

## OPERATING INSTRUCTIONS

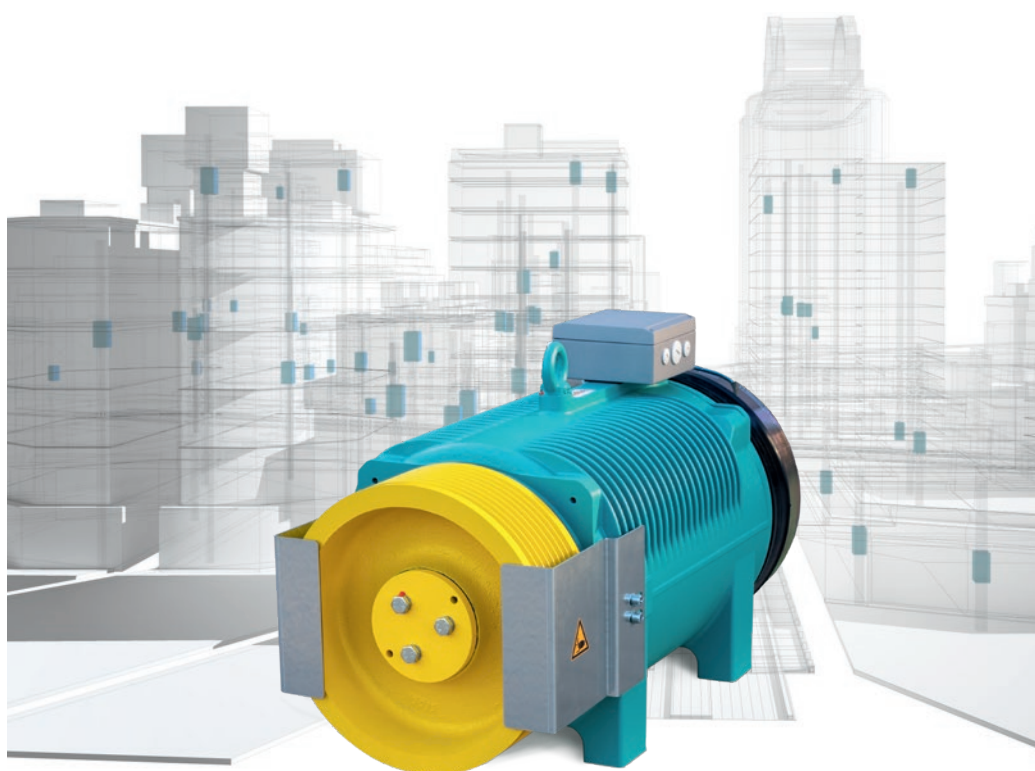
# WSG-MF

## GEARLESS LIFT MACHINE

Code **GM.8.004453.EN**

Version **A10**

Date **05. Aug 2024**



### Translation of the Original Operating Instructions

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# Gearless Lift Machine

## WSG-MF

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These operating instructions are applicable to lift machines:

**WSG - MF.1- .....**

**WSG - MF.2- .....**

**WSG - MF.3- .....**

date: 05. Aug 2024 version: A10

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#### Document history

Date	Version	Modifications
05. Aug 2019	0.11	Complete revision; new lever block for manual release; dimensions and measures updated
11. Sept 2019	0.12	Modifications for traction sheave replacement
22. Jan 2020	0.13	New declaration of conformity of the brake; additional instructions when using the return motion device
28. Aug 2020	0.14	Revision chapter „Electrical Installation“; Sub item „Earthing, potential equalization, EMC“ added
16. Feb 2021	0.15	Brake operating instructions updated; dimensional drawings of brake control units added; brake control updated; new drive code; removed chapter on traction sheave replacement;
23. Mrz 2021	0.16	Minor bug fixes
25. Nov 2021	0.17	New EU Declaration of Conformity; chapter „Traction sheave replacement“ added; dimensions of return device updated
07. Nov 2022	0.18	UKCA documents added; chapter “Spare parts” - reference to new document “Spare part catalogue”; new layout
09. Feb 2024	A08	EU Declaration of Conformity updated; additions to the product description; use of alternative brake control units
06. Mrz 2024	A09	New EU type-examination certificate for brakes (brake monitoring methods)
05. Aug 2024	A10	EU declaration of conformity for brakes updated, note on greasing when changing traction sheave

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## 1. General information

### 1.1. About this operating manual

The purpose of this operating manual is to ensure that any work on WSG-MF lift machines is carried out safely. Please regard it as part of the product and keep it within easy reach.

All persons working on or with WSG-MF lift machines must have read and understood this operating manual.

### 1.2. Intended use

WSG-MF lift machines are intended for use as gearless drives for rope lifts and they must never be connected directly to the mains supply. They may only be used for their intended purpose and with all safety devices in proper working order. WSG-MF lift machines are intended for use in an enclosed, lockable operating area to which only qualified personnel and personnel authorised by the customer have access.

WSG-MF lift machines may only be operated under the conditions described in this manual and with due regard to their performance limits.

WSG-MF lift machines are not ready-to-use products; they may only be operated after they have been installed in lift systems and their safe operation has been ensured by taking the appropriate measures.

### 1.3. Scope of delivery

The WSG-MF lift machines are customised to meet individual requirements. The exact scope of delivery can be found in the accompanying documentation.

### 1.4. Warranty and liability

Our „Conditions of Sale and Delivery“ shall apply for all our supplies and services.

Any warranty claims must be made immediately upon discovery of the deficiency or defect.

We do not accept any warranty or liability claims for personal injury or property damage resulting from one or more of the following causes:

- Improper use of the WSG-MF lift machine
- Improper installation, commissioning, operation or maintenance
- Operation of the WSG-MF with defective and/or inoperative safety or protective devices
- Non-compliance with the instructions contained in the operating manual or other documentation supplied
- Unauthorised construction modifications to the WSG-MF
- Insufficient monitoring of parts subject to wear
- Repairs carried out improperly
- Emergencies caused by external forces or force majeure.



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## 2. Safety

### 2.1. General safety instructions

#### 2.1.1. Qualified personnel





Only qualified personnel are authorised to perform any planning, installation or maintenance work, and this must be done in accordance with the relevant instructions. The personnel must be trained for the job and must be familiar with the installation, assembly, commissioning and operation of the product.

#### 2.1.2. Format of the safety instructions

The safety instructions contained in this operating manual are presented in a standardised format.

They comprise a danger symbol + signal word + instruction text. The danger symbol indicates the type of danger, the signal word specifies the severity of the danger, and the instruction text describes the danger and explains how to avoid it.

#### Danger symbols

	Risk of electric shock		Property damage
	General danger		Information

#### Signal words

- **DANGER** Serious injuries or death will result.
- **WARNING** Serious injuries or death may result.
- **CAUTION** Minor to moderate injuries may result.
- **NOTICE** Property damage may result.
- **Information** Points out useful information.

### 2.2. Safety precautions

- Check the proper functioning of the motor and the brake after installing the machine.
- Repairs may only be carried out by the manufacturer or an authorised repair agency. Unauthorised opening and tampering may result in injuries to persons and property.
- The machines are not designed for direct connection to the three-phase system but are to be operated via an electronic frequency inverter. Direct connection to the mains may damage the motor beyond repair.
- High surface temperatures may occur on the external parts of the machine. Therefore, no temperature-sensitive parts may be in contact with these parts or attached to them. Protection against accidental contact should be provided, if required.
- The EU type-examined fail-safe brakes provided are designed only for a limited number of emergency braking operations. They must not be used as working brakes.
- If the brake air gap exceeds the permissible value, the braking torque may be significantly reduced.
- If the motor is not energised, no torque is produced. This may result in uncontrolled acceleration of the lift, if the brakes are released. Therefore, the motor winding should be short-circuited to produce a speed-dependent braking torque while the motor is not supplied with current. (Use the main contacts for short-circuiting as rated motor current may be flowing.) The motor must never be short-circuited while it is energised.
- High voltages are present at the terminal connections during the operation of synchronous motors.


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## 3. EU Declaration of Conformity



**WITTUR Electric**  
Drives GmbH



### EU-Konformitätserklärung

### EU Declaration of Conformity

im Sinne der EG-Maschinenrichtlinie (2006/42/EG)  
as defined by the EG Machinery Directive (2006/42/EG)

Der Hersteller  
The manufacturer

**WITTUR Electric Drives GmbH**  
**Offenburger Straße 3**  
**D-01189 Dresden**  
**Deutschland / Germany**

erklärt hiermit, dass die folgenden Produkte  
certifies that the following products

**Produktbezeichnung:**  
**Product designation:**

Getriebe lose Aufzugsmaschinen vom Typ: WSG-..., WGG-..., WSU-..., WGU-..., OSG-..., OGG-..., HSG-..., HGG-...  
Gearless lift machines of the type:

den Bestimmungen der folgenden EU/EG-Richtlinien entsprechen:  
are in conformity with the following specification of the EU/EG Directives:

- **Maschinenrichtlinie 2006/42/EG**  
**Machinery Directive 2006/42/EG**
- **EMV-Richtlinie 2014/30/EU**  
**EMC Directive 2014/30/EU**

Folgende Normen sind angewandt:  
The following standards are in use:

**EN ISO 12100:2010**  
Sicherheit von Maschinen - Allgemeine Gestaltungsgrundsätze - Risikobeurteilung und Risikominderung  
Safety of machinery - General principles for design - Risk assessment and risk reduction

**EN 60034-1:2011**  
Drehende elektrische Maschinen; Teil 1: Bemessung und Betriebsverhalten  
Rotating electrical machines; Part 1: Rating and performance

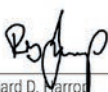
**EN 81-20:2020**  
Sicherheitsregeln für die Konstruktion und den Einbau von Aufzügen - Aufzüge für den Personen- und Gütertransport - Teil 20: Personen- und Lastenaufzüge  
Safety rules for the construction and installation of lifts - Lifts for the transport of persons and goods - Part 20: Passenger and goods passenger lifts

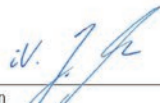
**DIN EN 60204-1:2019**  
Sicherheit von Maschinen; Elektrische Ausrüstung von Maschinen; Teil 1: Allg. Anforderungen  
Safety of machinery - Electrical equipment of machines. Part 1: General requirements

**EN 12015:2021**  
Elektromagnetische Verträglichkeit - Produktfamilien-Norm für Aufzüge, Fahrtreppen und Fahrsteige - Störaussendung  
Electromagnetic compatibility - Product family standard for lifts, escalators and moving walks - Emission

Erstmalige Anbringung der CE-Kennzeichnung: 1999  
Date of first application of CE-mark: 1999

Dresden, 2023-05-25  
(Ort, Datum)  
(Place, date)

  
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EU-Conformity\_WSG\_ed25May2023

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## 4. Type code

Example:	W	S	G-	MF	.	3	-	0	E	191	/	32A1	-	DQ
Customer specific identifier	<b>W</b>	<b>S</b>	<b>G-</b>	<b>Z1 Z2</b>	<b>.</b>	<b>Z3</b>	<b>-</b>	<b>X1</b>	<b>X2</b>	<b>X3</b>	<b>/</b>	<b>X4</b>	<b>-</b>	<b>X5 X6</b>
S: Synchronous motor														
G: Gearless														
Z1 Z2: Frame size														
Z3: Overall length 3 overall lengths are available; identified by: 1, 2, 3														
X1: Customer specific identifier														
X2: Motor voltage $E - U_N = 400 \text{ V} / U_{ZK} = 500...620 \text{ V DC}$														
X3: Rated speed $n_N$ z.B. 153 - 153 rpm (with $D_T = 400 \text{ mm}$ $v = 1,6 \text{ m/s}$ ; suspension 2:1) 191 - 191 rpm (with $D_T = 320 \text{ mm}$ $v = 1,6 \text{ m/s}$ ; suspension 2:1) 226 - 226 rpm (with $D_T = 270 \text{ mm}$ $v = 1,6 \text{ m/s}$ ; suspension 2:1)														
X4: Traction sheave design (Traction sheave diameter; width, groove design, groove geometry)														
X5 X6: Variant code (brake, measuring system, modifications) DE - dual-circuit brake, measuring system ECN 1313 - 2048 Incr. - SSI- Interface DF - dual-circuit brake, measuring system ECN 1313 - 2048 Incr. - EnDat- Interface DG - dual-circuit brake, measuring system ERN 1387 - 2048 Incr. DQ - dual-circuit brake, measuring system Sendix 8.5873.HKRF.C323 - 2048 Incr. - BiSS- Interface														

# Gearless Lift Machine

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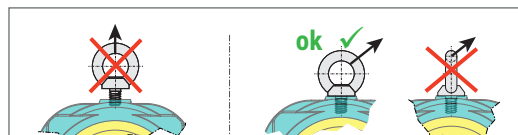
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## 5. Handling

### 5.1. Transport and storage

- Climate class: 2K3 according EN 60721
  - Transport temperature: -20°C bis +60°C, max. 20 K/hour fluctuated
  - Transport air humidity: max. relative humidity 85 % at 20°C (no moisture condensation)
  - The lift machines leave the factory in perfect condition after being tested. Make a visual check for any external damage immediately upon their arrival on site. If any damage is found to have occurred in transit, make a notice of claim in the presence of the carrier. If appropriate, do not put these machines into operation.
  - Do not expose the motor to any shocks or impact.
  - Observe the relevant safety regulations and take the centre of gravity into account when handling the lift machines.
  - Use only suitable transport and lifting equipment.
  - Check that the eyebolt are tightly fitted before using them.  
If necessary, screw the eyebolt completely into the threaded hole and tighten it only by hand.
- Important!** Avoid lateral pulling.



- The eyebolts are designed for the specified machine weight, i.e. additional loads must not be applied. Danger of breakage!

### 5.2. Storage

- Climate class: 2K3 nach EN 60721
- Storage temperature: -20°C to +60°C, max. 20 K/hour fluctuated
- Storage air humidity: max. relative humidity 85 % at 20°C (no moisture condensation)
- Store the motors only in closed, dry, dust-free, well-ventilated and vibration-free rooms. Do not store lift machines in the open air. Bright parts are not sufficiently preserved to withstand extended periods of exposure.



- Avoid excessive storage periods (recommendation: max. one year).  
► After prolonged storage (>3 months), rotate the motor - **every** three month continuously - in both directions at a low speed (< 20 min<sup>-1</sup>) to allow the grease to distribute evenly in the bearings. The ropes must not be fitted.

- Measure the insulation resistance before initial operation of the machine. If the value has dropped below 1 kΩ per volt of rated voltage, the winding needs to be dried (insulation meter voltage: 1,000 VDC).

#### Unpacking

- Dispose of the packaging material in an environmentally friendly manner or reuse it.
- Any special transport aids or shipping braces are left with the customer.

### 5.3. Disposal

- The lift machines consist of different materials. A waste separation of those different material components has to be done.
- The disposal must be professional and environmentally friendly according to law.

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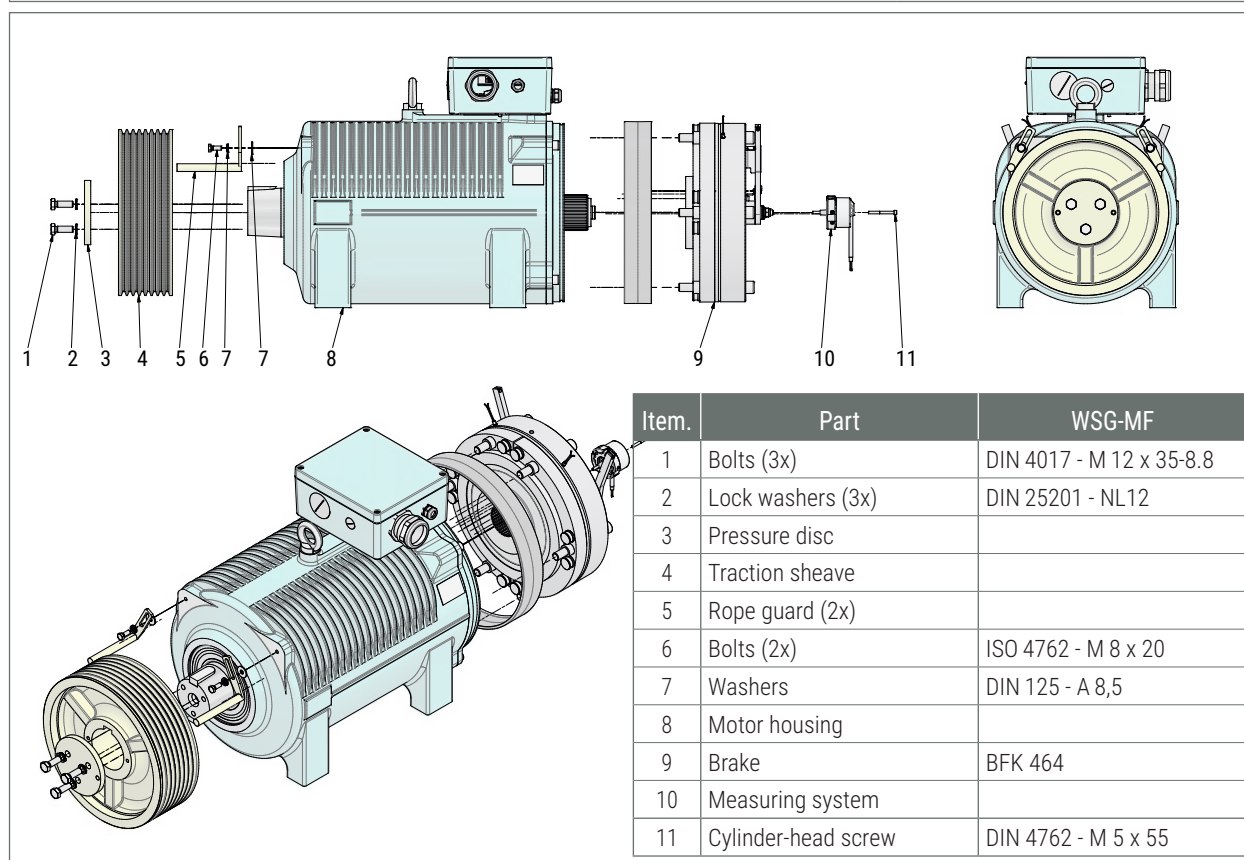
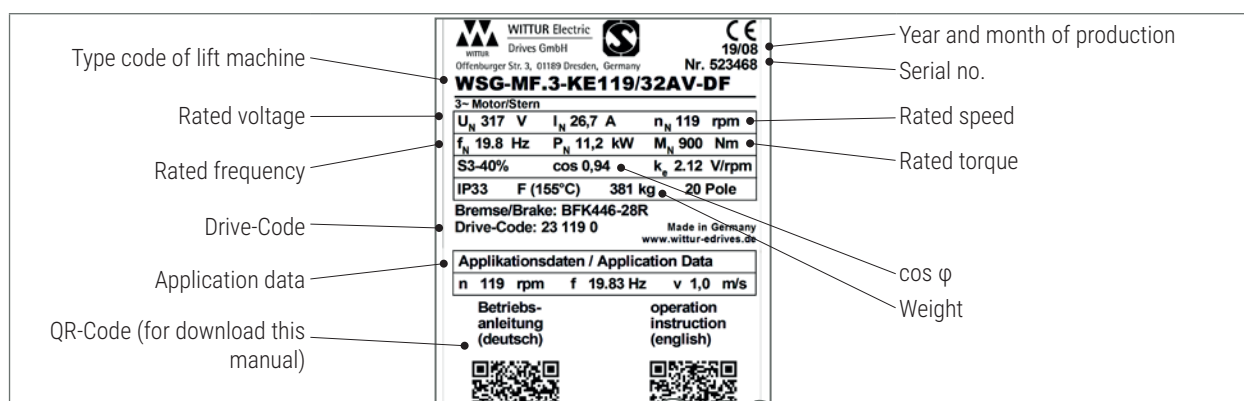
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## 6. Product overview

### 6.1. Product description

The compact gearless WSG-MF synchronous lift machines are designed for traction sheave lifts with conventional steel ropes and PU sheathed ropes. They are distinguished by their high efficiency, extremely low noise and excellent operating characteristics.

The machines can be supplied for several rated speeds, which can be further adapted to meet individual customer requirements. The machine comprises the synchronous motor with high-efficiency permanent magnets, the traction sheave, and the type-tested safety brake, which can be used to prevent uncontrolled upward movement of the car. The nameplate of the lift machine is on the motor housing.



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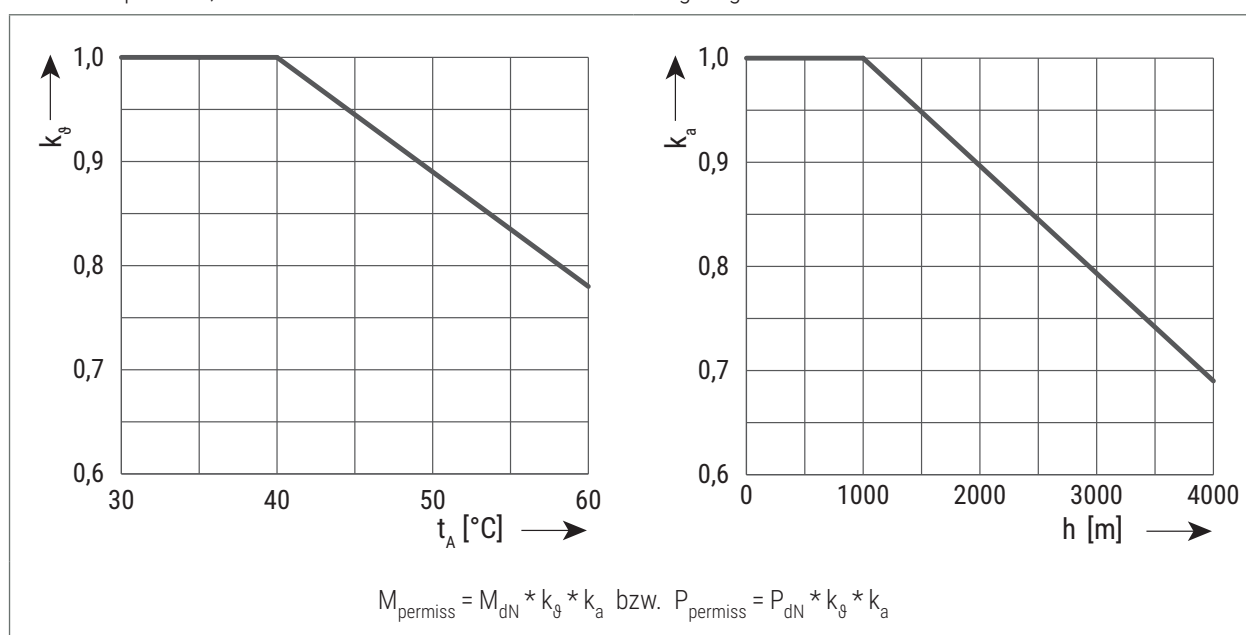
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## 6.2. Permissible ambient conditions

- Ambient temperature: -5°C to +40°C
- Air humidity: max. relative humidity: 85% at 20°C (no moisture condensation)
- Install the machine so that ventilation is not obstructed, i.e. sufficient heat dissipation by convection and radiation must be ensured.

### Deviating ambient conditions

At higher temperatures or altitudes, the overload capability of the motors is reduced. In the case of a deviating altitude and/or temperature, the reduction factors  $k$  shown in the following diagrams must be used.



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## 7. Installation

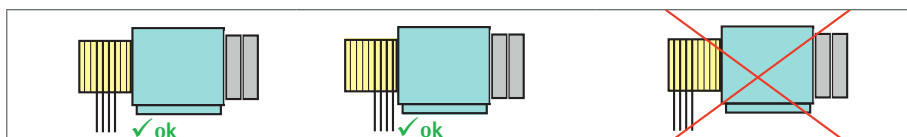
### 7.1. Mechanical installation

#### 7.1.1. Setting up



- ▶ Be sure to use calculations to check the base frame or foundation loads before installing the lift machine.
- ▶ The lift machines must be installed by trained and qualified personnel with professional knowledge of mechanical engineering and lift construction.

- The machines can be used in lift systems with or without a machine room.
- The permissible unevenness of the mounting surface is 0.1 mm. The mounting surface must be sufficiently distortion-resistant and stable to accommodate the forces occurring in the system.
- The rope force can be applied to the lift machine in any direction.
- The machine must be mounted on vibration dampers for vibration damping.
- No welding work may be performed on the lift machine, nor is it permissible to use the machine as a mass point for welding work. This might cause irreparable damage to the bearings and magnets.
- If there are more grooves on the traction sheave than the number of ropes used, position the ropes either in the centre of the traction sheave or towards the motor end.



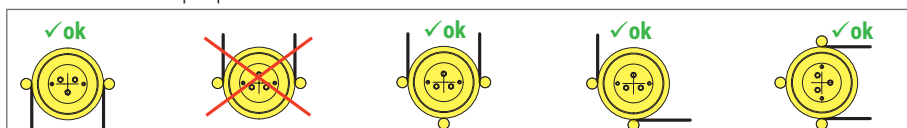
- The measuring system is only accessible from the rear side. Therefore, leave enough space between the wall and the rear side of the machine or ensure that the machine can be moved away from the wall.



- ▶ Cover the machine and especially the brakes when doing any machining or dust-producing work in the shaft or machine room.

#### Securing the machine

- Fasten the machine using four M24 bolts - strength class 8.8 tightening torque: 680 Nm .
- After completing the adjusting work or after a breakdown, tighten all the fastening bolts of the machine, using the specified torque .
- Lift machines are generally equipped with rope slip-off guards. After putting the ropes in place, adjust them so that the distance between the rope and the rope slip-off guard does not exceed 2 to 3 mm.
- If the lift machine is not installed at the head of the machine room as is usually the case, it may be necessary to modify the fitting of the rope slip-off guard to fulfill the requirements of EN 81-20 . Optional rope slip-off guards are available for this purpose.



Information

- ▶ When using the machine in a shaft, please take into account the patent situation.



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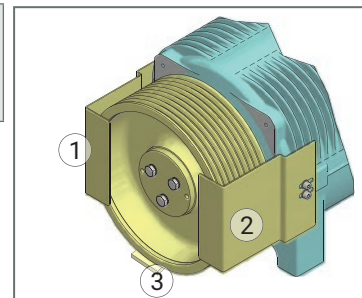
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#### 7.1.2. Rope guard



- All work on the rope guard may only be carried out when the system is at a standstill.

- The lift machine is fitted with a rope guard on the left and right (1, 2). A third rope guard (3) is available on request.
- A list of the rope guard design depending on the traction sheave diameter (standard/option) can be found in the following table. Depending on the variant, the rope guard can be adjusted for different angles of rope departure.



	Standard version	Option
Traction sheave dia 240 mm	flexible rope guard	
Traction sheave dia 270 mm	rigid rope guard	flexible rope guard
Traction sheave dia 320 mm	rigid rope guard	flexible rope guard
Traction sheave dia 400 mm Traction sheave dia 480 mm	rope slip-off guard	



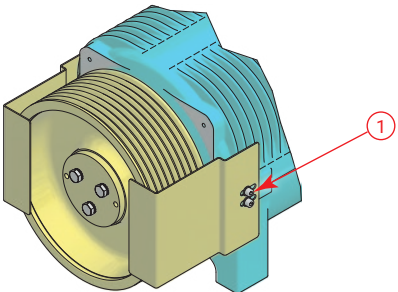
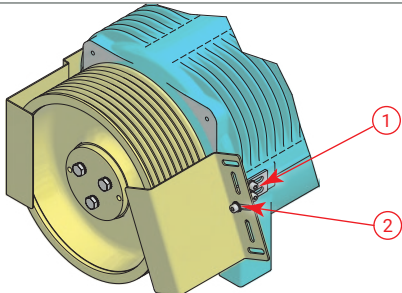
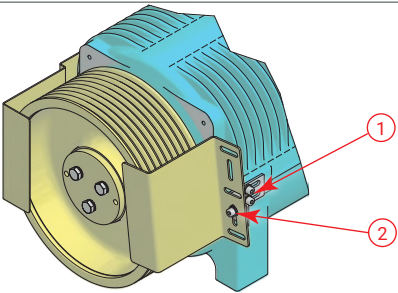
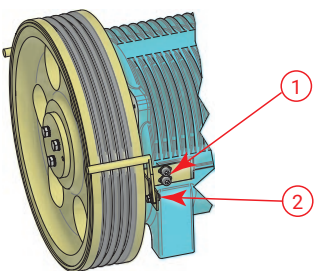
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#### Fastening rope guards

	Rope guard	Information
Rigid rope guard		<ul style="list-style-type: none"> <li>Fastening the rope guard with two screws (1) M 8 x 16 and washers <b>Tightening torque M8-8.8: 23 Nm</b></li> </ul>
Flexible rope guard		<ul style="list-style-type: none"> <li>Slotted holes make an adjustment to different angles of rope departure possible</li> <li>Fastening the rope guard with two screws (1) M 8 x 16 and washers and a screw (2) M 8 x 12 and a washer <b>Tightening torque M8-8.8: 23 Nm</b></li> </ul>
		
Rope slip-off guard		<ul style="list-style-type: none"> <li>Slotted holes make an adjustment to different angles of rope departure possible.</li> <li>Fastening the rope guard with two screws (1) M 8 x 16 and washers and a screw (2) M 8 x 12 and a washer <b>Tightening torque M8-8.8: 23 Nm</b></li> </ul>

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## 7.2. Electrical installation

### 7.2.1. General



- ▶ The electrical installation may only be carried out by trained and qualified personnel with professional knowledge of electrical engineering.

- Before starting any work on the machines, ensure that the lift machine or system is properly isolated.
- Before making any electrical connections check that:
  - » the connecting cables are suitable for their specific application and for the relevant voltages and currents
  - » the protective conductor is connected to the earthing terminal
  - » there are no foreign bodies, dirt or moisture in the terminal boxes
  - » cable entries not in use and the terminal box itself are tightly sealed to prevent the ingress of dust
  - » sufficiently dimensioned connecting cables, torsion, strain and shear relief, as well as anti-kink protection are provided.
- The insulation system of the motors is designed such that they can be connected to a inverter with a maximum DC link voltage  $U_{link\ max}$  up to max. 700 V DC.



- ▶  $U_{link\ max}$  is the maximum value of the DC link voltage which is only transient and approximately equivalent to the inception voltage of the braking chopper or of the energy recovery unit.



- ▶ The maximum permissible rate of voltage rise ( $dU/dt$ ) at the motor terminals is 4 kV/ $\mu$ s. The overvoltage at the motor terminals must not exceed 1.56 kV. It may be necessary to use motor current filters or reactors to achieve these values.

### 7.2.2. Motor connection / Winding protection

- The electrical connection of the motor and the winding sensors is made by power connector or in the terminal box.
- The cable cross-section must be determined in accordance with the applicable regulations, depending on the motor current and the ambient conditions, e.g. temperature and type of installation.
- The motor cable must be shielded. Ensure that the cable shield contacts the frame over a large area at both ends.
- In general, the motor power cable must not exceed a length of 25m. For other lengths, please contact us.
- The motor phases U1, V1 and W1 must be connected correctly to the corresponding phases of the inverter; they must not be interchanged.
- We recommend using a inverter with a maximum switching frequency of 10 to 12 kHz.
- The PTC resistor embedded in the winding must be evaluated in the control system or frequency inverter to protect the motor from overtemperature.

