SAB5, 6	SA-C 5, 6



4 Assembly

⚠ WARNING

Improper assembly can cause material damage or severe injuries.

- Ensure that a competent person carries out the assembly.
- Observe the national and local safety and accident prevention regulations, the occupational safety acts and environmental provisions.
- Use a lifting platform for work that cannot be carried out from the ground. Use a safety harness when performing any work outside of lifting platforms.
- Wear the prescribed personal protective equipment.
- Secure the danger zone.
- Keep a sufficient safety distance from the product.
- Use only original mounting accessories from the manufacturer.
- Tighten bolted connections to the prescribed tightening torques with a torque wrench.

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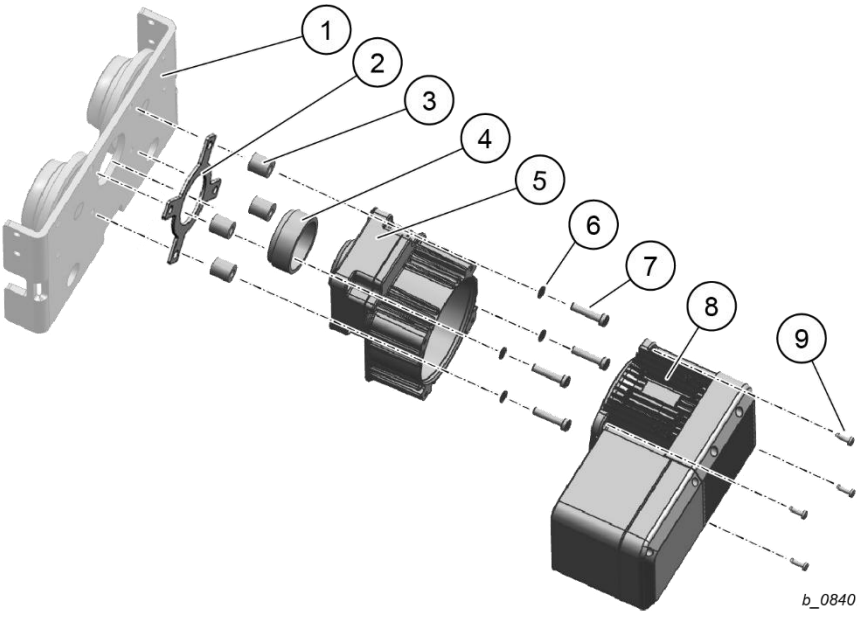
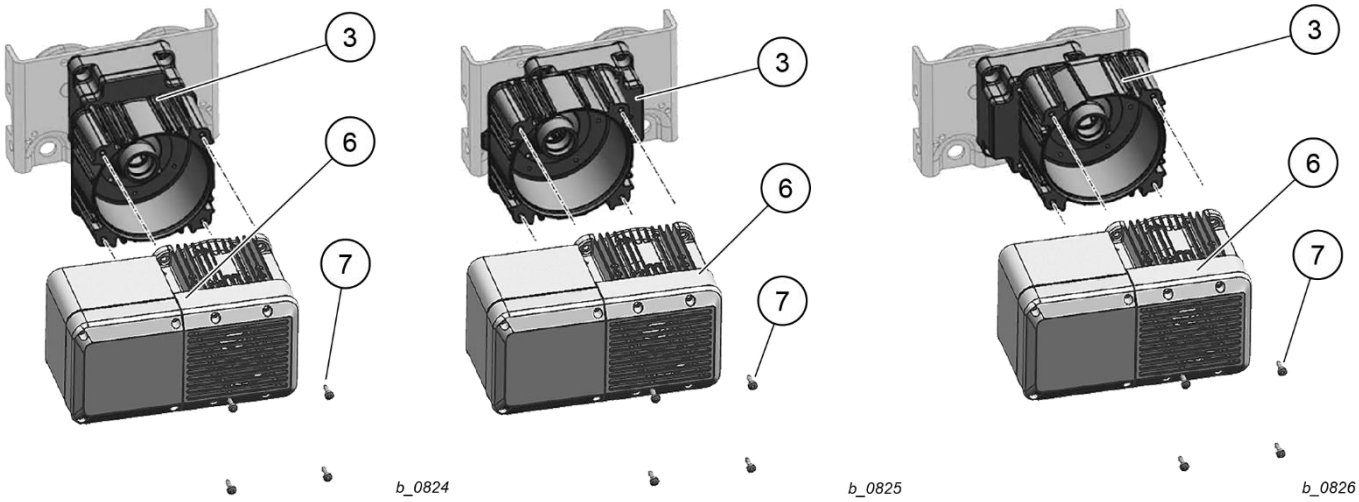
4.1 Assembling the travel drive SU-A



(1) Trolley/endcarriage (not in scope of delivery)
(2) Plate (optional)
(3) Bushing (optional)
(4) Bushing (optional)
(5) Gears
(6) Washer
(7) Screw
(8) Travel motor
(9) Screw

1. Before assembly, clean the contact surfaces of the trolley/endcarriage (1) and the gearbox underside (5) of dirt, rust or grease.
   - ➢ Ensure that the paint layer is no thicker than 80 µm.
2. Lightly lubricate the gearing of the gear's driven shaft (5) before assembly.
3. Insert the gearing of the driven shaft of the travel drive (5, 8) into the gearing of the sheaves on the trolley/endcarriage (1) up to the stop.
4. Use the screws (7) and washers (6) to fasten the travel drive with the bushings (3, 4 optional) or the plate (2, optional) to the trolley/endcarriage (1). Tighten the bolted connections to the prescribed tightening torques, see the ***Tightening torques for bolted connections*** chapter.

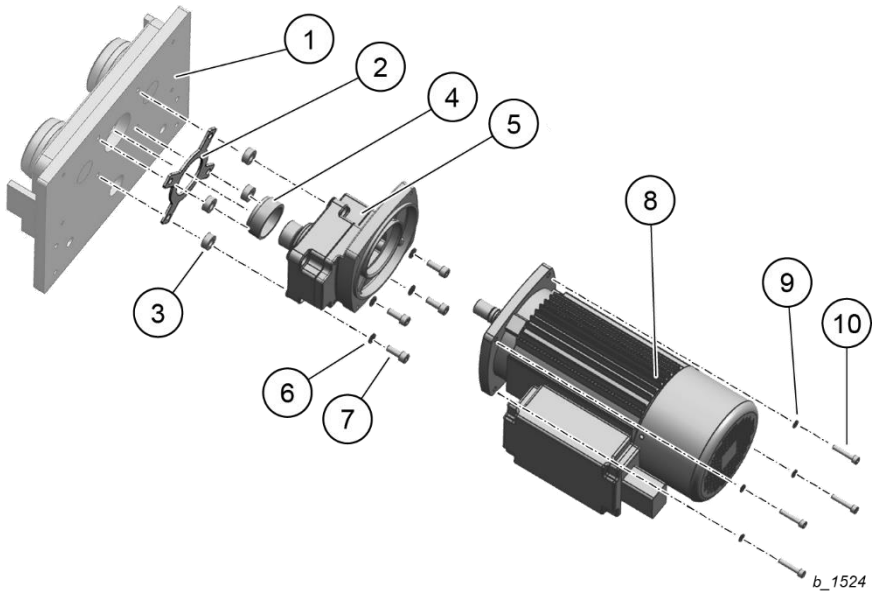
4.1.1 Permissible installation positions



1. Loosen the screws (7) from the motor.
2. Turn the gear (3) to the desired position.
3. Attach the motor (6) and tighten the screws (7) to the specified tightening torque of **4.5 Nm / 3 lb_f ft.**

   ATTENTION Do not damage the gearing!

4.2 Assembling travel drive SF 1. / SFC1.

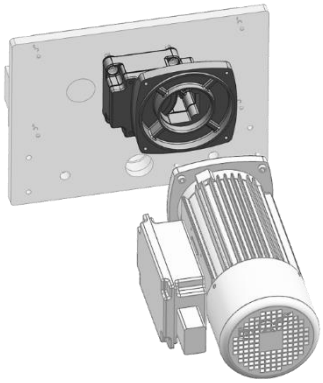


(1) Trolley/endcarriage
(2) Plate (optional)
(3) Bushing (optional)
(4) Bushing (optional)
(5) Gears
(6) Washer
(7) Screw
(8) Travel motor
(9) Washer
(10) Screw

1. Before assembly, clean the contact surfaces of the trolley/endcarriage (1) and the gearbox underside (5) of dirt, rust or grease.
   - ➢ Ensure that the paint layer is no thicker than 80 µm.
2. Lightly lubricate the gearing of the gear's driven shaft (5) before assembly.
3. Insert the gearing of the driven shaft of the travel drive (5, 8) into the gearing of the sheaves on the trolley/endcarriage (1) up to the stop.
4. Use the screws (7) and washers (6) to fasten the travel drive with the bushings (3, 4 optional) or the plate (2, optional) to the trolley/endcarriage (1). Tighten the bolted connections to the prescribed tightening torques, see the ***Tightening torques for bolted connections*** chapter.

4.2.1 Permissible installation positions, SF 1. / SFC1.

Gears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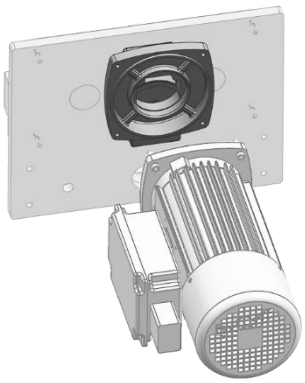
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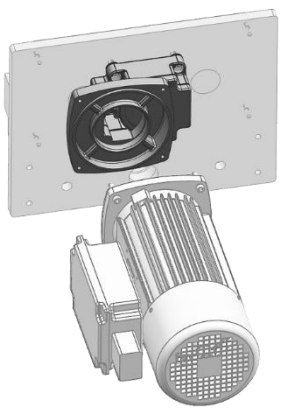
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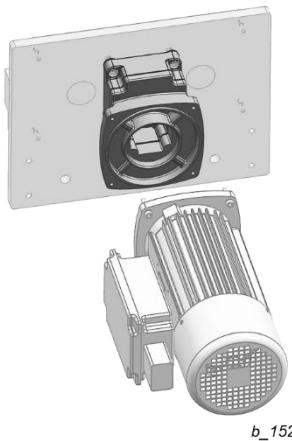
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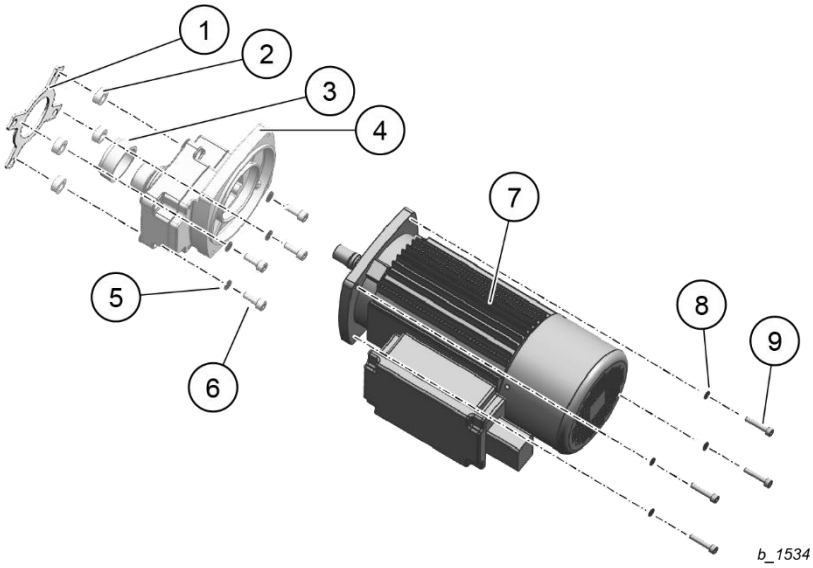
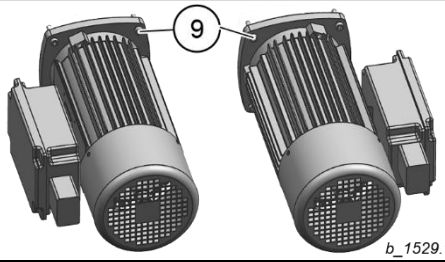
Travel motor



Standard installation position	Possible installation position



1. Loosen the screws (9) and the washers (8) of the motor.
2. Turn the travel motor (7) to the desired position.

   ATTENTION Do not damage the gearing!
3. Attach the travel motor to the gear and tighten the screws (9) and the washers (8) to the prescribed tightening torque, see ***Tightening torques for screw connections*** section

Check the position of the sealing plugs and drainage plugs on the motor, see the ***Assembling the stopping plugs/drainage plugs*** chapter.

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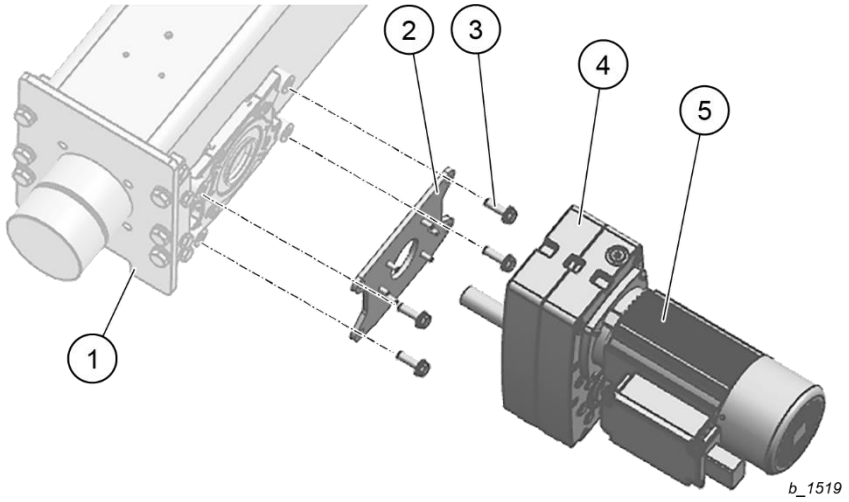
4.3 Assembling travel drive SF 2, 3 / SFB1, 2, 3

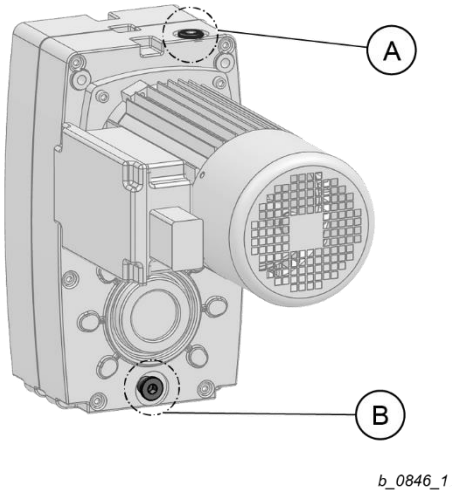


(1) Endcarriage/trolley
(2) Torque arm
(3) Screw
(4) Gears
(5) Travel motor

1. Before assembly, clean the contact surfaces of the endcarriage/trolley (1) and the torque arm (2) on the travel drive (4, 5) of dirt, rust or grease.
   - ➢ Ensure that the paint layer is no thicker than 80 µm.
2. Lightly lubricate the gearing of the gear's driven shaft (4) before assembly.
3. Insert the outer gearing of the travel drive into the inner gearing of the travel wheel on the endcarriage or trolley (1) up to the stop.
4. Use the screws (3) to fasten the travel drive to the endcarriage/trolley (1).
   Tighten the bolted connections to the prescribed tightening torques, see the ***Tightening torques for bolted connections*** chapter.

