Gearless Lift Machine

WSG-08 with caliper disk brake
Operating Instructions

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Gearless Lift Machines

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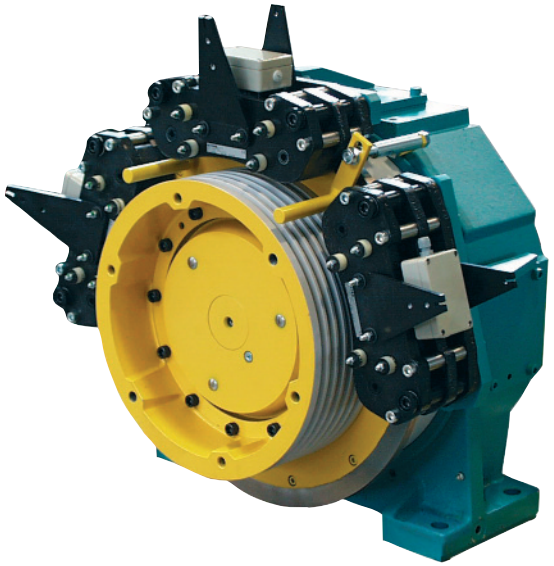
WSG-08.1
WSG-08.2
WSG-08.3
WSG-08.4

with caliper disk brake



English

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These operating instructions are applicable to lift machines:

WSG – 08. ....
with caliper disk brake

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Contents

1. General safety instructions

Explanation of symbols used in these instructions


Danger

means that death or serious injury to persons or serious damage to property will occur unless the appropriate precautions are taken.


Warning

means that death or serious injury to persons or serious damage to property may occur unless the appropriate precautions are taken.


Caution

means that injuries to persons or damage to property may occur unless the appropriate precautions are taken.


Note

points out important information and operating instructions. If these are not observed, damage, hazards or faults may result.

Intended use

The WSG-08 lift machines have been manufactured in compliance with the latest state of the art and recognised safety regulations. They may only be used for the purpose for which they are intended, and with all safety devices in proper working order.

The WSG-08 may only be used for driving lifts. "Intended use" also requires that the instructions contained in the documentation supplied with the machine and the commissioning instructions be observed, and that the specified inspection and maintenance work be carried out.

Warranty and liability

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

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-08 lift machine
- Improper installation, commissioning, operation or maintenance
- Operation of the WSG-08 with defective and/or inoperative safety or protective devices
- Non-compliance with the instructions contained in the operating instructions or other documentation supplied
- Unauthorised construction modifications to the WSG-08
- Insufficient monitoring of parts subject to wear
- Repairs carried out improperly
- Emergencies caused by external forces or force majeure

Safety precautions

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.

The WSG-08 lift machines are intended for use in an enclosed, lockable machine room to which only qualified personnel and personnel authorised by the customer have access.


Danger

- The instructions given in this manual or any other instructions supplied must always be observed to avoid danger or damage.
- WSG-08 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.
- 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 converter. Direct connection to the mains may destroy the motor.

Warning

- 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 EC 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.
- High voltages are applied at the terminal connections during the operation of synchronous motors.

2. Product description

The compact flat-type gearless WSG-08 lift machines are designed for gearless traction sheave lifts with or without a machine room. They are intended for operation with a 2:1 or 1:1 suspension and are distinguished by their high efficiency, extremely low noise and excellent operating characteristics.

The WSG-08 gearless lift machines are designed solely for use with electronic frequency converters.

The synchronous motor has been designed for various rated torques, based on a number of overall widths. It can also be supplied for several rated speeds, which can then be further adapted to meet individual customer requirements.

The brake disc is cast onto the spheroidal cast iron rotor to which the traction sheave (5) is also connected positively and by frictional contact. The traction sheave is optimised for customer-specific dimensions and grooves.

Six threaded holes (6) are provided on the front end periphery, permitting a mechanical return motion device to be fitted in case of an emergency.

The rotor with shaft (7) is inserted in the stator frame and supported in a robust self-aligning roller bearing (8) in the main bearing head and, at the other end, in a supporting ball bearing (9) or, if the traction sheave diameter is 340 mm, in a cylindrical roller bearing. The bearing is preloaded axially using an ondular washer (10) for noise reduction. The bearings are sealed on both

sides and life-lubricated. The main bearing has a provision for relubrication.

The drive-specific measuring system (11) is located within the centre of the machine behind the ball bearing. It is connected to the power supply by a signal plug connector (12). Within certain limits, depending on the motor dimensions, different measuring systems can be installed.

The electrical connection of the motor is made in the terminal box (13) where the temperature monitoring device is also connected.