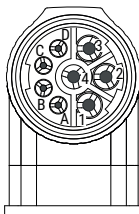
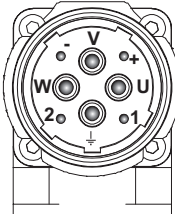
# Gearless Lift Machine

## WSG-MF

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#### 1. Plug connection

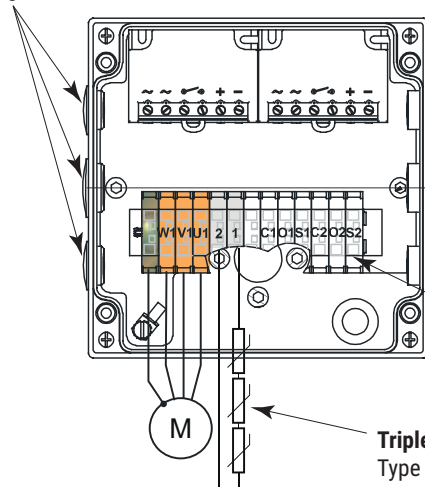
Signal	Pin	for $I_N \leq 35$ A	for $I_N > 35$ A	Pin
U1	1			U
PE	2			PE
W1	3			W
V1	4			V
not assigned	A			+
not assigned	B			-
temperature sensor	C	Pin contacts of flanged connector socket (exterior)		1
temperature sensor	D			2

The electrical connection of the motor and the winding temperature sensors is made by a rotatable 8-pole power connector provided on the motor.

For machines with  $I_N \leq 35$  A a connector type B ST A 078 FR 05 08 0035 000 and for machines with  $I_N > 35$  A a connector type C ST A 264 FR 48 45 0001 000 from „intercontec“ can be used, for example, as the female plug.

#### 2.1. Terminal box for $I_N \leq 35$ A

Screw plugs 2 x M 16 and 1 x M 25



**2 x M 16 Cable gland**  
for cable diameter 5-10 mm

**M 25 Cable gland**  
for cable diameter 13-18 mm

**WAGO 262**  
cable cross-section: ... 4 mm<sup>2</sup>  
stripping length required: 9-10 mm

**Triplet PTC**  
Type STM-150.DS...

# Gearless Lift Machine

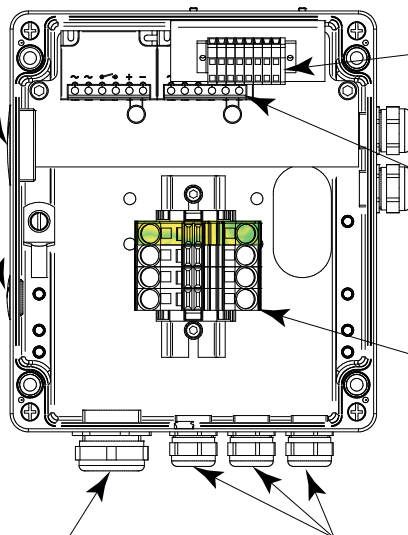
## WSG-MF

### Operating Instructions

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## 2.2. Terminal box for $I_N > 35\text{ A}$

Screw plugs M 40 and M 20



**Terminal strip for brake monitoring and winding protection connections WAGO 260**

cable cross section: ... 1,5 mm<sup>2</sup>  
 stripping length required: 8-9 mm

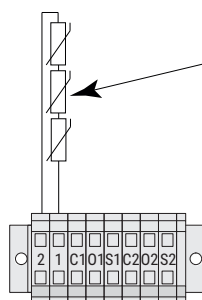
**Overexcitation rectifier**

**Terminal strip for motor WAGO 2016**

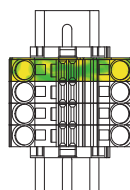
cable cross section: ... 16 mm<sup>2</sup>  
 stripping length required: 18-22 mm

**M 32 Cable gland**  
 for cable diameter 20-25 mm

**M 20 Cable gland (3x)**  
 for cable diameter 8-15 mm



**Triplet PTC**  
 Typ STM-150.DS...



**Terminal strip for motor WAGO 2016**

### Protective earth connection

- The protective earth conductor is made in the power connector or in motor terminal box.
- If the protective conductor is smaller than 10 mm<sup>2</sup> an additional protective conductor must be connected. The cross-section must correspond at least to the cross-section of the PE conductor on the motor power cable.

# Gearless Lift Machine

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#### PTC thermistors

- The maximum operating voltage of the PTC thermistors is not allowed to exceed 25 V DC
- To achieve the maximum precision, the measurement voltage per PTC thermistor must not exceed 2.5 V DC.

#### Short-circuiting the motor terminals

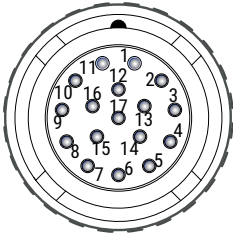
- The motor terminals of the synchronous lift machines, type WSG, can be short-circuited, if required, to brake the lift machine faster.
- However, this is only permissible at speeds less than or equal to the rated speed of the respective motor.

#### 7.2.3. Speed/Position measuring system

- The basic version of the lift machines is equipped with an sendix 8.5873 SineCosine encoder from Kübler GmbH. The encoder is connected by cable (length: 10m) with open wire ends (no plug).
- Alternatively, the machines can be equipped with ECN 1313 or ERN 1387 encoders (from Heidenhain GmbH). We can also provide other measuring systems on request.
- Use a shielded cable to connect the measuring system to the inverter system. The maximum cable length should not be longer than 25 m. We recommend the use of our cable sets, which can be supplied as an accessory.



- ▶ The measuring system of WSG lift machines with a synchronous motor (WSG) is matched to the associated inverter. Do not change the adjustment, as this may make it impossible to use the motor. On the measuring system housing there is a label showing the „offset angle“ and the inverter type.
- ▶ The offset angle depends on the inverter used.

Measuring system Sendix 8.5873.HKEF.C323		Measuring system ECN 1313																																																							
Data interface: BiSS-C		Data interface: EnDat or SSI																																																							
Operating voltage: 5 V DC		Operating voltage: 5 V DC																																																							
Recommended mating connector: -		Recommended mating connector: ASTA 035 NN 00 73 0100 00 (company Intercontec GmbH)																																																							
<table><thead><tr><th>Ader</th><th>Signal</th></tr></thead><tbody><tr><td>white</td><td>0 V (<math>U_p</math>)</td></tr><tr><td>brown</td><td>+V (<math>U_p</math>)</td></tr><tr><td>green</td><td>Clock +</td></tr><tr><td>yellow</td><td>Clock -</td></tr><tr><td>grey</td><td>DATA +</td></tr><tr><td>pink</td><td>DATA -</td></tr><tr><td>blue</td><td>A +</td></tr><tr><td>red</td><td>A -</td></tr><tr><td>black</td><td>B +</td></tr><tr><td>violet</td><td>B -</td></tr><tr><td>grey-pink</td><td>0 V (Sensor)</td></tr><tr><td>red-blue</td><td>+V (Sensor)</td></tr><tr><td>shield</td><td>shield</td></tr></tbody></table>	Ader	Signal	white	0 V ( $U_p$ )	brown	+V ( $U_p$ )	green	Clock +	yellow	Clock -	grey	DATA +	pink	DATA -	blue	A +	red	A -	black	B +	violet	B -	grey-pink	0 V (Sensor)	red-blue	+V (Sensor)	shield	shield		<table><thead><tr><th>Pin</th><th>Signal</th></tr></thead><tbody><tr><td>1</td><td><math>U_p</math> Sensor</td></tr><tr><td>4</td><td>0 V Sensor</td></tr><tr><td>7</td><td><math>U_p</math></td></tr><tr><td>8</td><td>Clock +</td></tr><tr><td>9</td><td>Clock -</td></tr><tr><td>10</td><td>0 V (<math>U_p</math>)</td></tr><tr><td>12</td><td>B +</td></tr><tr><td>13</td><td>B -</td></tr><tr><td>14</td><td>DATA +</td></tr><tr><td>15</td><td>A +</td></tr><tr><td>16</td><td>A -</td></tr><tr><td>17</td><td>DATA -</td></tr></tbody></table>	Pin	Signal	1	$U_p$ Sensor	4	0 V Sensor	7	$U_p$	8	Clock +	9	Clock -	10	0 V ( $U_p$ )	12	B +	13	B -	14	DATA +	15	A +	16	A -	17	DATA -	<div><p>Pin contacts of flanged connector socket (exterior)</p></div>
Ader	Signal																																																								
white	0 V ( $U_p$ )																																																								
brown	+V ( $U_p$ )																																																								
green	Clock +																																																								
yellow	Clock -																																																								
grey	DATA +																																																								
pink	DATA -																																																								
blue	A +																																																								
red	A -																																																								
black	B +																																																								
violet	B -																																																								
grey-pink	0 V (Sensor)																																																								
red-blue	+V (Sensor)																																																								
shield	shield																																																								
Pin	Signal																																																								
1	$U_p$ Sensor																																																								
4	0 V Sensor																																																								
7	$U_p$																																																								
8	Clock +																																																								
9	Clock -																																																								
10	0 V ( $U_p$ )																																																								
12	B +																																																								
13	B -																																																								
14	DATA +																																																								
15	A +																																																								
16	A -																																																								
17	DATA -																																																								

# Gearless Lift Machine

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#### 7.2.4. Brake

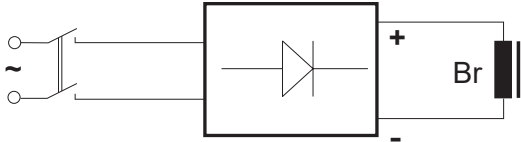
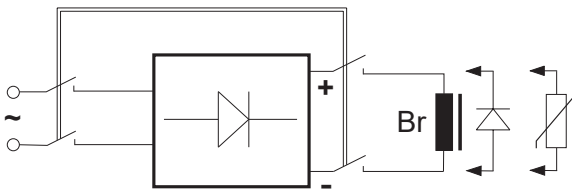
- Please refer also to the operating instructions for the brake on page 73.
- The brakes are supplied with DC voltage by the overexcitation rectifiers, which are supplied separately or in the terminal box.
- We recommend to use the supplied brake control units. Alternatively, other devices/controllers that fulfil the necessary requirements can also be used - see „10. Technical data“ on page 32.
- Repeated switching of the brake magnets during the overexcitation period must be avoided as this will result in overloading of the brake control unit. Therefore, a minimum brake operating time of approx. 1.5 – 2 s should be maintained, especially during an inspection or commissioning drive.
- To reduce the switch-off time, switching can be effected from the DC side. However, switching must also be performed from the AC side at the same time ! (Wiring with a varistor as shown in the „Circuitry suggestion for brake control“ on page 21.
- The brakes must be protected with varistors against overvoltage from switching operations. The varistor must be directly connected to the coil.

#### Note on the use of DC/AC side switching



Information

- ▶ AC side switching is recommended for normal operation, since the lift machine is then decelerated in a controlled manner to zero speed and the switching noise of the brake is negligible.
- ▶ When braking in the event of a breakdown (emergency stop) or during an inspection drive, the switching should be performed from the DC side, since this ensures a faster braking effect with the car being stopped earlier. We therefore recommend the use of 2 separate contactors for the brake control circuitry, one of which switches at the DC side, the other at the AC side.

AC side switching	DC side switching
<ul style="list-style-type: none"> <li>▶ Low-noise switching of the brake</li> <li>▶ No protective measures required for switching contact</li> <li>▶ Slow application of the brake.</li> </ul>  <p>Attention: Schematic diagram!</p>	<ul style="list-style-type: none"> <li>▶ Noisy switching</li> <li>▶ Burn-up protection for switching contact required (e.g. varistor, free-wheeling diode)</li> <li>▶ Fast application of the brake.</li> </ul>  <p>Attention: Schematic diagram!</p>

#### Time-delayed application of the two brake circuits



NOTICE

- ▶ If ropes with plastic sheathing or belts are used, the increased friction during emergency stops may be damaged the suspensions. For this reason, both braking circuits should not be applied simultaneously, but one after the other with a time delay. This also helps to avoid in-admissibly high decelerations in the car.
- ▶ To achieve this time delay between the two brake circuits, it is sufficient to use a diode D1 in one of the two brake circuits, as shown in the connection diagram on page 21. Pay attention to the polarity of the diode!
- ▶ Check the function of the diode regularly, as this avoids suspensions wear or in-admissibly high decelerations of the car.

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#### Monitoring the brakes

- There are various options for monitoring the switching status of the brakes - see the type examination certificate for the brake.
- If a micro-switch (standard) is used, a contact current of at least 10 mA must be ensured to keep the contacts clean.



- The micro-switches must be evaluated separately for each partial brake to ensure compliance with the requirements of the type examination.

#### Connection of the brakes

The brake coils, the brake control units and the monitoring contacts are connected to the mains in the motor terminal box.

#### 1. Plug connection

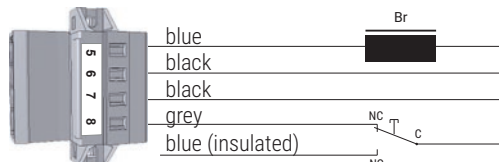


The electrical connection of the brake made by two 4-pole power connector mounted on the brake. A type 231-104/037-000 connector from „WAGO“ can be used as the female plug.- Included in the scope of delivery.

1<sup>st</sup>. partial brake

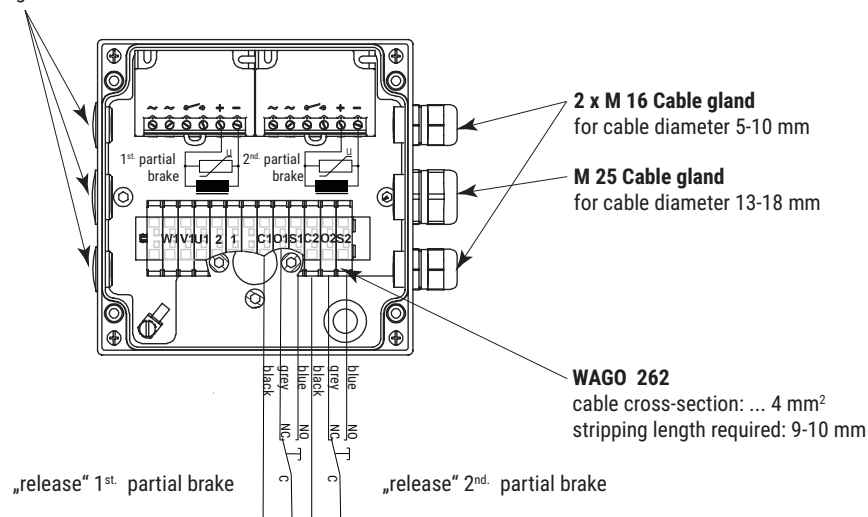


2<sup>nd</sup>. partial brake



#### 2.1. Terminal box for $I_N \leq 35 A$

Screw plugs 2 x M 16 and 1 x M 25



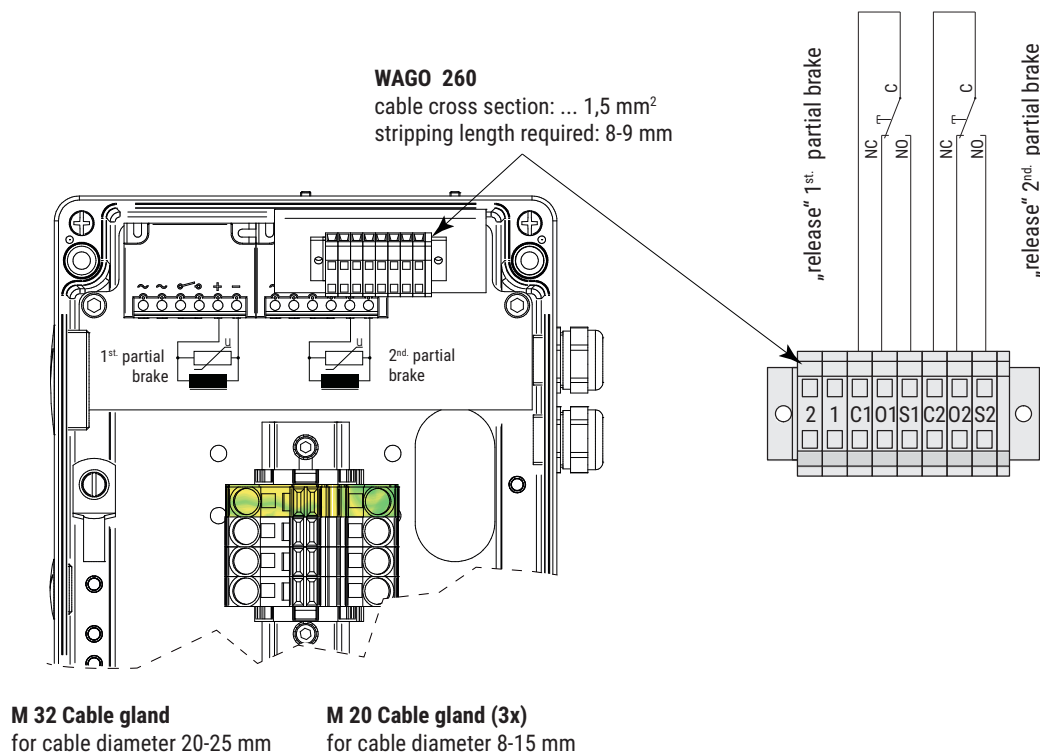
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## 2.2. Terminal box for $I_N > 35 A$





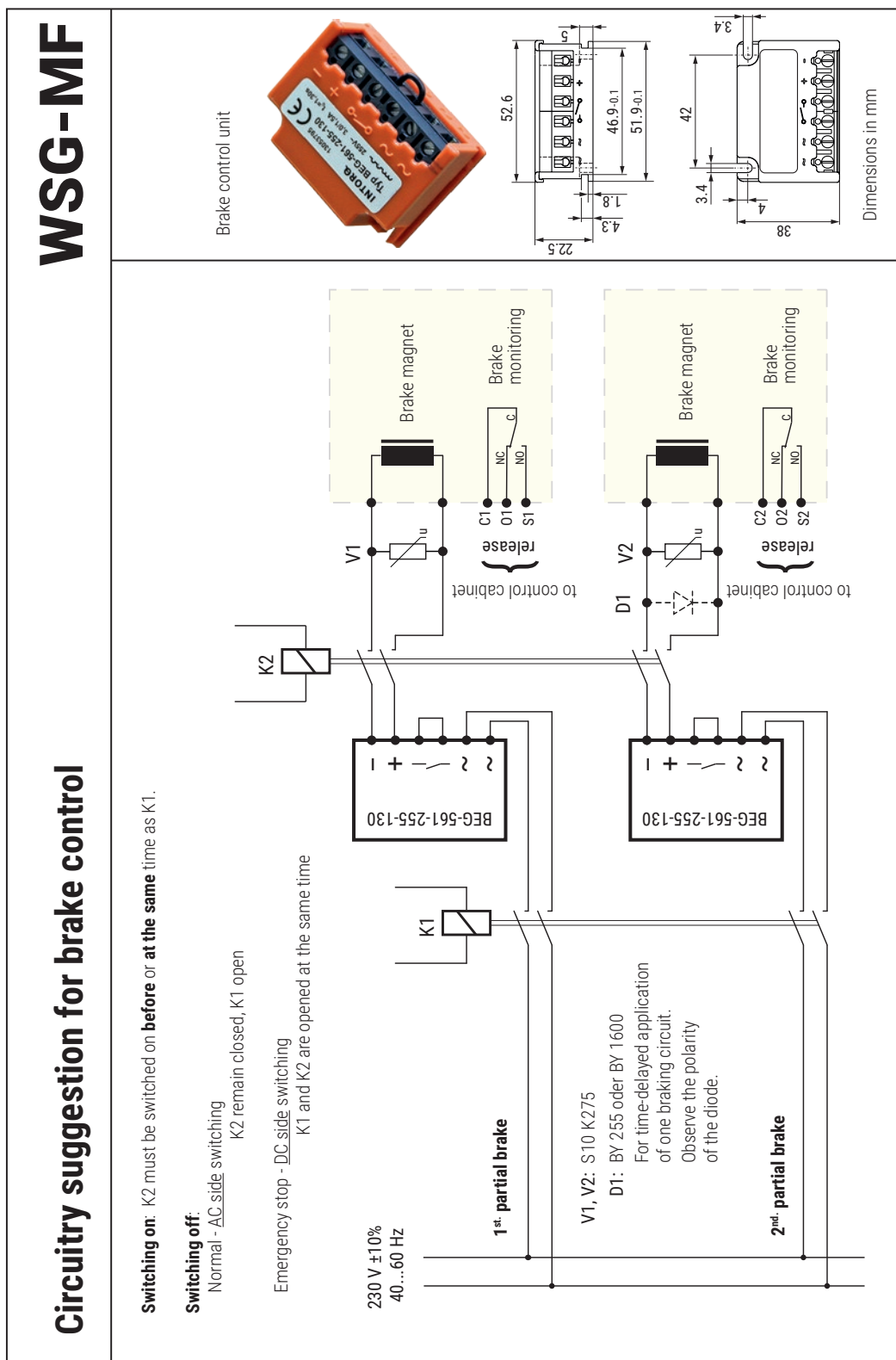
# Gearless Lift Machine

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#### Circuitry suggestion for brake control



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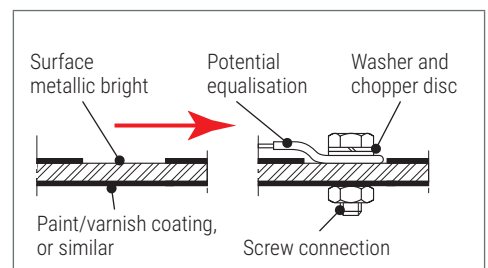
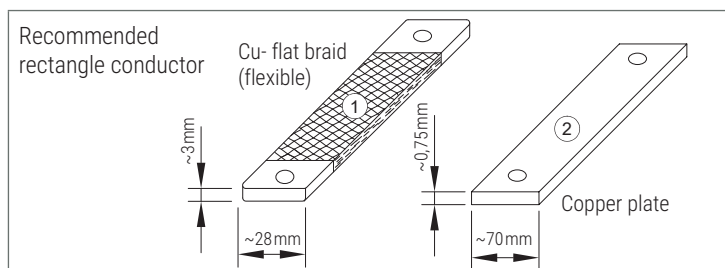
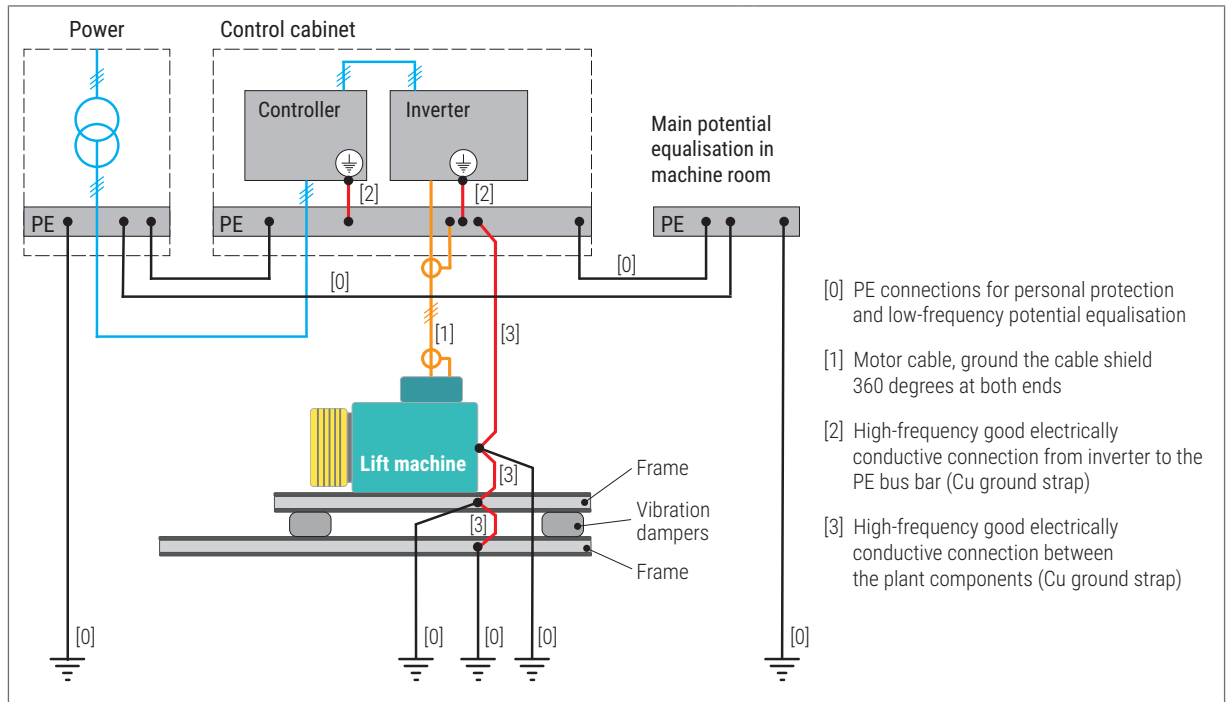
## WSG-MF

### Operating Instructions

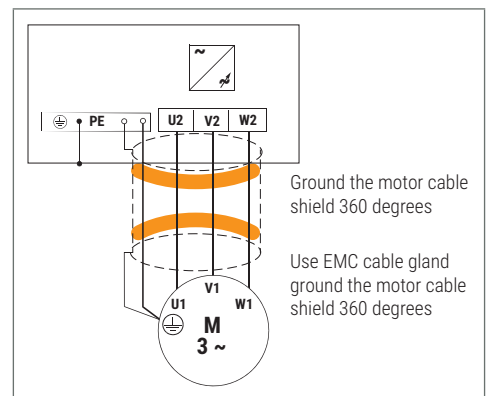
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### 7.2.5. Earthing, potential equalisation, electromagnetic compatibility (EMC)

- Always keep in mind the generally applicable regulations and the specifications of the inverter manufacturer. The following notes give an overview for the construction of an EMC- compliant installation.
- Ensure proper earthing and comprehensive potential equalisation between the system components, which is also effective at high frequencies - use **rectangle conductors**! Ensure that the connection points are metallic bright!



- The motor cable must be shielded. Ground the motor cable shield 360° at both ends.
- Always connect cable shields 360°. Use suitable cable glands or special cable mounting clamps for shield contact.
- Never connect the shield via a twisted shielding braid (so-called "pigtail") or via a wire extension. This reduces the shielding effect by up to 90 %.
- Keep control cables (e.g. measuring system cables) separately from the mains power and motor cables.
- **Safety always has the highest priority and takes precedence over EMC requirements.**

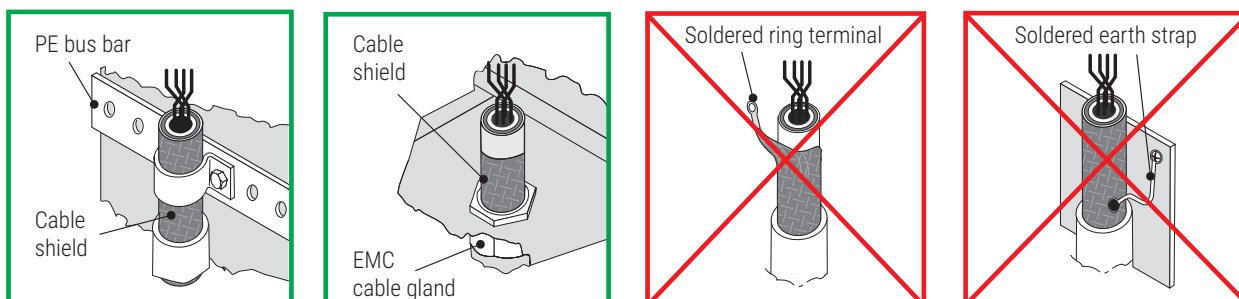


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### 7.3. Overview

The following notes should help you to carry out the assembly and wiring in an appropriate sequence, without overlooking anything.

Site	Please note the intended use and the permissible ambient conditions of the machine. The site must be free of conductive and aggressive material.
Ventilation	Install the machine so that ventilation is not obstructed, i.e. sufficient heat dissipation by convection and radiation must be ensured.
Assembly	Be aware of the secure motor fastening and the proper use of vibration dampers.
Cable selection	Select cables and wire cross section in accordance with the binding regulations and law.
Earthing / Shielding	Use correct earthing of machine and machine frame and that all components are installed in accordance with EMC requirements. Important notes can be found in the manual of the inverter manufacturer.
Wiring	We recommend the use of our cable sets, which can be supplied as an accessory. Route power cables as separately as possible from control cables. - Connect the motor leads - Connect the measurement system and the winding protection. - Connect the safety brake, the brake control units and the brake monitoring switches
Check	Final check of the installed wiring, according to the wiring diagram which was used.

# Gearless Lift Machine

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## 8. Commissioning and operating

### 8.1. Important notes



- ▶ The commissioning may only be carried out by trained and qualified personnel with professional knowledge of electrical engineering and lift construction.
- ▶ Check that all live connection points are safe against accidental contact.
- ▶ During commissioning, unintentional movements of the traction sheave may occur. Make sure that, even if the motor starts to move unintentionally, no danger can result for personnel or machinery.

Before starting up the motor the following points must be checked:



- Check that all performance and application data specified on the name plate of the machine are consistent with your application.
- Have all securing, auxiliary and installation tools been removed from the danger area?
- Check if the lift machine is being used for its intended purpose – comply with the permissible ambient conditions.
- Check if the lift machine has been properly fastened with the fastening bolts – have all the bolts been tightened to the specified torque and secured?
- Has the motor been properly connected, including the motor protection? Has the PE terminal been properly connected? Is the potential equalisation with the machine frame ensured?
- Check the proper functioning of the temperature monitoring devices (e.g. by interrupting the temperature monitoring circuit).
- Has the measuring system been properly connected?
- Check the brake connection and the proper functioning of the brake monitoring switches.
- Ensure that the brake operates correctly; perform a brake test using one partial brake.
- Has the rope slip-off guard been tightly fastened and properly adjusted?



Information

- ▶ An initial function test of the motor and the brake, together with the inverter, should be performed before the ropes are put in place.
- ▶ If the motors are being operated at no shaft load (no ropes put in place) for an extended period of time, abnormal noise may occur resulting from the bearing type used.

### Half-load test



Information

- ▶ If the motor winding is short-circuited with the control system deactivated, a speed-dependent braking torque will be produced, even at low speeds. Therefore, the short-circuiting should be deactivated during the half-load test. It is imperative for it to be reactivated after the test.