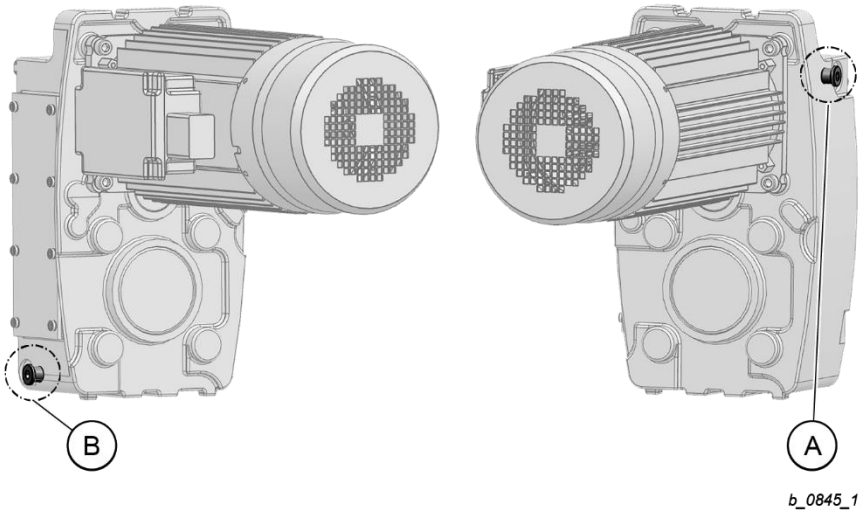
4.3.1 Assembling bleeder screw SF 2, 3 / SFB2, 3

SF 2 / SFB2



b_0846_1

SF 3 / SFB3



b_0845_1

5. Install the bleeder screw before commissioning.

The screw plugs are assembled in the delivery condition!

- Before commissioning, the **separately supplied** bleeder screw must be replaced with the screw plug in the highest position (A).
- Depending on the installation position, this is one of the screw positions (A, B) marked on the sketch.

Small quantities of oil may leak out of the bleeder screw (A).

6. Check the lubricant level before commissioning.

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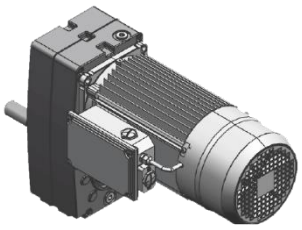
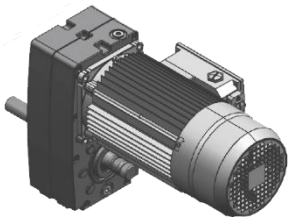
4.3.2 Permissible installation positions SF 2, 3 / SFB1, 2, 3

Travel drive

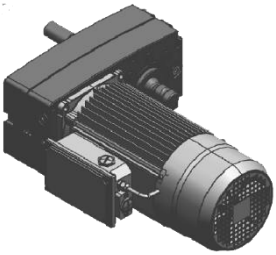
Depending on the torque arm and trolley/endcarriage, the travel drive cannot be mounted in all installation positions shown.



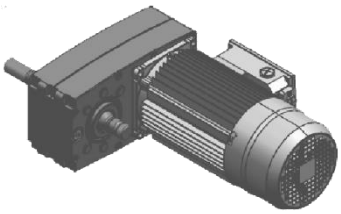
b_0827



b_0828



b_0829

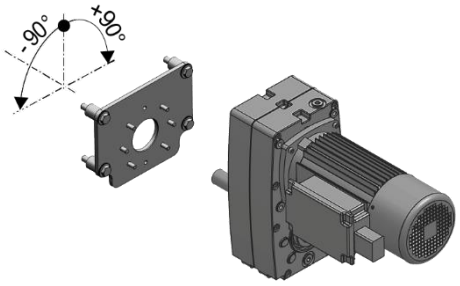


b_0830

Check the position of the sealing plugs and drainage plugs on the motor, see the ***Assembling the stopping plugs/drainage plugs*** chapter.

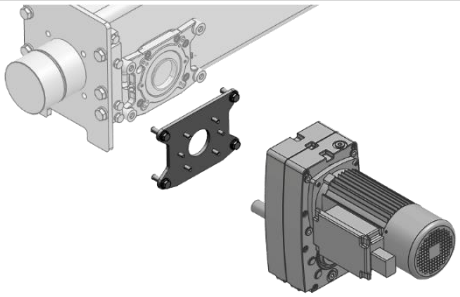
Torque arm SF 2, 3 / SFB1, 2, 3

SF 1. , SF 2. , SF 3. on overhead travelling crane endcarriage and double-rail trolleys



b_1566

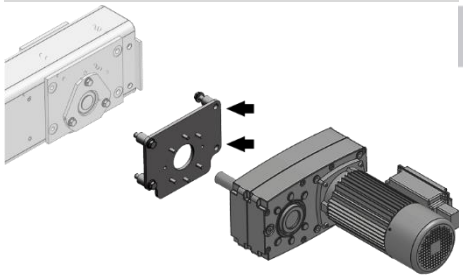
SFB1, 2, 3 on overhead travelling crane endcarriage



b_1523

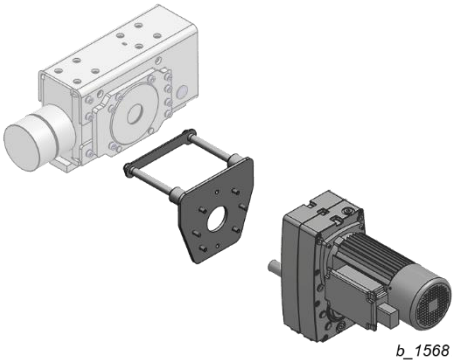
SF 2. , SF 3.on double-rail trolleys

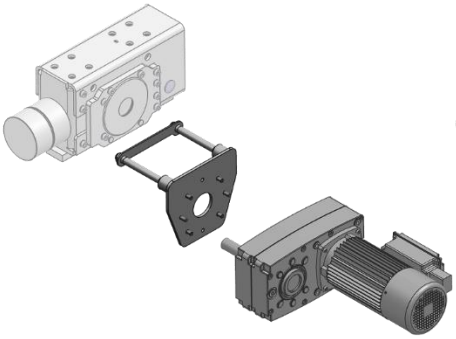
In this version, the torque arm of the SF 2, SF 3 travel drive is screwed to the double-rail trolley OE-S. on one side from behind, see ***diagram b_1567***.

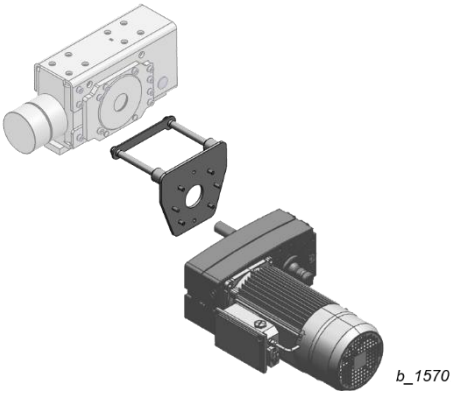


b_1567

SF 1, 2, 3 on wheel block


b_1568

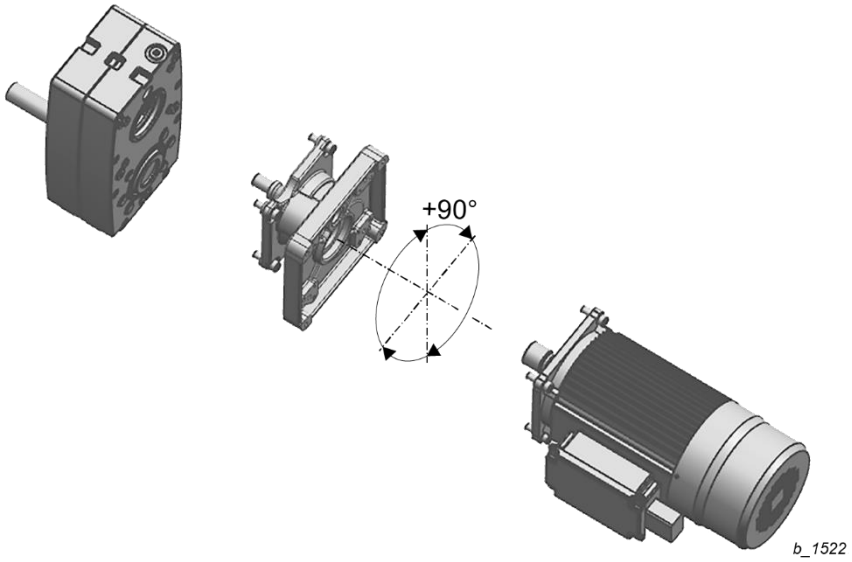

b_1569


b_1570

For assembly of the travel drive on a wheel block, see the ***wheel block operating instructions***.

Check the position of the sealing plugs and drainage plugs on the motor, see the ***Assembling the stopping plugs/drainage plugs*** chapter.

Intermediate gear (optional)



b_1522

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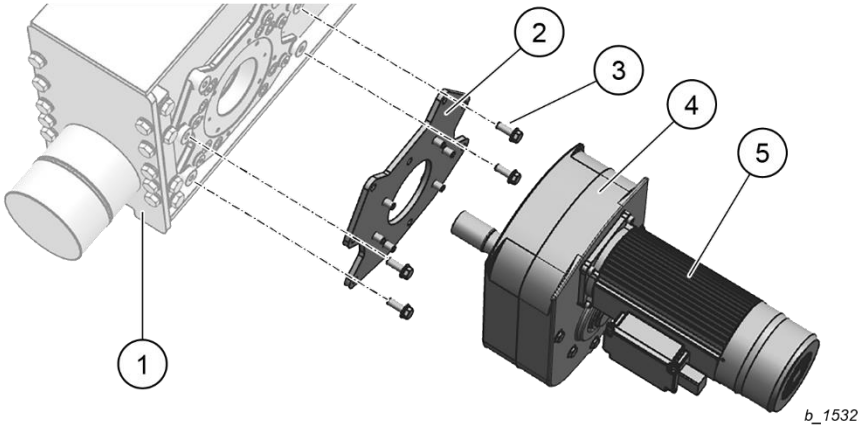
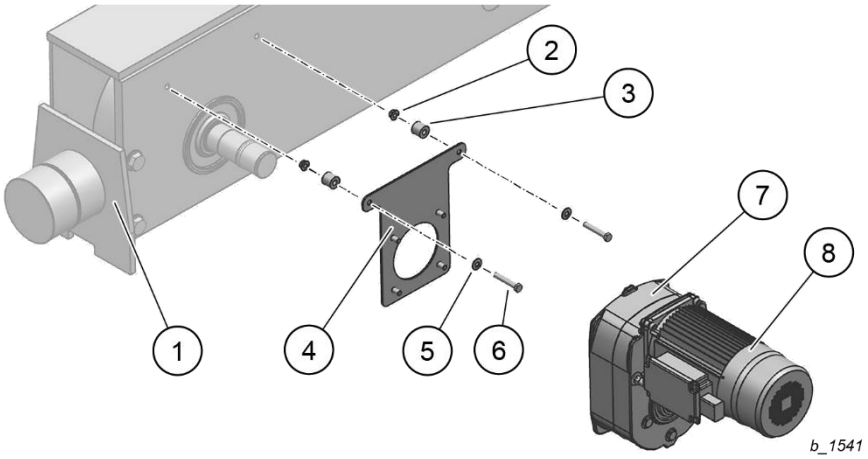
4.4 Assembling the travel drive SAB5 / SAB6



(1) Endcarriage/trolley
(2) Torque arm
(3) Screw
(4) Gears
(5) Travel motor

1. Before assembly, clean the contact surfaces of the endcarriage/trolley (1) and the torque arm (2) on the travel drive (4, 5) of dirt, rust or grease.
   - ➢ Ensure that the paint layer is no thicker than 80 µm.
2. Lightly lubricate the gearing of the endcarriage's driven shaft (1) before assembly.
3. Insert the outer gearing of the travel drive (2, 4, 5) into the inner gearing of the travel wheel on the endcarriage or trolley (1) up to the stop.
4. Use the screws (3) to fasten the travel drive to the endcarriage/trolley (1). Tighten the bolted connections to the prescribed tightening torques, see the ***Tightening torques for bolted connections*** chapter.

4.5 Assembling travel drive SA-C 5 / SA-C 6



(1) Endcarriage/trolley
(2) Nut
(3) Bushing
(4) Torque arm
(5) Washer
(6) Screw
(7) Gears
(8) Travel motor

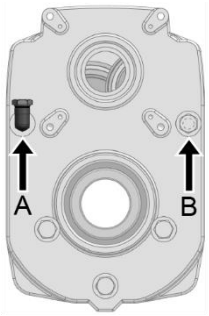
1. Before assembly, clean the contact surfaces of the endcarriage/trolley (1) and the torque arm (4) on the travel drive (7, 8) of dirt, rust or grease.
   - ➢ Ensure that the paint layer is no thicker than 80 µm.
2. Lightly lubricate the gearing of the gear's driven shaft (7) before assembly.
3. Insert the inner gearing of the travel drive (4, 7, 8) into the outer gearing of the drive shaft of the endcarriage or trolley (1) up to the stop.
4. Secure the travel drive with the retaining ring on the drive shaft of the endcarriage (1) or trolley.
5. Use the screws (6) and washers (5) to secure the travel drive (4, 7, 8), the bushings and the nut to the endcarriage/trolley (1).

   Tighten the bolted connections to the prescribed tightening torques, see the ***Tightening torques for bolted connections*** chapter.

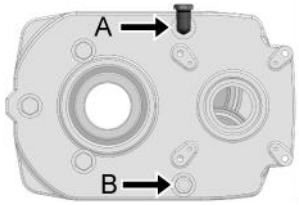
ba-o.3.4.1-us-5.1-ys | A11867601 Rev AE

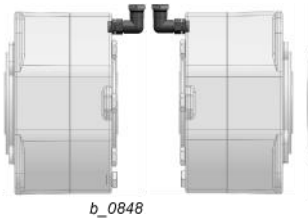
4.5.1 Assembling bleeder screw SA-C 5, 6 / SAB5, 6

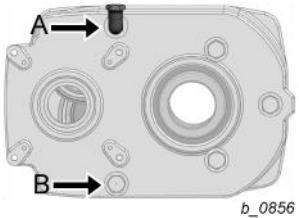
SA-C 5 / SAB5




b_0847

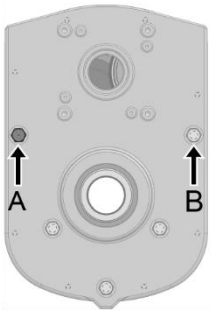



b_0848

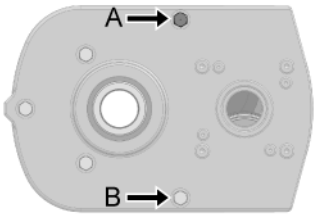


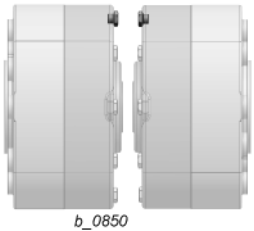
b_0856

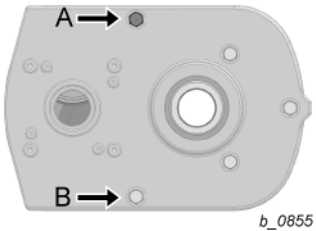
SA-C 6 / SAB6




b_0849




b_0850



b_0855

6. Check the bleeder screw (A) before commissioning.
   - The bleeder screw (A) must always be located at the **highest** point of the gear.
   - Depending on the installation position, the bleeder screw (A) must be replaced with the screw plug (B).

Small quantities of oil may leak out of the bleeder screw.

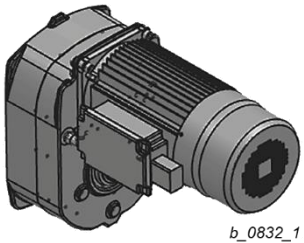
7. Check the lubricant fill level before commissioning.
8. Remove the sticker from the bleeder screw.