The EC type-examined brake system comprises two or three external caliper disk brakes (14), which are connected to the supply voltage via separate brake control devices. The devices are located in the respective terminal boxes (15), which also accommodate the terminals for the monitoring contacts. Each brake can thus be released individually. The brakes can also be released manually, if required, by fitting lever eye bolts or a Bowden cable to the lever plates (16).

The brakes are designed such that in the case of failure of one brake the remaining brakes are able to decelerate a car carrying a full payload.

The two rope slip-off guards (18, 19) can also be fitted at locations 20 and 21 if required.

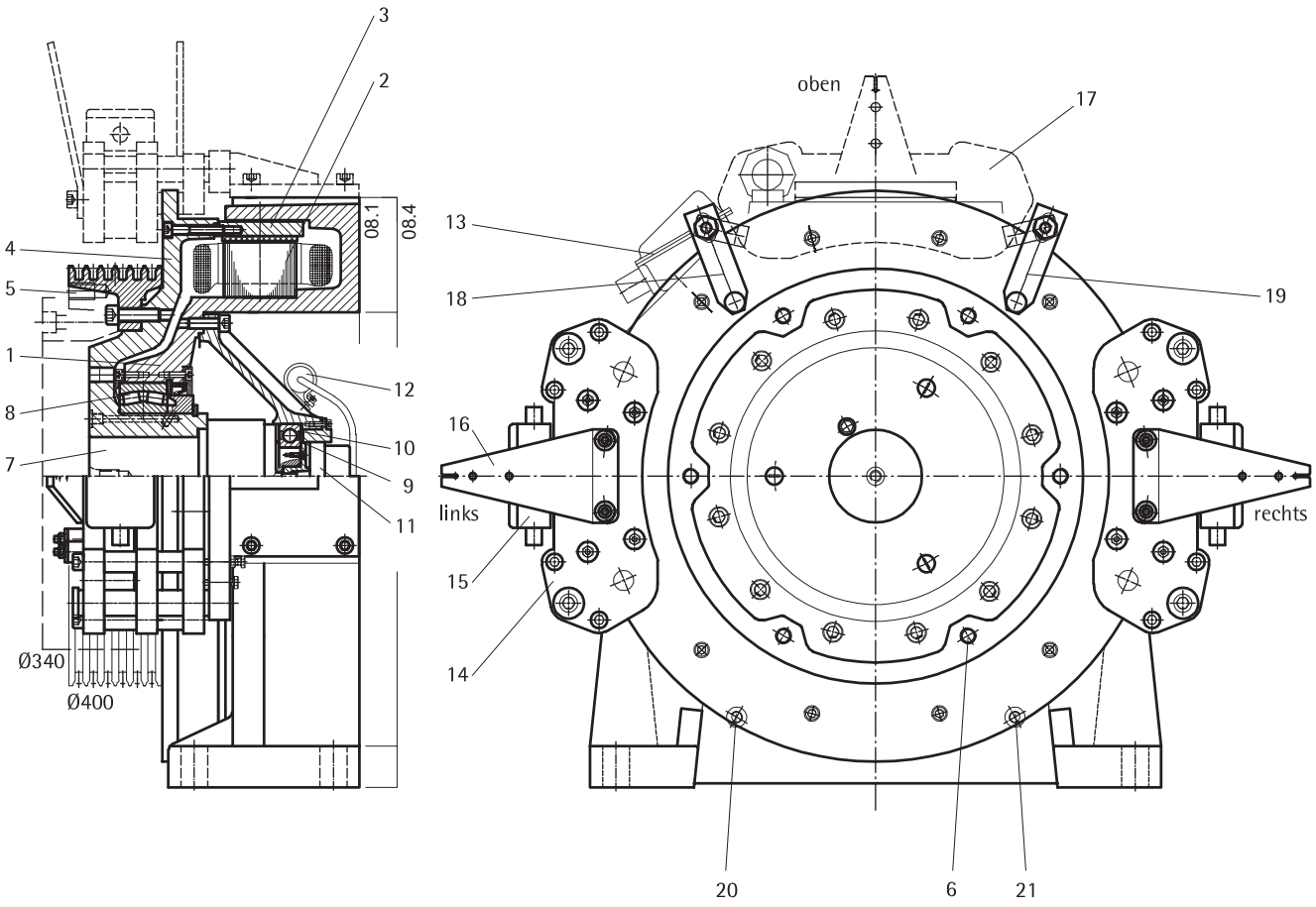
We would like to refer to the relevant patents held by KONE Corporation for lifts without machine room.

3. Nameplate

The nameplate of the lift machine is on the motor frame.