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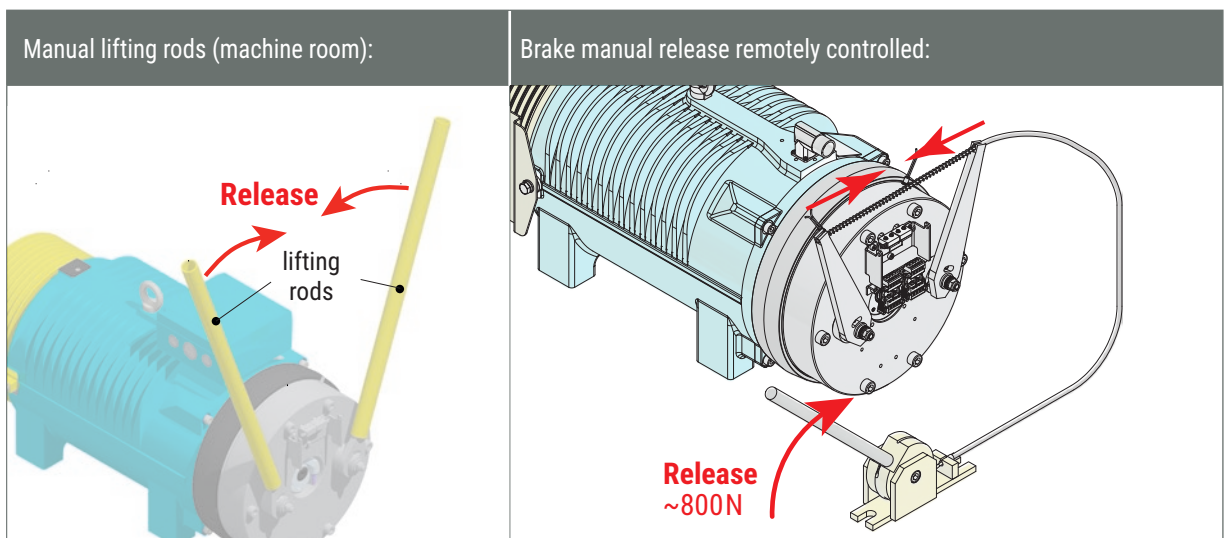
## 8.2. Emergency evacuation



- ▶ The emergency evacuation procedure must be specified by the installer or operator of the lift system. Only he knows the requirements and special conditions of the system.
- ▶ All actions for evacuation in case of emergency have to be done by qualified service personnel.
- ▶ When attempting an evacuation, the car may not move even when the brakes are released, as a result of load compensation between the car and the counterweight. In this case, add weight to the car by suitable means, e.g. sand bags, or use the mechanical return motion device..

### Manually operated evacuation in case of emergency

- The brakes can be opened manually by using the release levers (option)
- Two different options can be chosen (shown in the following pictures). The installation and operation of this device is described in section „12.3. Brake manual release“ on page 37.



- Is the brake opened manually, the cabin moves in the direction of the higher weight.
- The motor winding has to be short-circuited via the motor contactors. With the short circuit the motor creates a brake torque, which is dependent on the motor speed. This prevents an uncontrolled acceleration of the elevator.
- It is possible that the brake torque which is created by the motor short circuit is not enough to limit the speed of the elevator. Therefore the cabin speed has to be observed carefully during the evacuation and if needed, the evacuation has to be stopped.
- When the cabin has reached the next floor, the manually opened brake is closed again. The rescue of the trapped persons in the cabin can begin.



- ▶ Make sure that you restore the lift system to its original state after completing the emergency evacuation. Take particular care to remove the lever extensions and all parts of the mechanical return motion device.

### Electrically operated evacuation in case of emergency

- The electrical opening of the brakes is done using the power grid or an UPS.
- The operating instructions of the controller, the inverter or the evacuation unit with UPS have to be followed!

# Gearless Lift Machine

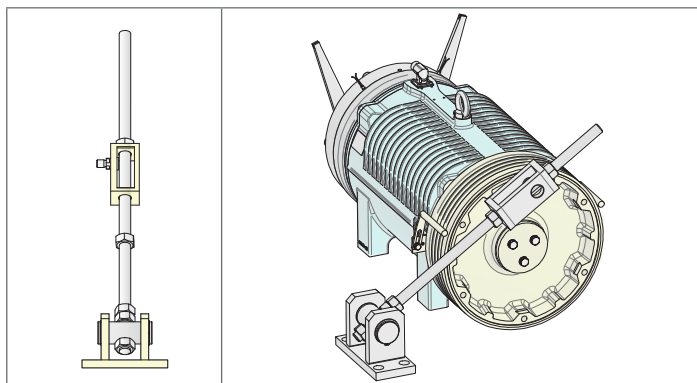
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#### Return motion device

- For cases such as lift failure or the car being retained by the safety device, a mechanical return motion device can be used to move the lift manually. Use of the return motion device is shown in the drawing.
- Instructions for installing and using the return motion device can be found in section „12.4. Return motion device“ on page 39.



- Make sure that you restore the lift system to its original state after completing the emergency evacuation. Take particular care to remove the lever extensions and all parts of the mechanical return motion device.

### 8.3. Testing the brake system to EN 81



- The brake system should be tested with the car about halfway down the shaft. If any motor short-circuit connections have been made, these should be deactivated so that the brake effect can be tested independently.

#### Overload

- The brake system should be tested by interrupting the power supply to the motor and brake system with the car moving downward at rated speed and 1.25 times the rated load. The brake system must be capable of decelerating the car.

#### Failure of a brake

- If one brake fails, the brake system must still be capable of decelerating the car sufficiently during its downward travel at rated load and rated speed.
- When simulating the failure of one brake, the other brakes must be kept open separately, even if the safety circuit is open. This should be done using suitable electric circuitry.
- This state must not be maintained in the long term!
- Observe the lift during this test. If it does not decelerate, close the open brake circuit immediately.

#### Separate operation of the individual brakes

- The only method by which the partial brakes can be released separately is through electrical control. The brakes can be activated/deactivated quickly using individual control buttons.

#### Monitoring the brakes

- Check the brake monitoring switches individually. No car travel must be permitted if a micro-switch signal is missing or a wrong signal operates.

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## 8.4. Trouble shooting

Fault	Possible cause	Remedy
Motor does not start, operates out of control or develops no torque	Motor not connected in proper phase sequence	Connect motor correctly
	Measuring system not properly connected	Connect measuring system correctly
	Inverter parametrisation incorrect	Check inverter parametrisation
	EMC disturbance	Carry out shielding and earthing measures as described by the inverter manufacturer
	Measuring system offset angle incorrectly set	Check measuring system offset angle (see inverter's instruction manual)
	Measuring system defective	Replace measuring system
Motor noise	Inverter parametrisation incorrect	Check inverter parametrisation
	Bearing defective	Notify customer service
Motor temperature too high	Motor surface dirty	Clean the motor surface
	Ambient temperature too high	Improve shaft and machine room ventilation
	Inverter parametrisation incorrect	Check inverter parametrisation
Braking system does not release	Braking system is not supplied with voltage	Check electrical connection
	Brake mechanically blocked	Remove mechanical blocking
	Brake control unit defective	Replace brake control unit
Delay in braking system release	Brake control unit defective	Replace brake control unit
Braking system does not engage	Brake mechanically blocked	Remove mechanical blocking
Delay in engaging of braking system	Switch-off time too short with AC side switching	Brake control using DC side switching of the overexcitation rectifier
Brake makes loud switching noise	DC side switching of the brake in "normal operation"	Change over to brake control by AC side switching in "normal operation"
	Brake air gap too large	Adjust brake air gap
Braking torque too low	Brake friction surface or brake linings dirty	Notify customer service
	Foreign bodies between friction surface and brake lining	Remove foreign bodies
	Brake friction surface or brake lining have come into contact with oily or greasy materials	Notify customer service
	Load torque too high	Reduce load torque
Condition monitoring of the brakes does not switch	Micro-switch defective	Replace micro-switch
	Micro-switch adjustment faulty	Adjust micro-switch
	Dirty contacts	Use micro-switch with at least 10 mA contact current, Replace micro-switch

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## 9. Maintenance

### 9.1. General

- The regulations concerning operation, maintenance and inspection pursuant to the applicable safety regulations for lift construction such as DIN EN 81-20, DIN EN 81-50, LD 2014/33/EU and other relevant regulations are to be strictly observed.
- The operator is responsible for ensuring that the motor is installed properly and in accordance with the safety requirements, as well as for its inspection and maintenance as specified in the applicable regulations.
- The proper maintenance of gearless lift machines requires adequately trained specialist personnel and special devices and tools.
- Repairs other than those described in these operating instructions are not to be carried out by the lift fitter/ maintenance technician for liability reasons.

#### Bolt/screw tightening torques

- When performing any work on the machine or replacing parts, make sure that the specified bolt/screw strength class and the tightening torques are observed (see table).
- Secure the bolts/screws with "omnifit 100" or a similar product against accidental loosening.

Dimension	Tightening torque [Nm]		
	8.8	10.9	12.9
M 4	2,8	4,1	4,8
M 5	5,5	8,1	9,5
M 6	9,6	14	16
M 8	23	34	40
M 10	46	67	79
M 12	79	115	135
M 16	195	290	340
M 20	395	560	660
M 24	680	970	1150

### 9.2. Maintenance intervals

	During commissioning or after the first 3 months	Every year	Note
Check the brake function and brake monitoring switches	x	x	see the brake operating instructions
Check the brake air gap	x	x	see section 9.4 and the brake operating instructions (page 73)
Check the bearing noise		x	
Check the traction sheave for wear		x	
Make a visual check of the fastening bolts/screws on the frame, brake and traction sheave	x	x	
Check the rope slip-off guard	x	x	
Clean the motor surface	x	x	



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### 9.3. Regreasing the bearings

- The anti-friction bearings have been provided with a grease filling at the factory that is sufficient for the planned service life of the machine. Under normal operating conditions, regreasing is not required or recommended.

### 9.4. Check brake air gap



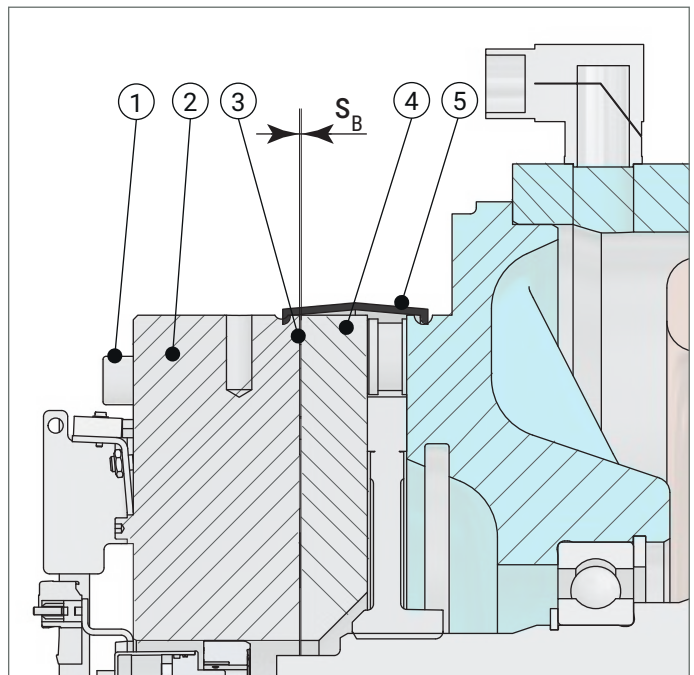
- If the brake air gap exceeds the permissible value „ $s_{B \max}$ “, the braking torque may be significantly reduced. Shut down the lift system and inform customer service.
- Unit-power-off. Lock out and tag out. Motor and brake have to be de-energised!

#### Necessary tools



- Feeler gauge 0,05 ... 1,0 mm

- Observe the brake operating manual from page 73.
- Remove the rubber cover ring (5) from the air gap.
- Measure the air gap „ $s_B$ “ (3) at two opposite points near the fastening screws (1) between the armature plate (4) and the stator (2) using a feeler gauge.
- Do not insert feeler gauge more than 10 mm between armature plate (4) and stator (2) !
- Compare the measured air gap with the maximum permissible air gap „ $s_{B \max}$ “, see section „10. Technical data“ on page 32.
- If the brake air gap exceeds the permissible value „ $s_{B \max}$ “, shut down the lift system and inform the customer service.
- After the measurement has been completed, fit the protective brake covers.



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## 9.5. Replacing the traction sheave



- The traction sheave can work loose if it is not properly installed.

### Necessary tools



- Hoisting equipment
- Torque wrench (50 Nm; M 8)
- Service kit TK
- Cleaning cloth

### Disassembly

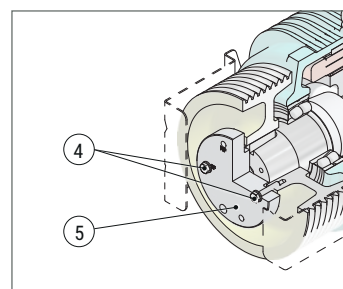
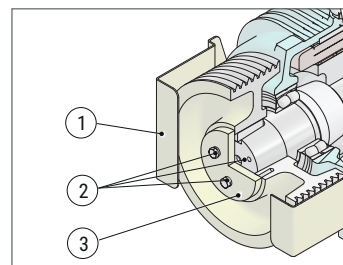
- Disconnect the system and safeguard against accidental restarting. Unit power-off. Lock out and tag out.
- Secure the car and the counter-weight.
- Remove the rope slip-off guards (1) and the rope guards, if provided.
- Relieve the load on the traction sheave; remove the ropes.
- Support the traction sheave by means of a hoisting gear
- Remove the three M 12 bolts (2) at the pressure disc and the pressure disc (3) itself.
- Screw two forcing screws (4) from the TK service kit (M 12 x 50 12.9) into the corresponding holes of the forcing-off disc (5) from the TK service kit and the traction sheave.



Information

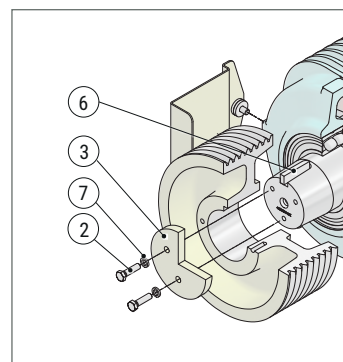
- Lightly grease the forcing screws (4) under the screw head and the thread before use. This will make it easier to press off.

- Pull the traction sheave off the taper of the shaft by tightening the screws (4) evenly.



### Assembly

- Clean the traction sheave and the motor shaft.
- Support the traction sheave by means of a hoisting gear.
- Insert the feather key (6) into the shaft end.
- Slide the traction sheave onto the motor shaft.
- Fit the pressure disc (3) to the traction sheave and fasten it using three pairs of NORD-LOCK washers (7) and M 12 x 35-8.8 bolts (2). Tighten the bolts alternately around the circle in three torque steps (30, 60 and 85 Nm) as far as they will go (**final tightening torque: 85 Nm**).
- Replace the ropes and reinstall the rope slip-off guard.



- Always use new Nord-Lock washers (7) when mounting the traction sheave.

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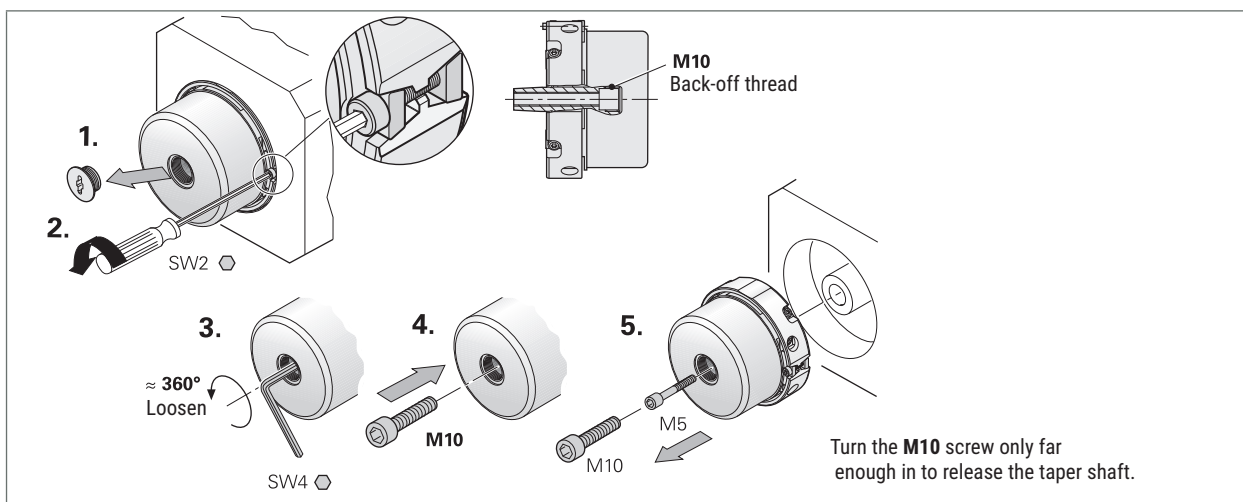
## 9.6. Replacing the measuring system

### Necessary tools

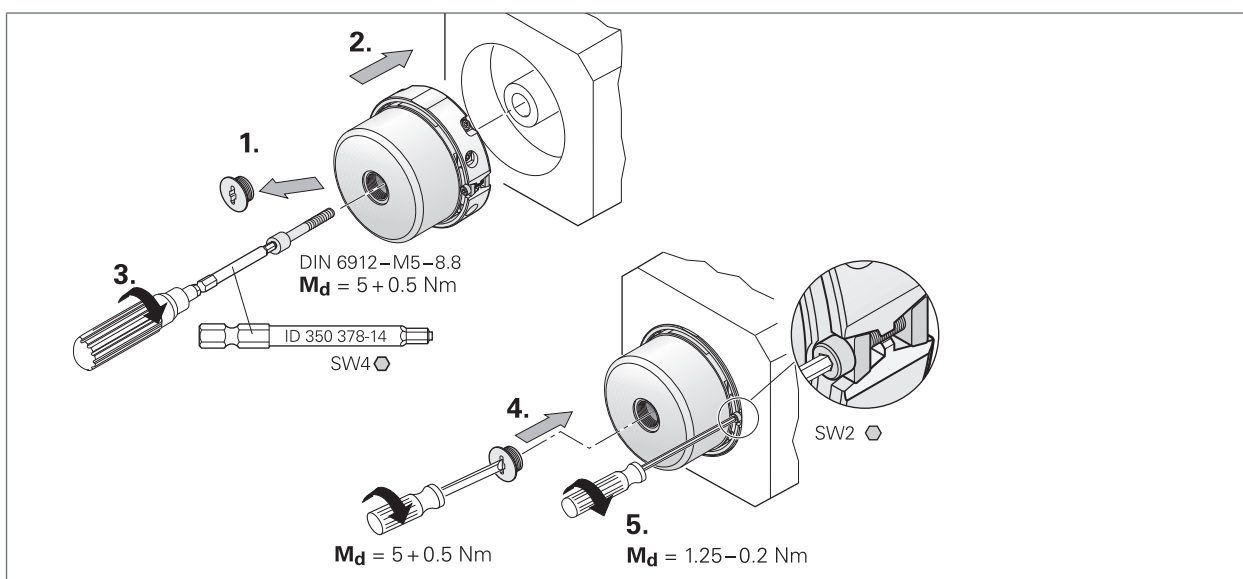


- Torque wrench (1 ... 5Nm) with Allen key size 2 and 4 mm
  - Allen wrench size 8 mm
- ▶ Valid for ECN 1313 and ERN 1387 (Heidenhain).
  - ▶ The measuring system is only accessible from the rear side of the motor.
  - ▶ See the mounting instructions for the Heidenhain encoder.
  - ▶ Disassemble the measuring system only if this is necessary because of a defect. Remember to readjust the offset value after reassembly (see the inverter operating instructions).

### Disassembly



### Assembly



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## 10. Technical data

Duty type:	S3 - 40 % ED		
Traction sheave:	dia. 240 mm, dia. 270 mm, dia. 320 mm, dia. 400 mm or dia. 480 mm		
Traction sheave hardness:	minimum 220 HB 30		
DE bearing	self-aligning roller bearing		
NDE bearing:	ball bearing		
Drive motor:	synchronous motor		
Permissible shaft load $F_S$ :	45 kN		
Number of pole pairs:	10		
Thermal class:	155 (F)		
Degree of protection:	IP 33		
Overload capability:	1,9-fold ( $I_{max}/I_N$ )		
Winding protection:	triple PTC 150°C		
Site conditions			
Max. altitude:	max. 1,000 m (derating required at higher altitudes)		
Ambient temperature:	-5°C ... +40°C		
Max. rel. humidity:	85 % at 20°C (no moisture condensation)		
Dual-circuit fail-safe brake			
Motor:	WSG-MF.1	WSG-MF.2	WSG-MF.3
Brake:	BFK 464-22R	BFK 464-25R	BFK 464-28R
Max. braking torque:	2 x 600 Nm	2 x 900 Nm	2 x 1,200 Nm
Air gap $s_B$ :	0.4 <sup>+0.06/-0.08</sup> mm	0.4 <sup>+0.06/-0.08</sup> mm	0.5 <sup>+0.06/-0.08</sup> mm
Max. air gap $s_{B\ max}$ :	0.6 mm	0.6 mm	0.8 mm
Holding voltage:	103 V DC	103 V DC	103 V DC
Holding current:	2 x 0.69 A	2 x 0.73 A	2 x 0.98 A
Overexcitation voltage:	205 V DC	205 V DC	205 V DC
Overexcitation current:	2 x 1.39 A	2 x 1.46 A	2 x 1.96 A
Overexcitation time:	1,3 s	1,3 s	1,3 s
Brake control units			
Type:	BEG-561-255-130		
Operating voltage:	230 V AC (±10%); 40...60 Hz		
Dimensions:	52 x 22 x 38 (w x h x l))		
Brake monitoring contacts			
Contact rating:	12...30 V DC / 0.01-0.1 A		
Min. contact current:	10 mA		
Mechanical life of contacts:	2 x 10 <sup>6</sup> switching operations		

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Motor		WSG-MF.1												WSG-MF.2					
Drehmoment torque (S3-40 %)	M <sub>N</sub> [Nm]	500												700					
max. Drehmoment max. torque	M <sub>max</sub> [Nm]	950												1330					
Bremsmoment brake torque	M <sub>br</sub> [Nm]	2 x 600												2 x 900					
Treibscheibe traction sheave	D <sub>T</sub> [mm]	240	270	320	400	480							270						
für Nennlasten *) for loads up to *)	Q [kg]	1350	1275	1075	850	675							1800						
Aufhängung / suspension		Tabelle gilt für / table applies for 2 : 1																	
Motorströme gelten für 500...620 V Zwischen- kreisspannung  Motor currents applicable to 500...620 V d.c. link voltage	v ms	η <sub>N</sub> [rpm]	P <sub>N</sub> [kW]	I <sub>N</sub> [A]	η <sub>N</sub> [rpm]	P <sub>N</sub> [kW]	I <sub>N</sub> [A]	η <sub>N</sub> [rpm]	P <sub>N</sub> [kW]	I <sub>N</sub> [A]	η <sub>N</sub> [rpm]	P <sub>N</sub> [kW]	I <sub>N</sub> [A]	η <sub>N</sub> [rpm]	P <sub>N</sub> [kW]	I <sub>N</sub> [A]	η <sub>N</sub> [rpm]	P <sub>N</sub> [kW]	I <sub>N</sub> [A]
	0,5	80	4,2	15,5	71	3,7	11,5	60	3,1	11,5	48	2,5	8,3	40	2,1	8,3	71	5,2	17,6
	0,63	100	5,2	15,5	89	4,7	15,5	75	3,9	11,5	60	3,1	11,5	50	2,6	11,5	89	6,5	17,6
	1,0	159	8,3	19,3	141	7,4	19,3	119	6,2	15,5	95	5,0	15,5	80	4,2	15,5	141	10,4	26,4
	1,6	255	13,3	28,1	226	11,9	28,1	191	10,0	22,1	153	8,0	19,3	127	6,7	19,3	226	16,6	34,8
	2.0	-			-			239	12,5	28.1	191	10.0	22.1	159	8.3	19.3	-		

\*) Reference values. Achievable nominal load depends on specific lift system data.

The table is applicable to an overall shaft efficiency of approx. 80..85 % (counterweight: 50 %). It lists a standard selection of machines. The lift and project data will be adapted to actual site conditions and may deviate from the above values.

Motor		WSG-MF.2									WSG-MF.3								
Drehmoment torque (S3-40 %)	M <sub>N</sub> [Nm]	700									900								
max. Drehmoment max. torque	M <sub>max</sub> [Nm]	1330									1710								
Bremsmoment brake torque	M <sub>br</sub> [Nm]	2 x 900									2 x 1200								
Treibscheibe traction sheave	D <sub>T</sub> [mm]	320	400	480							320	400	480						
für Nennlasten *) for loads up to *)	Q [kg]	1350	1200	1000							1800	1600	1275						
Aufhängung / suspension		Tabelle gilt für / table applies for 2 : 1																	
Motorströme gelten für 500...620V Zwischen- kreisspannung	v [ms]	η <sub>N</sub> [rpm]	P <sub>N</sub> [kW]	I <sub>N</sub> [A]	η <sub>N</sub> [rpm]	P <sub>N</sub> [kW]	I <sub>N</sub> [A]	η <sub>N</sub> [rpm]	P <sub>N</sub> [kW]	I <sub>N</sub> [A]		P <sub>N</sub> [kW]	I <sub>N</sub> [A]	η <sub>N</sub> [rpm]	P <sub>N</sub> [kW]	I <sub>N</sub> [A]	η <sub>N</sub> [rpm]	P <sub>N</sub> [kW]	I <sub>N</sub> [A]
	0,5	60	4,4	13,2	48	3,5	11,3	40	2,9	11,3	60	5,6	16,9	48	4,5	16,9	40	3,7	16,9
	0,63	75	5,5	17,6	60	4,4	13,2	50	3,7	13,2	75	7,1	22,9	60	5,7	16,9	50	4,7	16,9
	1,0	119	8,7	21,1	95	7,0	17,6	80	5,8	17,6	119	11,2	26,7	95	9,0	22,9	80	7,5	22,9
	1,6	191	14,0	31,7	153	11,2	26,4	127	9,3	26,4	191	18,0	40,2	153	14,4	32,1	127	12,0	32,1
Motor currents applicable to 500...620V d.c. link voltage	2.0	239	17,5	34,8	191	14,0	31,7	159	11,7	26,4	239	22,5	45,5	191	18,0	40,2	159	15,0	32,1

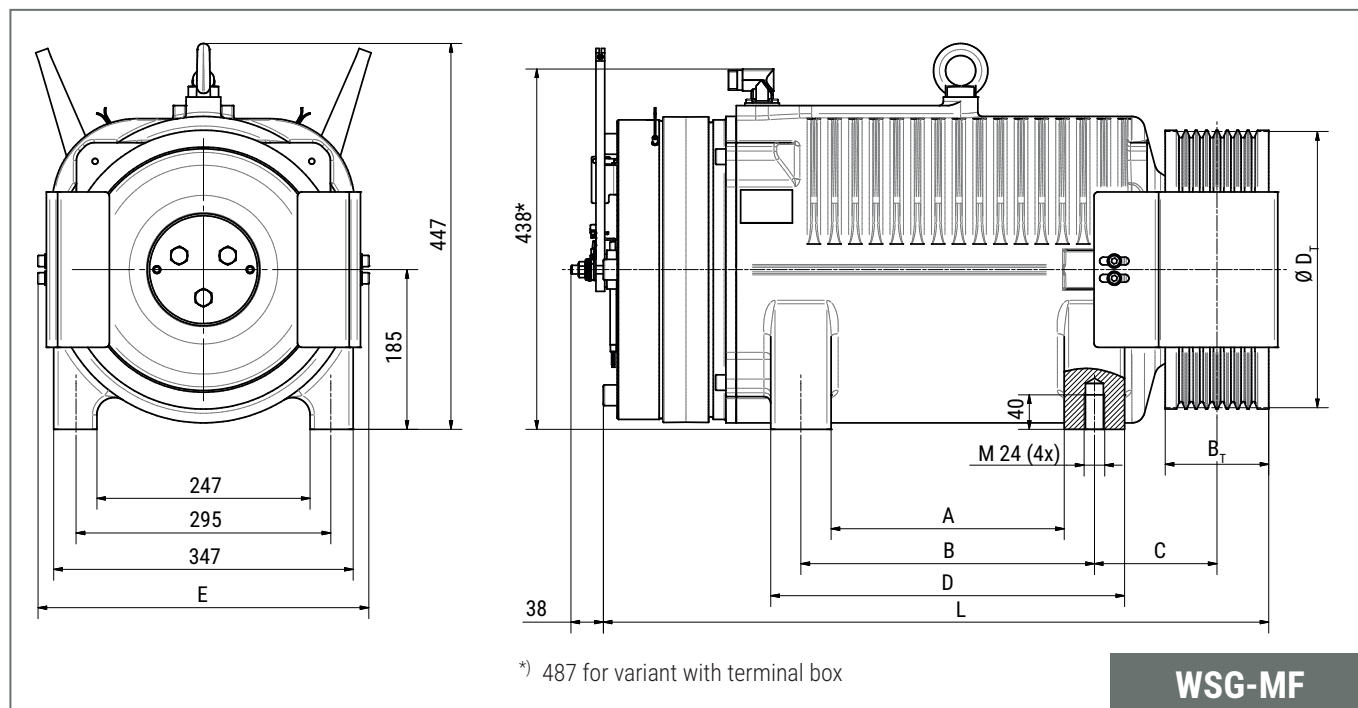
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## 11. Dimension drawing



WSG-	MF.1					MF.2				MF.3		
Ø D <sub>T</sub> / dia. D <sub>T</sub>	240	270	320	400	480	270	320	400	480	320	400	480
B <sub>T</sub>	120	120	120	105	105	120	120	105	105	120	105	105
C	158	158	142	134,5	134,5	158	142	134,5	134,5	142	134,5	134,5
L	649	649	633	618	618	774	758	743	743	771	756	756
E	388	404	388	450	550	404	388	450	550	388	450	550
A	165					270				270		
B	235					340				340		
D	304					410				410		
m <sub>G</sub> [kg]	269	273	266	278	310	323	316	328	361	355	368	400
J <sub>G</sub> [kgm <sup>2</sup> ]	0,57	0,63	0,84	1,5	2,9	0,74	0,95	1,6	3,0	1,06	1,7	3,1
F <sub>S</sub> [kN]	45					45				45		

# Gearless Lift Machine

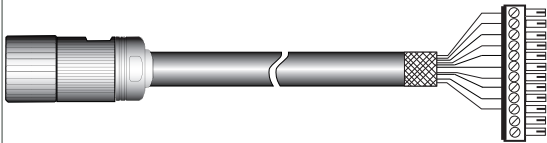
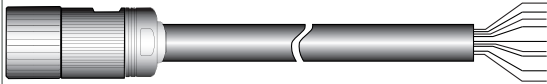

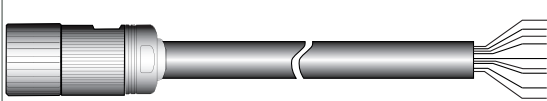


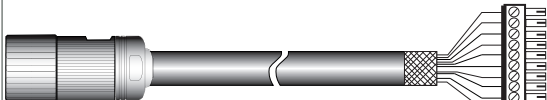
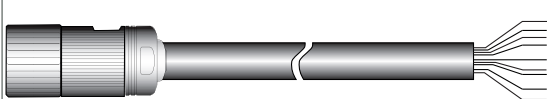