Check the position of the sealing plugs and drainage plugs on the motor, see the ***Assembling the stopping plugs/drainage plugs*** chapter.

ba-o.3.4.1-us-5.1-ys | A11867601 Rev AE

4.5.2 Permissible installation positions SFB3 / SAB5 / SA-C 5, 6

Depending on the torque arm and trolley/endcarriage, the travel drive cannot be mounted in all installation positions shown.


b_0832_1

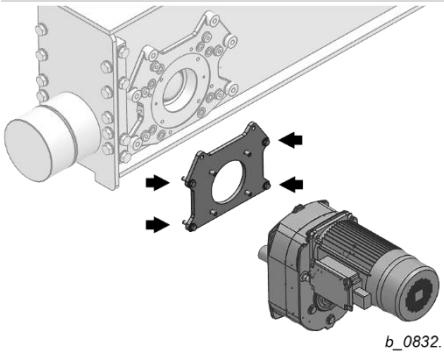

b_0833

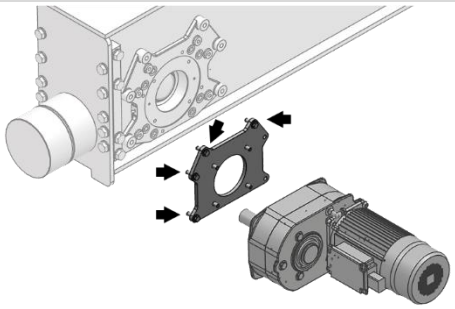

b_0834

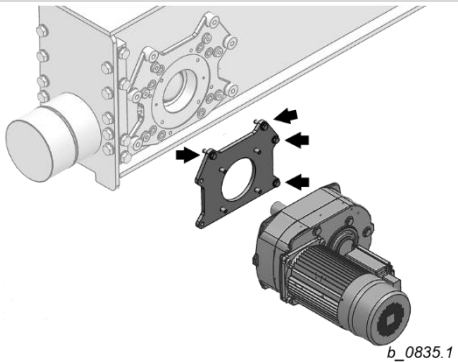

b_0835

Check the position of the sealing plugs and drainage plugs on the motor, see the ***Assembling the stopping plugs/drainage plugs*** chapter.

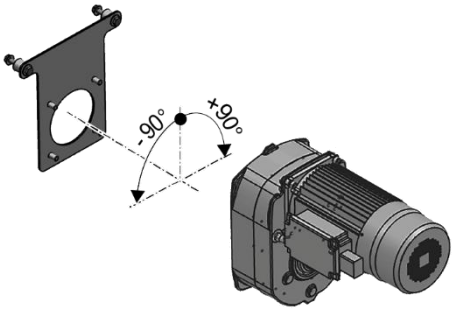
SAB5,6 on overhead travelling crane endcarriage and double-rail trolleys.


b_0832.1

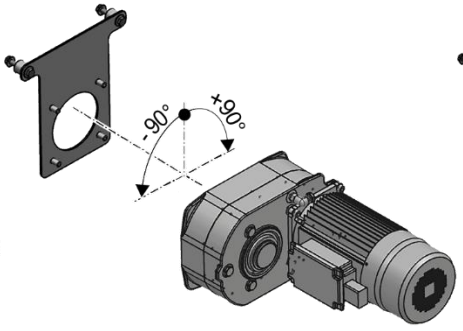

b_0833.1


b_0835.1

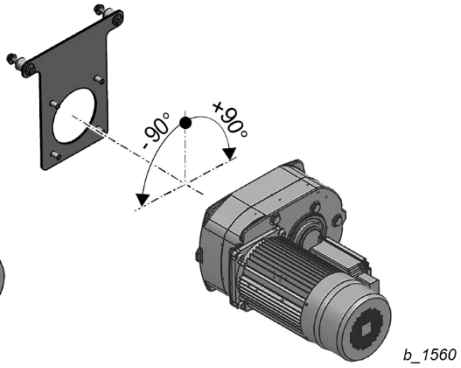
SA-C 5, 6 on overhead travelling crane endcarriage and double-rail trolleys



b_1556

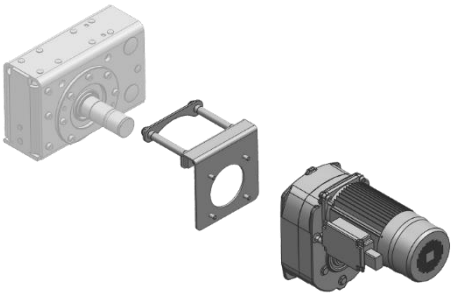


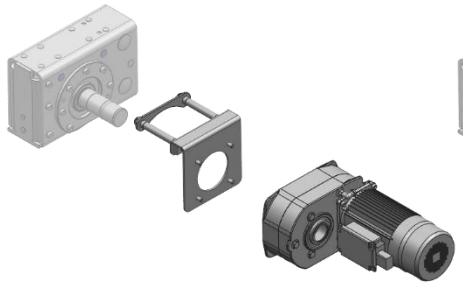
b_1559

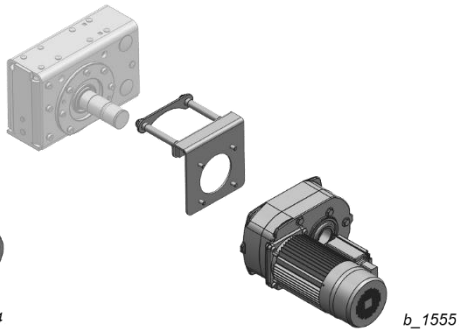


b_1560

SA-C 5, 6 on wheel block


b_0836

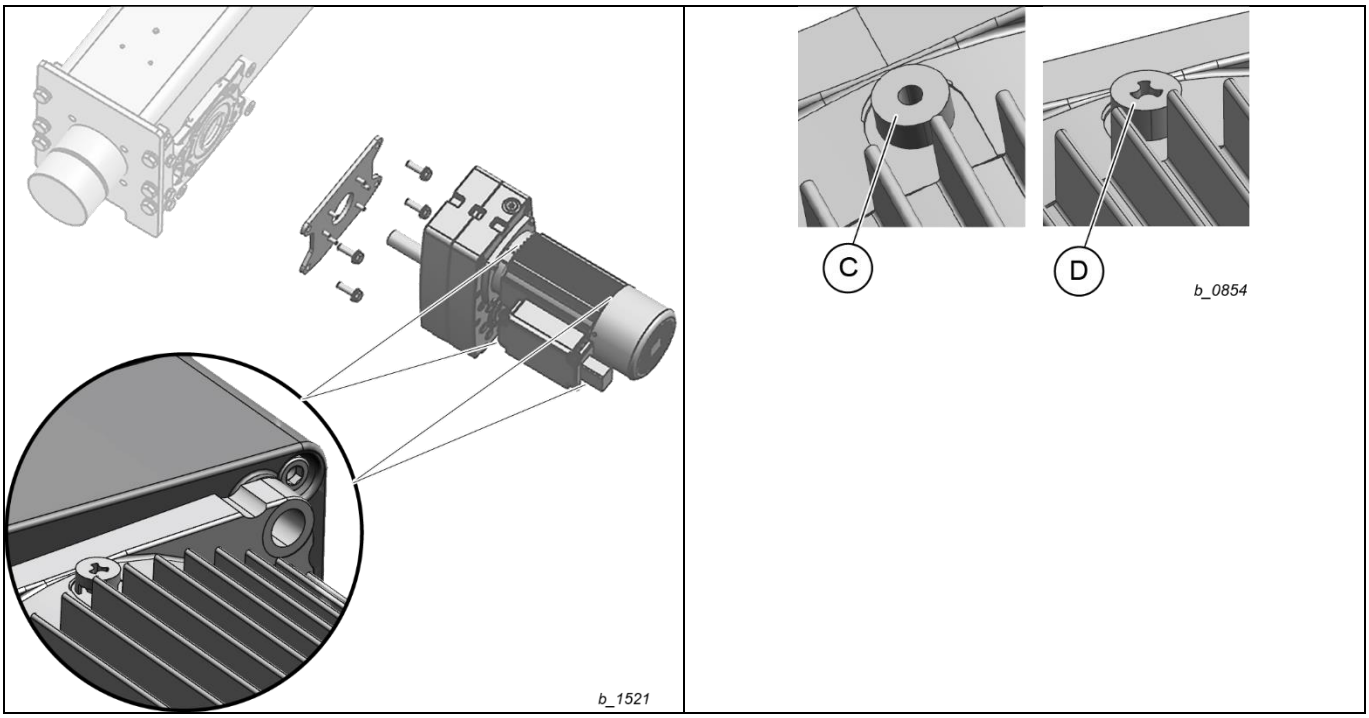

b_1554


b_1555

For assembly of the travel drive on a wheel block, see the ***wheel block operating instructions***.

4.6 Assembling stopping plug/drainage plug SF / SFB / SFC / SA-C / SAB

The following measure is only necessary for degree of protection IP55.



1. Check the stopping plug (C) and drainage plug (D) before commissioning.
   - The stopping plugs (C) on the motor flange and motor cover must always be assembled at the **top** and the opposing drainage plugs (D) (see detailed image) always at the bottom.

   The stopping plug (C) and drainage plug (D) on the motor cover are located beneath the fan cover.
   - In order to replace the stopping plug (C) and drainage plug (D) it is possible to use a SPAX screw.

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5 Electrical installation

5.1 Performing the electrical installation

⚠ DANGER

Improper electrical installation can cause serious injuries or death.

- ➢ Ensure that a competent person (qualified electrician) carries out electrical installation.
- ➢ Before starting work, disconnect the machinery from the power supply and secure it against an unintentional restart.
- ➢ Observe the national and local safety and accident prevention regulations, the occupational safety acts and environmental provisions.
- ➢ Use a lifting platform for work that cannot be carried out from the ground. Use a safety harness when performing any work outside of lifting platforms.
- ➢ Wear the prescribed personal protective equipment.
- ➢ Secure the danger zone.
- ➢ Keep a sufficient safety distance from the product.
- ➢ Use only original mounting accessories from the manufacturer.
- ➢ Observe the specifications in the circuit diagram provided.
- ➢ Tighten bolted connections to the prescribed tightening torques with a torque wrench.

- ➢ Ensure that the information on the product corresponds to the mains voltage/frequency or the electrical output values of the upstream devices.
- ➢ Ensure the cable diameter of the connection cable matches with the nominal diameter of the cable gland.
- ➢ With a moving connection cable, use a cable gland with strain relief.
- ➢ Avoid damaging the conductors when stripping the insulation.
- ➢ Install the cable such that they cannot be pinched, kinked or chafed during operation.
- ➢ Observe the specifications on the terminals.
- ➢ Ensure that no foreign objects, dirt or moisture are present inside the enclosure.

5.1.1 Protective conductor

⚠ WARNING

There is an electric shock hazard if the protective conductor is missing. Material damage, severe injuries or death can result.

- ➢ Connect the external protective earthing system (PE) close to the terminals of the phase conductor using a protective conductor for each mains connection.

Without a protective earth connection, malfunctions can arise during operation. The protective earth connection facilitates protective equipotential bonding for protection against electric shocks, as well as function equipotential bonding for the avoidance of electrical interference effects on electronic systems.

5.1.2 Versions without controls

ATTENTION

If live wires are connected to a temperature sensor, the thermal contactor of the motor may be removed and the motor may be damaged.

➢ Do not connect live cables to the temperature sensors.

5.1.3 Electromagnetic Compatibility (EMC)

The product cannot be operated independently within the terms of the EMC Directive 2014/30/EU. Only after the product has been integrated into an overall system (control) can it be evaluated with regard to EMC. In the case of electronic equipment (e.g. rectifiers), the evaluation was verified for the individual product under laboratory conditions, but not in the overall system.
In order to meet the requirements of the EMC standards/directive with regard to interference, further measures may be necessary on site.

We recommend using our radio interference suppression module FEM1 in the control.

- Radio interference suppression module FEM1 ≤ 415 V, ordering no. 5785250
- Radio interference suppression module FEM1 ≤ 800 V, ordering no. 5785260

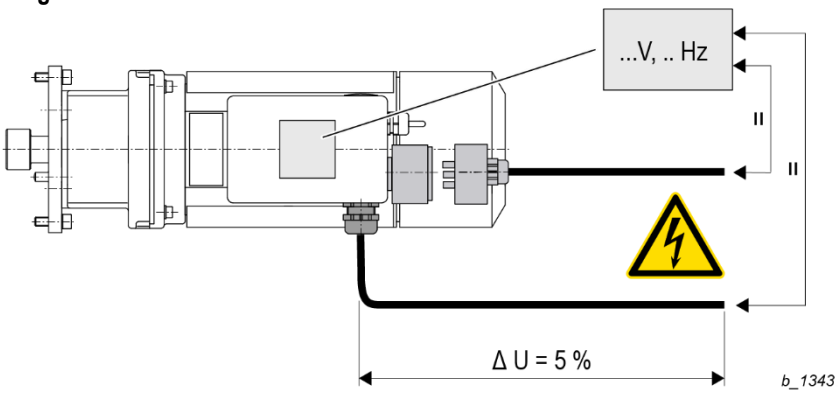
The radio interference suppression module FEM1 is clamped onto the DIN rail and connected to the connection cable.

5.1.4 Connecting the travel drive

The electrical connection is made via a plug-in connection or via a cable gland.

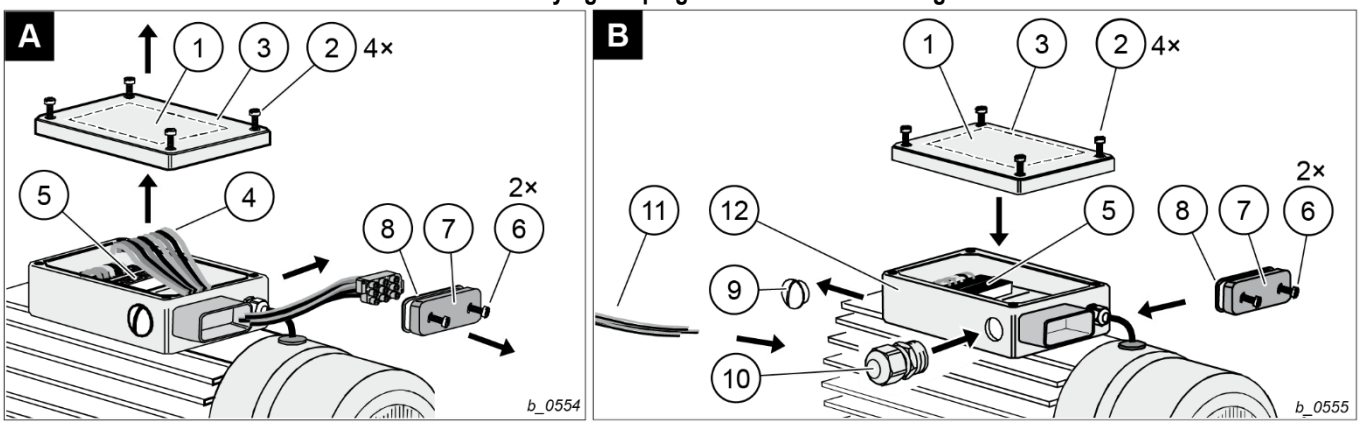
If the electrical connection is made via a cable gland, it must be carried out according to the specifications in the supplied connection diagram.

Plug-in connection



A maximum voltage drop of 5 % from the crane-supply-switch to the motor is permissible

Modifying the plug-in connection to cable gland



(1) Rating plate/motor connection diagram (rear side of lid)
(2) 4× screw
(3) Cover
(4) Individual conductors
(5) Terminals
(6) 2× screw
(7) Cover
(8) Seal
(9) Stopping plug
(10) Cable gland
(11) Motor cable
(12) Terminal box

Figure **A**

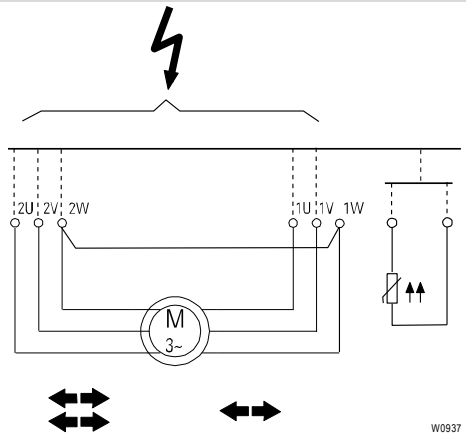
1. Loosen the screws (2).
2. Remove the cover (3).
3. Disconnect the individual conductors (4) from the terminal (5).
4. Loosen the screws (6).
5. Remove the cover (7) and the seal (8).
6. Draw out the individual conductors (4).
7. Observe the information on the rating plate/motor connection diagram (1) on the back of the cover.

Figure **B**

1. Make sure a suitable motor cable (11) is used.
2. Remove the stopping plug (9).
3. Screw the cable gland (10) into the terminal box (12).
4. Feed the motor cable (11) into the cable gland (10) and connect the individual conductors onto the terminals (5) in accordance with the wiring diagram.
5. Mount the cover (7) and the seal (8) to the terminal box (12) with the screws (6).
6. Mount the cover (3) to the terminal box (12) with the screws (2).
7. Tighten the screws (2) and (6) to the prescribed tightening torque **1.5 Nm / 1 lb_f ft**.

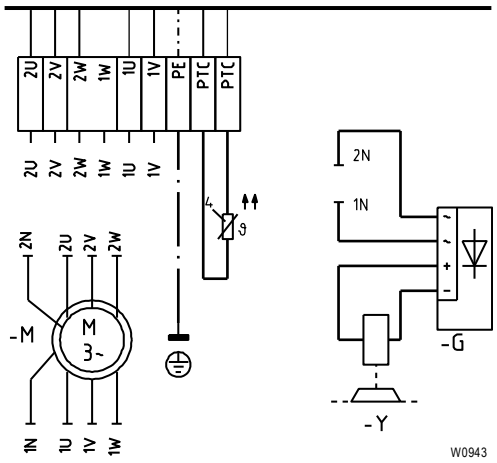
5.1.5 Principle connection diagram SU-A

Motor A04

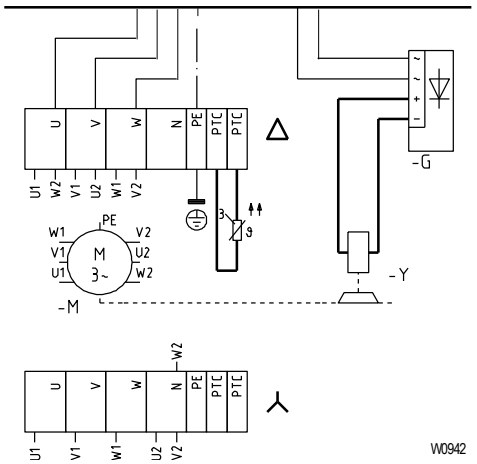


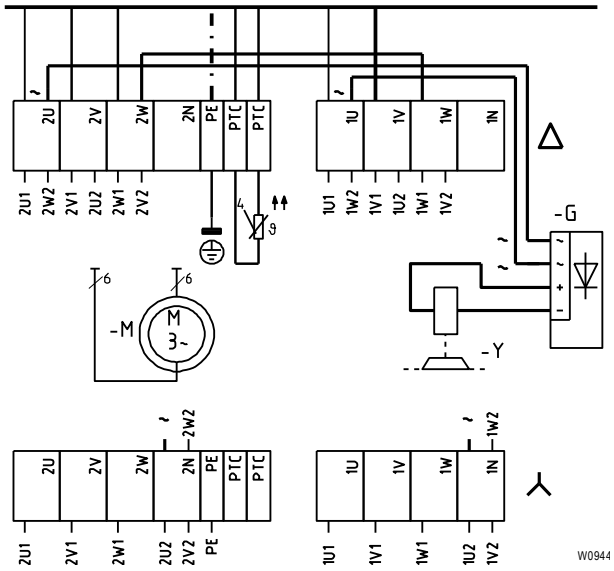
5.1.6 Principle connection diagram SF, SFB, SFC, SA-C, SAB

Motor 8/2 F.



Motor 4 F..





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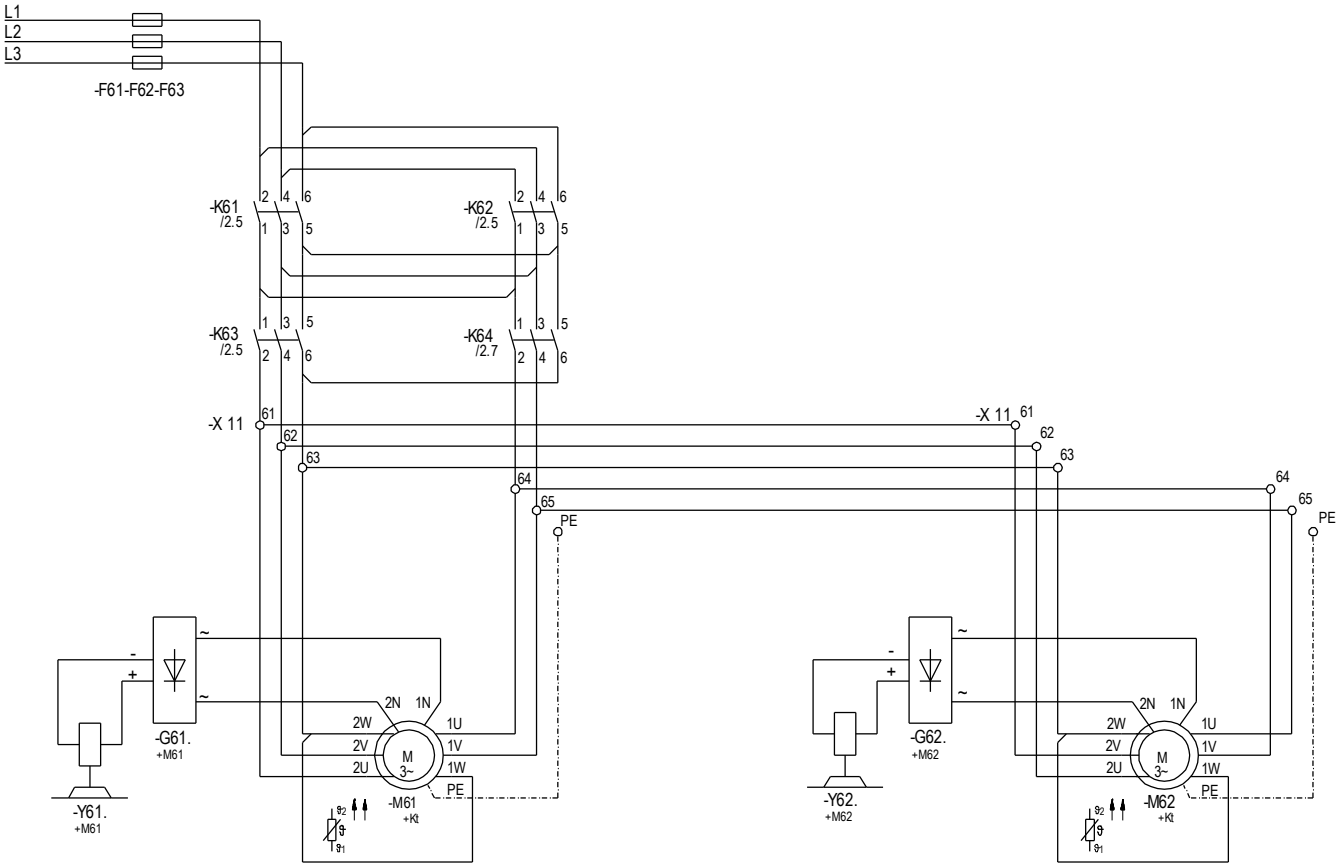
5.1.7 Standard setting values for frequency converters for travel drives

maximum control frequency 120 Hz at mains frequency 50 Hz and 60 Hz
for the intended control frequency see the respective order documentation

Travel speed	[m/min]	8	10	12.5	16	20	25	32	40	50	63	80	100
	[fpm]	31	39	49	63	79	98	126	157	197	248	315	394
Min. acceleration time	[s]	2.1	2.4	2.8	3.3	3.8	4.2	4.7	5.4	6.1	6.8	7.6	8.4
Min. deceleration time	[s]	1.7	1.9	2.2	2.6	3.0	3.4	3.8	4.3	4.9	5.4	6.1	6.7

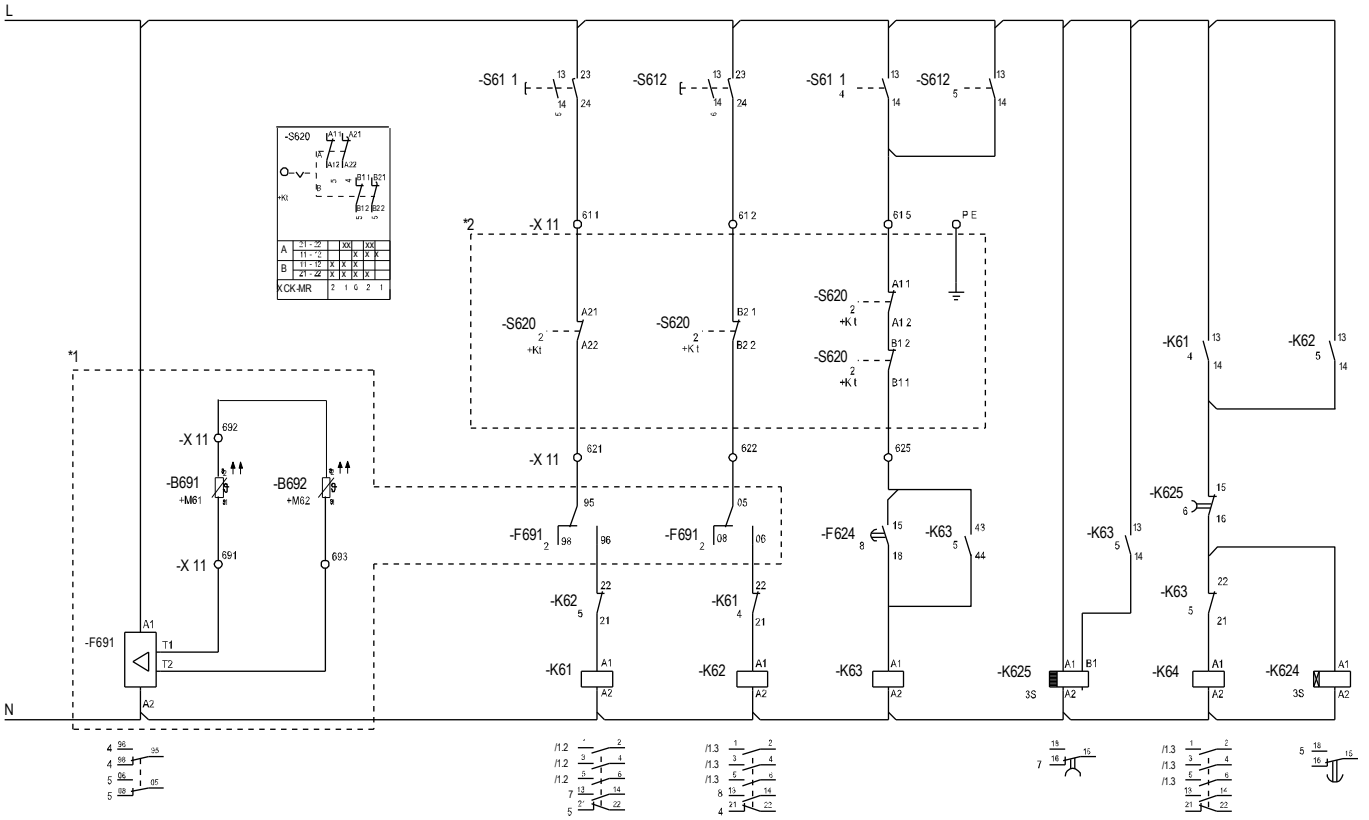
5.1.8 Principle circuit diagram

Crane travel motor 1 | Crane travel motor 2



5.1.9 Principle circuit diagram - temperature monitoring

Temperature monitoring	forward	backward	fast	Switchover time fast-slow	Start up slowly slow



*1 Option: Temperature monitoring
*2 Option: Travel limit switch

The time relays -K624 and -K625 shown in the circuit diagram are preset (approx. 3 sec.). Depending on the load and travel speed, a readjustment of the time relay -K625 must be carried out during commissioning. This changeover time adaptation must be dimensioned in such a way that no speed jumps occur at the drive at the moment the slow speed is switched on.

How it works:
During start-up -K624 implements the mandatory 8-pole start-up for the set time.
When braking, -K625 implements the brake application for the set time, so that regenerative braking and high torque loading of the drive are avoided.

We recommend the starting circuit from motor size 8/2 F42...
The braking circuit is required for all drives.

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6 Commissioning

⚠ WARNING

Improper commissioning can cause material damage or serious injuries.

- Ensure that a competent person authorized to test cranes authorizes commissioning.
- Observe the national and local safety and accident prevention regulations, the occupational safety acts and environmental provisions.
- Wear the prescribed personal protective equipment.
- Secure the danger zone.
- Do not stand under suspended loads.
- Keep a sufficient safety distance from the product.

6.1 Testing before commissioning

The prescribed tests in the section ***Inspection and maintenance intervals*** must be observed.

The test ensures that the product is in a safe condition and that any defects and damage, such as those caused by improper transport, are detected and remedied. The test must be arranged by the owner. Correct commissioning must be logged in the log book.

Test must be carried out in accordance with national and local regulations (In Germany per "DGUV Guideline 309-001 – Crane testing").

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7 Operation

⚠ WARNING

Improper operation can cause material damage or serious injuries.

- Ensure that an authorized person operates the system.
- Train personnel at regular intervals.
- Observe the national and local safety and accident prevention regulations, the occupational safety acts and environmental provisions.
- Wear the prescribed personal protective equipment.
- Keep a sufficient safety distance from the product.

7.1 Tests required every time before operation

The crane operator must carry out visual and functional tests every day before operation. If defects that may impair safety are detected, operation must be stopped. All defects must be reported to the supervisor. If the crane operator changes, the replacement must also be informed.

The prescribed tests in the section ***Inspection and maintenance intervals*** must be observed.

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8 Troubleshooting

Fault	Possible cause	Measure	see the chapter/section
Travel drive does not start, "motor hums"	Not all current phases are available	Check the fuses Check supply line Checking control and switching devices	
Longer braking distance	Motor brake worn, Motor brake faulty	Replacing the motor brake	See section ***Replacing the motor brake***
Brake does not release, Motor noise "loud clicking"	Air gap too great	Replace the brake pad	See section ***Replacing the motor brake***
	Rectifier defective	Replace the rectifier	
Travel drive sluggish	Runway dirty	Remove dirt from the runway beam	
	Track gauge incorrectly set	Check track gauge	See documentation provided
	Runway not assembled horizontally; travel drive moves "uphill"	Align runway	
	Travel drive runs with resistance, may be braked by additional forces such as a cable drum	Rectify the error	

9 Inspection and maintenance

⚠ WARNING

Improper inspection or maintenance can cause material damage or serious injuries.