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## 12. Accessories

### 12.1. Connecting cable for measuring systems for ECN 1313/ERN 1387

	Inverter type	Recommended encoder system	Recommended measurement system cable
	F-Pack WLD 302	ECN 1313 - EnDat	514 273 022-xx
	E-Pack Arkel ARCODE	ECN 1313 - (EnDat/SSI)	503 325 021-xx
	D-Pack Arkel ADrive CT undrive SP / E	ECN 1313 - (EnDat/SSI)	502 452 021-xx
	Fuji Frenic	ECN 1313 - (EnDat/SSI)	502 679 022-xx
	RST Elektronik FRC	ECN 1313 - EnDat	508 752 022-xx
	GEFRAN (SIEI) AVY-L-M	ERN 1387	502 599 022-xx
	Vacon NXP	ECN 1313 - EnDat	503 289 021-xx
	Yaskawa/Omron L7 Telemecanique/Schneider Altivar 71	ECN 1313 - EnDat	503 715 022-xx
	KW Goliath Ziehl-Abegg 3C	ECN 1313 - EnDat	508 749 022-xx
	Ziehl-Abegg 4C	ECN 1313 - (EnDat/SSI)	504 503 022-xx

xx .. cable length [m]

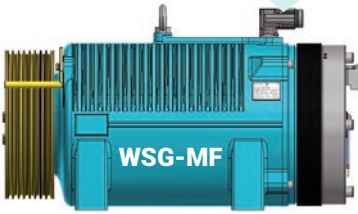
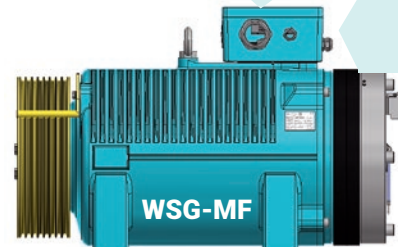
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## 12.2. Cable set for motor and brake

<b>Motor cable set</b> <b>Connector</b>	 <p><b>Motor cable</b> - <math>I_N \leq 35 \text{ A}</math> - halogen-free: 508 828 222-xx</p> <p><math>35 &lt; I_N \leq 42 \text{ A}</math> - halogen-free: 640 002 422-xx</p> <p><math>42 &lt; I_N \leq 57 \text{ A}</math> - halogen-free: 640 003 622-xx</p> <table border="1"> <thead> <tr> <th>Pin</th> <th>Wire</th> </tr> </thead> <tbody> <tr> <td>1 (U1)</td> <td>No.1 / U1</td> </tr> <tr> <td>4 (V1)</td> <td>No.2 / V1</td> </tr> <tr> <td>3 (W1)</td> <td>No.3 / W1</td> </tr> <tr> <td>PE</td> <td>green/yellow</td> </tr> <tr> <td>C (T1)</td> <td>No.5 / BR1</td> </tr> <tr> <td>D (T2)</td> <td>No.6 / BR2</td> </tr> </tbody> </table> <p><b>Brake cable</b> halogen-free: 510 676 011-xx</p> <table border="1"> <thead> <tr> <th>Wire</th> <th></th> <th></th> </tr> </thead> <tbody> <tr> <td>1</td> <td>brake coil</td> <td rowspan="2">brake 1</td> </tr> <tr> <td>2</td> <td>brake coil</td> </tr> <tr> <td>3</td> <td>switch</td> <td rowspan="2">brake 2</td> </tr> <tr> <td>4</td> <td>switch</td> </tr> </tbody> </table> <p>xx .. cable length [m]</p>	Pin	Wire	1 (U1)	No.1 / U1	4 (V1)	No.2 / V1	3 (W1)	No.3 / W1	PE	green/yellow	C (T1)	No.5 / BR1	D (T2)	No.6 / BR2	Wire			1	brake coil	brake 1	2	brake coil	3	switch	brake 2	4	switch
Pin	Wire																											
1 (U1)	No.1 / U1																											
4 (V1)	No.2 / V1																											
3 (W1)	No.3 / W1																											
PE	green/yellow																											
C (T1)	No.5 / BR1																											
D (T2)	No.6 / BR2																											
Wire																												
1	brake coil	brake 1																										
2	brake coil																											
3	switch	brake 2																										
4	switch																											
<b>Motor cable set</b> <b>Terminal box</b>	 <p><b>Motor cable</b> - <math>I_N \leq 35 \text{ A}</math> - halogen-free: 514 073 221-xx</p> <p><math>35 &lt; I_N \leq 42 \text{ A}</math> - halogen-free: 514 073 422-xx</p> <p><math>42 &lt; I_N \leq 57 \text{ A}</math> - halogen-free: 514 073 621-xx</p> <p><b>Brake cable set</b> halogen-free: 514 074 011-xx</p> <p>xx .. cable length [m]</p>																											



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## 12.3. Brake manual release

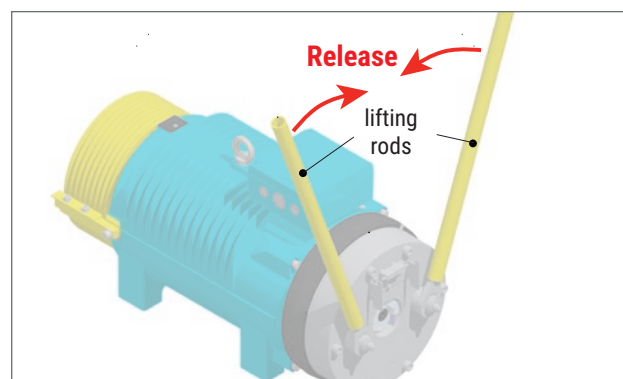
The brake can be fitted with a manual brake releasing device on customer request. This must be specified when ordering the machine. You can implement manual brake release in two variants:

1. Manual lifting rods
2. Brake manual release remotely controlled

### 12.3.1. Manual lifting rods

Hand release rods can be attached to the levers for easy opening of the brake.

Due to the machine accessibility, this variant can only be used for installations with a machine room.

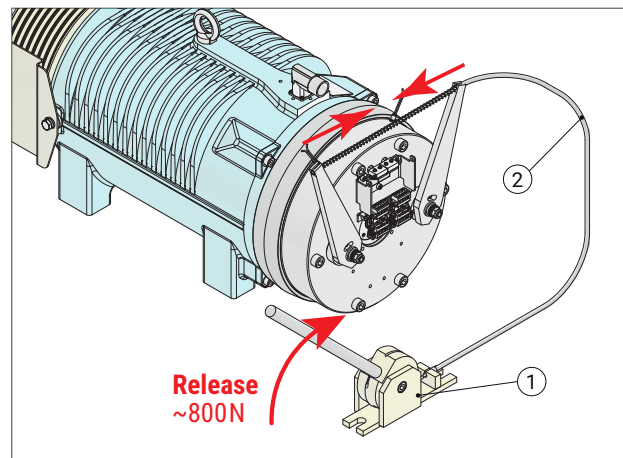


### 12.3.2. Brake manual release remotely controlled

The brakes can be released remotely by hand using a lever block (1) and Bowden cable (2).

The necessary manual release lever including the Bowden cable for releasing can be delivered, if required.

The standard length of the Bowden cable is 3 m. Other lengths on request.



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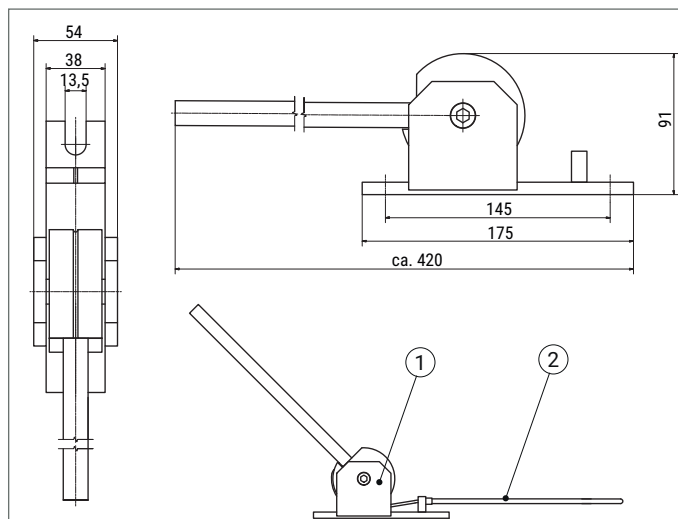
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#### Installation

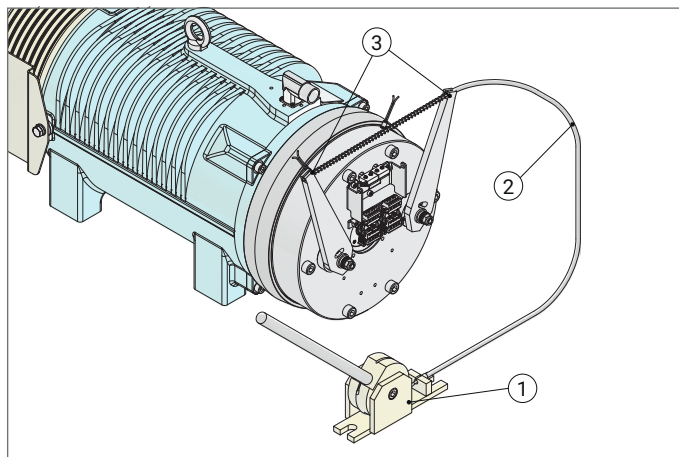


- ▶ Lock the car and the counterweight and ensure that all of the necessary safety precautions are observed for the lift system. The lift may move in an uncontrolled manner.
- ▶ Ideally, the manual releasing device should be installed without the ropes in place.
- ▶ Install the manual releasing device while the brake is disconnected from the power supply.

1. Install the lever block (1) with two M 12 bolts in a suitable location in the vicinity of the lift machine.

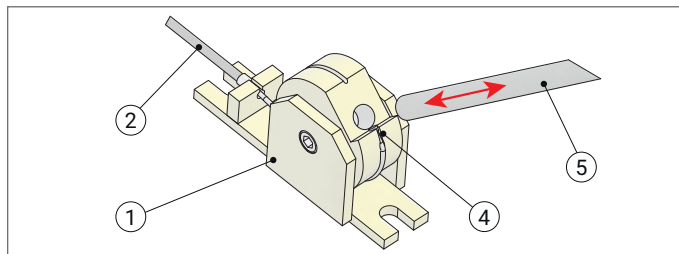


2. Insert the Bowden cable (2) – the ends with the spring – into the manual release lever of the brake (3.)



3. Insert the Bowden cable (2) into the lever block (1) in position (4). To do this, remove the lever (5).

4. Perform a functional test (at least three times).



- ▶ The Bowden cable has to be installed in wide arcs only (bending radius > 0.5 m, if possible). **Put no loops !**

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## 12.4. Return motion device



- Only qualified service personnel are permitted to take any evacuation measures in the event of an emergency.

The return motion device is used to move the lift manually in an emergency, such as if the car is retained by the safety device.

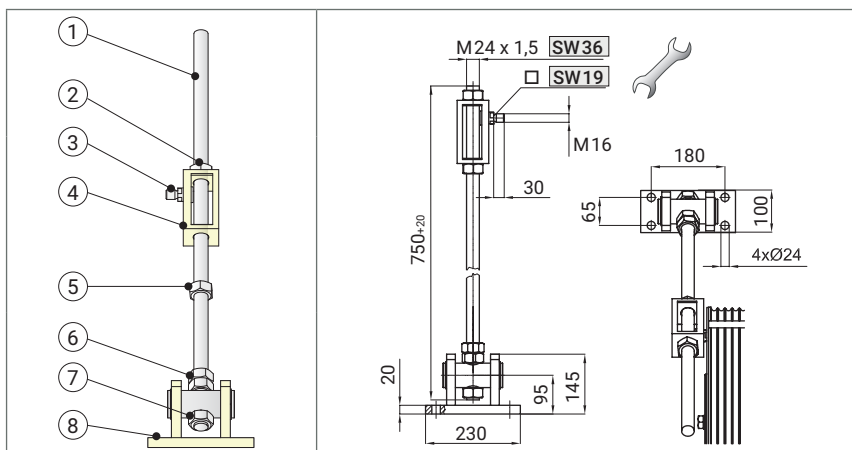


**Caution.** When using the return motion device, beware of the potential risk of collision with parts of the lift machine or other safety devices, such as the rope slip-off guards.



### Special tools required

- 36 mm jaw spanner
- 19 mm jaw spanner

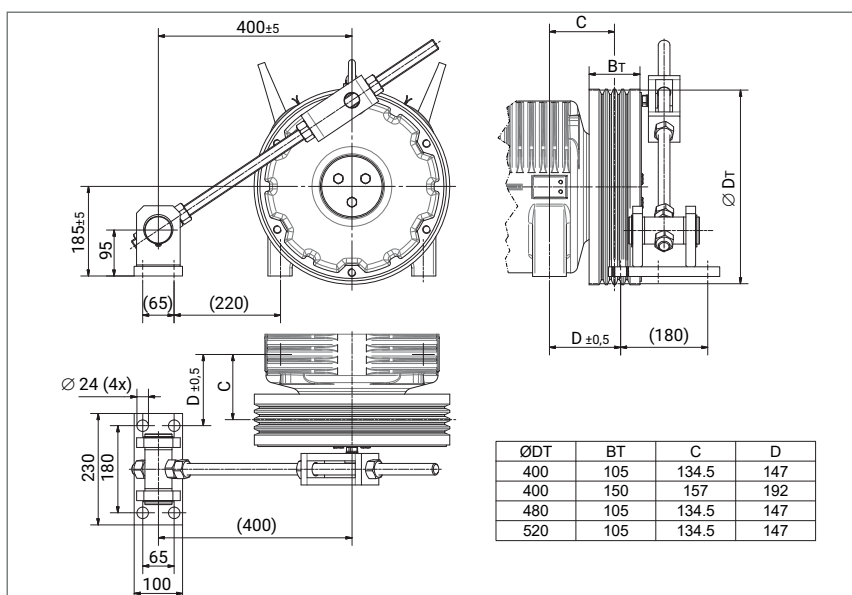


### Installation

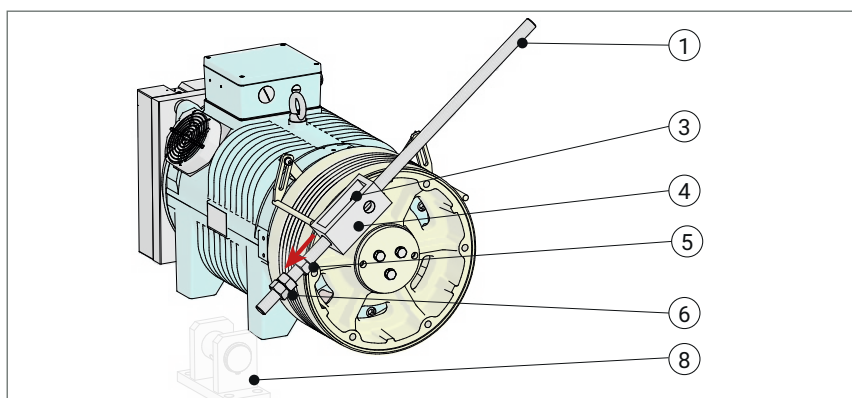
1. Slacken the nut (7) and remove the bearing block (8) from the threaded rod (1), which is provided with a fine thread (M24 x 1,5).
2. Install the bearing block (8) as recommended in the drawing on the machine frame. It can be mounted to the left or right-hand side of the machine.



**Warning:** Ensure that the safety circuit of the lift system is interrupted by a switching contact while mounting the bearing block (8), to prevent any unintentional electric operation of the machine.



3. Remove nut (2) from the threaded rod (1) and turn nut (5) towards nuts (6).
4. Screw the slide block (4) into a suitably located threaded hole in the traction sheave with the threaded bolt (3); the threaded rod (1) should be loosely inserted into the slide block (4).

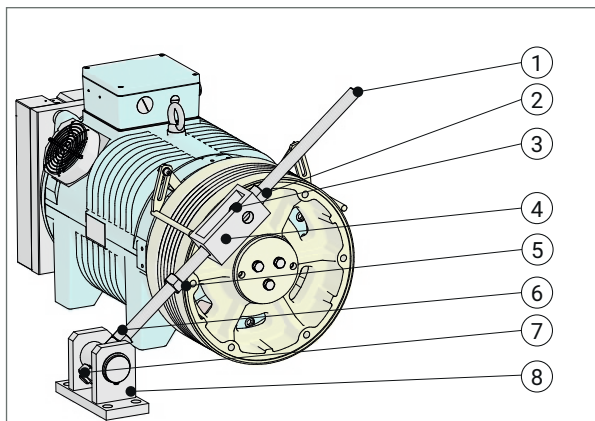


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5. Insert the threaded rod (1) into the bearing block (8) and fasten it using the nut (7).

Ensure that the nut (7) is completely screwed onto the threaded rod (1) with 2-4 mm of thread left protruding beyond the nut. The turning movement of the lever must not be obstructed.

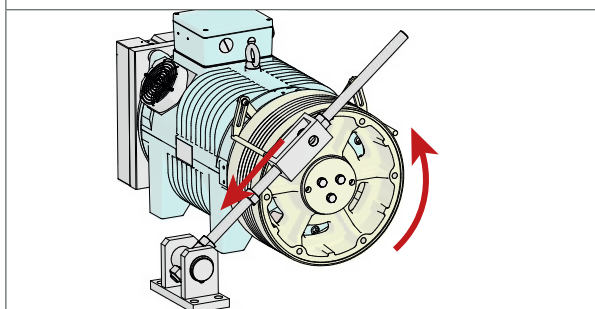
6. Screw the nut (2) onto the threaded rod (1) flush with the slide block (4).

The return motion device is now ready for use.

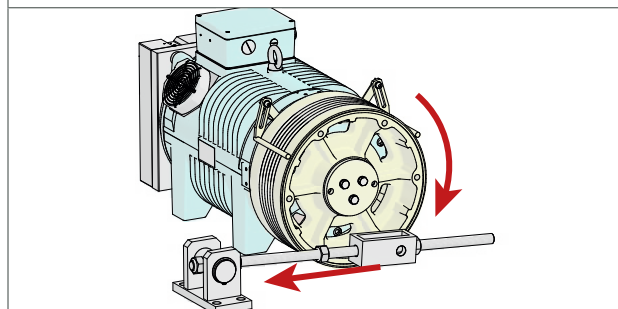


- As a rule, the threaded rod (1) may only be subjected to compressive load.
- This causes the traction sheave to rotate anti-clockwise in the version shown above.

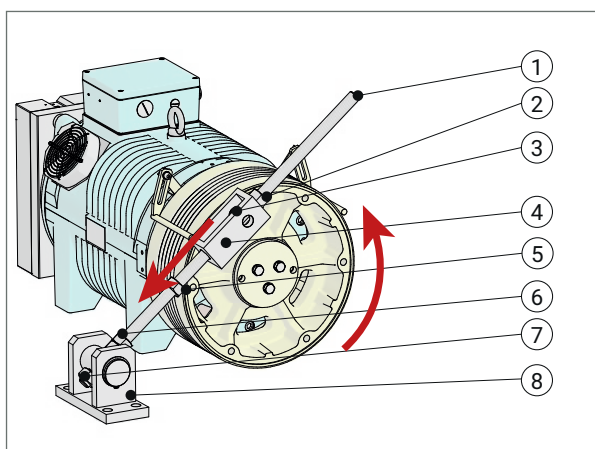
Anti-clockwise rotation of the traction sheave



Alternative position of the return motion device for clockwise rotation of the traction sheave



### Use of the return motion device



1. Once the return motion device has been installed correctly, the brakes of the lift machine can be released by means of the hand release lever or electrically.
2. Turn the nut (2) clockwise; the traction sheave will rotate anti-clockwise.  
Make sure that the nut (5) does not obstruct the movement of the slide block (4).
3. If necessary, the slide block (4) can be repositioned by inserting the threaded bolt (3) into a subsequent hole in the traction sheave.



- When changing the position of the threaded bolt in the holes, the lift must be secured by its brakes.



- Make sure that you restore the lift system to its original state after completing the emergency evacuation. Take particular care to remove the lever extensions and all parts of the mechanical return motion device.

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## 13. Spare parts



Information

► For the spare parts refer to "Spare Part Document SM.8.005972.EN"



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## 14. Annex

### 14.1. Calculation of the traction sheave shaft WSG-MF

<b>Report</b> <b>on the examination of calculation documents</b>		 Industrie Service Choose certainty. Add value.
<b>Customer:</b>	WITTUR Electric Drives GmbH Offenburger Straße 3 01189 Dresden - Germany	
<b>TÜV Equipment:</b>	2840594	
<b>Subject of examination:</b>	Traction sheave shaft for Lift machines, types WSG-MF.X	
<b>Scope of order:</b>	Examination of the calculation of the traction sheave shaft	Date: 2018-05-09
<b>Specification:</b>	DIN 743-1: 2012-12 - Calculation of load capacity of shafts and axles	Our reference: IS-F11-DRE/dmü Document: 2840594_en.docx
<b>Scope of examination:</b>	- Examination of the calculations to ensure compliance with the specifications - Examination of the calculation results - Examination of the calculation documents to ensure compliance with the data in the drawings	This Document consists of 2 Pages. Page 1 of 2 Excerpts from this document may only be reproduced and used for advertising purposes with the express written approval of TÜV SÜD Industrie Service GmbH. The test results refer exclusively to the units under test.
<b>Expert:</b>	Dipl.-Ing. Thoralf Mührel Sachverständiger	
<div style="display: flex; justify-content: space-between; align-items: flex-end;"> <div>           Headquarters: Munich            Trade Register Munich HRB 96 869            VAT ID No. DE129484218            Information pursuant to § 2 [1] DL-InfoV (Germany) at <a href="http://www.tuv-sud.com/imprint">www.tuv-sud.com/imprint</a> </div> <div>           Supervisory Board:            Reiner Block (Chairman)            Board of Management:            Ferdinand Neuwieser (CEO),            Christian Bauerschmidt, Thomas Kainz         </div> <div>           Phone: +49 351 4202-213            Fax: +49 351 4202-242  <a href="http://www.tuv-sud.com/is">www.tuv-sud.com/is</a>   </div> <div>           TÜV SÜD Industrie Service GmbH            Niederlassung Leipzig            Abteilung Fördertechnik            Drescherhäuser 5d            01159 Dresden            Germany         </div> </div>		



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Reference/Date: IS-FT1-DRE/dmü /2018-05-09  
Document: 2840594\_en.docx



Industrie Service

#### 1. Calculation documents

The following technical documentation was subject of the examination:

- Calculation documents WSG-MF\_FE1\_2018.docx, pages 1 to 6, dated 2018-04-05 incl. Annexes.
- Drawing 640 502 X00 (revision Äm 74/18, 2018-03-09).

#### 2. Technical Data

The data which are of relevance to the calculation are specified as follows in the calculation document WSG-MF\_FE1\_2018.docx:

- |                                               |           |
|-----------------------------------------------|-----------|
| – max. axle load (center of traction sheave): | 45,0 kN   |
| – max. magnetic pull:                         | 0,8 kN    |
| – Rated torque:                               | 1620,0 Nm |
| – Brake torque:                               | 1224,0 Nm |
| – Emergency braking torque:                   | 2400,0 Nm |
| – Traction sheave weight:                     | 51,4 kg   |
| – Rotor weight:                               | 55,0 kg   |

#### 3. Examination result

The calculations submitted were drawn up in compliance with the specification. The values determined in the safety verification calculation could be confirmed by performing a control calculation. The data in drawing no. 640 502 X00 comply with the values relevant for the calculation.

The expert



Thoralf Mührel



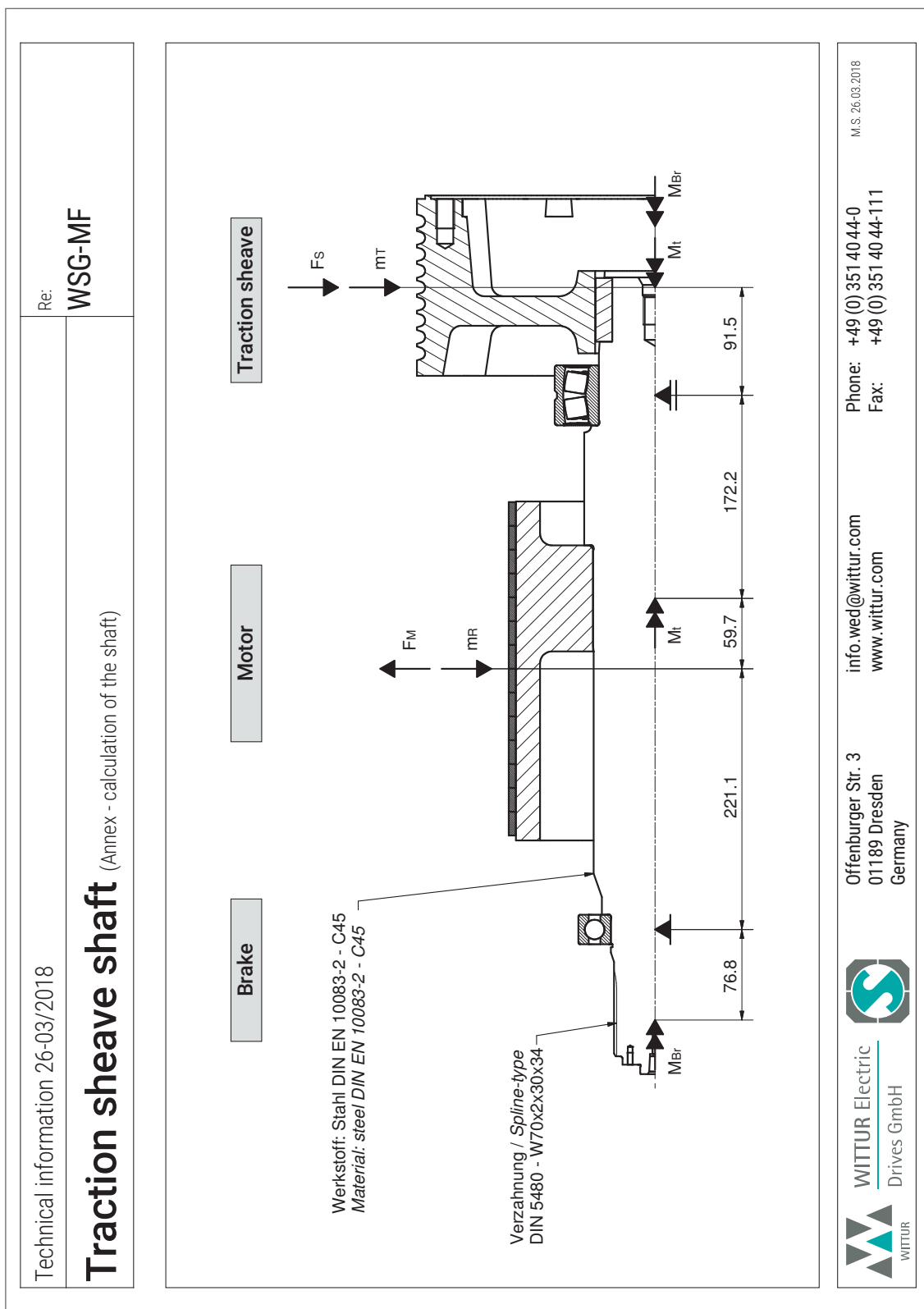
# Gearless Lift Machine

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## 14.2. Traction sheave shaft WSG-MF






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### 14.3. EU type-examination certificate EU-BD 1054 (WSG-MF.1)

<p style="writing-mode: vertical-rl; transform: rotate(180deg);"> ZERTIFIKAT ♦ CERTIFICATE  認証証書 ♦ CERTIFICADO ♦ CERTIFICAT </p>	 Industrie Service	
	<h2>EU TYPE-EXAMINATION CERTIFICATE</h2> <p>According to Annex IV, Part A of 2014/33/EU Directive</p>	
	<b>Certificate No.:</b>	EU-BD 1054-1
	<b>Notified Body:</b>	TÜV SÜD Industrie Service GmbH Westendstr. 199 80686 Munich - Germany Identification No. 0036
	<b>Certificate Holder:</b>	Kendrion INTORQ GmbH Wülmser Weg 5 31855 Aerzen - Germany
	<b>Manufacturer of the Test Sample:</b> <small>(Manufacturer of Serial Production – see Enclosure)</small>	Kendrion INTORQ GmbH Wülmser Weg 5 31855 Aerzen - Germany
	<b>Product:</b>	Braking device acting on the shaft of the traction sheave, as part of the protection device against overspeed for the car moving in upwards direction and braking element against unintended car movement
	<b>Type:</b>	BFK464-22R
	<b>Directive:</b>	2014/33/EU
	<b>Reference Standards:</b>	EN 81-20:2020 EN 81-50:2020
<b>Test Report:</b>	EU-BD 881-1, 1093-1 of 2024-02-22	
<b>Outcome:</b>	The product conforms to the essential health and safety requirements of the mentioned Directive if the requirements of the annex to this EU-type examination certificate are kept.	
<b>Date of Issue:</b>	2024-02-28	
	 Achim Janocha Notified Body LCC	
	 	

# Gearless Lift Machine

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#### Annex to the EU-Type Examination Certificate No. EU-BD 1054-1 of 2024-02-28



#### 1 Scope of application

##### 1.1 Use as braking device – part of the the protection device against overspeed for the car moving in upwards direction – permissible brake torques and tripping rotary speeds

1.1.1 Permissible brake torque when the braking device acts on the shaft of the traction sheave while the car is moving upwards

Nominal brake torque [Nm]	Maximum tripping rotary speed of the traction sheave [rpm]
720	750
1200	

##### 1.1.2 Maximum tripping speed of the overspeed governor and maximum rated speed of the lift

The maximum tripping speed of the overspeed governor and the maximum rated speed of the lift must be calculated on the basis of the traction sheave's maximum tripping rotary speed as outlined above taking into account traction sheave diameter and car suspension.

$$v = \frac{D_{TS} \times \pi \times n}{60 \times i}$$

$v$  = Tripping (rated) speed (m/s)  
 $D_{TS}$  = Diameter of the traction sheave from rope's center to rope's center (m)  
 $\pi$  = 3,14  
 $n$  = Rotary speed (rpm)  
 $i$  = Ratio of the car suspension

##### 1.2 Use as braking element – part of the protection device against unintended car movement (acting in up and down direction) – permissible brake torques, tripping rotary speeds and characteristics

1.2.1 Nominal brake torques and response times with relation to a brand-new brake element

Intermediate values can be interpolated

Minimum brake torque* [Nm]	Maximum brake torque* [Nm]	Maximum tripping rotary speed [rpm]	Maximum response times** [ms]		
			without / with overexcitation		
			$t_{10}$	$t_{50}$	$t_{90}$
2 x 360 = 720	2 x 600 = 1200	750	67 / 95	123 / 151	179 / 207
			35 / 53	71 / 89	107 / 125

#### Explanations:

\* **Nominal brake torque:** Brake torque assured for installation operation by the safety component manufacturer.

\*\* **Response times:**  $t_x$  time difference between the drop of the braking power until establishing X% of the nominal brake torque,  $t_{50}$  optionally calculated  $t_{50} = (t_{10} + t_{90})/2$  or value taken from the examination recording

##### 1.2.2 Assigned execution features

Type of powering / deactivation	continuous current / continuous current end
Brake control	serial / parallel
Nominal air gap	0.45 mm
Damping elements	YES
Overexcitation	2-fold non-release voltage

Note: The English text is a translation of the German original. In case of any discrepancy, the German version is valid only.