- Ensure that persons who perform inspection and maintenance are authorized to carry out this work.
- Observe the national and local safety and accident prevention regulations, the occupational safety acts and environmental provisions.
- Before starting work, disconnect the machinery from the power supply and secure it against an unintentional restart.
- Use a lifting platform for work that cannot be carried out from the ground. Use a safety harness when performing any work outside of lifting platforms.
- Wear the prescribed personal protective equipment.
- Secure the danger zone.
- Observe inspection and maintenance intervals.
- Document the results and any measures implemented.
- Keep a sufficient safety distance from the product.
- Use only original spare parts from the manufacturer.
- Tighten bolted connections to the prescribed tightening torques with a torque wrench.

9.1 General overhaul

If the theoretical duration of service is reached, it is necessary to perform a general overhaul. The general overhaul must be commissioned by the owner or their representative. The release for further use must be implemented by the manufacturer or by a specialist company authorized by the manufacturer. The results must be documented in the log book.

Mechanism group per ISO 4301-1	M3	M4	M5	M6	M7
Theoretical duration of service	400 h	800 h	1600 h	3200 h	6300 h

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9.2 Inspection and maintenance intervals

The inspection and maintenance intervals listed apply to normal conditions. If the intervals are found to be too long, for example due to heavy-duty operating conditions, the owner must define shorter intervals.

Additional inspections must be carried out on the product in the following cases:

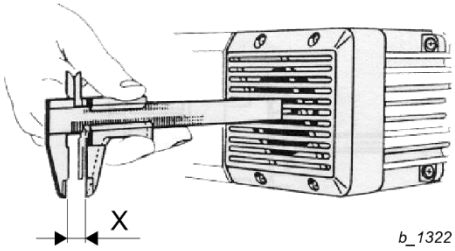
- After special incidents or material damage
- After an extended system shutdown (> 1 year)
- When used near the sea

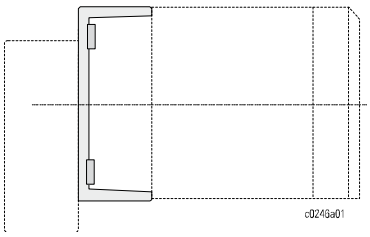
Tests shall be carried out in accordance with national and local regulations (In Germany per "DGUV Guideline 309-001 – Crane testing").

Authorized person	Symbol
Qualified specialist personnel (crane operators)	☐
Competent person	⭘
Service technician of the manufacturer	✖

	Commissioning	Daily before every operation	Monthly	Every 3 months	Annually	Every 10 years
Technical documentation						
Perform a visual inspection for completeness	⭘					
Plates and stickers						
Perform a visual inspection for completeness and legibility	⭘				⭘	
Electrical connection						
Check for correct connection of the lines and the power supply	⭘				⭘	
Bolted connections						
Perform a visual inspection for corrosion	⭘				⭘	
Check bolted connections are well secured ***(see the Checking bolted connections section)***	⭘				⭘	
Travel wheels						
Check gearing lubrication, relubricate if necessary (see the Lubrication points/lubricants chapter)	⭘				⭘	
Motor brake						
Check function	⭘	☐			⭘	
Check for wear (see ***Checking the motor brake*** section)					⭘	
Gears						
Check gear (see ***Checking gear*** chapter)					⭘	
Check the oil level	⭘				⭘	
Perform an oil change (see the ***Performing an oil change*** section)						⭘

9.3 Checking motor brake





ATTENTION

Danger of material damage
Have replacement and repair work performed exclusively by trained specialist personnel.

Test the brake at regular intervals. In the event of respective stress, the intervals are to be adjusted.

9.3.1 SU-A

1. Have a calliper ready, see ***Special tools and auxiliary equipment*** chapter.
2. Drive trolley to a safe position.
3. Jack up the trolley in the area of the fall protection, so that the sheaves can turn freely. If this is not possible, the trolley will move during measurement.
4. At the slowest travel speed, measure displacement path X of the motor shaft of the drive motor, see sketch.
5. Compare the determined displacement path with the specification in the table.

Motor Type	Displacement path			
	Nominal dimension		Wear limit	
	[mm]	[in]	[mm]	[in]
A04	1 ±0.25	0,04 ±0,01	> 1.5	> 0,06

The brake is OK if the determined value “S” ≤ is 1.5 mm / 0,06 in.

If the wear limit is reached (determined displacement path > 1.5 mm / 0,06 in), the brake disc (gear housing) must be replaced, see the ***Disassembling/Assembling gear housing with brake pad SU-A*** section.

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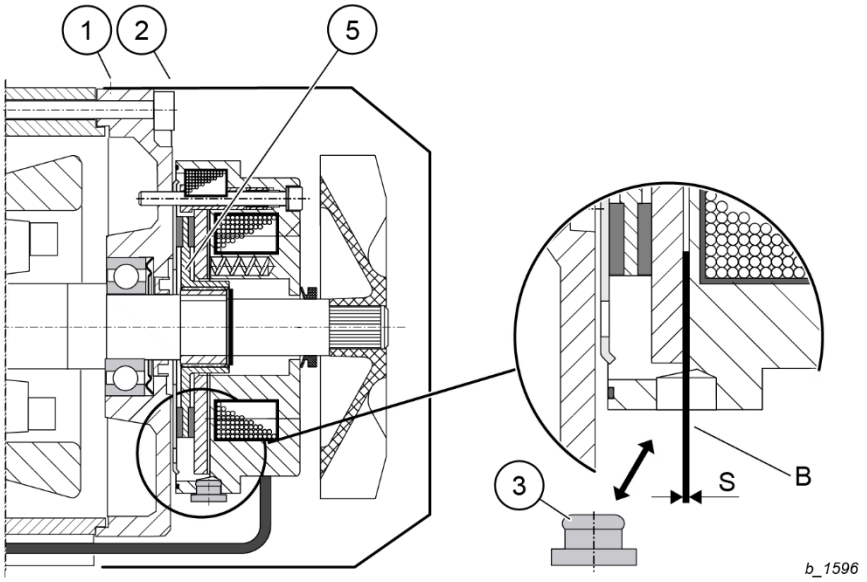
9.3.2 SF / SFB / SFC / SA-C / SAB



(1) Screw
(2) Fan cover
(3) Stopping plug
(5) Brake rotor

1. Have a feeler gauge ready, see the ***Special tools and auxiliary equipment*** chapter.
2. **⚠ WARNING** Entanglement hazard due to sudden machine movements.
   ➢ Disconnect the machinery from the power supply and protect against unintentional restart.
3. Remove the screws (1).
4. Remove the fan cover (2).
5. Remove the stopping plug (3).
6. Measure the air gap “S” with the feeler gauge (B).
7. Compare the determined value with the specifications in the table.

Travel drive	Motor type	Brake	Braking torque		S min		S max.		t min		(9)	↻	
			[Nm]	[lbf ft]	[mm]	[in]	[mm]	[in]	[mm]	[in]		[Nm]	[lbf ft]
SF/SFB/SFC/SA-C/SAB xx xxx 123	8/2F12/2xx.223	FDW 08	1.3	0.96	0.2	0.008	2.0	0.079	5.7	0.224	3×M4	3	2
SF/SFB/SFC/SA-C/SAB xx xxx 133	8/2F13/2xx.233	FDW 08	2.5	1.84	0.2	0.008	1.6	0.063	6.1	0.24	3×M4	3	2
SF/SFB/SFC/SA-C/SAB xx xxx 184	4F18/2xx.243	FDW 08	5	3.69	0.2	0.008	0.7	0.028	7.0	0.276	3×M4	3	2
SF/SFB/SFC/SA-C/SAB xx xxx 313	8/2F31/2xx.423	FDW 13	5	3.69	0.3	0.012	2.0	0.079	8.8	0.346	3×M6	10	7
SF/SFB/SFC/SA-C/SAB xx xxx 384	4F38/2xx.443	FDW 13	13	9.59	0.3	0.012	2.0	0.079	8.8	0.346	3×M6	10	7
SF/SFB/SFC/SA-C/SAB xx xxx 423	8/2F42/2xx.433	FDW 13	8	5.9	0.3	0.012	2.0	0.079	8.8	0.346	3×M6	10	7
SF/SFB/SFC/SA-C/SAB xx xxx 484	4F48/2xx.453	FDW 13	20	14.75	0.3	0.012	1.0	0.039	9.8	0.386	3×M6	10	7
SF/SFB/SFC/SA-C/SAB xx xxx 523	8/2F52/2xx.523	FDW 15	13	9.59	0.3	0.012	2.0	0.079	10.8	0.425	3×M6	10	7

If the values determined are within the wear limits:

8. Attach the stopping plug again and fix the fan cover with the screws (2). Tighten the screws (1) to the prescribed tightening torque, see the ***Tightening torques for bolted connections*** chapter.
9. Re-establish the power supply.

If a wear limit is reached:

10. Replace the motor brake,
    see the ***Replace the motor brake*** section and the ***Wear parts*** chapter.

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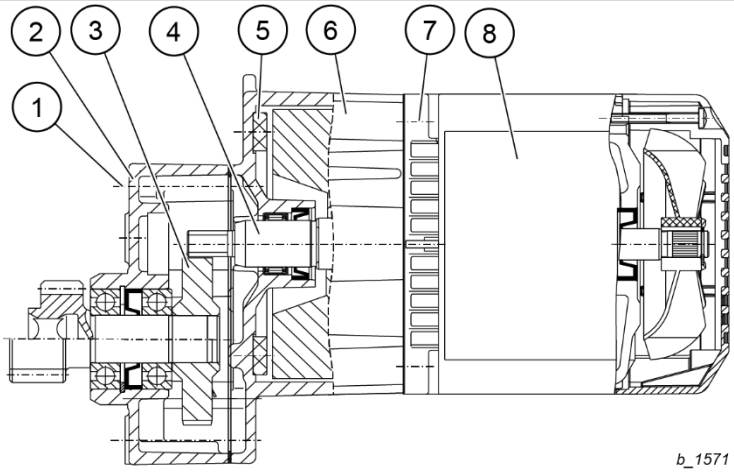
9.4 Replacing the motor brake

⚠ WARNING

Improper replacement can cause material damage or severe injuries.

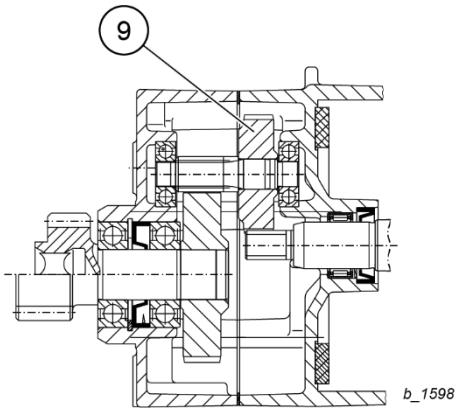
9.4.1 Disassembling/assembling gear housing with brake pad SU-A

SU-A xxxx1xx, 1-stage



(1) Screw
(2) Gear cover
(3) Gearwheel
(4) Motor shaft
(5) Brake pad

SU-A xxxx2xx, 2-stage



(6) Gear housing
(7) Screw
(8) Motor
(9) Gearwheel

1. Unscrew the travel drive from the trolley side cheek/endcarriage.
2. Unscrew the screws (7) and remove the motor.
3. Pull off motor shaft (4).
4. Remove the screws (1) from the gear cover (2) and pull the gear cover off the gear housing (6).
5. On the 2-stage version, remove the shaft with the gearwheel (9).
6. Replace the gear housing (6).

The shaft sealing ring and needle bush are factory fitted in the gearbox housing.

⚠ WARNING Dirt on the friction surfaces reduces the braking action. Material damage, severe injuries or death can result.

➢ Ensure that the friction surface and the brake pad are not contaminated.

7. On the 2-stage version, insert the shaft with gearwheel (9) into the gear housing (6).
8. Screw the gear cover (2) onto the new gear housing (6) with the screws (1).
9. Push the motor shaft (4) into the gearing of the gearwheel (3) in the gear cover.
10. Screw the motor onto the gear housing with the screws (7), see the ***Tightening torques for bolted connections*** chapter.
11. Screw the travel motor to the trolley side cheek/endcarriage with the screws, see the ***Tightening torques for bolted connections*** chapter.

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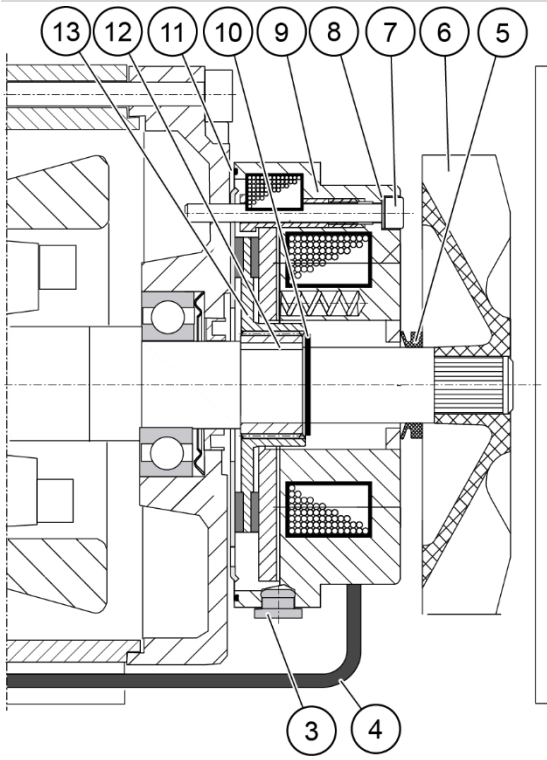
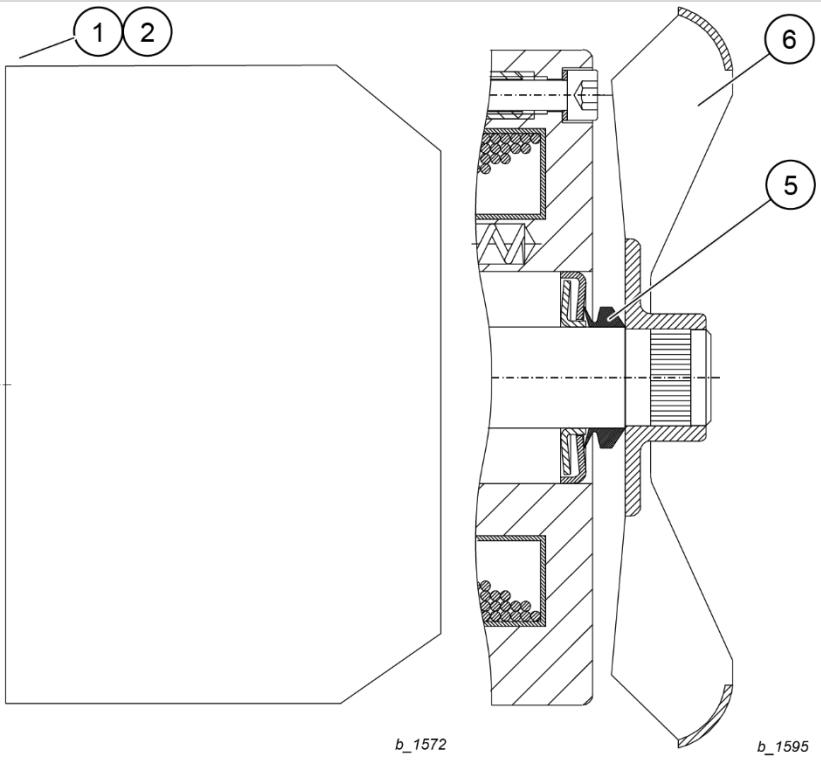
9.4.2 Disassembling motor brake SF / SFB / SFC / SA-C / SAB

8/2F12, 8/2F13, 4F18



8/2F31, 4F38, 8/2F42, 4F48, 8/2F52



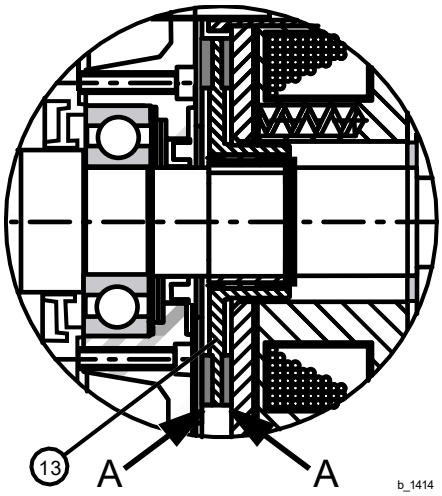
(1) Fan cover
(2) Screw
(3) Stopping plug
(4) Cable
(5) V-ring (IP66 version only)
(6) Fanwheel
(7) Screw
(8) Sealing ring
(9) Coil carrier
(10) Retaining ring
(11) O-ring
(12) Hub with parallel key
(13) Brake rotor

1. Have a puller ready, see ***Special tools and auxiliary equipment*** chapter.
2. **DANGER** Electric shock hazard.
   - ➢ Disconnect the machinery from the power supply and protect against unintentional restart.
3. Disconnect the motor from the power supply as follows:

Connection via plug-in connection	Connection via cable gland
➢ On the terminal box of the motor housing pull the plug out of the plug-in connection.	➢ On the terminal box of the motor housing disconnect the individual conductors from the terminals. ➢ Loosen the cable gland and remove the motor cable.

4. Loosen the screws (2) of the fan cover (1) and remove the fan cover.
5. Remove the cable with rubber grommet from the fan cover (1), put the fan cover aside.
6. Take off the fanwheel (6).
7. Remove the V-Ring (5) (on IP66 version only).
8. Remove the screws (7) and the sealing rings (8).
9. Remove the coil carrier (9).

10. Take off the brake rotor (13).
11. Remove the retaining ring (10).
12. Use a puller to remove the hub with the parallel key (12).
13. Take off the brake rotor (13).



9.4.3 Clean the contact surface of the brake

ATTENTION

The brake rotor itself must not be cleaned, as this could damage it.

- ➢ Do not use conventional brake cleaner, but isopropyl alcohol.
- ➢ Only clean the contact surfaces “A”, NOT the brake rotor itself.

1. Keep isopropyl alcohol ready for cleaning.
2. Moisten a cloth with isopropyl alcohol.
3. Clean the contact surfaces “A” of the brake rotor.

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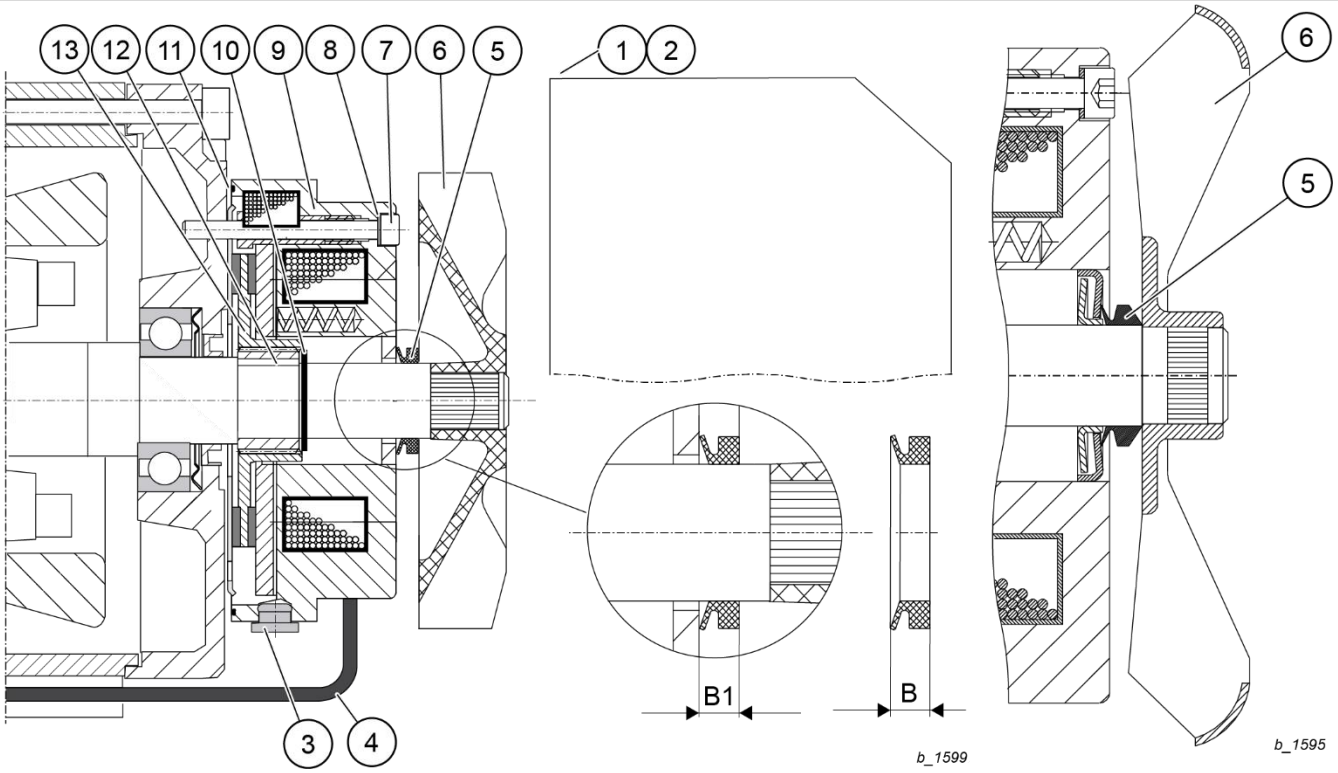
9.4.4 Assembling motor brake SF / SFB / SFC / SA-C / SAB

All parts of the supplied motor brake must be installed.

8/2F12, 8/2F13, 4F18 | 8/2F31, 4F38, 8/2F42, 4F48, 8/2F52



(1) Fan cover
(2) Screw
(3) Stopping plug
(4) Cable
(5) V-ring (IP66 version only)
(6) Fanwheel
(7) Screw
(8) Sealing ring
(9) Coil carrier
(10) Retaining ring
(11) O-ring
(12) Hub with parallel key
(13) Brake rotor

1. Replace the parallel key and assemble it with the hub (11) onto the motor shaft. Use some assembly paste if necessary.
   ⚠ WARNING Dirt on the friction surfaces reduces the braking action. Material damage, severe injuries or death can result.
   ➢ Ensure that the friction surface and the brake pad are not contaminated.
2. Push the brake rotor (13) onto the hub gearing.
3. Fix the hub (12) with the retaining ring (10) on the motor shaft.
4. Push the coil carrier (9) onto the shaft and tighten it with the screws (7) and the sealing rings (8) to the ***prescribed tightening torque*** from the table.
5. Assemble the V-ring (5) onto the shaft, observing dimension B1 (on IP66 version only).

Travel motor	Brake	Part	Profile width before assembly B		Profile width after assembly B1	
			[mm]	[in]	[mm]	[in]
F1.	FDW 08	V-ring	7.7	0,30	6.7 ±0.6	0,26 ±0.024
F3. /F4. /F5.	FDW 13	V-ring	10.5	0,41	9.0 ±0.8	0,35 ±0.031

6. Fit the fanwheel (6) onto the gearing of the shaft.

7. Attach the cable with rubber grommet to the fan cover (1).
8. Position the fan cover (1) and tighten the screws (2) to the prescribed tightening torque, see the ***Tightening torques for bolted connections*** chapter.
9. Establish the electrical connection in reverse order to disassembly. Ensure that the stopping plug (3) is located at the bottom.
10. Tighten the cable gland on the terminal box to the prescribed tightening torque, see the ***Tightening torques for bolted connections*** chapter.

Travel drive	Motor type	Brake	Braking torque		S min		S max.		t min		(9)	↻	
			[Nm]	[lbf ft]	[mm]	[in]	[mm]	[in]	[mm]	[in]		[Nm]	[lbf ft]
SF/SFB/SFC/SA-C/SAB xx xxx 123	8/2F12/2xx.223	FDW 08	1.3	0.96	0.2	0.008	2.0	0.079	5.7	0.224	3×M4	3	2
SF/SFB/SFC/SA-C/SAB xx xxx 133	8/2F13/2xx.233	FDW 08	2.5	1.84	0.2	0.008	1.6	0.063	6.1	0.24	3×M4	3	2
SF/SFB/SFC/SA-C/SAB xx xxx 184	4F18/2xx.243	FDW 08	5	3.69	0.2	0.008	0.7	0.028	7.0	0.276	3×M4	3	2
SF/SFB/SFC/SA-C/SAB xx xxx 313	8/2F31/2xx.423	FDW 13	5	3.69	0.3	0.012	2.0	0.079	8.8	0.346	3×M6	10	7
SF/SFB/SFC/SA-C/SAB xx xxx 384	4F38/2xx.443	FDW 13	13	9.59	0.3	0.012	2.0	0.079	8.8	0.346	3×M6	10	7
SF/SFB/SFC/SA-C/SAB xx xxx 423	8/2F42/2xx.433	FDW 13	8	5.9	0.3	0.012	2.0	0.079	8.8	0.346	3×M6	10	7
SF/SFB/SFC/SA-C/SAB xx xxx 484	4F48/2xx.453	FDW 13	20	14.75	0.3	0.012	1.0	0.039	9.8	0.386	3×M6	10	7
SF/SFB/SFC/SA-C/SAB xx xxx 523	8/2F52/2xx.523	FDW 15	13	9.59	0.3	0.012	2.0	0.079	10.8	0.425	3×M6	10	7

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9.5 Check the gears

The gear has a long lifetime. All bearing points are mounted in anti-friction bearings. The gearings are hardened, hard-machined and have a high degree of safety.

Travel drive	Lubricant type
SU-A 1/SF 1/SFB1/SFC1	Grease
Intermediate gear	
SF 2,3 /SFB2,3 / SA-C 5,6 / SAB5,6	Oil

- During the annual maintenance check whether lubricant has leaked. If a loss of lubricant is detected, a lubricant change must be carried out and possibly a repair must be scheduled.
- Pay attention to gear noises when the crane is loaded and unloaded. Coarse, loud running, knocking noises are indications of possible malfunctions.
- If any malfunctions are discovered, repairs must be planned.
- In the event of uncertainty, new findings can be made after consultation with other experts, e.g. the manufacturer.

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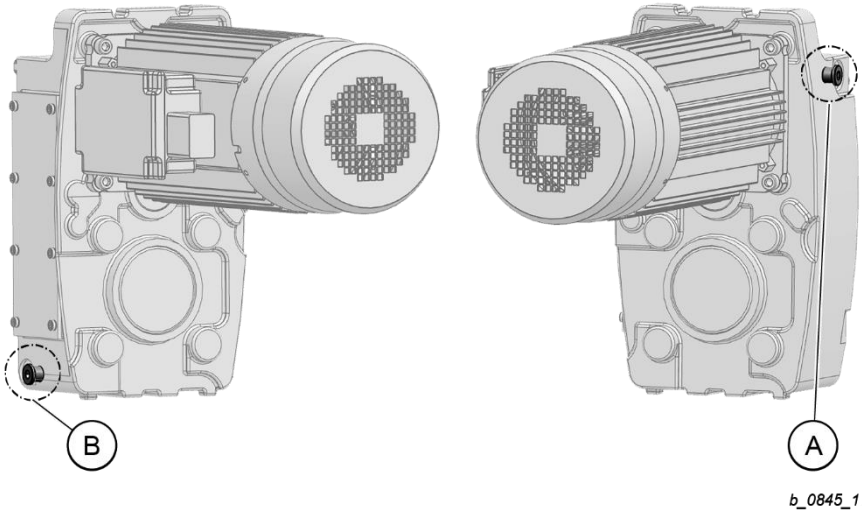
9.6 Performing an oil change

The information on lubrication points and lubricants in the ***Lubrication Points/lubricants*** chapter must be observed.

⚠ CAUTION

Lubricants can cause skin irritation and allergic reactions.

- ➢ Wear safety gloves and safety eyewear when handling lubricants.
- ➢ Observe the product data sheets of the lubricant manufacturer.
- ➢ Observe safety data sheets for the lubricants.
- ➢ Dispose of the lubricants in accordance with national and local legal provisions.



(A) Oil filler plug/bleeder screw
(A) Copper sealing ring
(B) Oil drain screw
(B) Copper sealing ring

- The oil change must be performed by a competent person.
- The oil should be drained when at operating temperature if possible.
- Care must be taken to ensure that no contaminants or foreign objects enter the hoist gear interior during the oil change.
- For the suitable type and quantity of oil, see the ***Lubrication points/lubricants*** chapter.

1. **⚠ DANGER** Electric shock hazard.
   - ➢ Disconnect the machinery from the power supply and protect against unintentional restart.
2. Have new copper sealing rings ready, see the ***Wear parts*** chapter.
3. Open the oil drain screw (B) and oil filler plug/bleeder screw (A).
4. Collect the oil in a suitable receptacle.
5. Remove the copper sealing rings (A) and (B) and dispose of them properly.
6. Insert new copper sealing rings (A) and (B).
7. Tighten the oil drain screw (B) to the prescribed tightening torque **10 Nm / 7 lb_f ft**.
8. Add new oil.
9. Tighten the oil filler plug/bleeder screw (A) to the prescribed tightening torque **10 Nm / 7 lb_f ft**.
10. Re-establish the power supply.

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9.7 Checking bolted connections

⚠ WARNING

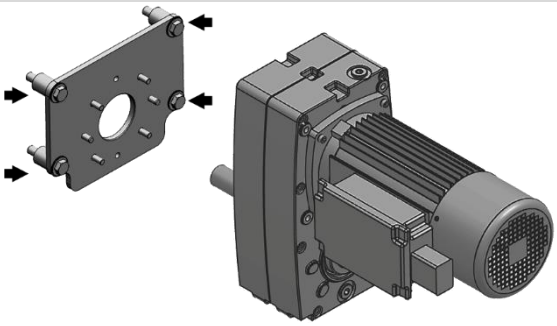
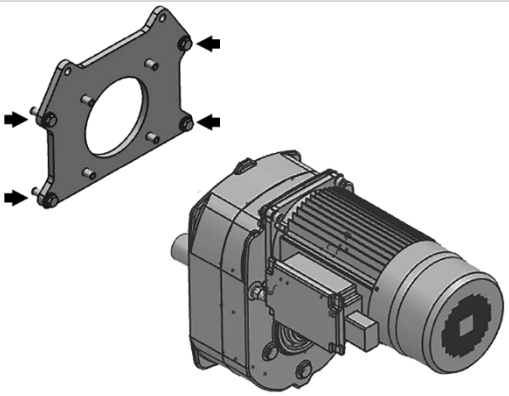
If the bolted connections are not properly checked, parts may come loose and fall off. Material damage, severe injuries or death can result.

- ➢ Check bolted connections with a calibrated torque wrench.
- ➢ Check that the bolted connections are tightened to the prescribed tightening torque.
- ➢ For through bolts with nuts, perform the check on the nut.