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#### Annex to the EU-Type Examination Certificate No. EU-BD 1054-1 of 2024-02-28



## 2 Conditions

- 2.1 Above mentioned safety component represents only a part at the protection device against overspeed for the car moving in upwards direction and unintended car movement. Only in combination with a detecting and triggering component in accordance with the standard (two separate components also possible), which must be subjected to an own type-examination, can the system created fulfil the requirements for a protection device.
- 2.2 The installer of a lift must create an examination instruction to fulfil the overall concept, add it to the lift documentation and provide any necessary tools or measuring devices, which allow a safe examination (e. g. with closed shaft doors).
- 2.3 The manufacturer of the drive unit must provide calculation evidence that the connection traction sheave – shaft – brake disc and the shaft itself is sufficiently safe, if the brake disc is not a direct component of the traction sheave (e. g. casted on). The shaft itself has to be statically supported in two points.  
The calculation evidence must be enclosed with the technical documentation of the lift.
- 2.4 The setting of the brake torque has to be secured against unauthorized adjustment (e. g. sealing lacquer).
- 2.5 The identification drawing no. 5023203 (page 3 of 3), 5024148 (page 3 of 3) or 5032466 (page 3 of 3) including stamp dated 2024-02-22 shall be included to the EU-type examination for the identification and information of the general construction and operation and distinctness of the approved type.
- 2.6 The EU-type examination certificate may only be used in combination with the corresponding annex and enclosure (List of authorized manufacturer of the serial production). The enclosure will be updated immediately after any change by the certification holder.

## 3 Remarks

- 3.1 In the scope of this type-examination it was found out, that the brake device also functions as a brake for normal operation, is designed as a redundant system and therefore meets the requirements to be used also as a part of the protection device against overspeed for the car moving in upwards direction and as braking element as part of the protection device against unintended car movement.
- 3.2 In the scope of this type-examination, it was determined, that the braking device was designed without a switching status control to evaluate the position of the anchor plates.  
The brakes should be monitored as follows
  - a. through microswitches or proximity switches on both brakes that are connected to the lift control, or
  - b. through a built-in brake monitoring system of the lift control to ensure the correct opening and closing of both brakes before each start or stop of the elevator, or
  - c. through an automatic system specified by the lift manufacturer to check or ensure the correct braking torque. This test procedure must be carried out at least once daily.
- 3.3 Checking whether the requirements as per section 5.9.2.2 of EN 81-20:2020 (D) have been complied with is not part of this type examination.
- 3.4 Other requirements of the standard, such as reduction of brake moment respectively brake force due to wear or operational caused changes of traction are not part of this type examination.
- 3.5 This EU-type examination certificate was issued according to the following standards:
  - EN 81-20:2020, part 5.6.6.11, 5.6.7.13
  - EN 81-50:2020, part 5.7 and 5.8
- 3.6 A revision of this EU-type examination certificate is inevitable in case of changes or additions of the above-mentioned standards or of changes of state of the art.

**Note:** The English text is a translation of the German original. In case of any discrepancy, the German version is valid only.

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#### Enclosure to the EU-Type Examination Certificate No. EU-BD 1054-1 of 2024-02-28



#### Authorised Manufacturer – Production Sites (valid from: 2024-02-07):

<b>Company</b>	Kendrion INTORQ GmbH
<b>Address</b>	Wülmser Weg 5 31855 Aerzen - Germany
<b>Company</b>	Kendrion (China) Co., Ltd.
<b>Address</b>	No. 10 Huipu Road, Suzhou Industrial Park, 215021 Suzhou, P.R. China

- END OF DOCUMENT -

Based on: Application of Co. Kendrion INTORQ GmbH dated 2024-02-07

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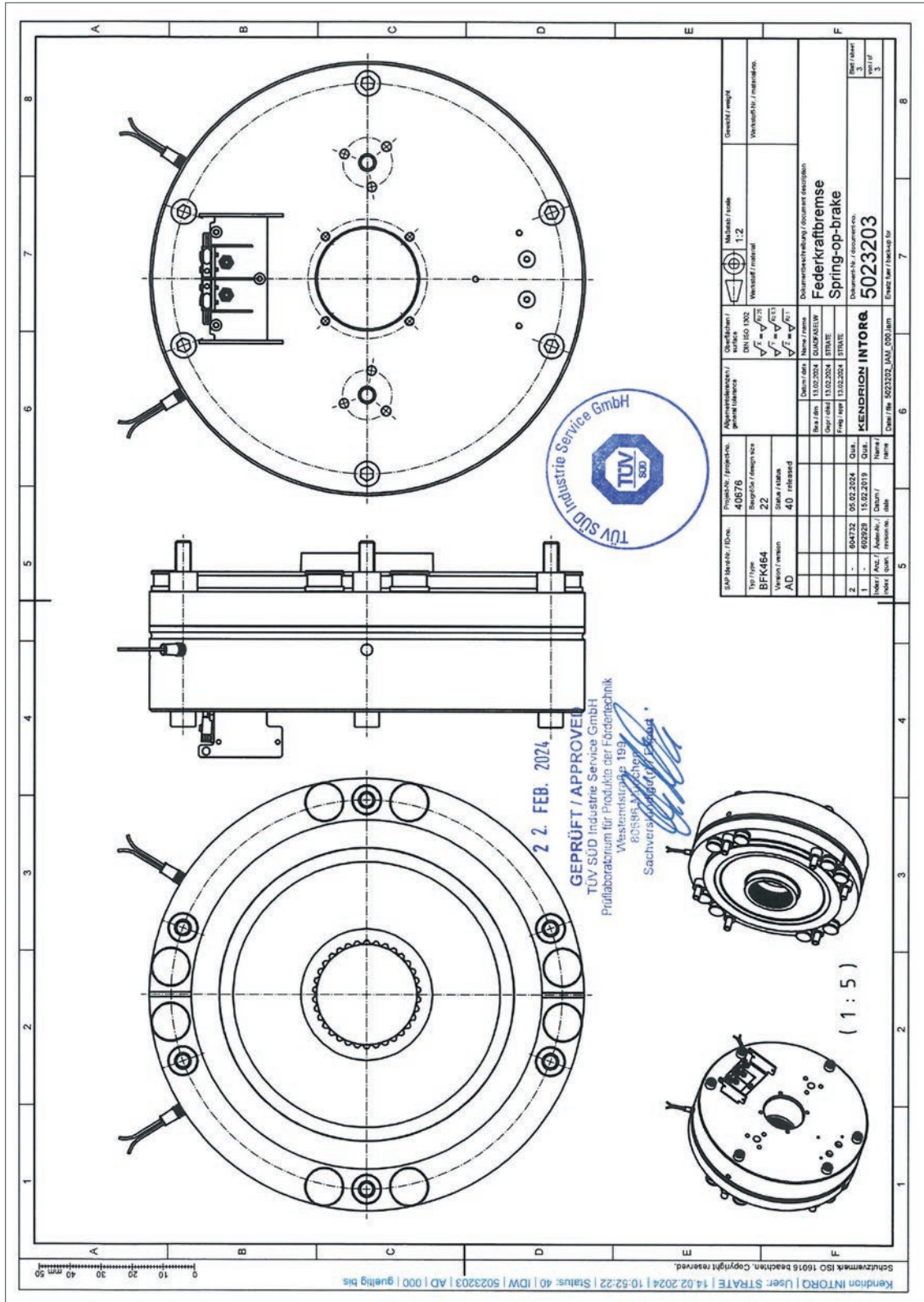


# Gearless Lift Machine

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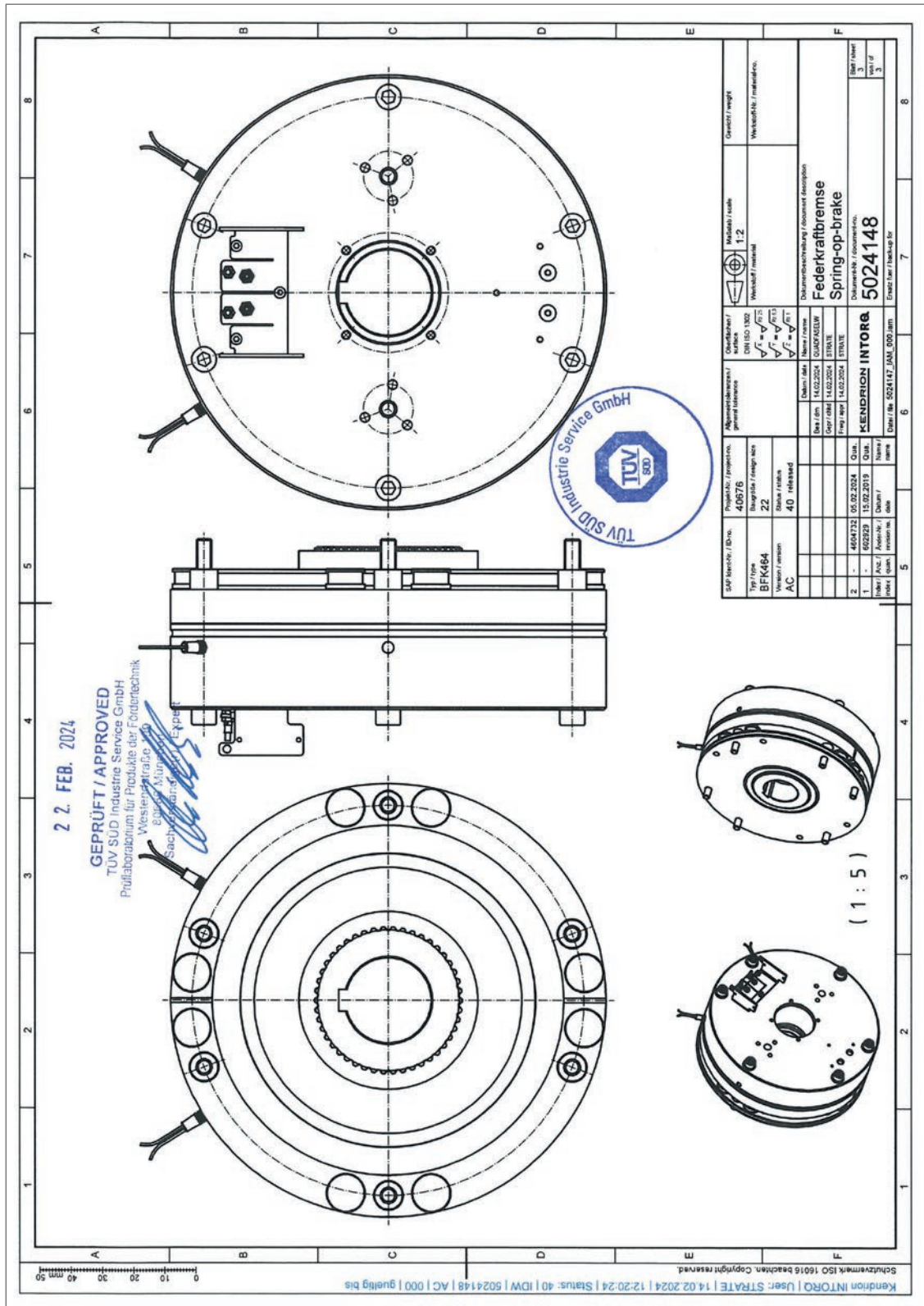
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EN

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#### 14.4. EU type-examination certificate EU-BD 1053 (WSG-MF.2)

<p style="writing-mode: vertical-rl; transform: rotate(180deg);"> ZERTIFIKAT ♦ CERTIFICATE ♦ 認証証書 ♦ CERTIFICADO ♦ CERTIFICAT </p>	 Industrie Service	
	<h3>EU TYPE-EXAMINATION CERTIFICATE</h3> <p>According to Annex IV, Part A of 2014/33/EU Directive</p>	
	<b>Certificate No.:</b>	EU-BD 1053-1
	<b>Notified Body:</b>	TÜV SÜD Industrie Service GmbH Westendstr. 199 80686 Munich - Germany Identification No. 0036
	<b>Certificate Holder:</b>	Kendrion INTORQ GmbH Wülmser Weg 5 31855 Aerzen - Germany
	<b>Manufacturer of the Test Sample:</b> <small>(Manufacturer of Serial Production – see Enclosure)</small>	Kendrion INTORQ GmbH Wülmser Weg 5 31855 Aerzen - Germany
	<b>Product:</b>	Braking device acting on the shaft of the traction sheave, as part of the protection device against overspeed for the car moving in upwards direction and braking element against unintended car movement
	<b>Type:</b>	BFK464-25R
	<b>Directive:</b>	2014/33/EU
	<b>Reference Standards:</b>	EN 81-20:2020 EN 81-50:2020
<b>Test Report:</b>	EU-BD 881-1, 1093-1 of 2024-02-22	
<b>Outcome:</b>	The product conforms to the essential health and safety requirements of the mentioned Directive if the requirements of the annex to this EU-type examination certificate are kept.	
<b>Date of Issue:</b>	2024-02-28	
 Achim Janocha Notified Body LCC		
 TUV®		

# Gearless Lift Machine

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#### Annex to the EU-Type Examination Certificate No. EU-BD 1053-1 of 2024-02-28



### 1 Scope of application

#### 1.1 Use as braking device – part of the the protection device against overspeed for the car moving in upwards direction – permissible brake torques and tripping rotary speeds

1.1.1 Permissible brake torque when the braking device acts on the shaft of the traction sheave while the car is moving upwards

Nominal brake torque [Nm]	Maximum tripping rotary speed of the traction sheave [rpm]
1080	700
1800	600

1.1.2 Maximum tripping speed of the overspeed governor and maximum rated speed of the lift

The maximum tripping speed of the overspeed governor and the maximum rated speed of the lift must be calculated on the basis of the traction sheave's maximum tripping rotary speed as outlined above taking into account traction sheave diameter and car suspension.

$$v = \frac{D_{TS} \times \pi \times n}{60 \times i}$$

$v$  = Tripping (rated) speed (m/s)  
 $D_{TS}$  = Diameter of the traction sheave from rope's center to rope's center (m)  
 $\pi$  = 3,14  
 $n$  = Rotary speed (rpm)  
 $i$  = Ratio of the car suspension

#### 1.2 Use as braking element – part of the protection device against unintended car movement (acting in up and down direction) – permissible brake torques, tripping rotary speeds and characteristics

1.2.1 Nominal brake torques and response times with relation to a brand-new brake element

Intermediate values can be interpolated

Minimum brake torque* [Nm]	Maximum brake torque* [Nm]	Maximum tripping rotary speed [rpm]	Maximum response times** [ms]		
			without / with overexcitation		
			t <sub>10</sub>	t <sub>50</sub>	t <sub>90</sub>
2 x 540 = 1080		700	97 / 130	157 / 190	217 / 250
	2 x 900 = 1800	600	53 / 73	93 / 113	133 / 153

#### Explanations:

\* **Nominal brake torque:** Brake torque assured for installation operation by the safety component manufacturer.

\*\* **Response times:** t<sub>x</sub> time difference between the drop of the braking power until establishing X% of the nominal brake torque, t<sub>50</sub> optionally calculated t<sub>50</sub> = (t<sub>10</sub> + t<sub>90</sub>)/2 or value taken from the examination recording

1.2.2 Assigned execution features

Type of powering / deactivation	continuous current / continuous current end
Brake control	serial / parallel
Nominal air gap	0.45 mm
Damping elements	YES
Overexcitation	2-fold non-release voltage

Note: The English text is a translation of the German original. In case of any discrepancy, the German version is valid only.

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#### 2 Conditions

- 2.1 Above mentioned safety component represents only a part at the protection device against overspeed for the car moving in upwards direction and unintended car movement. Only in combination with a detecting and triggering component in accordance with the standard (two separate components also possible), which must be subjected to an own type-examination, can the system created fulfil the requirements for a protection device.
- 2.2 The installer of a lift must create an examination instruction to fulfil the overall concept, add it to the lift documentation and provide any necessary tools or measuring devices, which allow a safe examination (e. g. with closed shaft doors).
- 2.3 The manufacturer of the drive unit must provide calculation evidence that the connection traction sheave – shaft – brake disc and the shaft itself is sufficiently safe, if the brake disc is not a direct component of the traction sheave (e. g. casted on). The shaft itself has to be statically supported in two points.  
 The calculation evidence must be enclosed with the technical documentation of the lift.
- 2.4 The setting of the brake torque has to be secured against unauthorized adjustment (e. g. sealing lacquer).
- 2.5 The identification drawing no. 5023216 (page 3 of 3), 5023968 (page 3 of 3) or 5032467 (page 3 of 3) including stamp dated 2024-02-22 shall be included to the EU-type examination for the identification and information of the general construction and operation and distinctness of the approved type.
- 2.6 The EU-type examination certificate may only be used in combination with the corresponding annex and enclosure (List of authorized manufacturer of the serial production). The enclosure will be updated immediately after any change by the certification holder.

#### 3 Remarks

- 3.1 In the scope of this type-examination it was found out, that the brake device also functions as a brake for normal operation, is designed as a redundant system and therefore meets the requirements to be used also as a part of the protection device against overspeed for the car moving in upwards direction and as braking element as part of the protection device against unintended car movement.
- 3.2 In the scope of this type-examination, it was determined, that the braking device was designed without a switching status control to evaluate the position of the anchor plates.  
 The brakes should be monitored as follows
  - a. through microswitches or proximity switches on both brakes that are connected to the lift control, or
  - b. through a built-in brake monitoring system of the lift control to ensure the correct opening and closing of both brakes before each start or stop of the elevator, or
  - c. through an automatic system specified by the lift manufacturer to check or ensure the correct braking torque. This test procedure must be carried out at least once daily.
- 3.3 Checking whether the requirements as per section 5.9.2.2 of EN 81-20:2020 (D) have been complied with is not part of this type examination.
- 3.4 Other requirements of the standard, such as reduction of brake moment respectively brake force due to wear or operational caused changes of traction are not part of this type examination.
- 3.5 This EU-type examination certificate was issued according to the following standards:
  - EN 81-20:2020, part 5.6.6.11, 5.6.7.13
  - EN 81-50:2020, part 5.7 and 5.8
- 3.6 A revision of this EU-type examination certificate is inevitable in case of changes or additions of the above-mentioned standards or of changes of state of the art.

**Note:** The English text is a translation of the German original. In case of any discrepancy, the German version is valid only.

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#### Enclosure to the EU-Type Examination Certificate No. EU-BD 1053-1 of 2024-02-28



#### Authorised Manufacturer – Production Sites (valid from: 2024-02-07):

<b>Company Address</b>	Kendrion INTORQ GmbH Wülmser Weg 5 31855 Aerzen - Germany
<b>Company Address</b>	Kendrion (China) Co., Ltd. No. 10 Huiipu Road, Suzhou Industrial Park, 215021 Suzhou, P.R. China

- END OF DOCUMENT -

Based on: Application of Co. Kendrion INTORQ GmbH dated 2024-02-07

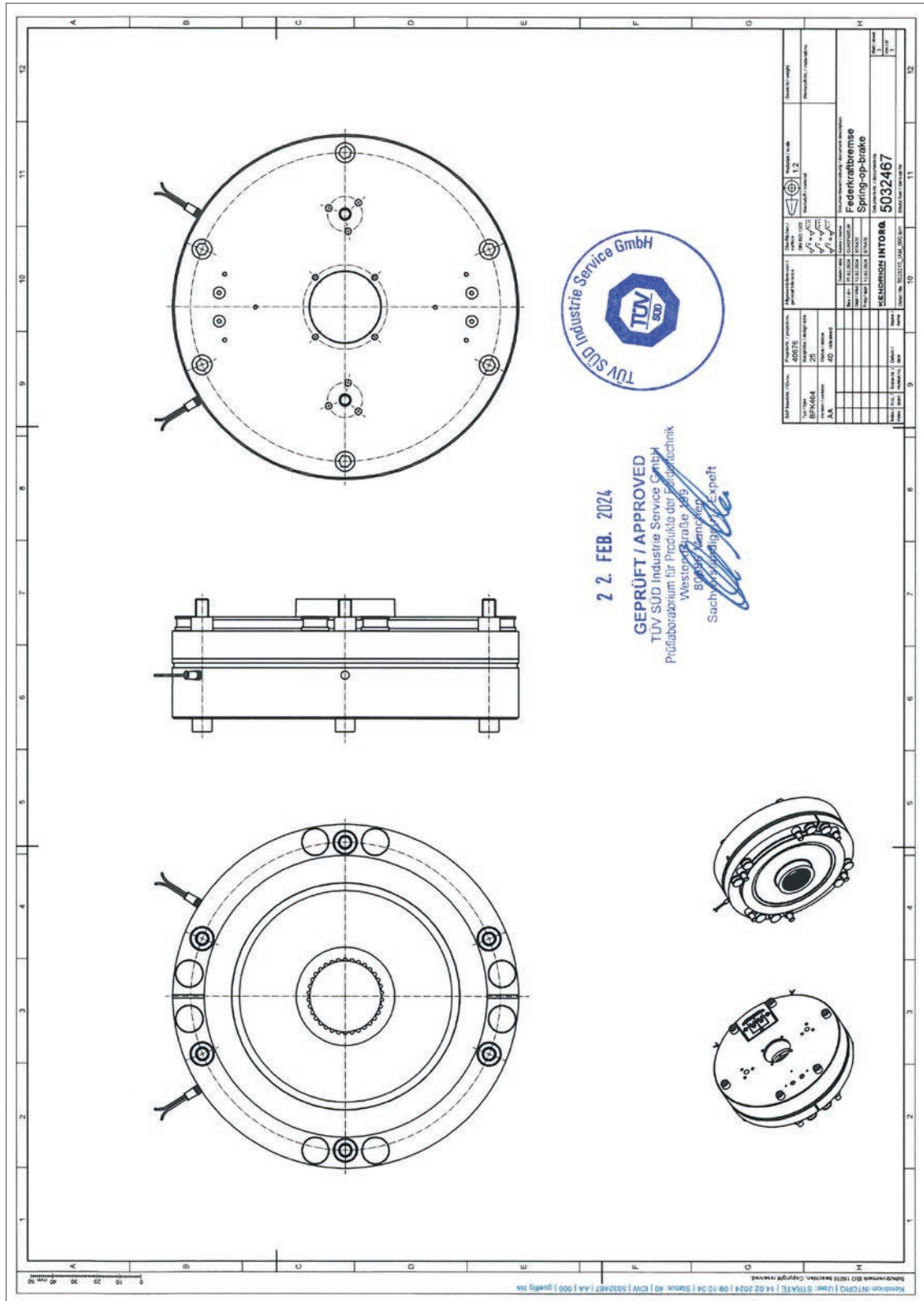
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# Gearless Lift Machine

## WSG-MF

### Operating Instructions

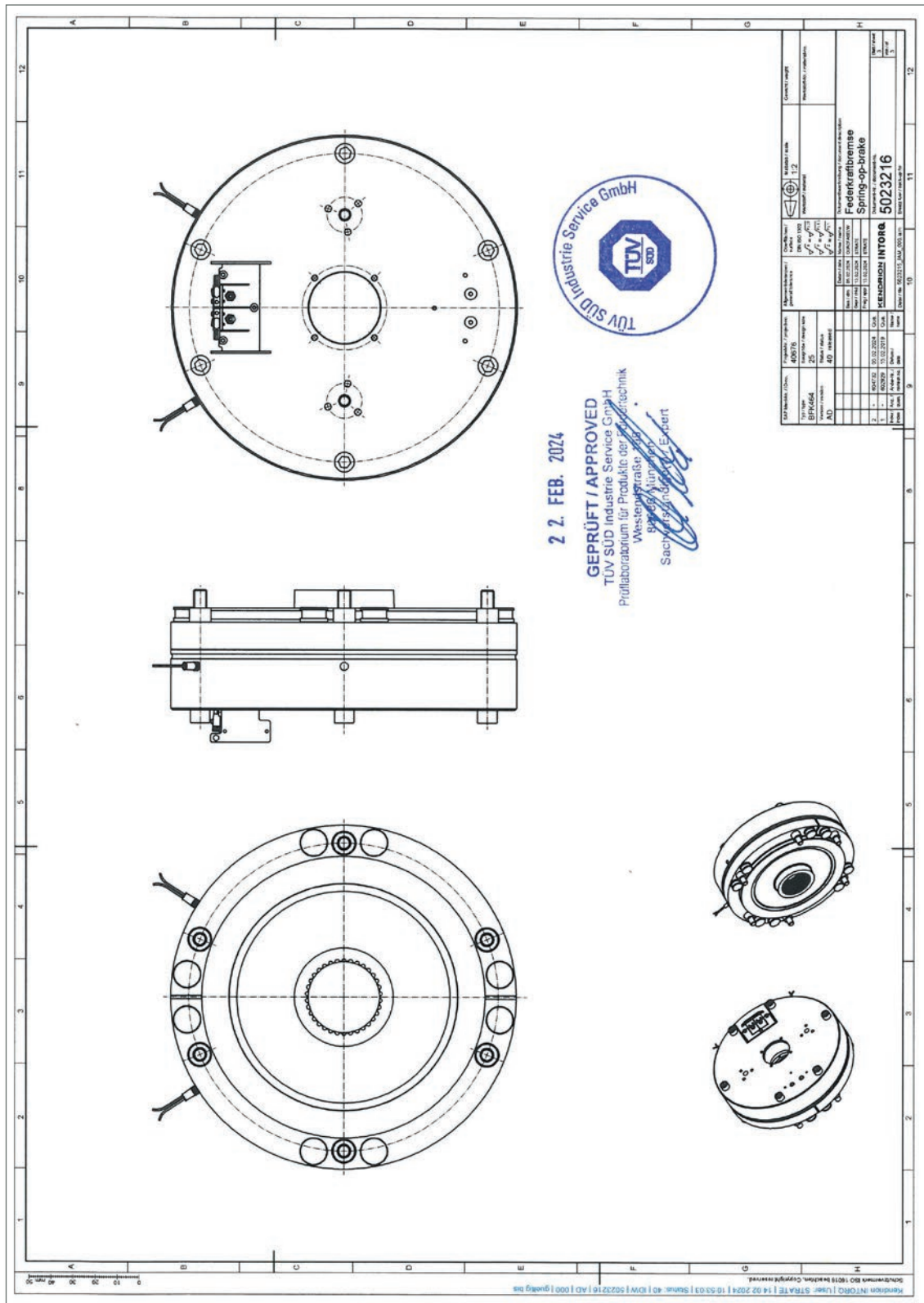
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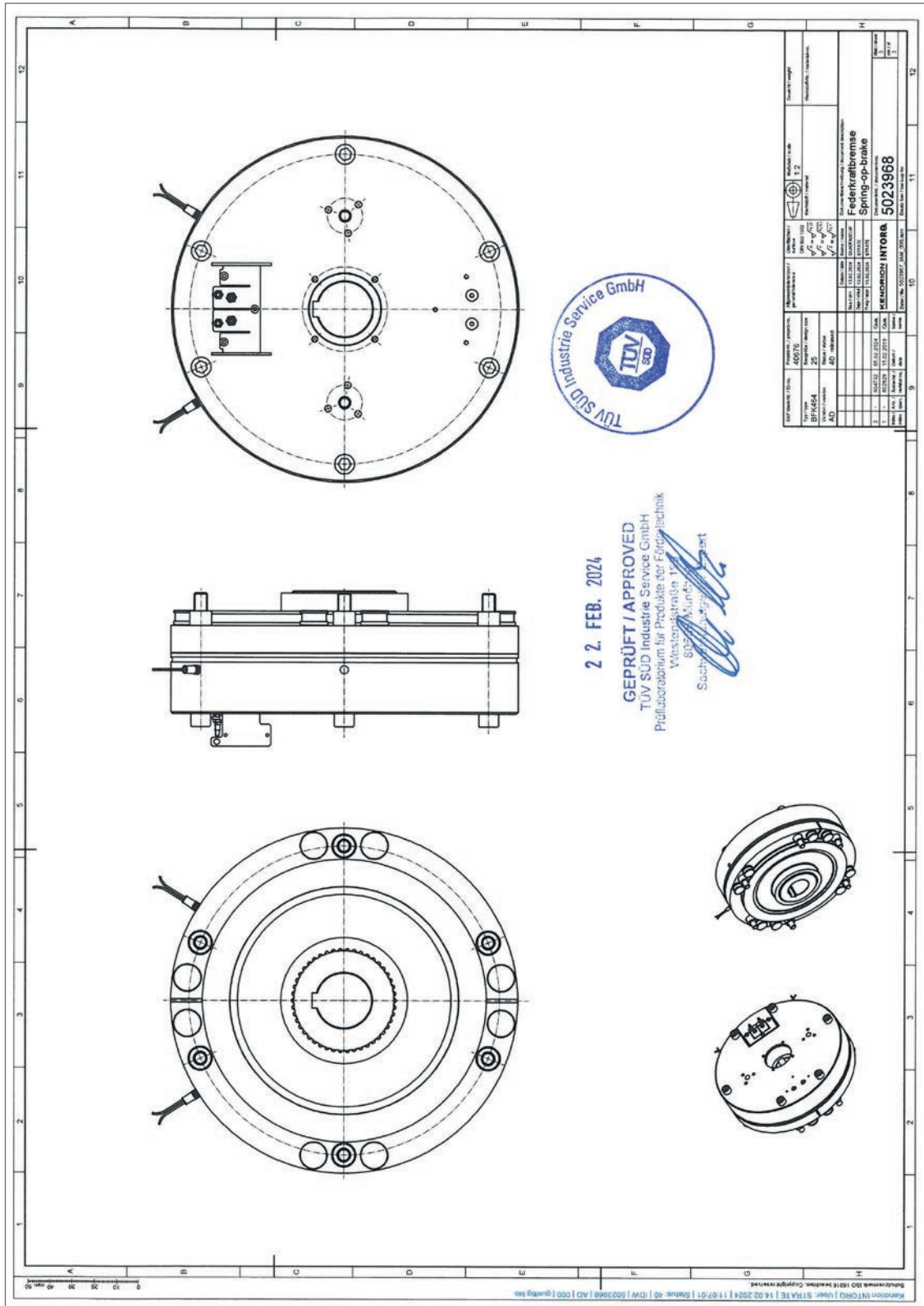


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# Gearless Lift Machine

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### 14.5. EU type-examination certificate EU-BD 1052 (WSG-MF.3)

<p style="writing-mode: vertical-rl; transform: rotate(180deg);"> ZERTIFIKAT ♦ CERTIFICATE ♦ 認証証書 ♦ CERTIFICADO ♦ CERTIFICAT </p>	 Industrie Service	
	<h2>EU TYPE-EXAMINATION CERTIFICATE</h2> <p>According to Annex IV, Part A of 2014/33/EU Directive</p>	
	<b>Certificate No.:</b>	EU-BD 1052-1
	<b>Notified Body:</b>	TÜV SÜD Industrie Service GmbH Westendstr. 199 80686 Munich - Germany Identification No. 0036
	<b>Certificate Holder:</b>	Kendrion INTORQ GmbH Wülmsers Weg 5 31855 Aerzen - Germany
	<b>Manufacturer of the Test Sample:</b> <small>(Manufacturer of Serial Production – see Enclosure)</small>	Kendrion INTORQ GmbH Wülmsers Weg 5 31855 Aerzen - Germany
	<b>Product:</b>	Braking device acting on the shaft of the traction sheave, as part of the protection device against overspeed for the car moving in upwards direction and braking element against unintended car movement
	<b>Type:</b>	BFK464-28R
	<b>Directive:</b>	2014/33/EU
	<b>Reference Standards:</b>	EN 81-20:2020 EN 81-50:2020
<b>Test Report:</b>	EU-BD 881-1, 1093-1 of 2024-02-22	
<b>Outcome:</b>	The product conforms to the essential health and safety requirements of the mentioned Directive if the requirements of the annex to this EU-type examination certificate are kept.	
<b>Date of Issue:</b>	2024-02-28	
 Achim Janocha Notified Body LCC		
 Notified Body		
		

# Gearless Lift Machine

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#### Annex to the EU-Type Examination Certificate No. EU-BD 1052-1 of 2024-02-28



#### 1 Scope of application

##### 1.1 Use as braking device – part of the the protection device against overspeed for the car moving in upwards direction – permissible brake torques and tripping rotary speeds

1.1.1 Permissible brake torque when the braking device acts on the shaft of the traction sheave while the car is moving upwards

Nominal brake torque [Nm]	Maximum tripping rotary speed of the traction sheave [rpm]
1440	600
2400	500

##### 1.1.2 Maximum tripping speed of the overspeed governor and maximum rated speed of the lift

The maximum tripping speed of the overspeed governor and the maximum rated speed of the lift must be calculated on the basis of the traction sheave's maximum tripping rotary speed as outlined above taking into account traction sheave diameter and car suspension.

$$v = \frac{D_{TS} \times \pi \times n}{60 \times i}$$

$v$  = Tripping (rated) speed (m/s)  
 $D_{TS}$  = Diameter of the traction sheave from rope's center to rope's center (m)  
 $\pi$  = 3,14  
 $n$  = Rotary speed (rpm)  
 $i$  = Ratio of the car suspension

##### 1.2 Use as braking element – part of the protection device against unintended car movement (acting in up and down direction) – permissible brake torques, tripping rotary speeds and characteristics

1.2.1 Nominal brake torques and response times with relation to a brand-new brake element

Intermediate values can be interpolated

Minimum brake torque* [Nm]	Maximum brake torque* [Nm]	Maximum tripping rotary speed [rpm]	Maximum response times** [ms]		
			without / with overexcitation		
			t <sub>10</sub>	t <sub>50</sub>	t <sub>90</sub>
2 x 720 = 1440		600	106 / 141	174 / 209	242 / 277
	2 x 1200 = 2400	500	48 / 69	101 / 122	155 / 176

#### Explanations:

\* **Nominal brake torque:** Brake torque assured for installation operation by the safety component manufacturer.