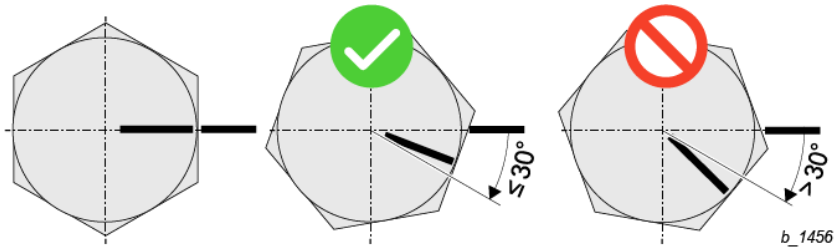
For prescribed tightening torques for bolted connections, see the ***Tightening torques for bolted connections*** chapter or information in the corresponding chapters and sections of these instructions.

9.7.1 Extended test method for certain bolted connections

The following bolted connections must be checked as described below.

SF/SFB1, 2, 3	SA-C/SAB5, 6
	
b_1556 .1	b_0832.2

1. Mark the current position of the bolted connection, e.g. with a waterproof pen.
2. Tighten the bolted connection to the specified tightening torque.
3. Check how large the torque angle is in relation to the mark.



b_1456

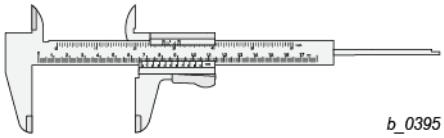
If the rotation of the screw or nut ≤ is 30° then the bolted connection is OK.

4. If the rotation of the screw or nut is > 30°, replace the bolted connection.

10 Special tools and auxiliary equipment

The following special tools and auxiliary equipment are required for the assembly and maintenance.

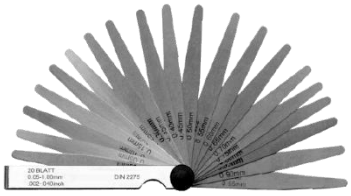
10.1 Calliper



b_0395

Calliper, calibrated

10.2 Feeler gauge



b_0391

Feeler gauge

10.3 Puller

b_1390

Puller

10.4 Impact puller

b_1394

Impact puller

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11 Technical data

Mechanical data	
Weight	See works certificate
General data	
Degree of protection acc. to EN 60529	
Standard	IP55
Optional	IP66
Electromagnetic Compatibility (EMC)	EN 61000-6-2
	EN 61000-6-3
Ambient temperature range	
Standard	−20 °C... +40 °C / −4 °F…+104 °F
Optional	−40 °C... +60 °C / −40 °F…+140 °F

Operating conditions
The component is designed for industrial use and normal industrial environmental conditions.

For special applications, e.g. high chemical load, higher ambient temperature, use outdoors, off-shore, etc., special measures must be provided.

The manufacturer will be pleased to advise you.

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11 Technical data

11.1 Motor data

11.1.1 SU-A

Pole-changing travel motors

Index no.	Type	50 Hz									
		P_N		n_N	T_N		T_{Hm}		T_B		CDF
		[kW]	[HP]	[rpm]	[Nm]	[lbf ft]	[Nm]	[lbf ft]	[Nm]	[lbf ft]	[%]
43	2/8 A04/507	0.07 0.32	0.09 0.43	595 2670	1.14	0.841	2.1 2.3	1.549 1.696	1.3	0.959	20 40

Index no.	Type	50 Hz					
		I_N			I_K		
		220 - 240 V	380 - 415 V	480 - 525 V	220 - 240 V	380 - 415 V	480 - 525 V
		[A]	[A]	[A]	[A]	[A]	[A]
43	2/8 A04/507	1.9 2.1	1.1 1.2	0.9 1.0	2.1 5.6	1.2 3.2	1.0 2.6

Index no.	Type	60 Hz									
		P_N		n_N	T_N		T_{Hm}		T_B		CDF
		[kW]	[HP]	[rpm]	[Nm]	[lbf ft]	[Nm]	[lbf ft]	[Nm]	[lbf ft]	[%]
43	2/8 A04/507	0.09 0.38	0.12 0.51	710 3200	1.14	0.841	2.1 2.3	1.549 1.696	1.3	0.959	20 40

Index no.	Type	60 Hz					
		I_N			I_K		
		380 - 415 V	440 - 480 V	550 - 600 V	380 - 415 V	440 - 480 V	550 - 600 V
		[A]	[A]	[A]	[A]	[A]	[A]
43	2/8 A04/507	1.3 1.4	1.1 1.2	0.9 1.0	1.4 3.7	1.2 3.2	1.0 2.6

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11.1.2 SF / SFB / SFC / SA-C / SAB

Pole-changing travel motors

Index no.	Type	50 Hz									
		P_N		n_N	T_N		T_{Hm}		T_B		CDF
		[kW]	[HP]	[rpm]	[Nm]	[lbf ft]	[Nm]	[lbf ft]	[Nm]	[lbf ft]	[%]
123	8/2F12/220.223	0.09 0.37	0.12 0.50	590 2420	1.46	1.077	2.6 2.6	1.918 1.918	1.3	0.959	20 40
133	8/2F13/220.233	0.13 0.55	0.17 0.74	600 2540	2.07	1.527	4.1 4.0	3.024 2.95	2.5	1.844	20 40
313	8/2F31/210.423	0.32 1.25	0.43 1.68	660 2550	4.68	3.452	7.6 8.1	5.605 5.974	5.0	3.688	20 40
423	8/2F42/210.433	0.50 2.00	0.67 2.68	665 2680	7.13	5.259	10.0 12.0	7.376 8.851	8.0	5.9	20 40
523	8/2F52/210.523	0.80 3.20	1.07 4.29	610 2550	11.98	8.836	18.0 19.0	13.276 14.014	13.0	9.588	20 40

Index no.	Type	50 Hz					
		I_N			I_K		
		220 - 240 V	380 - 415 V	480 - 525 V	220 - 240 V	380 - 415 V	480 - 525 V
		[A]	[A]	[A]	[A]	[A]	[A]
123	8/2F12/220.223	1.7 2.3	1.0 1.3	0.8 1.0	2.4 5.6	1.4 3.2	1.1 2.6
133	8/2F13/220.233	2.1 2.8	1.2 1.6	1.0 1.3	2.8 7.6	1.6 4.5	1.3 3.6
313	8/2F31/210.423	2.4 5.2	1.4 3.0	1.1 2.4	5.0 16.0	2.9 9.2	2.3 7.4
423	8/2F42/210.433	3.1 7.0	1.8 4.0	1.4 3.2	7.7 28.0	4.4 16.0	3.5 13.0
523	8/2F52/210.523	4.7 12.7	2.7 7.3	2.2 5.8	10.6 43.0	6.1 25.0	4.9 20.0

Index no.	Type	50 Hz					
		I_N			I_K		
		575 - 630 V	660 - 720 V		575 - 630 V	660 - 720 V	
		[A]	[A]		[A]	[A]	
123	8/2F12/220.223	0.7 0.9	0.6 0.8		0.9 2.1	0.8 1.9	
133	8/2F13/220.233	0.8 1.1	0.7 0.9		1.1 3.0	0.9 2.6	
313	8/2F31/210.423	0.9 2.0	0.8 1.7		1.9 6.1	1.7 5.3	
423	8/2F42/210.433	1.2 2.7	1.0 2.3		2.9 10.9	2.6 9.4	
523	8/2F52/210.523	1.8 4.9	1.6 4.2		4.1 16.7	3.5 14.5	

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11 Technical data

Index no.	Type	60 Hz									
		P_N		n_N	T_N		T_{Hm}		T_B		CDF
		[kW]	[HP]	[rpm]	[Nm]	[lb$_f$ ft]	[Nm]	[lb$_f$ ft]	[Nm]	[lb$_f$ ft]	[%]
123	8/2F12/220.223	0.11 0.44	0.15 0.59	710 2900	1.46	1.077	2.6 2.6	1.918 1.918	1.3	0.959	20 40
133	8/2F13/220.233	0.16 0.66	0.21 0.89	720 3050	2.07	1.527	4.1 4.0	3.024 2.950	2.5	1.844	20 40
313	8/2F31/210.423	0.36 1.50	0.48 2.01	790 3060	4.68	3.452	7.6 8.1	5.605 5.974	5.0	3.688	20 40
423	8/2F42/210.433	0.60 2.40	0.8 3.22	800 3220	7.13	5.259	10.0 12.0	7.376 8.851	8.0	5.9	20 40
523	8/2F52/210.523	0.90 3.80	1.21 5.1	730 3060	11.98	8.836	18.0 19.0	13.276 14.014	13.0	9.588	20 40

Index no.	Type	60 Hz					
		I_N			I_K		
		220 - 240 V	380 - 415 V	440 - 480 V	220 - 240 V	380 - 415 V	440 - 480 V
		[A]	[A]	[A]	[A]	[A]	[A]
123	8/2F12/220.223	2.0 2.6	1.2 1.5	1.0 1.3	2.8 6.4	1.6 3.7	1.4 3.2
133	8/2F13/220.233	2.4 3.2	1.4 1.8	1.2 1.6	3.2 9.0	1.8 5.2	1.6 4.5
313	8/2F31/210.423	2.8 6.0	1.6 3.5	1.4 3.0	5.8 18.4	3.3 10.6	2.9 9.2
423	8/2F42/210.433	3.6 8.0	2.1 4.6	1.8 4.0	8.8 33.0	5.1 19.0	4.4 16.0
523	8/2F52/210.523	5.4 14.6	3.1 8.4	2.7 7.3	12.2 50.0	7.0 29.0	6.1 25.0

Index no.	Type	60 Hz					
		I_N			I_K		
		550 - 600 V	660 - 720 V		550 - 600 V	660 - 720 V	
		[A]	[A]		[A]	[A]	
123	8/2F12/220.223	0.8 1.0	0.7 0.9		1.1 2.6	0.9 2.1	
133	8/2F13/220.233	1.0 1.3	0.8 1.1		1.3 3.6	1.1 3.0	
313	8/2F31/210.423	1.1 2.4	0.9 2.0		2.3 7.4	1.9 6.1	
423	8/2F42/210.433	1.4 3.2	1.2 2.7		3.5 13.0	2.9 10.9	
523	8/2F52/210.523	2.2 5.8	1.8 4.9		4.9 20.0	4.1 16.7	

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Frequency-controlled travel motors SF/SFB/SFC/SA-C/SAB
maximum control frequency 120 Hz at mains frequency 50 Hz and 60 Hz
for the intended control frequency see the respective order documentation

4F18/220.243/4F18/231.243 Index no. 184																	
U_B	f_N			P_N			n_N			T_N	T_{Hm}	T_B	I_N	I_K	CDF	R_{KI}	
	Y	Δ	Δ	Y	Δ	Δ	Y	Δ	Δ				Y	Y		[Ω]	
[V]	[Hz]			[kW] [HP]			[rpm]			[Nm] [lbf ft]	[Nm] [lbf ft]	[Nm] [lbf ft]	[A]	[A]	[%]	Y	Δ
190…210	50	100	87	0.38	0.75	0.65	1220	2440	2110	2.94	3.8	5	2.2	5.0	60	14.2	4.7
220…240				0.51	1.01	0,87				2.168	2.803	3.688	1.9	4.7		18.4	6.1
380…415													1.1	2.7		56.4	18.8
420…460													1.0	2.5		73.4	24.5
480…525													0.9	2.2		89.0	29.7
575…630													0.7	1.8		120.6	40.2
660…720													0.6	1.6		172.8	57.6
190…210	60	120	104	0.45	0.90	0.78	1460	2930	2530	2.94	3.8	5	2.5	6.2	60	11.4	3.8
220…240				0.60	1.21	1.05				2.168	2.803	3.688	2.2	5.4		14.2	4.7
380…415													1.3	3.1		43.2	14.4
440…480													1.1	2.7		56.4	18.8
550…600													0.9	2.2		89.0	29.7
660…720													0.7	1.8		120.6	40.2

4F38/210.443/4F38/221.443 Index no. 384																	
U_B	f_N			P_N			n_N			T_N	T_{Hm}	T_B	I_N	I_K	CDF	R_{KI}	
	Y	Δ	Δ	Y	Δ	Δ	Y	Δ	Δ				Y	Y		[Ω]	
[V]	[Hz]			[kW] [HP]			[rpm]			[Nm] [lbf ft]	[Nm] [lbf ft]	[Nm] [lbf ft]	[A]	[A]	[%]	Y	Δ
190…210	50	100	87	1.1	2.2	1.9	1370	2740	2370	7.7	13	13	5.2	19.0	60	4.4	1.5
220…240				1.48	2.95	2,55				5.679	9.588	9.588	4.5	16.5		5.4	1.8
380…415													2.6	9.5		16.8	5.6
420…460													2.4	8.6		21.4	7.1
480…525													2.1	7.6		27.0	9.0
575…630													1.7	6.3		35.6	11.9
660…720													1.5	5.5		51.6	17.2
190…210	60	120	104	1.3	2.6	2.3	1640	3290	2840	7.7	13	13	6.0	21.9	60	3.4	1.1
220…240				1.74	3.49	3.08				5.679	9.588	9.588	5.2	19		4.4	1.5
380…415													3.0	10.9		13.2	4.4
440…480													2.6	9.5		16.8	5.6
550…600													2.1	7.6		27.0	9.0
660…720													1.7	6.3		35.6	11.9

11 Technical data

4F48/210.453/4F48/220.453 Index no. 484																		
U_B	f_N			P_N			n_N			T_N	T_{Hm}	T_B	I_N	I_K	CDF	R_{KI}	
	Y	Δ	Δ	Y	Δ	Δ	Y	Δ	Δ				Y	Y		[Ω]	
[V]	[Hz]			[kW]			[rpm]			[Nm]	[Nm]	[Nm]	[A]	[A]	[%]	Y	Δ
				[HP]						[lb$_f$ ft]	[lb$_f$ ft]	[lb$_f$ ft]					
190…210	50	100	87	1.6	3.2	2.8	1425	2850	2470	10.7	34	20	8.6	46	60	1.8	0.6
220…240				2,15	4.29	3.75				7.892	25.08	14.75	7.5	40		2.7	0.9
380…415													4.3	23		7.8	2.6
420…460													3.9	21		9.6	3.2
480…525													3.4	18.4		12.3	4.1
575…630													2.9	15.3		16.2	5.4
660…720													2.5	13.3		23.1	7.7
190…210	60	120	104	1.9	3.8	3.3	1710	3420	2960	10.7	34	20	9.9	53	60	1.5	0.5
220…240				2.55	5.1	4.43				7.892	25.08	14.75	8.6	46		1.8	0.6
380…415													4.9	26		6.0	2.0
440…480													4.3	23		7.8	2.6
550…600													3.4	18.4		12.3	4.1
660…720													2.9	15.3		16.2	5.4

I_N/I_K		Conversion factor
Δ-87 Hz	=	√3 × I_N/I_K (Y 50 Hz)
Δ-100 Hz	=	2 × I_N/I_K (Y 50 Hz)
Δ-104 Hz	=	√3 × I_N/I_K (Y 60 Hz)
Δ-120 Hz	=	2 × I_N/I_K (Y 60 Hz)

The values for Y-50/60 Hz, D-87/104 Hz are the nominal data of the motor for the parameterization of the frequency inverters.
The values for D-100/120 Hz are values for the operating point in the field weakening range at nominal torque.

CDF	[%]	Duration factor
f_N	[Hz]	Nominal frequency
I_K	[A]	Short-circuit current
I_N	[A]	Nominal current
n_N	[rpm]	Engine speed, rpm
P_N	[kW / HP]	Motor output
T_B	[Nm / lb$_f$ ft]	Braking torque
T_{Hm}	[Nm / lb$_f$ ft]	Run-up torque (motor shaft)
T_N	[Nm / lb$_f$ ft]	Rated motor torque
R_{KI}	[Ω]	Terminal resistance
U_B	[V]	Operating voltage range

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12 Lubrication points/lubricants

⚠ CAUTION

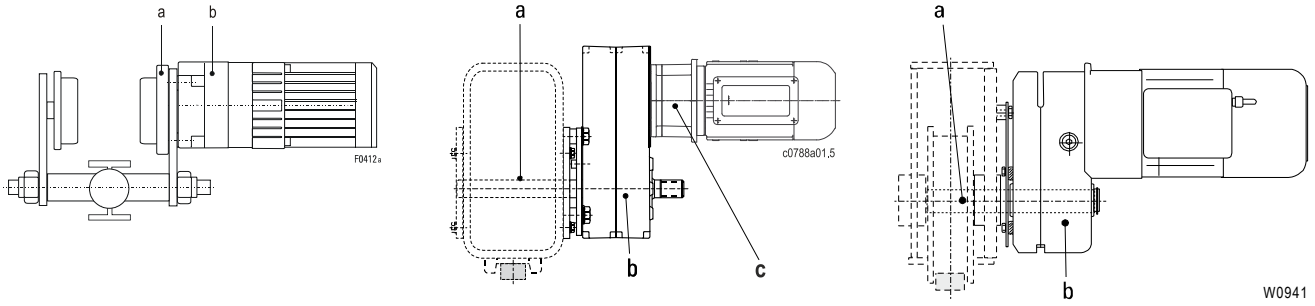
Lubricants can cause skin irritation and allergic reactions.

- ➢ Wear safety gloves and safety eyewear when handling lubricants.
- ➢ Observe the product data sheets of the lubricant manufacturer.
- ➢ Observe safety data sheets for the lubricants.
- ➢ Dispose of the lubricants in accordance with national and local legal provisions.

⚠ WARNING

Risk of crushing and entanglement hazard due to sudden machine movements.

- ➢ Keep a sufficient safety distance from the product during lubrication.



Item	Lubrication point	Lubricant type	Lubricant product name		Quantity
			Factory filling	Alternative	
a	Travel wheel (Gearing)	Grease	Mobil, MOBILUX EP 3	Shell, Gadus S2 V100 3 FUCHS, STABYL L 120 Klüber, Klüberplex BEM 41-132 Castrol, Spheerol AP 3	50 g / 1.8 oz
			Mobil, Mobilgrease 28 [1]	FUCHS, RENOLIT RHF 1 [1]	
b	Trolley gear	Grease	FUCHS, RENOLIT FLM 0 FUCHS, RENOLIT RHF 1 [1]	Shell, Gadus S2 V220 0 Aral, Aralub LFZ 0 Klüber, Klüberplex AG 11-461	SU-A 1.4.1: 130 g / 4.6 oz SU-A 1.4.2: 200 g / 7.1 oz SF/SFB/SFC1.1... 100 g / 3.5 oz SF/SFB1.2... 200 g / 7.1 oz SF/SFB1.2.... 600 g / 1.3 lb [2]
		Oil	FUCHS, RENOLIN CLP 460 FUCHS, RENOLIN UNISYN CLP 220 [1]	Aral, Degol BG 460 Plus Castrol, Alpha SP 460	SF 2/SFB2....1000 ml / 0.88 qt SF 3/SFB3 1500 ml / 1.32 qt SA-C 5/SAB5.. 1000 ml / 0.88 qt SA-C 6/SAB6.. 3000 ml / 2.64 qt
c	Intermediate gear	Grease	FUCHS, RENOLIT FLM 0 FUCHS, RENOLIT RHF 1 [1]	Shell, Gadus S2 V220 0	100 g / 3.5 oz

[1] synthetic lubricant, suitable for low operating temperatures down to -40 °C
[2] "Motor down" mounting position

13 Tightening torques for bolted connections

⚠ WARNING

Parts can loosen, fall down and cause serious injuries due to incorrect tightening torques.

➢ Tighten bolted connections to the prescribed tightening torques with a torque wrench.

Deviating tightening torques are listed in the corresponding chapters and sections of these instructions.

Thread	Tightening torque									
	Property class									
	08.8		8.8		010.9		10.9		VERBUS RIPP® 100	
	[Nm]	[lbf ft]	[Nm]	[lbf ft]	[Nm]	[lbf ft]	[Nm]	[lbf ft]	[Nm]	[lbf ft]
M5	--		6	4	--		--		11	8
M5 [1)]	--		1	1	--		--		--	
M6	8.2	6	10.3	8	--		--		19	14
M8	20	15	25	18	28	21	35	26	42	31
M10	39	29	49	36	55	41	69	51	85	63
M12	69	51	86	63	98	72	122	90	130	96
M14	109	80	136	100	152	112	190	140	--	
M16	170	125	210	155	240	177	300	221	330	243
M18	232	171	290	214	328	242	410	302	--	
M20	330	243	410	302	472	348	590	435	--	
M22	448	330	560	413	632	466	790	583	--	
M24	570	420	710	524	800	590	1000	738	--	
M27	832	614	1040	767	1168	861	1460	1077	--	
M30	1130	833	1410	1040	1600	1180	2000	1475	--	
M33	1528	1127	1910	1409	2160	1593	2700	1991	--	
M36	1970	1453	2460	1814	2800	2065	3500	2581	--	

[1)] Electrical plug-in connections

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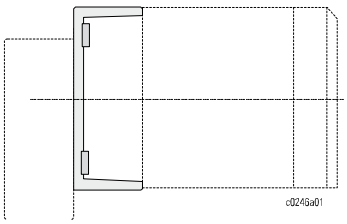
14 Wear parts

The additional spare parts lists in the enclosed technical documentation must be observed.

When ordering spare parts, quote the serial number of the product.

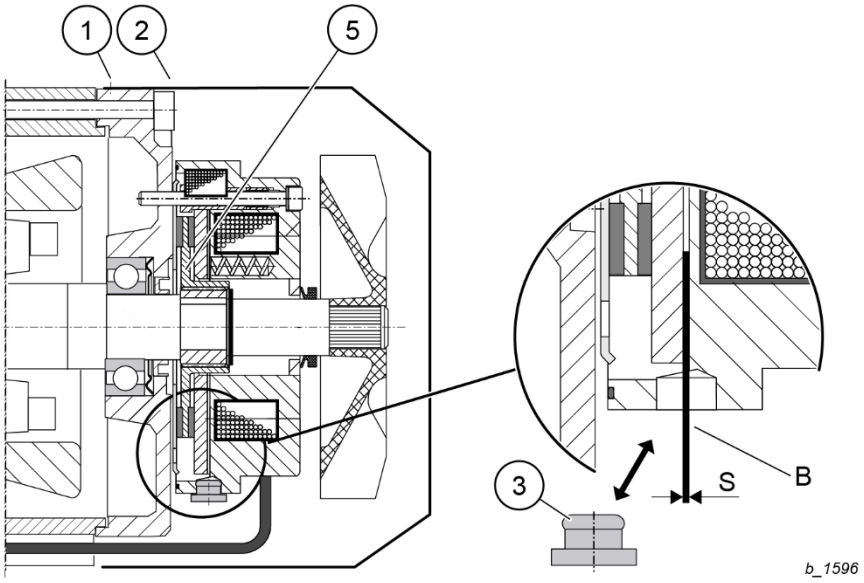
14.1 Brake disc/brake rotor



14.1.1 SU-A

Part	Travel drive	Part no.
Brake disc (gear housing)	SU-A 1.4.1	51 250 79 37 0
	SU-A 1.4.2	51 250 78 37 0

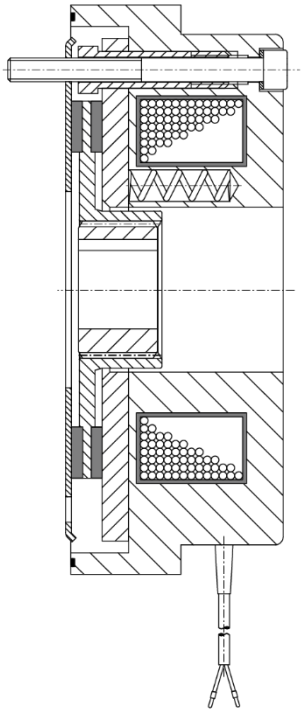
14.1.2 SF / SFB / SFC / SA-C / SAB



(5) Brake rotor
(1) Screw
(2) Fan cover
(3) Stopping plug

Item	Part	Travel drive	Motor type	Part no.
5	Brake rotor	SF/SFB/SFC/SA-C/SAB xx xxx 123	8/2F12/2xx.223	21 270 23 65 0
		SF/SFB/SFC/SA-C/SAB xx xxx 133	8/2F13/2xx.233	21 270 23 65 0
		SF/SFB/SFC/SA-C/SAB xx xxx 184	4F18/2xx.243	21 270 23 65 0
		SF/SFB/SFC/SA-C/SAB xx xxx 313	8/2F31/2xx.423	21 270 36 65 0
		SF/SFB/SFC/SA-C/SAB xx xxx 384	4F38/2xx.443	21 270 36 65 0
		SF/SFB/SFC/SA-C/SAB xx xxx 384	8/2F42/2xx.433	21 270 36 65 0
		SF/SFB/SFC/SA-C/SAB xx xxx 484	4F48/2xx.453	21 270 36 65 0
		SF/SFB/SFC/SA-C/SAB xx xxx 523	8/2F52/2xx.523	21 270 42 65 0

14.2 Motor brake



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Part	Coil voltage	Qty.	Part no.
Complete motor brake Type FDW 08 for motor 8/2F12/2xx.223	104 – 120 V	1	567 102 0
	130 – 150 V	1	567 103 0
	156 – 180 V	1	567 104 0
	180 – 207 V	1	on inquiry
	225 – 259 V	1	on inquiry
Complete motor brake Type FDW 08 for motor 8/2F13/2xx.233	104 – 120 V	1	567 135 0
	130 – 150 V	1	567 188 0
	156 – 180 V	1	567 189 0
	180 – 207 V	1	567 134 0
	225 – 259 V	1	567 370 0
Complete motor brake Type FDW 08 for motor 4F18/2xx.243	104 – 120 V	1	567 528 0
	180 – 207 V	1	567 529 0
	225 – 259 V	1	567 530 0
Complete motor brake Type FDW 13 for motor 8/2F31/2xx.423	104 – 120 V	1	567 128 0
	130 – 150 V	1	567 129 0
	156 – 180 V	1	567 130 0
	180 – 207 V	1	on inquiry
	225 – 259 V	1	on inquiry
Complete motor brake Type FDW 13 for motor 4F38/2xx.443	104 – 120 V	1	567 350 0
	180 – 207 V	1	567 351 0
	225 – 259 V	1	567 368 0
Complete motor brake Type FDW 13 for motor 8/2F42/2xx.433	104 – 120 V	1	567 131 0
	130 – 150 V	1	567 132 0
	156 – 180 V	1	567 133 0
	180 – 207 V	1	567 136 0
	225 – 259 V	1	567 369 0
Complete motor brake Type FDW 13 for motor 4F48/2xx.453	104 – 120 V	1	567 531 0
	180 – 207 V	1	567 532 0
	225 – 259 V	1	567 533 0
Complete motor brake Type FDW 15 for motor 8/2F52/2xx.523	104 – 120 V	1	567 137 0
	130 – 150 V	1	567 138 0
	156 – 180 V	1	567 139 0
	180 – 207 V	1	567 140 0
	225 – 259 V	1	on inquiry

14.3 Copper sealing ring

Part	Qty.	Ordering no.
Copper sealing ring 10×13.5, DIN 7603	1	515 996 0

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INDEMNIFICATION AND SAFE OPERATION

Buyer shall comply with and require its employees to comply with directions set forth in instructions and manuals furnished by Seller and shall use and require its employees to follow such instructions and manuals and to use reasonable care in the use and maintenance of the goods. Buyer shall not remove or permit anyone to remove any warning or instruction signs on the goods. In the event of personal injury or damage to property or business arising from the use of the goods, Buyer shall within 48 hours thereafter give Seller written notice of such injury or damage. Buyer shall cooperate with Seller in investigating any such injury or damage and in the defense of any claims arising therefrom.

If Buyer fails to comply with this section or if any injury or damage is caused, in whole or in part, by Buyer's failure to comply with applicable federal or state safety requirements, Buyer shall indemnify and hold Seller harmless against any claims, loss or expense for injury or damage arising from the use of the goods.

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A. Columbus McKinnon Corporation ("Seller") warrants to the original end user ("Buyer") that: (a) for a period of one (1) year from the date of Seller's delivery of the goods (collectively, the "Goods") to the carrier, the electrical components of the Goods will be free from defects in workmanship and materials; and (b) for a period of three (3) years from the date of Seller's delivery of the goods (collectively, the "Goods") to the carrier, the mechanical components of the Goods will be free from defects in workmanship and materials.

B. IN THE EVENT OF ANY BREACH OF SUCH WARRANTY, SELLER'S SOLE OBLIGATION SHALL BE EXCLUSIVELY LIMITED TO, AT THE OPTION OF SELLER, REPAIR OR REPLACEMENT, F.O.B. SELLER'S POINT OF SHIPMENT, OF ANY GOODS THAT SELLER DETERMINES TO HAVE BEEN DEFECTIVE OR, IF SELLER DETERMINES THAT SUCH REPAIR OR REPLACEMENT IS NOT FEASIBLE, TO A REFUND OF THE PURCHASE PRICE UPON RETURN OF THE GOODS TO SELLER. NO CLAIM AGAINST SELLER FOR ANY BREACH OF (i) SUCH WARRANTY WITH RESPECT TO THE ELECTRICAL COMPONENTS OF ANY GOOD SHALL BE VALID OR ENFORCEABLE UNLESS BUYER'S WRITTEN NOTICE THEREOF IS RECEIVED BY SELLER WITHIN ONE (1) YEAR FROM THE DATE OF SELLER'S DELIVERY TO THE CARRIER AND (ii) SUCH WARRANTY WITH RESPECT TO THE MECHANICAL COMPONENTS OF ANY GOOD SHALL BE VALID OR ENFORCEABLE UNLESS BUYER'S WRITTEN NOTICE THEREOF IS RECEIVED BY SELLER WITHIN ONE (1) YEAR FROM THE DATE THE DATE ANY ALLEGED CLAIM ACCRUES. EXCEPT FOR THE WARRANTY SET FORTH ABOVE, SELLER MAKES NO OTHER WARRANTIES WITH RESPECT TO THE GOODS, WHETHER EXPRESSED OR IMPLIED, INCLUDING ANY WARRANTIES OF MERCHANTABILITY, FITNESS FOR A PARTICULAR PURPOSE, QUALITY AND/OR THOSE ARISING BY STATUTE OR OTHERWISE BY LAW OR FROM ANY COURSE OF DEALING OR USE OF TRADE, ALL OF WHICH ARE HEREBY EXPRESSLY DISCLAIMED.

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E. This warranty is limited and provided only to the original end user. **Each Good must be registered within sixty (60) days of receipt of each product to establish eligibility**. Please register at www.cmworks.com/hoist-warranty-registration or submit registration card via US mail.

F. Any action against Seller for breach of warranty, negligence or otherwise in connection with the electrical components of any Good must be commenced by Buyer within one (1) year after: (a) the date any alleged claim accrues; or (b) the date of delivery of the Goods to Buyer, whichever is earlier. Any action against Seller for breach of warranty, negligence or otherwise in connection with the mechanical components of any Good must be commenced by Buyer within one (1) year after the date any alleged claim accrues.

G. This warranty is contingent upon Buyer's proper maintenance and care of the Goods, and does not extend to normal wear and tear. Seller reserves the right, at its option, to void this warranty in the event of Buyer's use with the Goods of parts or accessories other than those supplied by Seller.

⚠ WARNING

Alterations or modifications of equipment and use of non-factory repair parts can lead to dangerous operation and injury.

TO AVOID INJURY:
- **Do not alter or modify equipment.**
- **Do use only factory replacement parts.**

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