\*\* **Response times:** t<sub>x</sub> time difference between the drop of the braking power until establishing X% of the nominal brake torque, t<sub>50</sub> optionally calculated t<sub>50</sub> = (t<sub>10</sub> + t<sub>90</sub>)/2 or value taken from the examination recording

##### 1.2.2 Assigned execution features

Type of powering / deactivation	continuous current / continuous current end
Brake control	serial / parallel
Nominal air gap	0.45 mm
Damping elements	YES
Overexcitation	2-fold non-release voltage

Note: The English text is a translation of the German original. In case of any discrepancy, the German version is valid only.

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#### 2 Conditions

- 2.1 Above mentioned safety component represents only a part at the protection device against overspeed for the car moving in upwards direction and unintended car movement. Only in combination with a detecting and triggering component in accordance with the standard (two separate components also possible), which must be subjected to an own type-examination, can the system created fulfil the requirements for a protection device.
- 2.2 The installer of a lift must create an examination instruction to fulfil the overall concept, add it to the lift documentation and provide any necessary tools or measuring devices, which allow a safe examination (e. g. with closed shaft doors).
- 2.3 The manufacturer of the drive unit must provide calculation evidence that the connection traction sheave – shaft – brake disc and the shaft itself is sufficiently safe, if the brake disc is not a direct component of the traction sheave (e. g. casted on). The shaft itself has to be statically supported in two points.  
 The calculation evidence must be enclosed with the technical documentation of the lift.
- 2.4 The setting of the brake torque has to be secured against unauthorized adjustment (e. g. sealing lacquer).
- 2.5 The identification drawing no. 5023226 (page 3 of 3), 5024137 (page 3 of 3) or 5032468 (page 3 of 3) including stamp dated 2024-02-22 shall be included to the EU-type examination for the identification and information of the general construction and operation and distinctness of the approved type.
- 2.6 The EU-type examination certificate may only be used in combination with the corresponding annex and enclosure (List of authorized manufacturer of the serial production). The enclosure will be updated immediately after any change by the certification holder.

#### 3 Remarks

- 3.1 In the scope of this type-examination it was found out, that the brake device also functions as a brake for normal operation, is designed as a redundant system and therefore meets the requirements to be used also as a part of the protection device against overspeed for the car moving in upwards direction and as braking element as part of the protection device against unintended car movement.
- 3.2 In the scope of this type-examination, it was determined, that the braking device was designed without a switching status control to evaluate the position of the anchor plates.  
 The brakes should be monitored as follows
  - a. through microswitches or proximity switches on both brakes that are connected to the lift control, or
  - b. through a built-in brake monitoring system of the lift control to ensure the correct opening and closing of both brakes before each start or stop of the elevator, or
  - c. through an automatic system specified by the lift manufacturer to check or ensure the correct braking torque. This test procedure must be carried out at least once daily.
- 3.3 Checking whether the requirements as per section 5.9.2.2 of EN 81-20:2020 (D) have been complied with is not part of this type examination.
- 3.4 Other requirements of the standard, such as reduction of brake moment respectively brake force due to wear or operational caused changes of traction are not part of this type examination.
- 3.5 This EU-type examination certificate was issued according to the following standards:
  - EN 81-20:2020, part 5.6.6.11, 5.6.7.13
  - EN 81-50:2020, part 5.7 and 5.8
- 3.6 A revision of this EU-type examination certificate is inevitable in case of changes or additions of the above-mentioned standards or of changes of state of the art.

**Note:** The English text is a translation of the German original. In case of any discrepancy, the German version is valid only.

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#### Authorised Manufacturer – Production Sites (valid from: 2024-02-07):

<b>Company Address</b>	Kendrion INTORQ GmbH Wülmser Weg 5 31855 Aerzen - Germany
<b>Company Address</b>	Kendrion (China) Co., Ltd. No. 10 Huiipu Road, Suzhou Industrial Park, 215021 Suzhou, P.R. China

- END OF DOCUMENT -

Based on: Application of Co. Kendrion INTORQ GmbH dated 2024-02-07

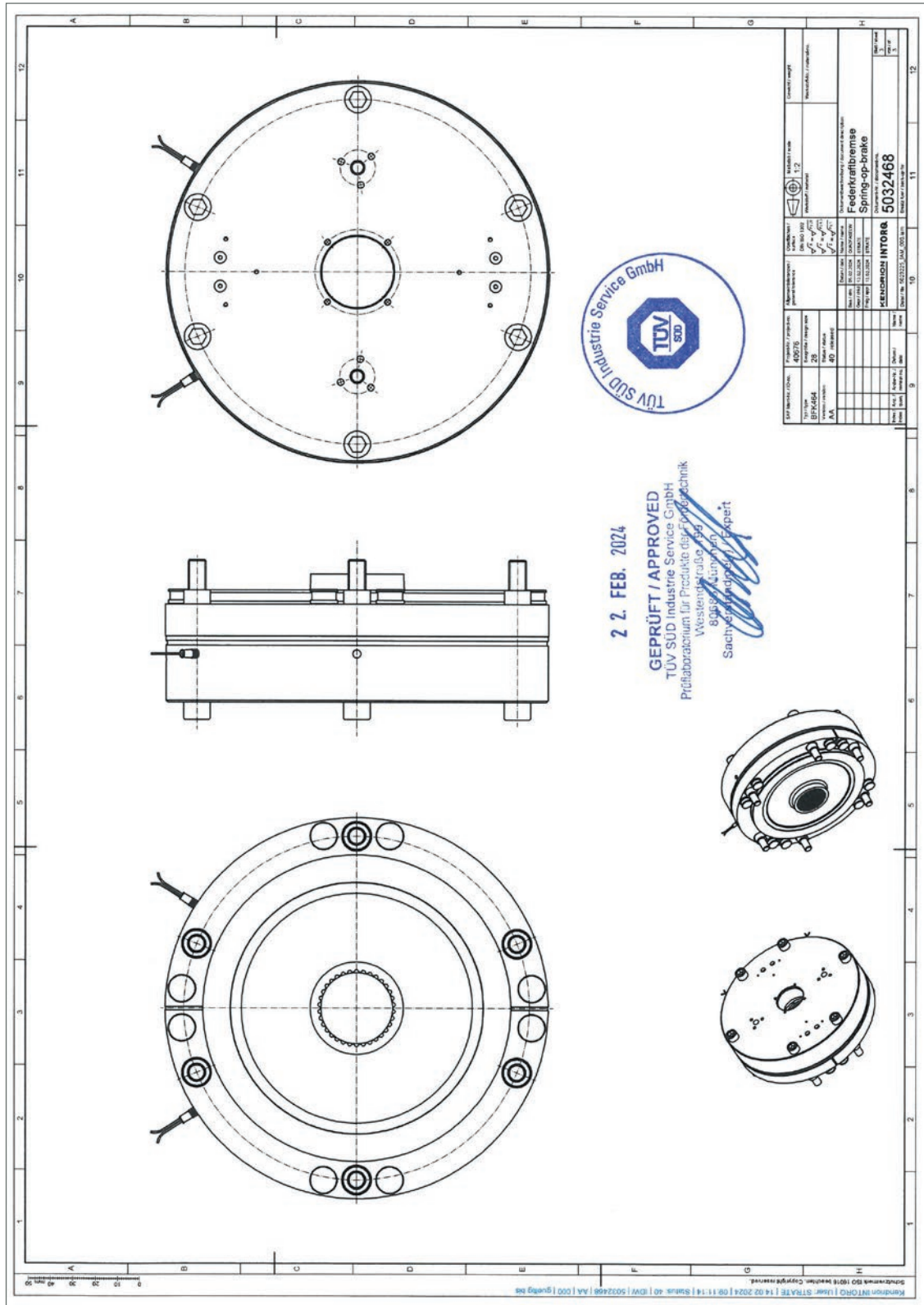
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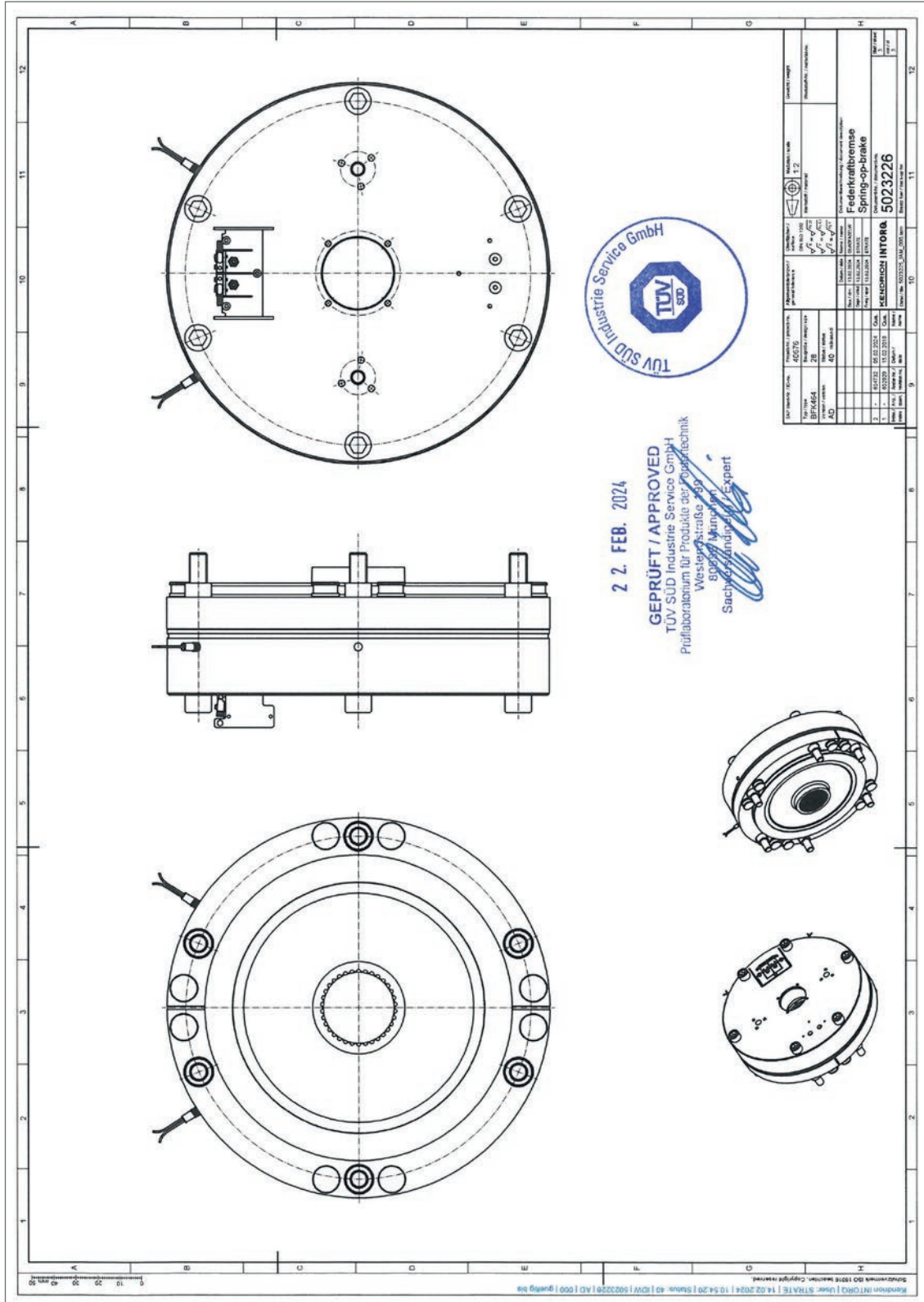


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## 14.6. EU Declaration of Conformity brake WSG-MF



  
POWERED BY KENDRION  
**Kendrion INTORQ GmbH**  
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 31855 Aerzen  
 PO Box 11 03  
 31849 Aerzen  
 Germany  
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 F +49 5154 70534-100  
 info-aerzen-lb@kendrion.com  
 www.kendrion.com  
 Managing Director:  
 Lars Knoke

## EU Declaration of Conformity

Original Declaration of Conformity



We hereby declare that the type of construction of

**Designation:** *Electromagnetically releases spring-operated brake*

**Machine type:** *INTORQ BFK464*

**Function:** *Brake assembly acting on the leaving sheave shaft as part of the protection for the upwards moving lift car against excessive speed*

**Year of manufacture:** *2018 ff.*

complies with the following European directives and harmonised standards which were valid on the date of issue indicated below in their versions applicable at that time.

**EU Directives**

2006/42/EC Machinery Directive

2014/35/EU Low Voltage Directive

2014/33/EU European Lift Directive

**Applied, harmonised standards**

DIN EN ISO 12100:2011-03 Safety of machinery

DIN EN 60204-1:2019-06 Safety of machinery - Electrical equipment of machines - Part 1 – General requirements

DIN VDE 0580:2011-11 Electromagnetic devices and components - General Specifications

Deutsche Bank AG  
BIC: DEUTDE2HXXX  
IBAN: DE05 2507 0070 0026 2501 00

Sparkasse Hameln-Weserbergland  
BIC: NOLADE21SWB  
IBAN: DE88 2545 0110 0000 8035 69

Commerzbank Hannover  
BIC: DRESDEFF250  
IBAN: DE12 2508 0020 0701 2421 00

HSBC The Netherlands  
BIC: HSBCNL2A  
IBAN: NL07 HSBC 1046 5580 15

HSBC Bank USA  
US BIC: MRMDUS33  
USD Account: 104048816

Commercial Register  
AG Hanover, HRB 220878  
VAT No. DE 814 222 523

# Gearless Lift Machine

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## **KENDRION**

**INTORQ**

POWERED BY KENDRION

- DIN EN 60529:2014-09 Degrees of protection provided by enclosures
- DIN EN 81-20:2020-06 Safety rules for the construction and installation of lifts - Lifts for the transport of persons and goods - Part 20: Passenger and goods lifts
- DIN EN 81-50:2020-06 Safety rules for the construction and installation of lifts - Examination and tests - Part 50: Design rules, calculations, examination and tests of lift components

Brake type	Type examination RL 2014/33/EU
BFK464-17R	EU-BD 1051-1
BFK464-18R	EU-BD 1056-1
BFK464-18R.1	EU-BD 1058-1
BFK464-19R	EU-BD 1055-1
BFK464-20R	EU-BD 1034-1
BFK464-20R.1	EU-BD 1057-1
BFK464-22R	EU-BD 1054-1
BFK464-25R	EU-BD 1053-1
BFK464-28R	EU-BD 1052-1

### **Testing lab**

TÜV SÜD Industrie Service GmbH  
 Westendstraße 199  
 80686 München/Germany  
 Identification number 0036

### **Production control**

TÜV SÜD Industrie Service GmbH  
 Gottlieb-Daimler-Str. 7  
 70794 Filderstadt/Deutschland  
 Identification number 0036

  
 Lars Knoke  
 Managing Director  
 Aerzen, 03.07.2024

i.V.   
 Winfried Kuter  
 R&D Head of Technology



EN

# Gearless Lift Machine

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# Gearless Lift Machine

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## 14.7. UKCA type-examination of the brake

**KENDRION**

**Declaration of Conformity**

We hereby declare under our sole responsibility that the product(s)

**Description:** *Electromagnetically released spring-applied brake*

**Type:** *INTORQ BFK455,  
INTORQ BFK464,  
INTORQ BFK466*

**Function:** *Braking device acting on the traction sheave, as part of the protection device against overspeed for the car moving in upwards direction and breaking element against unintended car movement.*

**Year of manufacture:** *2022 ff.*

fulfills all the relevant provisions of the regulations:

- Health and Safety: Supply of Machinery (Safety) Regulations 2008
- Electric Equipment (Safety) Regulations 2016
- Lifts Regulations 2016

**Applied designated standards:**

- EN ISO 12100 Safety of machinery
- EN 60204-1 Safety of machinery – Electrical equipment of machines – Part 1 – General requirements
- EN 81-20 Safety rules for the construction and installation of lifts – Lifts for the transport of persons and goods – Part 20: Passenger and goods lifts
- EN 81-50 Safety rules for the construction and installation of lifts – Examination and tests – Part 50: Design rules, calculations, examination and tests lift components

**INTORQ**

POWERED BY KENDRION

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Deutsche Bank AG  
 BIC: DEUTDE2HXXX  
 IBAN: DE05 2507 0070 0026 2501 00

Sparkasse Hameln-Weserbergland  
 BIC: NOLADE21SWB  
 IBAN: DE88 2545 0110 0000 8035 69

Commerzbank Hannover  
 BIC: DRESDEFF250, IBAN: DE12 2508 0020 0701 2421 00

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## 14.8. Brake operating instructions WSG-MF



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**INTORQ**

#### Document history

Material number	Version			Description
33006446	1.0	09/2017	SC	First edition
33006446	2.0	05/2018	SC	Update of HR and tightening torques
33006446	3.0	10/2019	SC	Migration to ST4

#### Legal regulations

##### Liability

- The information, data and notes in these Operating Instructions are up to date at the time of printing. Claims referring to drive systems which have already been supplied cannot be derived from this information, illustrations and descriptions.
- We do not accept any liability for damage and operating interference caused by:
  - inappropriate use
  - unauthorised modifications to the product
  - improper work on or with the drive system
  - operating errors
  - disregarding the documentation

#### Warranty



##### Notice

The warranty conditions can be found in the terms of sale and delivery from INTORQ GmbH & Co. KG.

- Warranty claims must be made to INTORQ immediately after the defects or faults are detected.
- The warranty is void in all cases when liability claims cannot be made.

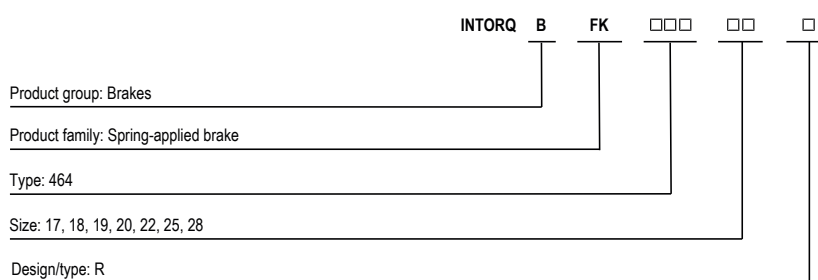
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#### Product key



Not coded: Connection voltage, hub bore hole, options

#### Checking the delivery

After receipt of the delivery, check immediately whether the items delivered match the accompanying papers.

INTORQ does not accept any liability for deficiencies claimed subsequently.

- Claim visible transport damage immediately to the deliverer.
- Claim visible deficiencies or incomplete deliveries immediately to INTORQ GmbH & Co. KG.



#### NOTICE

##### Labelling of drive systems and individual components

- Drive systems and components are unambiguously designated by the labelling on their name plates.
- The spring-applied INTORQ brake is also delivered in single modules which can then be put together by the customer according to their requirements. The specifications – particularly the packaging label, name plate and type code – apply to a complete stator.
- The labelling is not included when components are delivered individually.



# Gearless Lift Machine

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**INTORQ**

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#### General information

**INTORQ**


## 1 General information

### 1.1 Using these Operating Instructions

- These Operating Instructions will help you to work safely with the spring-applied brake with electromagnetic release. They contain safety instructions that must be followed.
- All persons working on or with electromagnetically released spring-applied brakes must have the Operating Instructions available and observe the information and notes relevant for them.
- The Operating Instructions must always be in a complete and perfectly readable condition.

### 1.2 Conventions in use

This document uses the following styles to distinguish between different types of information:

<b>Spelling of numbers</b>	Decimal separator	Point	The decimal point is always used. For example: 1234.56
<b>Page reference</b>	Underscore, orange	<u>      </u>	Reference to another page with additional information For example: <u>Using these Operating Instructions, Page 6</u>
<b>Symbols</b>	Wildcard	□	Wildcard (placeholder) for options or selection details For example: BFK464-R-□□ = BFK464-R-10
	Notice		Important notice about ensuring smooth operations or other key information.

### 1.3 Safety instructions and notices

The following icons and signal words are used in this document to indicate dangers and important safety information:

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## WSG-MF


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#### General information

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#### Structure of safety notices:

	<b>CAUTION</b>
	<b>Icon</b>
	Indicates the type of danger
	<b>Signal word</b>
	Characterizes the type and severity of danger.
	<b>Notice text</b>
	Describes the danger.
	<b>Possible causes</b>
	List of possible consequences if the safety notices are disregarded.
	<b>Protective measures</b>
	List of protective measures required to avoid the danger.

#### Danger level

	<b>DANGER</b>
	DANGER indicates a hazardous situation which, if not avoided, <i>will</i> result in death or serious injury.
	<b>WARNING</b>
	WARNING indicates a potentially hazardous situation which, if not avoided, <i>could</i> result in death or serious injury.
	<b>CAUTION</b>
	CAUTION indicates a hazardous situation which, if not avoided, could result in minor or moderate injury.
	<b>NOTICE</b>
	Notice about a harmful situation with possible consequences: the product itself or surrounding objects could be damaged.

#### 1.4

#### Terminology used

Term	In the following text used for
Spring-applied brake	Spring-applied brake with electromagnetic release
Drive system	Drive systems with spring-applied brakes and other drive components

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#### General information

**INTORQ**

### 1.5 Abbreviations used

Letter symbol	Unit	Designation
$F_R$	N	Rated frictional force
$I$	A	Current
$I_H$	A	Holding current, at 20 °C and holding voltage
$I_L$	A	Release current, at 20 °C and release voltage
$I_N$	A	Rated current, at 20 °C and rated voltage
$M_A$	Nm	Tightening torque of fastening screws
$M_{dyn}$	Nm	Braking torque at a constant speed of rotation
$M_K$	Nm	Rated torque of the brake, rated value at a relative speed of rotation of 100 rpm
$n_{max}$	rpm	Maximum occurring speed of rotation during the slipping time $t_3$
$P_H$	W	Coil power during holding, after voltage change-over and 20 °C
$P_L$	W	Coil power during release, before voltage change-over and 20 °C
$P_N$	W	Rated coil power, at rated voltage and 20 °C
$Q$	J	Quantity of heat/energy
$Q_E$	J	Max. permissible friction energy for one-time switching, thermal parameter of the brake
$Q_R$	J	Braking energy, friction energy
$Q_{Smax}$	J	Maximally permissible friction energy for cyclic switching, depending on the operating frequency
$R_m$	N/mm <sup>2</sup>	Tensile strength
$R_N$	Ohms	Rated coil resistance at 20 °C
$R_z$	µm	Averaged surface roughness
$S_h$	1/h	Operating frequency: the number of switching operations evenly spread over the time unit
$S_{hue}$	1/h	Transition operating frequency, thermal parameter of the brake
$S_{hmax}$	1/h	Maximum permissible operating frequency, depending on the friction energy per switching operation
$s_L$	mm	Air gap: the lift of the armature plate while the brake is switched
$s_{LN}$	mm	Rated air gap
$s_{Lmin}$	mm	Minimum air gap
$s_{Lmax}$	mm	Maximum air gap
$s_{HL}$	mm	Air gap for hand-release
$t_1$	ms	Engagement time, sum of the delay time and braking torque: rise time $t_1 = t_{11} + t_{12}$
$t_2$	ms	Disengagement time, time from switching the stator until reaching 0.1 $M_{dyn}$

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Letter symbol	Unit	Designation
$t_3$	ms	Slipping time, operation time of the brake (according to $t_{11}$ ) until standstill
$t_{11}$	ms	Delay during engagement (time from switching off the supply voltage to the beginning of the torque rise)
$t_{12}$	ms	Rise time of the braking torque, time from the start of torque rise until reaching the braking torque
$t_{ue}$	s	Over-excitation period
$U$	V	Voltage
$U_H$	V DC	Holding voltage, after voltage change-over
$U_L$	V DC	Release voltage, before voltage change-over
$U_N$	V DC	Rated coil voltage; in the case of brakes requiring a voltage change-over, $U_N$ equals $U_L$

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#### Safety instructions

INTORQ

## 2 Safety instructions

### 2.1 General safety instructions

- Never operate INTORQ components when you notice they are damaged.
- Never make any technical changes to INTORQ components.
- Never operate INTORQ components when they are incompletely mounted or incompletely connected.
- Never operate INTORQ components without their required covers.
- Only use accessories that have been approved by INTORQ.
- Only use original spare parts from the manufacturer.

Keep the following in mind during the initial commissioning and during operation:

- Depending on the degree of protection, INTORQ components may have both live (voltage carrying), moving and rotating parts. Such components require the appropriate safety mechanisms.
- Surfaces can become hot during operation. Take the appropriate safety measures (to ensure contact/touch protection).
- Follow all specifications and information found in the Operating Instructions and the corresponding documentation. These must be followed to maintain safe, trouble-free operations and to achieve the specified product characteristics.
- The installation, maintenance and operation of INTORQ components may only be carried out by qualified personnel. According to IEC 60364 and CENELEC HD 384, skilled personnel must be qualified in the following areas:
  - Familiarity and experience with the installation, assembly, commissioning and operation of the product.
  - Specialist qualifications for the specific field of activity.
  - Skilled personnel must know and apply all regulations for the prevention of accidents, directives, and laws relevant on site.

### 2.2 Disposal

The INTORQ components are made of various differing materials.

- Recycle metals and plastics.
- Ensure professional disposal of assembled PCBs according to the applicable environmental regulations.



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#### Product description

**INTORQ**

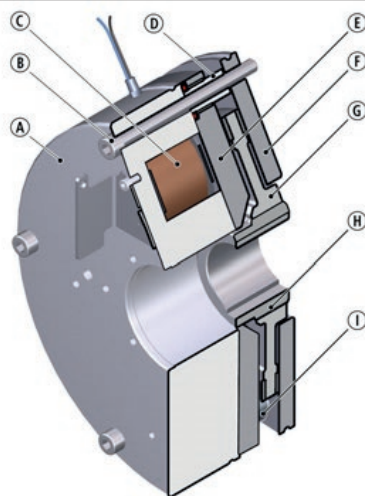
## 3 Product description

### 3.1 Proper and intended usage

#### 3.1.1 Standard applications

INTORQ components are intended for use in machinery and facilities. They may only be used for purposes as specified in the order and confirmed by INTORQ. The INTORQ components may only be operated under the conditions specified in these Operating Instructions. They may never be operated beyond their specified performance limits. The technical specifications (refer to [Technical specifications, Page 15](#)) must be followed to comply with the proper and intended usage. Any other usage is considered improper and prohibited.

### 3.2 Layout



**Fig. 1: Layout of an INTORQ BFK464-R spring-applied brake Complete stator + rotor + flange**

A Stator	B Socket-head cap screw	C Coil
D Sleeve	E Armature plate	F Flange (optional)
G Rotor	H Hub (optional)	I Noise reducer

The BFK464-R spring-applied brake is a single-disk brake with two friction surfaces. The braking torque is applied through two separate braking circuits, both electrical and mechanical, via several compression springs in the form of friction locking. The brake circuits are released electromagnetically. Due to its division into two brake circuits, the brake is particularly suitable for applications such as lift systems and stage/platform technology. The brake can be selected based on the rated torque for one brake circuit. The second brake circuit meets the requirement for redundancy (refer to [Rated data for coil power, Page 16](#)).

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The division of the brake circuits is done using a two-part armature disk with the associated compression springs and electromagnetic coils. Each brake circuit can be operated individually due to the separate supply lines for each stator and armature plate (siehe ).

Each brake circuit has a micro-switch which monitors the switching state of the spring-applied brake. Using the associated switching device, the supply voltage (AC voltage) is rectified and, when the brake is released, lowered after a short period of time. This results in a reduction of the average electrical power of the brake.

The BFK464 spring-applied brake (with the high rated torque for the respective size) is designed for a maximum duty cycle of 60% with holding current reduction. The brakes with the lower rated torques are suitable for a maximum 60% duty cycle with no holding current reduction. The permissible operating frequency for both versions in each size is 180 1/h (with a short-term maximum of 240 1/h).

Size	Rated torque $M_k$ [Nm]	EC-type examination certificate Directive 2014/33/EC
17R	2 x 75	EU-BD 1051
	2 x 150	
18R	2 x 170	EU-BD 1056
	2 x 280	
19R	2 x 210	EU-BD 1055
	2 x 350	
20R	2 x 280	EU-BD 1034
	2 x 450	
22R	2 x 360	EU-BD 1054
	2 x 600	
25R	2 x 540	EU-BD 1053
	2 x 900	
28R	2 x 720	EU-BD 1052
	2 x 1200	

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### 3.3 Function

This brake is an electrically releasable spring-applied brake with a rotating brake disc (rotor) that is equipped on both sides with friction linings. In its de-energised state, the rotor is clamped with braking force applied by pressure springs between the armature plate and a counter friction surface. This corresponds to a fail-safe functionality.

The brake torque applied to the rotor is transferred to the input shaft via a hub that has axial gear teeth.

The brake can be used as a holding brake, as an operating brake, and as an emergency stop brake for high speeds.

The asbestos-free friction linings ensure a safe braking torque and low wear.

To release the brake, the armature plate is released electromagnetically from the rotor. The rotor, shifted axially and balanced by the spring force, can rotate freely.

### 3.4 Braking and release

During the braking procedure, the inner and outer springs use the armature plate to press the rotor (which can be shifted axially on the hub) against the friction surface. The asbestos-free friction linings ensure high braking torque and low wear. The braking torque is transmitted between the hub and the rotor via gear teeth.

When the brakes are applied, an air gap ( $s_L$ ) is present between the stator and the armature plate. To release the brake, the coil of the stator is energised with the DC voltage provided. The resulting magnetic flux works against the spring force to draw the armature plate to the stator. This releases the rotor from the spring force and allows it to rotate freely.

### 3.5 Project planning notes

- When designing a brake for specific applications, torque tolerances, the limiting speeds of the rotors, the thermal resistance of the brake, and the effect of environmental influences must all be taken into account.
- The brakes are dimensioned in such a way that the specified rated torques are reached safely after a short run-in process.
- However, as the organic friction linings used do not all have identical properties and because environmental conditions can vary, deviations from the specified braking torques are possible. These must be taken into account in the form of appropriate dimensioning tolerances. Increased breakaway torque is common in particular after long downtimes in humid environments where temperatures vary.
- If the brake is used as a pure holding brake without dynamic load, the friction lining must be reactivated regularly.

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### 3.6 Optional configuration

#### 3.6.1 Hand-release (optional)

To temporarily release the brake when there is no electricity available, a hand-release function is available as an option. The hand-release function can be retrofitted.

#### 3.6.2 Optional micro-switch

The micro-switch is used for the release monitoring or for wear monitoring. The user is responsible for arranging the electrical connection for this optional micro-switch.

- Usage for the (air) release monitoring: The motor will start only after the brake has been released. This enables the micro-switch to monitor for errors (e.g. when the motor does not start because of a defective rectifier, if there are broken connection cables, defective coils, or an excessive air gap).
- Usage for monitoring wear: The brake and motor are not supplied with power when the air gap is too large.

#### 3.6.3 Optional encapsulated design

This design not only prevents the penetration of spray water and dust, but also the spreading of abrasion particles outside the brake. This is achieved by the following enclosures:

- A cover ring over the armature plate and rotor.

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## 4 Technical specifications

### 4.1 Possible applications of the INTORQ spring-applied brake

- Degree of protection:
  - The brake is designed for operation under the environmental conditions that apply to IP54 protection. Because of the numerous possibilities of using the brake, it is still necessary to check the functionality of all mechanical components under the corresponding operating conditions.
- Ambient temperature:
  - -20 °C to +40 °C (Standard)

### 4.2 Rated data

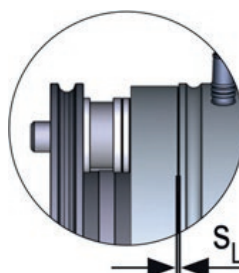


Fig. 2: Air gap measurement

Size	Air gap		Permissible wear distance	Rotor thickness		Mass of stator
	$S_{LN}^{+0.06/-0.08}$	$S_{Lmax}$		Min.	Max.	m
	[mm]	[mm]	[mm]	[mm]	[mm]	[kg]
17R	0.4	0.6	0.2	12.7	13.0	12.4
18R						19.2
19R						22.5
20R						26.5
22R						31.0
25R	0.5	0.8	0.3	12.6	13.0	41.5
28R						55.5

Tab. 1: Rated data for air gap specifications

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Size	Screw hole circle		Fastening screws DIN 912		Minimum thread depth		Tightening torque M <sub>A</sub>		
	Diameter	Thread	without flange	with flange	without flange	with flange <sup>1)</sup>	without flange	with flange <sup>1)</sup>	
	[mm]		[mm]	[mm]	[mm]	[mm]	[Nm]	[Nm]	
17R	176	M8	6 x M8x85	6 x M8x95	13.0	12.0	24.6	24.6	
18R	212		6 x M8x95	6 x M8x105 <sup>1)</sup>				30.4	
19R	220	M10	6 x M10x100	6 x M10x110	16.0	15.0	48.0	48.0	
20R	233		6 x M10x110	6 x M10x120 <sup>1)</sup>	21.0	20.0		66.5	
22R	252								
25R	282	M12	6 x M12x110	6 x M12x130 <sup>1)</sup>	18.0	25.0	84.0	104.7	
28R	314	M16	6 x M16x130	6 x M16x140	30.0	27.5	206.0	206.0	

Tab. 2: Rated data for the screw set for brake mounting

<sup>1)</sup> Bolt fastening class 10.9 with washers in accordance with ISO 7089--300HV-A2C

**⚠ CAUTION**

- The screws for the different brake attachment variants have different strength grades and may have special surface coatings. In order to guarantee a secure screw connection, use **ONLY** the proper screws from INTORQ!
- It is very important to comply with the minimum thread depth of the end shield (refer to [Rated data for the screw set for brake mounting, Page 16](#)).
- If the required thread depth is not maintained, the fastening screws may run onto the thread root. This has the effect that the required pre-load force is no longer established – the brake is no longer securely fastened!

Size	Rated torque <sup>1)</sup> $M_K$	Voltage		Power <sup>2)</sup>		Coil resistance $R_N^{\pm 5\%}$	Current <sup>3)</sup> $I_L$
		Release $\pm 10\%$	Hold $\pm 10\%$	Brake release	Brake hold		
		$U_L$	$U_H$	$P_N$	$P_H$		
		[V DC]	[V DC]	[W]	[W]	[Ω]	[A]
17R	2 x 75	205	205	2 x 75	2 x 75	2 x 560	2 x 0.37
		103	103			2 x 142	2 x 0.73
	2 x 150	205	103	2 x 200	2 x 50	2 x 210	2 x 0.98
		103	51.5			2 x 52	2 x 1.99
18R	2 x 170	205	205	2 x 88	2 x 88	2 x 478	2 x 0.43
		103	103			2 x 121	2 x 0.85
	2 x 280	205	103	2 x 230	2 x 57.5	2 x 183	2 x 1.12
		103	51.5			2 x 46	2 x 2.23

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Size	Rated torque <sup>1)</sup>  $M_K$  [Nm]	Voltage		Power <sup>2)</sup>		Coil resistance  $R_N^{\pm 5\%}$  [Ω]	Current <sup>3)</sup>  $I_L$  [A]
		Release $\pm 10\%$	Hold $\pm 10\%$	Brake release	Brake hold		
		$U_L$ [V DC]	$U_H$ [V DC]	$P_N$ [W]	$P_H$ [W]		
19R	2 x 210	205	205	2 x 95	2 x 95	2 x 442	2 x 0.46
		103	103			2 x 112	2 x 0.92
	2 x 350	205	103	2 x 245	2 x 61	2 x 172	2 x 1.20
		103	51.5			2 x 43	2 x 2.38
20R	2 x 280	205	205	2 x 100	2 x 100	2 x 420	2 x 0.49
		103	103			2 x 106	2 x 0.97
	2 x 450	205	103	2 x 270	2 x 67.5	2 x 156	2 x 1.32
		103	51.5			2 x 39	2 x 2.62
22R	2 x 360	205	205	2 x 110	2 x 110	2 x 382	2 x 0.54
		103	103			2 x 96	2 x 1.07
	2 x 600	205	103	2 x 285	2 x 71	2 x 147	2 x 1.39
		103	51.5			2 x 37	2 x 2.77
25R	2 x 540	205	205	2 x 120	2 x 120	2 x 350	2 x 0.59
		103	103			2 x 88	2 x 1.17
	2 x 900	205	103	2 x 300	2 x 75	2 x 140	2 x 1.46
		103	51.5			2 x 35	2 x 2.91
28R	2 x 720	205	205	2 x 160	2 x 160	2 x 262	2 x 0.78
		103	103			2 x 66	2 x 1.55
	2 x 1200	205	103	2 x 400	2 x 100	2 x 106	2 x 1.95
		103	51.5			2 x 26	2 x 3.88

Tab. 3: Rated data for coil power

<sup>1)</sup> Minimum braking torque with run-in friction pairs at  $\Delta n = 100$  rpm

<sup>2)</sup> Power at 20 °C

<sup>3)</sup> Current at 20 °C during brake release



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### 4.3 Switching times

The operating times listed here are guide values which apply to DC switching with rated air gap  $s_{LN}$ , warm coil and standard characteristic torque. The operating times given are mean values and subject to variations. The engagement time  $t_1$  is approximately 8 to 10 times longer for AC switching. ...

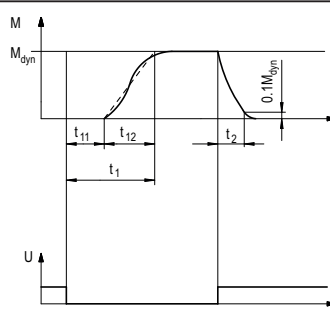


Fig. 3: Operating/switching times of the spring-applied brakes

$t_1$  Engagement time  
 $t_2$  Disengagement time (up to  $M = 0.1 M_{dyn}$ )  
 $M_{dyn}$  Braking torque at a constant speed of rotation  
 $t_{11}$  Delay time during engagement  
 $t_{12}$  Rise time of the braking torque  
 $U$  Voltage

Size	Rated torque	Max. permissible switching energy	Transitional operating frequency	Switching times						Max. speed
	$M_K$	$Q_E$	$S_{hue}$	DC-side engagement				Disengaging		$n_{max}^{5)}$
	[Nm]	[J]	[1/h]	$t_{10}^{1)}$	$t_{90}^{1)}$	$t_{11,AC}^{2)}$	$t_{1,AC}^{2)}$	$t_{2ab@S_{LN}}^{3)}$	$t_{2ab@S_{Lmax}}^{3)}$	
17R	2 x 75	42000	25	68	140	275	530	180	339	900
17R <sup>4)</sup>	2 x 150			39	77	150	315	134	194	
18R	2 x 170	60000	20	86	172	350	800	234	365	
18R <sup>4)</sup>	2 x 280			55	100	225	615	169	265	
19R	2 x 210	68000	19	100	182	425	1025	240	435	
19R <sup>4)</sup>	2 x 350			53	116	225	735	180	310	
20R	2 x 280	80000	19	87	175	350	1100	334	700	
20R <sup>4)</sup>	2 x 450			49	106	200	830	216	390	
22R	2 x 360	90000	18	95	207	350	1160	323	622	750
22R <sup>4)</sup>	2 x 600			53	125	200	890	234	400	
25R	2 x 540	120000	15	130	250	450	1410	362	800	700
25R <sup>4)</sup>	2 x 900			73	153	250	970	287	480	600

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Size	Rated torque	Max. permissible switching energy	Transitional operating frequency	Switching times						Max. speed
				DC-side engagement				Disengaging		
	M <sub>K</sub>	Q <sub>E</sub>	S <sub>hue</sub>	t <sub>10</sub> <sup>1)</sup>	t <sub>90</sub> <sup>1)</sup>	t <sub>11,AC</sub> <sup>2)</sup>	t <sub>1,AC</sub> <sup>2)</sup>	t <sub>2ab @ S<sub>LN</sub></sub> <sup>3)</sup>	t <sub>2ab @ S<sub>Lmax</sub></sub> <sup>3)</sup>	n <sub>max</sub> <sup>5)</sup>
	[Nm]	[J]	[1/h]	[ms]	[ms]	[ms]	[ms]	[ms]	[ms]	[rpm]
28R	2 x 720	180000	14	141	277	500	1490	402	750	600
28R <sup>4)</sup>	2 x 1200			69	176	300	1050	298	500	500

Tab. 4: Switching energy - operating frequency - operating times

- <sup>1)</sup> Operating/switching times, according to type examination certificate, are based on the rated torque.  $t_{50} = (t_{10} + t_{90}) / 2$ .
- <sup>2)</sup> Operating times refer to steady braking torque.
- <sup>3)</sup> Venting times under unfavorable conditions (240 switching operations per hour, 60% DC, 40 °C ambient temperature).
- <sup>4)</sup> Brake supplied with over-excitation (release voltage / holding voltage = 2/1).
- <sup>5)</sup> Max. speed according to type examination certificate (for higher speeds, please first contact the manufacturer).

#### Engagement time

The transition from a brake-torque-free state to a holding-braking torque is not free of time lags.

For emergency braking, short engagement times for the brake are absolutely essential. The DC-side switching in connection with a suitable spark suppressor must therefore be provided.

Engagement time for AC-side switching: The engagement time is significantly longer (approx. 5 times longer).



#### NOTICE

Connect the spark suppressors in parallel to the contact. If this is not admissible for safety reasons (e.g. with hoists and lifts), the spark suppressor can also be connected in parallel to the brake coil.

- If the drive system is operated with a frequency inverter so that the brake will not be de-energized before the motor is at standstill, AC switching is also possible (not applicable to emergency braking).
- The specified engagement times are valid for DC switching with a spark suppressor.
  - Circuit proposals: refer to DC switching at mains – fast engagement.



#### Notice

Spark suppressors are available for the rated voltages.

#### Disengagement time

The disengagement time is the same for DC-side and AC-side switching. The specified disengagement times always refer to control using INTORQ rectifiers and rated voltage.

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#### 4.4 Friction work / operating frequency

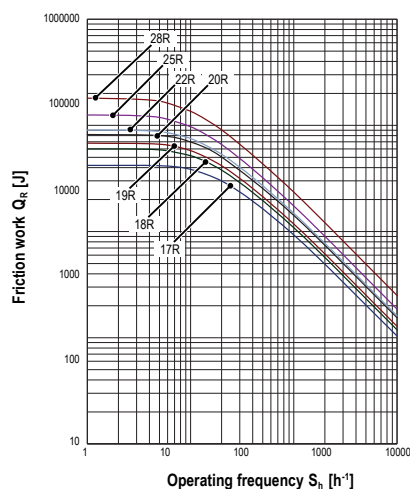


Fig. 4: Friction work as a function of the operating frequency

$$S_{hmax} = \frac{-S_{hue}}{\ln\left(1 - \frac{Q_R}{Q_E}\right)}$$

$$Q_{hmax} = Q_E \left(1 - e^{\frac{-S_{hue}}{S_h}}\right)$$

The permissible operating frequency  $S_{hmax}$  depends on the amount of heat  $Q_R$  (refer to Figure Friction work / operating frequency, Page 20). At a pre-set operating frequency  $S_h$ , the permissible amount of heat is  $Q_{Smax}$ .



#### Notice

With high speeds of rotation and switching energy, the wear increases, because very high temperatures occur at the friction surfaces for a short time.

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#### 4.5 Electromagnetic compatibility



##### Notice

The user must ensure compliance with EMC Directive 2014/30/EC using appropriate controls and switching devices.



##### NOTICE

If an INTORQ rectifier is used for the DC switching of the spring-applied brake and if the operating frequency exceeds five switching operations per minute, the use of a mains filter is required.

If the spring-applied brake uses a rectifier of another manufacturer for the switching, it may become necessary to connect a spark suppressor in parallel with the AC voltage. Spark suppressors are available on request, depending on the coil voltage.

#### 4.6 Emissions

##### Heat

Since the brake converts kinetic energy as well as mechanical and electrical energy into heat, the surface temperature varies considerably, depending on the operating conditions and possible heat dissipation. Under unfavourable conditions, the surface temperature can reach 130 °C.

##### Noise

The loudness of the switching noise during engaging and disengaging depends on the air gap "s<sub>t</sub>" and the brake size.

Depending on the natural oscillation after installation, operating conditions and the state of the friction surfaces, the brake may squeak during braking.

##### Others

The abrasion of the friction parts produces dust.

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#### 4.7 Labels on product

There is a packaging label on the package. The name plate is glued to the outer surface of the brake.

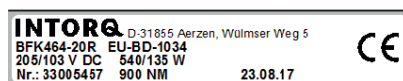


Fig. 5: Name plate

INTORQ	Manufacturer
BFK464-20-R	Type (refer to <a href="#">Product key, Page 3</a> )
EU-BD-1934	EC-type examination certificate
205/103 V DC	Rated voltage
540/135 W	Rated power
33005457	ID number
900 NM	Rated torque
23.08.17	Packaging date
CE	CE mark



Fig. 6: Packaging label

INTORQ	Manufacturer
33005457	ID number
BFK464-20R	Type (refer to <a href="#">Product key, Page 3</a> )
	Bar code
SPRING-APPLIED BRAKE	Designation of the product family
205/103 V DC	Rated voltages of both braking circuits
900 NM	Rated torque
Pieces	Qty. per box
540/135 W	Rated powers for both braking circuits
28.07.17	Packaging date
Anti-rust packaging: keep friction surface free of grease!	Addition
CE	CE mark

# Gearless Lift Machine

## WSG-MF

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#### Technical specifications

**INTORQ**



Fig. 7: Product traceability sticker

BFK464-20-R	Type (refer to <a href="#">Product key, Page 3</a> )
33005457	ID number
G1708200000000000	Serial number
	QR code

# Gearless Lift Machine

## WSG-MF

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#### Mechanical installation

**INTORQ**

## 5 Mechanical installation

This chapter provides step-by-step instructions for the installation.

#### Important notes



#### NOTICE

The toothed hub and screws must not be lubricated with grease or oil.

### 5.1 Design of end shield and shaft

- Comply with the specified minimum requirements regarding the end shield and the shaft to ensure a correct function of the brake.
- The diameter of the shaft shoulder must not be greater than the tooth root diameter of the hub.
- The form and position tolerances apply only to the materials mentioned. Consult with INTORQ before using other materials; INTORQ's written confirmation is required for such usage.
- The brake flange must be supported by the end shield across the full surface.
- Keep the end shield free from grease or oil.

#### Minimum requirements of the end shield

Size	Material	Roughness	Run-out	Levelness
			[mm]	[mm]
17R ... 28R	S235JR; C15; EN-GJL-250	Rz10 ... Rz16	< 0.1	< 0.1

Tab. 5: End shield as counter friction surface



# Gearless Lift Machine

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#### Mechanical installation

**INTORQ**

### 5.2 Tools

Size	Torque wrench Insert for hexagonal socket (Allen) screws		Open-end wrench Width across flats	Socket wrench for transport safety bolts
				
	Measuring range	Wrench width	Width across flats	Width across flats
	[Nm]	[mm]	[mm]	[mm]
17R	20 to 100	6	10	5
18R				
19R		8	13	6
20R				
22R		10	17	8
25R				
28R	40 to 250	14	19	10
Multimeter		Caliper gage		Feeler gage
				

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#### Mechanical installation

INTORQ

### 5.3 Preparing the installation

1. Remove the packaging from the spring-applied brake and dispose of it properly.
2. Check the delivery for completeness.
3. Check the name plate specifications (especially rated voltage)!



#### Notice

We provide a lifting mechanism for hooking onto a hoist to make it easier to remove the brake from its shipping container.

For sizes 22, 25 and 28, there is also an M10 thread (not shown) located in the middle between the connecting cables of the two brake circuits.

Make sure that the cylindrical dampers on the armature plate are not damaged when you are lifting the brake using an eyebolt.



Fig. 8: Lifting mechanism for hooking onto a hoist

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#### Mechanical installation

INTORQ

### 5.4 Installing the hub onto the shaft



#### Notice

The customer is responsible for dimensioning the shaft-hub connection. Make sure that the supporting length of the key is identical to the length of the hub.



#### NOTICE

If you are using the spring-applied brake for reverse operations, glue the hub to the shaft.

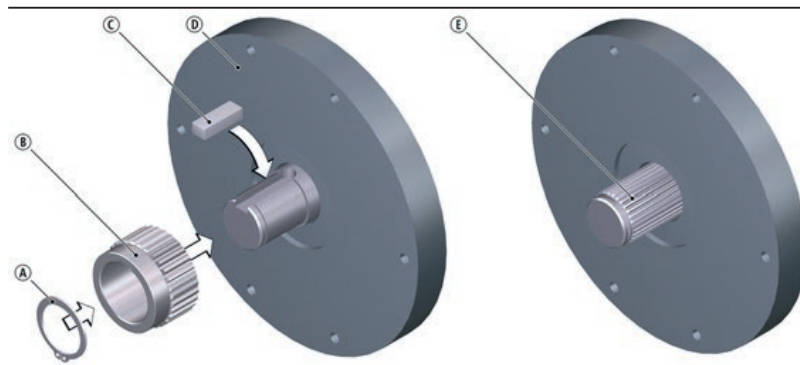


Fig. 9: Installing the hub onto the shaft

- |                |                              |                                   |
|----------------|------------------------------|-----------------------------------|
| (A) Circlip    | (B) Hub (optional)           | (C) Key shape B (angular version) |
| (D) End shield | (E) Toothed shaft (optional) |                                   |

1. Insert the key into the shaft.
2. Press the hub with a moderate amount of force to the shaft.
3. Secure the hub against axial displacement (for example, by using a circlip).

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#### Mechanical installation

INTORQ

### 5.5 Mounting the flange (optional)

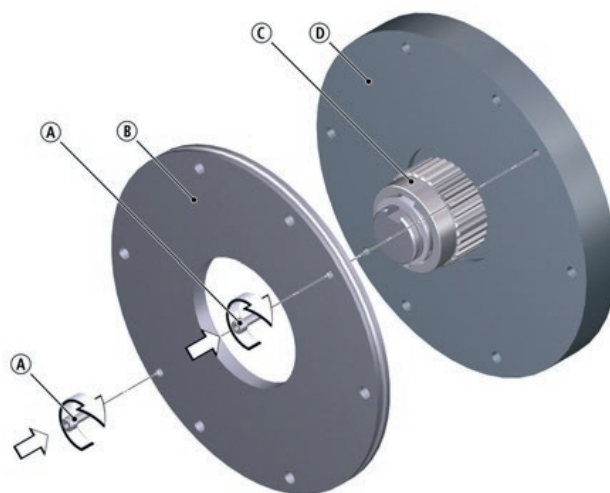


Fig. 10: Mounting the flange

- (A) Socket-head cap screw
- (B) Flange (optional)
- (C) Hub or shaft with teeth (optional)
- (D) End shield

1. Hold the flange to the end shield. Place the chamfer at the inner diameter on the side of the end shield.
2. Align the through holes in the flange to the threads of the fastening bore holes.

# Gearless Lift Machine

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#### Mechanical installation

INTORQ

### 5.6 Brake mounting



#### Notice

Here, the mounting of the brake is shown in the version with the optional flange and toothed shaft



#### NOTICE

Only in the case of rotors with mounting paste on their gear teeth:

- Remove cover films from both front ends of the rotor.
- Protect friction surfaces against contact with mounting paste!
- After the mounting, excessive mounting paste must be removed properly!

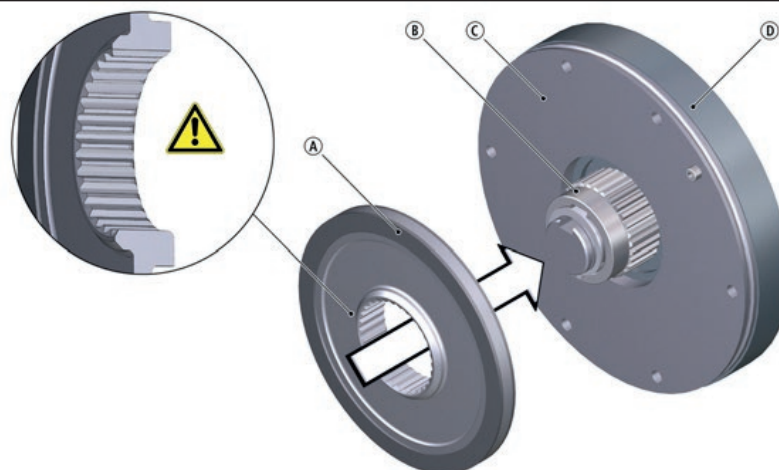


Fig. 11: Assembly of the rotor

- Ⓐ Rotor
- Ⓑ Hub or shaft with teeth (optional)
- Ⓒ Flange (optional)
- Ⓓ End shield



#### CAUTION

Note the illustration showing the chamfer of the rotor!

1. Push the rotor onto the shaft and check that it can be moved by hand.

# Gearless Lift Machine

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#### Mechanical installation

INTORQ

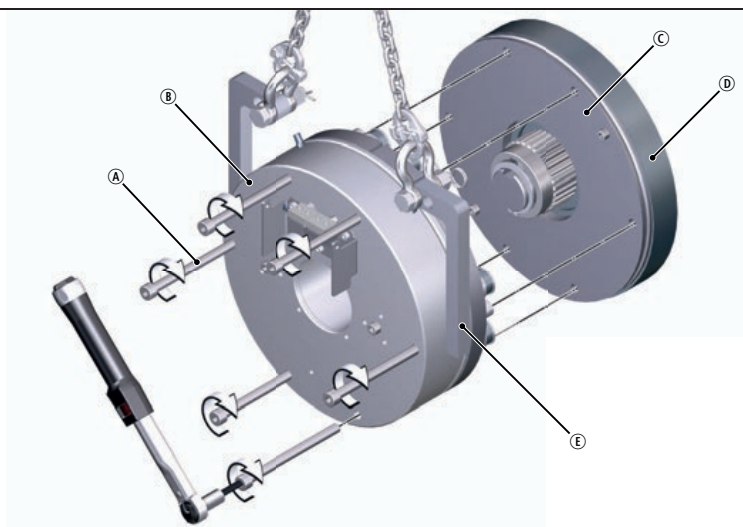


Fig. 12: Assembly of the stator

- |                            |                                  |                       |
|----------------------------|----------------------------------|-----------------------|
| (A) Socket head cap screws | (B) Stator                       | (C) Flange (optional) |
| (D) End shield             | (E) Lifting mechanism (optional) |                       |

2. Push the complete stator onto the shaft.
3. Evenly tighten the brake with the six socket head cap screws included in the scope of supply in several runs using a torque wrench.
4. Establish the electrical connection and energize the brake (siehe Chapter [Electrical connection](#), Page 38).

# Gearless Lift Machine

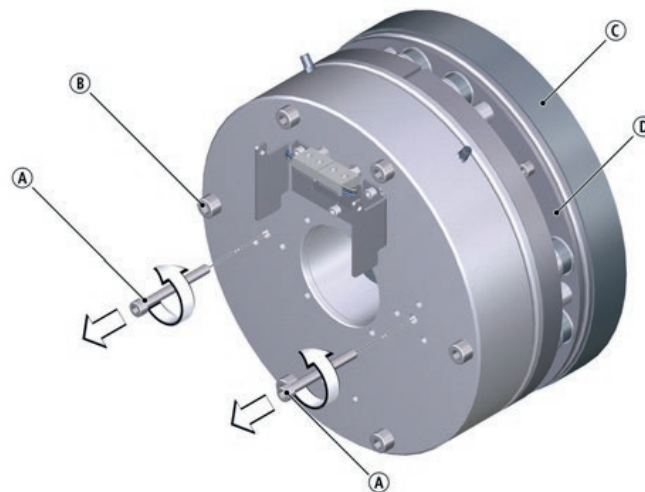
## WSG-MF

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#### Mechanical installation

**INTORQ**



**Fig. 13: Remove the safety bolts**

- (A) Transport safety bolts
- (B) Socket head cap screws
- (C) End shield
- (D) Flange (optional)

5. Remove the screws of the transport lock.
6. Use a torque wrench to retighten the supplied fastening screws with the required tightening torque, as shown in the table Rated data for the screw set for brake mounting, Page 16.
7. Switch off the power.



# Gearless Lift Machine

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#### Mechanical installation

**INTORQ**

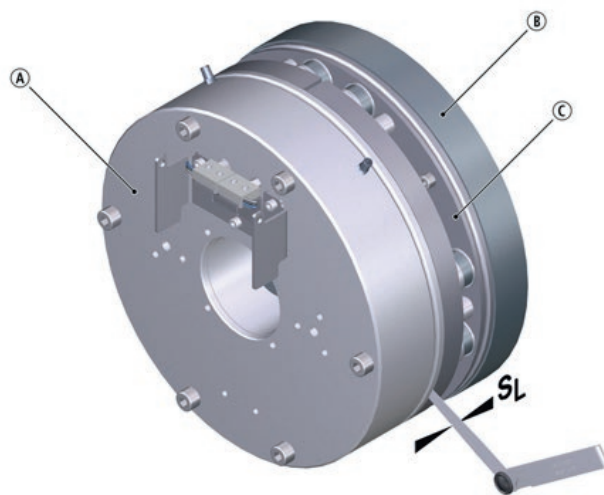
#### Checking the air gap



#### **⚠ DANGER**

**Danger: rotating parts!**

Switch off the voltage. The brake must be free of residual torque.



**Fig. 14:** Checking the air gap

8. Check the air gap near the screws by means of a feeler gage. Compare the measured values to the values for " $s_{LN}$ " in the table ([Rated data, Page 15](#)).



#### **Notice**

Do not insert feeler gage more than 10 mm between armature plate and stator!



#### **Notice**

If the measured value for " $s_L$ " is not within the tolerance, then the brake and the motor end shield must be checked!

# Gearless Lift Machine

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#### Mechanical installation

**INTORQ**

### 5.7 Cover ring assembly



#### NOTICE

Brakes without flange require a groove at the end shield for the lip of the cover ring.

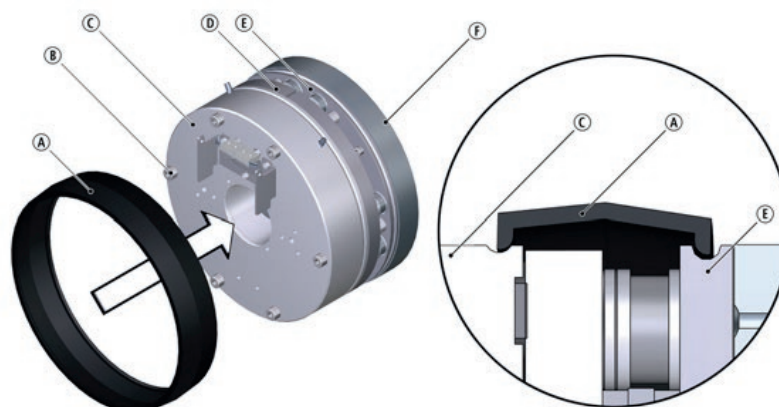


Fig. 15: Cover ring assembly

- |                    |                            |                |
|--------------------|----------------------------|----------------|
| (A) Cover ring     | (B) Socket head cap screws | (C) Stator     |
| (D) Armature plate | (E) Flange (optional)      | (F) End shield |

1. Disconnect electrical connection.
2. Pull the cable through the cover ring.
3. Push the cover ring over the complete stator.
4. Press the lips of the cover ring into the groove of the complete stator and flange / end shield.
5. Re-establish the electrical connection.



#### NOTICE

Cover ring with condensation drain hole:  
Attach the cover ring so that condensation can drain through the bore hole.

### 5.8 Installing the hand-release (retrofitting)



#### Notice

The hand-release is mounted on the spring-applied brake which is already fitted on the motor. During this, the brake is not energized (except for steps 10 through 14). The brake's air gap is less than the maximum permissible value " $S_{Lmax}$ ".

# Gearless Lift Machine

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#### Mechanical installation

INTORQ

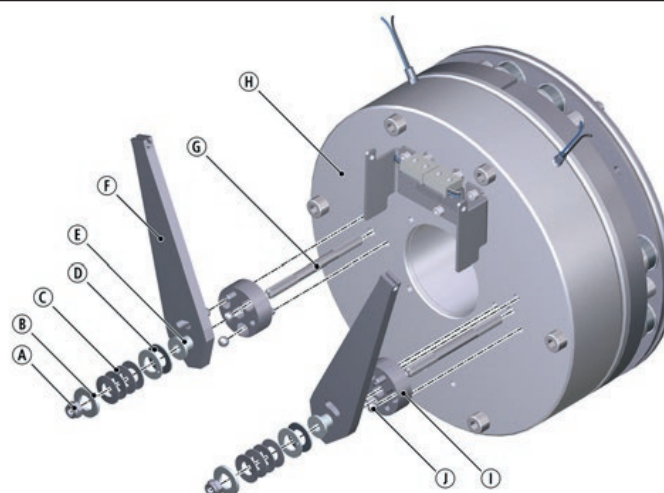


Fig. 16: Assembly of the hand-release BFK464-R

- |                   |            |                     |
|-------------------|------------|---------------------|
| (A) Nut           | (B) Washer | (C) Disk spring     |
| (D) Thrust washer | (E) Sleeve | (F) Lever           |
| (G) Stud bolt     | (H) Stator | (I) Perforated disk |
| (J) Ball          |            |                     |

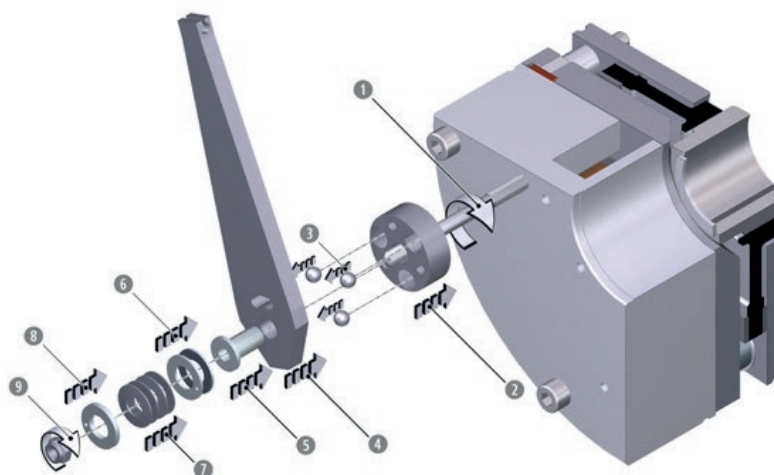


Fig. 17: Assembly of the hand-release BFK464-R

# Gearless Lift Machine

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#### Mechanical installation

**INTORQ**

1. Insert two stud bolts (with the short threaded ends first) into the housing bore holes of the transport locking screws (which have already been removed). Use a suitable tool to tighten them with the following tightening torques:  
10 Nm for sizes 17R and 18R, 20 Nm for sizes 19R and 20R, 40 Nm for sizes 22R and 25R or 70 Nm for size 28R.
2. Mount the disk with the three dowel pins into the bore holes on the brake. The protruding pins on the visible side of the disk must be oriented towards the cable outlet at the stator.
3. Insert the balls using some assembly paste into the bores of the lever.



#### NOTICE

Keep the friction lining free from grease and oil.

4. Put the lever (with the balls already inserted) onto the disk so it is concentric with the stud bolts. The dowel pin must protrude into the slot of the lever.
5. Insert the sleeves into the holes in the lever.
6. Place two thrust washers on the sleeve so that the lubricated coated sides face each other.
7. Place four disk springs in alternate directions in each of the thrust washers.
8. Place ring washers on the disk springs.
9. Screw the self-locking nuts onto the stud bolts and tighten them until they are flush against the ring washers.
10. Connect the brake to a suitable power supply and switch on the voltage (electrical release).
11. Tighten the nuts with the following tightening torques:  
4 Nm for sizes 17R and 18R, 7 Nm for sizes 19R and 20R, 10 Nm for sizes 22R and 25R or 15 Nm for size 28R.
12. Turn the nuts back according to the corresponding degrees:  
450° for sizes 17R and 18R, 360° for sizes 19R and 20R, 300° for sizes 22R and 25R or 260° for size 28R.
13. Check if a gap remains between the slot in the lever and the dowel pin while in this state (during hand-release).
14. Switch off the voltage.
15. Hook the Bowden cable onto the levers and operate the hand-release five times. Check the function of the hand-release mechanism (if the rotor can rotate). If necessary, repeat the configuration as described in steps 10 to 15.



#### NOTICE

Be sure to check the air gap "s<sub>L</sub>" before adjusting the hand-release (siehe [Checking the air gap, Page 32](#)).

# Gearless Lift Machine

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#### Mechanical installation

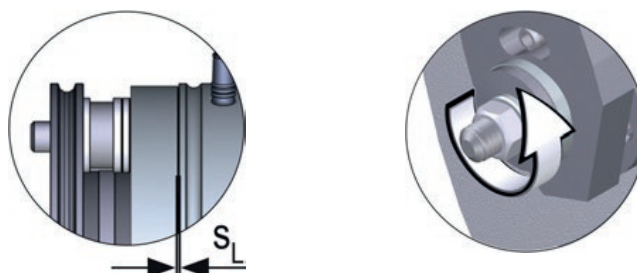

**INTORQ**


Fig. 18: Dimension "s<sub>L</sub>"

Size	s <sub>LN</sub> <sup>+0.06/-0.08</sup>	Turn-back degrees
	[mm]	[°]
17R	0.4	450 (1 1/4 turn)
18R		
19R		360 (1 turn)
20R		
22R		
25R	0.5	300 (5/6 turn)
28R		260 (7/10 turn)

Tab. 6: Turn-back degrees and air gap



**⚠ DANGER**

**The brake may fail.**

If the hand-release is incorrectly adjusted, the brake may fail and cause serious personal injury and damage to property.

Protective measure:

- Make sure that you comply with the specified turn-back degrees.

# Gearless Lift Machine

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#### Electrical installation

**INTORQ**

## 6 Electrical installation

#### Important notes



#### **DANGER**

**There is a risk of injury by electrical shock!**

- The electrical connections may only be made by trained electricians!
- Make sure that you switch off the electricity before working on the connections! There is a risk of unintended start-ups or electric shock.



#### **NOTICE**

Make sure that the supply voltage matches the voltage specification on the name plate.



#### **NOTICE**

- If an emergency stop is carried out without the required suppressor circuit, the control unit may be destroyed.
- Observe the correct polarity of the suppressor circuit!



#### **NOTICE**

- To functionally test the individual brake circuits, the power supply must be able to be switched off individually. For a new over-energizing during switch-on, it is also necessary to open switches K1/K3.
- The protective circuitry contained in the INTORQ switching device BEG-561-□□□-□□□ is not permitted for use in the lift technology. The protective circuitry must be connected in parallel to the brake coil (refer to the figure ).

# Gearless Lift Machine

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#### Electrical installation

INTORQ

### 6.1 Electrical connection

#### Switching suggestions

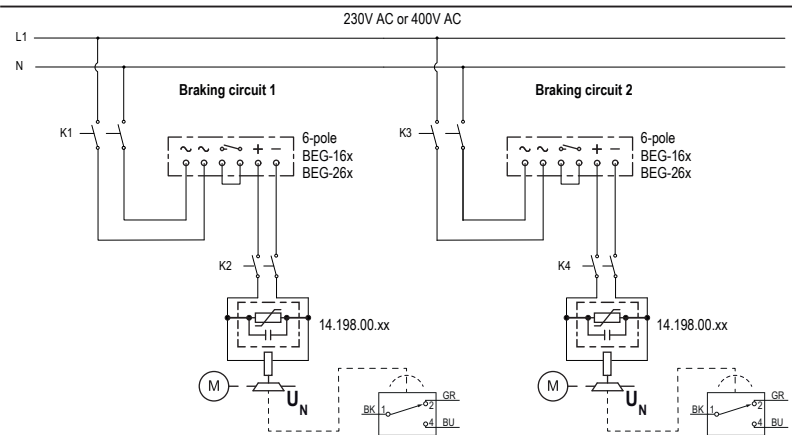


Fig. 19: Switching suggestion for the BFK464-R with holding current reduction

BK Black

GR Grey

BU Blue

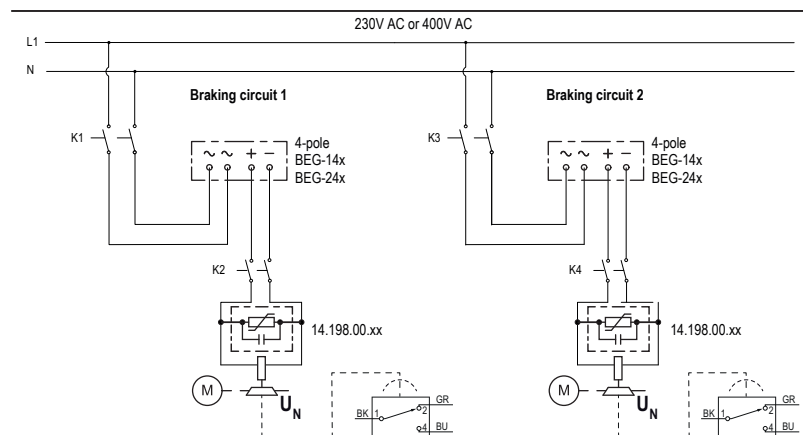


Fig. 20: Switching suggestion for the BFK464-R without holding current reduction

BK Black

GR Grey

BU Blue



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#### Electrical installation

**INTORQ**

##### Switching on

- K2/K4 must be switched on **before or at the same time** as K1/K3!

##### Switching off

- Normal - AC switching
  - K2/K4 remain closed
  - K1/K3 open
- Emergency stop - DC switching
  - K1/K3 and K2/K4 are opened at the same time



##### Notice

Recommended current load for the micro-switches

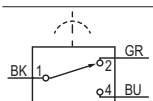
- DC current: 10 mA to 100 mA at 12 V
- AC current: 10 mA to 5 A at 12 V / max. 250 V
- Suppressor circuit: The limit voltage impacts the switching times (refer to the table [Switching energy - operating frequency - operating times, Page 18](#)).

## 6.2 Technical specifications for the micro-switch

The brake can be equipped with a micro-switch for monitoring the release or wear. The micro-switch can be integrated into the circuit as an NO or NC contact.

Design	Micro-switch
3-wire connecting cable	3 x 0.34 mm <sup>2</sup> (AWG22) black / grey / blue
	UL file number 36479
	Single wires, length 500 mm
Contacts	Silver
Current carrying capacity 250 V AC	Max. 3 A
Current carrying capacity 30 V DC	Max. 3 A
Minimum load at 24 V DC	10 mA
Temperature range:	-40 °C to +85 °C
Protection class	IP67

Tab. 7: Technical specifications for the micro-switch

	Switching states	s <sub>i</sub> = 0	s <sub>LN</sub>	s <sub>Lmax</sub> (-0.1)
	Checking the air gap	1 - 4	1 - 2	1 - 2
	Monitoring wear	1 - 4	1 - 4	1 - 2

Tab. 8: Switching states of the mechanical micro-switches

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#### Electrical installation

**INTORQ**

### 6.3 Rectifier

#### 6.3.1 Bridge-half-wave rectifier for brakes with holding voltage reduction

##### BEG-561-□□□-□□□

The bridge-half-wave rectifiers are used to supply electromagnetic DC spring-applied brakes which are approved for use with such rectifiers. Other use is only permitted with the approval of INTORQ.

Once a set over-excitation period has elapsed, the bridge-half-wave rectifiers switch over from bridge rectification to half-wave rectification.

Terminals 3 and 4 are located in the brake's DC circuit. When used in passenger elevators, these contacts must not be used to switch off the brake. Be sure to provide a protective circuit according to the "Switching suggestions" figures in the chapter [Electrical connection, Page 38](#).

#### 6.3.2 Bridge rectifier for brakes without holding voltage reduction

##### BEG-142-270

The four-pole bridge rectifiers are used to supply electromagnetic DC spring-applied brakes which are approved for use with such rectifiers. Other use is only permitted with the approval of INTORQ.

#### 6.3.3 Assignment: Rectifier - Brake size

Rectifier type	Supply voltage	Over-excitation		Holding current reduction	
	[V AC]	Coil voltage [V DC]	Size	Coil voltage [V DC]	Size
BEG-561-255-130	230	205	17R ... 28R	103	17R ... 28R
BEG-561-440-030-1	400	360	17R ... 28R	180	17R ... 28R
BEG-142-270	230	205	17R ... 28R	Without holding current reduction	

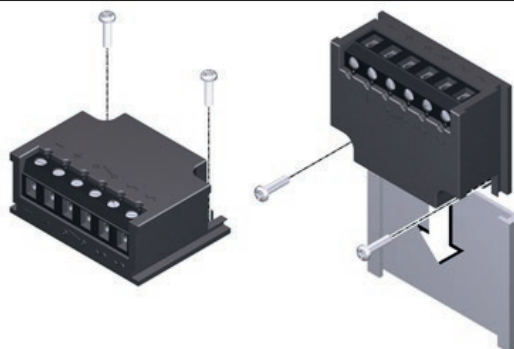


Fig. 21: BEG-561 fastening options

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#### Electrical installation

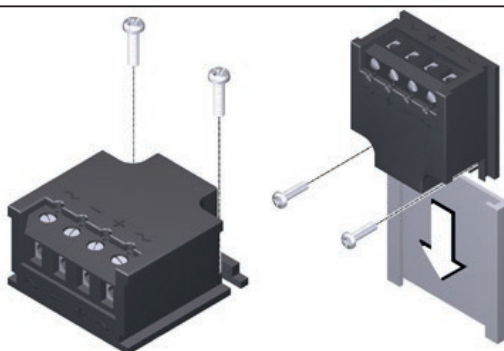
**INTORQ**


Fig. 22: BEG-142-270 fastening options

#### 6.3.4 Technical specifications

Rectifier type	Bridge / half-wave rectifier	Bridge rectifiers
Output voltage for bridge rectification	$0.9 \times U_1$	$0.9 \times U_1$
Output voltage for half-wave rectification	$0.45 \times U_1$	without
Ambient temperature (storage/operation) [°C]	-25 – +70	-25 – +80

$U_1$  input voltage (40 – 60 Hz)

Type	Input voltage $U_1$ (40 Hz – 60 Hz)			Max. current $I_{max}$		Over-excitation period $t_{ue}$ ( $\pm 20\%$ )		
	Min.	Rated	Max.	Bridge	half-wave	at $U_{1min}$	at $U_{1Nom}$	at $U_{1max}$
	[V~]	[V~]	[V~]	[A]	[A]	[s]	[s]	[s]
BEG-561-255-130	160	230	255	3.0	1.5	1,870	1,300	1,170
BEG-561-440-030-1	230	400	440	3.0	1.5	2,300	1,300	1,200
BEG-142-270	-	230	270	1.0	without	without	without	without

Tab. 9: Rectifier data

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#### Electrical installation

INTORQ

#### 6.3.5 Permissible current load at ambient temperature

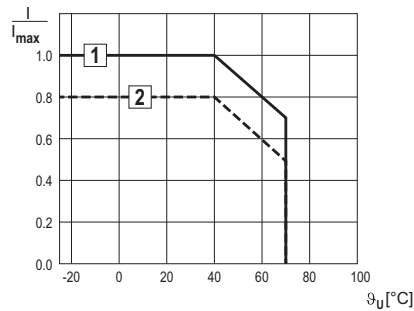


Fig. 23: Permissible current load for BEG-561-xxx-xxx

- ① If screwed to metal surface (good heat dissipation)
- ② For other installations (e.g. with adhesive)

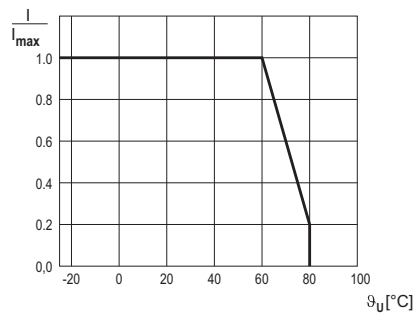


Fig. 24: Permissible current load for BEG-142-270

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#### Commissioning and operation

**INTORQ**

## 7 Commissioning and operation

#### Important notes



#### **DANGER**

##### **Danger: rotating parts!**

- The running rotor must not be touched.
- Take structural design measures on your final product and implement organizational safety rules to ensure that nobody can touch a rotor.



#### **DANGER**

##### **There is a risk of injury by electrical shock!**

The live connections must not be touched.

- The brakes are dimensioned in such a way that the specified rated torques are reached safely after a short run-in period.
- Increased breakaway torque is common, in particular after long downtimes in humid environments where temperatures vary.
- Before the initial commissioning, check the braking torque when the brake is being used on the customer's friction surfaces.
- If the brake is used as a pure holding brake without any dynamic load, the friction lining must be reactivated regularly by implementing the friction work.

### 7.1 Function checks before initial commissioning

#### 7.1.1 Brake with micro-switch

1. The switching contact for the brake must be open.
2. Remove two bridges from the motor terminals to de-energize the motor.
  - Do not switch off the voltage supply to the brake.



#### **NOTICE**

If the brake is connected via the neutral point of the motor, this connection must also be used for connecting the neutral conductor.

3. Apply DC voltage to the brake.
4. Measure the AC voltage at the motor terminals. The measured level must be zero.
5. Close the switching contact for the brake.
  - The brake is released.

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#### Commissioning and operation

**INTORQ**

6. Measure the DC voltage at the brake:
  - After the over-excitation time (refer to the table ), the measured DC voltage must correspond to the holding voltage (refer to Assignment: Bridge/half-wave rectifier – brake size). A deviation of  $\pm 10\%$  is permissible.
7. Check the air gap "s<sub>1</sub>".
8. It must be zero and the rotor must rotate freely.
9. Check the switching status of the micro-switch (siehe to table [Switching status of micro-switch, Page 44](#)).
10. Open the switching contact for the brake.
  - The brake is applied.
11. Check the switching status of the micro-switch (siehe to table [Switching status of micro-switch, Page 44](#)).
12. Switch off DC voltage for the brake.
13. Screw the bridges onto the motor terminals.
14. If necessary, remove the neutral conductor from the neutral point (step 2).

Contact type	Connection	Brake released	Micro-switch closed
N/C contact	black / grey	yes	no
		no	yes
NO contact	black / blue	yes	yes
		no	no

Tab. 10: Switching status of micro-switch

The preparations for commissioning are completed.

#### 7.1.2

#### Checking the hand-release



##### NOTICE

##### Labeling of drive systems and individual components

- The hand-release is designed for activation via a Bowden cable.
- An individual brake circuit can only be released electrically.

# Gearless Lift Machine

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Fig. 25: Turning direction of the lever



#### **DANGER**

**Danger: rotating parts!**

The motor must **not** be running when checking the hand-release.

1. Hang the Bowden cable (not included in the scope of delivery) and tighten it using the torque required for that size (750 to 1100 newtons for size 17 to size 28).
  - The drive must be able to turn freely. A low residual torque is permitted.
2. Release the lever.
  - A torque must now be built up!

## 7.2 Commissioning

1. Switch on drive system.
2. Carry out a braking test.



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### 7.3 During operation



#### **⚠ DANGER**

**Danger: rotating parts!**

The running rotor must not be touched.



#### **⚠ DANGER**

**There is a risk of injury by electrical shock!**

The live connections must not be touched.

- Checks must be carried out regularly. Pay special attention to:
  - unusual noises or temperatures
  - loose fixing elements
  - the condition of the electrical cables
- The armature plate must be tightened and the rotor must move without residual torque.
- Measure the DC voltage at the brake.
  - After the over-excitation time (refer to the table ), the measured DC voltage must correspond to the holding voltage (refer to Assignment: Bridge/half-wave rectifier – brake size). A deviation of  $\pm 10\%$  is permissible.
- If a fault occurs once, go through the troubleshooting table (siehe the chapter Troubleshooting and fault elimination). If the fault cannot be fixed or eliminated, please contact the customer service department.

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#### Maintenance and repair

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## 8 Maintenance and repair

INTORQ spring-applied brakes are wear-resistant and designed for long maintenance intervals. The friction lining and braking mechanism are subject to operational wear. To ensure safe and trouble-free operations, the brake must be checked at regular intervals and replaced when necessary (refer to the table Maintenance intervals BFK458).

### 8.1 Wear of spring-applied brakes



**⚠ WARNING**

**Braking torque reduction**

The system must **not** be allowed to continue operations after the maximum air gap  $s_{Lmax}$  has been exceeded. Exceeding the maximum air gap can cause a major reduction in the braking torque!

The table below shows the different causes of wear and their impact on the components of the spring-applied brake. The influential factors must be quantified so that the service life of the rotor and brake can be calculated and so that the prescribed maintenance intervals can be specified accurately. The most important factors in this context are the applied friction work, the initial speed of rotation of braking and the operating frequency. If several of the causes of friction lining wear occur in an application at the same time, the effects should be added together when the amount of wear is calculated.

Component	Cause	Effect	Influencing factors
Friction lining	Braking during operation	Wear of the friction lining	Friction work
	Emergency stops		
	Overlapping wear during start and stop of drive		
	Active braking via the drive motor with support of brake (quick stop)		Number of start/stop cycles
	Starting wear in case of motor mounting position with vertical shaft, even when the brake is not applied		
Armature plate and flange	Rubbing and friction of the brake lining	Armature plate and flange are run in	Friction work
Gear teeth of brake rotor	Relative movements and shocks between brake rotor and brake hub / toothed shaft	Wear of gear teeth (primarily on the rotor side)	Number of start/stop cycles
Brake support	Load reversals and jerks in the backlash between the armature plate and guide pins	Breaking of armature plate and guide pins	Number of start/stop cycles, braking torque
Springs	Axial load cycle and shear stress of springs through radial backlash on reversal of armature plate	Reduced spring force or fatigue failure	Number of switching operations of brake

Tab. 11: Causes for wear

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## 8.2 Inspections

To ensure safe and trouble-free operations, the spring-applied brakes must be checked at regular intervals and, if necessary, replaced. Servicing at the facility will be easier if the brakes are made accessible. This must be considered when installing the drives in the plant.

Primarily, the required maintenance intervals for industrial brakes result from their load during operation. When calculating the maintenance interval, all causes for wear must be taken into account. (Refer to the table Causes for wear). For brakes with low loads (such as holding brakes with emergency stop function), we recommend a regular inspection at a fixed time interval. To reduce costs, the inspection can be carried out along with other regular maintenance work in the plant.

Failures, production losses or damage to the system may occur when the brakes are not serviced. Therefore, a maintenance strategy that is adapted to the particular operating conditions and brake loads must be defined for every application. For the spring-applied brakes, the maintenance intervals and maintenance operations listed in the table below must be followed. The maintenance operations must be carried out as described in the detailed descriptions.

### 8.2.1 Maintenance intervals

Versions	Operating brakes	Holding brakes with emergency stop
BFK464-R	■ according to the service life calculation	■ at least every 2 years
	■ or else every six months	■ after 1 million cycles at the latest
	■ after 4000 operating hours at the latest	■ Plan shorter intervals for frequent emergency stops.

## 8.3 Maintenance



#### Notice

Brakes with defective armature plates, springs or flanges must be completely replaced. Observe the following for inspections and maintenance works:

- Contamination by oils and greases should be removed using brake cleaner, or the brake should be replaced after determining the cause. Dirt and particles in the air gap between the stator and the armature plate endanger the function and should be removed.
- After replacing the rotor, the original braking torque will not be reached until the run-in operation for the friction surfaces has been completed. After replacing the rotor, the run-in armature plates and the flanges have an increased initial rate of wear.

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#### 8.3.1 Checking the components

With mounted brake	■ Check release function and control	Refer to <a href="#">Release / voltage, Page 50</a>
	■ Measure the air gap	
	■ Measure the rotor thickness (replace rotor if required)	Refer to <a href="#">Check the rotor thickness, Page 49</a>
	■ Thermal damage of armature plate or flange (dark-blue tarnishing)	
After removing the brake	■ Check the play of the rotor gear teeth (replace worn-out rotors)	Refer to <a href="#">Replace rotor, Page 51</a>
	■ Check for breaking out of the torque support at the guide parts and the armature plate	
	■ Check the springs for damage	
	■ Check the armature plate and flange or end shield <ul style="list-style-type: none"> <li>– Flatness depending on the size</li> <li>– Max. run-in depth = rated air gap for the size</li> </ul>	Refer to the End shield as counter-friction surface: Table table. Refer to the Rated data for air gap specifications table.

#### 8.3.2 Check the rotor thickness



**⚠ DANGER**  
**Danger: rotating parts!**  
The motor must **not** be running when checking the rotor thickness.

1. Remove the fan cover.
2. Remove the cover ring, when present.
3. Measure the rotor thickness using a caliper gage. For the friction-plate design: observe the edging on outer diameter of friction plate.
4. Compare the measured rotor thickness with the minimum permissible rotor thickness. (Refer to the values in the table Rated data for air gap specifications.) If the measured rotor thickness is insufficient, the rotor must be replaced completely. (Refer to Replace rotor for the description.)

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#### 8.3.3 Checking the air gap



##### **⚠ DANGER**

**Danger: rotating parts!**

The motor must **not** run while the air gap is being checked.

1. Measure the air gap  $s_L$  between the armature plate and the stator near the fastening screws using a feeler gauge. (Refer to table Rated data for air gap specifications for the values.)
2. Compare the measured air gap to the value for the max. permissible air gap  $s_{Lmax}$ . (Refer to table Rated data for air gap specifications for the values.)
3. If required, replace both rotors completely ([Replace rotor, Page 51](#)).

#### 8.3.4 Release / voltage



##### **⚠ DANGER**

**Danger: rotating parts!**

The running rotor must not be touched.

1. Check the brake functionality when the drive is running: The armature plate must be tightened and the rotor must move without residual torque.
2. Measure the DC voltage at the brake.
  - Compare the measured voltage to the voltage specified on the name plate. A deviation of up to 10% is permitted.
  - When using bridge/half-wave rectifiers: After switching to one-way voltage, the measured DC voltage may drop to 45% of the voltage specified on the name plate.

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#### Maintenance and repair

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#### 8.3.5 Replace rotor



#### **⚠ DANGER**

##### **Danger: rotating parts!**

Switch off the voltage. The brake must be free of residual torque.  
Your system should be mechanically immobilized in the event that it could start moving when the brake is released.

1. Remove the connection cables.
2. Loosen the screws evenly and then remove them.
3. Pay attention to the connection cable during this step! Remove the complete stator from the end shield.
4. Check the armature plate's friction surface. Replace the complete stator when there is clearly visible scoring at the running surface.
5. Pull the rotor off the hub.
6. Check the hub's gear teeth.
7. Replace the hub if wear is visible.
8. Check the end shield's friction surface. Replace the friction surface on the end shield when there is clearly visible scoring at the running surface.
9. You can now install and adjust the new rotor and the complete stator. (Refer to [Brake mounting, Page 29.](#))
10. Re-connect the connection cables.
11. If necessary, deactivate the mechanical shutdown of the system.

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### 8.4 Spare parts list

- Only parts with item numbers are available.
  - The item numbers are only valid for the standard design.
- Please include the following information with the order:
  - Order number of the brake
  - Position number of the spare part



Fig. 26: Spring-applied brake 464-□□R

	Designation	Variant
Ⓐ	Complete hand-release	
Ⓑ	Fastening screws Fastening screws	<ul style="list-style-type: none"> <li>■ for mounting to the flange with through-holes</li> <li>■ for mounting to the motor</li> </ul>
Ⓒ	Complete stator	<ul style="list-style-type: none"> <li>■ Voltage</li> <li>■ Rated torques</li> </ul>
Ⓓ	Noise reducer	
Ⓔ	Hub	
Ⓕ	Complete rotor	<ul style="list-style-type: none"> <li>■ For brake with hub</li> <li>■ For directly toothed shaft</li> </ul>
Ⓖ	Flange	
Ⓗ	Cover ring	



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#### Troubleshooting and fault elimination

**INTORQ**

## 9 Troubleshooting and fault elimination

If any malfunctions should occur during operations, please check for possible causes based on the following table. If the fault cannot be fixed or eliminated by one of the listed steps, please contact customer service.

Fault	Cause	Remedy
Brake does not release	Coil interruption	<ul style="list-style-type: none"> <li>■ Measure coil resistance using a multimeter: <ul style="list-style-type: none"> <li>– If resistance is too high, replace the complete stator.</li> </ul> </li> </ul>
	Coil has contact to earth or between windings	<ul style="list-style-type: none"> <li>■ Measure coil resistance using a multimeter: <ul style="list-style-type: none"> <li>– Compare the measured resistance with the nominal resistance. Refer to Rated data for coil powers for the values. If resistance is too low, replace the complete stator.</li> </ul> </li> <li>■ Check the coil for short to ground using a multimeter: <ul style="list-style-type: none"> <li>– If there is a short to ground, replace the complete spring-applied brake.</li> </ul> </li> <li>■ Check the brake voltage (refer to section on defective rectifier, voltage too low).</li> </ul>
	Wiring defective or wrong	<p>Check the wiring and correct.</p> <ul style="list-style-type: none"> <li>■ Check the cable for continuity using a multimeter <ul style="list-style-type: none"> <li>– Replace a defective cable.</li> </ul> </li> </ul>
	Rectifier defective or incorrect	<ul style="list-style-type: none"> <li>■ Measure rectifier DC voltage using a multimeter.</li> <li>■ If DC voltage is zero:</li> <li>■ Check AC rectifier voltage.</li> <li>■ If AC voltage is zero: <ul style="list-style-type: none"> <li>– Switch on power supply</li> <li>– Check fuse</li> <li>– Check wiring.</li> </ul> </li> <li>■ If AC voltage is okay: <ul style="list-style-type: none"> <li>– Check rectifier,</li> <li>– Replace defective rectifier</li> </ul> </li> <li>■ Check coil for inter-turn fault or short circuit to ground.</li> <li>■ If the rectifier defect occurs again, replace the entire spring-applied brake, even if you cannot find any fault between turns or short circuit to ground. The error may only occur on warming up.</li> </ul>

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Fault	Cause	Remedy
Brake does not release	Incorrect micro-switch wiring	Check the wiring of the micro-switch and correct it.
	Micro-switch incorrectly set	Replace the complete stator and make a complaint about the setting of the micro-switch to the manufacturer.
	Air gap "s <sub>L</sub> " is too large	<ul style="list-style-type: none"> <li>For non-adjustable brakes: <ul style="list-style-type: none"> <li>Replace rotor. Refer to <a href="#">Replace rotor, Page 51</a>.</li> </ul> </li> </ul>
Rotor cannot rotate freely	Air gap "s <sub>L</sub> " too small	Check the air gap "s <sub>L</sub> ".
Rotor is too thin	Rotor has not been replaced in time	Replace rotor. Refer to <a href="#">Replace rotor, Page 51</a> .
The voltage is not zero during the functional test (refer to the chapter <a href="#">Function checks before initial commissioning, Page 43</a> ).	Incorrect micro-switch wiring	Check and correct the wiring of the micro-switch.
	Micro-switch defective or incorrectly set	Replace the complete stator and return the defective complete stator to the manufacturer.
Voltage too high	Brake voltage does not match the rectifier	Adjust rectifier and brake voltage to each other.
Voltage too low	Brake voltage does not match the rectifier	Adjust rectifier and brake voltage to each other.
	Defective rectifier diode	Replace the defective rectifier with a suitable undamaged one.
AC voltage is not mains voltage	Fuse is missing or defective	Select a connection with proper fusing.
	Incorrect micro-switch wiring	Check and correct the wiring of the micro-switch.
	Micro-switch defective or incorrectly set	Replace the complete stator and return the defective complete stator to the manufacturer.

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33006446 | BA 14.0214 | EN | 3.0 | © 10/2019 | SC

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