Gearless Lift Machine

WSG-08 with caliper disk brake
Operating Instructions



1	Main bearing head	11	Measuring system (ECN 1313)
2	Laminated stator core	12	Measuring system connection
3	Magnet ring	13	Motor connection
4	Rotor	14	caliper disk brake
5	Traction sheave	15	Brake connection
6	Thread for return motion device	16	Ever plate
7	Shaft	17	Example of "brake top-mounted"
8	Self-aligning roller bearing	18,19	Rope slip-off guards
9	Ball bearing	20, 21	Alternative locations for rope slip-off guard
10	Sinous spring		

4. Scope of supply

- Lift machine WSG-08 according to order specification
- Operating instructions
- Delivery note

Options:

- Release lever set with remotely controlled bowden cable
- Return motion device
- Connecting cable for measuring system
- Cable set for motor and brake
- UL-CSA approved

5. Transport and storage

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 incurred in transit is found, make a notice of claim in the presence of the carrier. If necessary, do not put these machines into operation.

Transport

Warning

Observe the relevant safety regulations and take the centre of gravity into account when handling the lift machines.

The eyebolts are designed for the specified machine weight, i.e. it is not permitted to suspend additional loads.

Storage

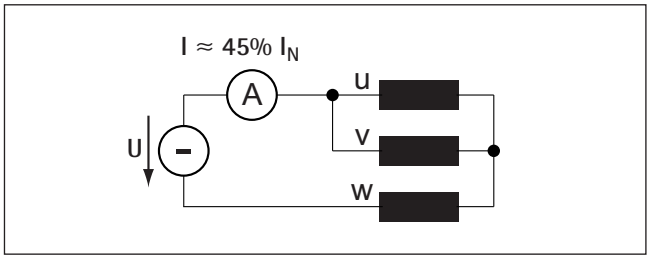
Store the motors only in closed, dry, dust-free, well-ventilated and vibration-free rooms (storage temperature: -20°C to 60°C). Do not store lift machines in the open air. Bright parts are not sufficiently preserved to withstand extended periods of exposure.

Avoid excessive storage periods (recommendation: max. one year).

After prolonged storage (>3 months), rotate the motor in both directions at a low speed (< 20 min^{-1}) to allow the grease to distribute evenly in the bearings.

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 V DC).

This can be done, for instance, with heated air, in a drying oven, or by applying a d.c. voltage to the motor connections.
Make sure that the voltage selected does not exceed the values shown in the figure *"Drying the winding"*. Let the temperature rise to about 70 – 80°C and maintain it for several hours.



Drying the winding

Unpacking

Note

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.

6. Installation

Danger

Be sure to check the base frame or foundation loads by calculation before installing the lift machine.

The lift machine may only be installed if the relevant safety precautions have been met.

The machines can be used in lift systems with or without a machine room.

Note

When using the machine in a shaft, please take the patent situation into consideration.

The machines may only be installed, electrically connected and put into operation by trained specialist personnel. The system-specific conditions and the requirements of the system manufacturer or plant constructor must be met.

Warning

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

Note

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.

Degree of protection

Lift machines are designed with degree of protection IP 41. Make sure that the cable entries to the terminal boxes are sealed properly when making the electrical installation.

Ambient conditions

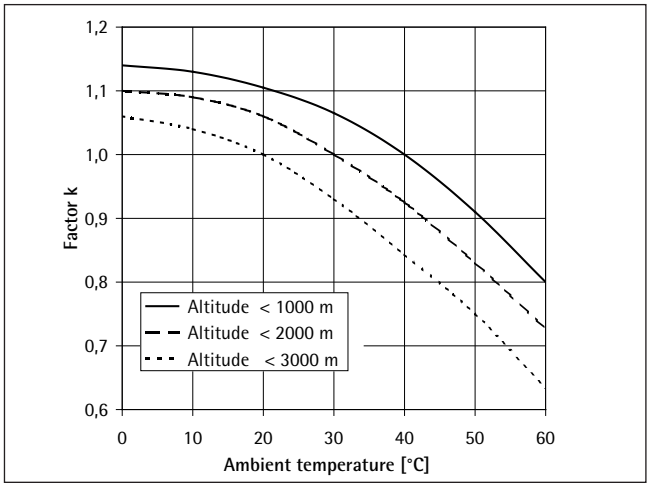
The following ambient conditions must be ensured on site:

Altitude:	max. 1,000 m a.s.l.
Ambient temperature:	- 5 ... 40°C
Max. rel. 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.

The torque and power values indicated in the Technical Data apply to the above ambient temperatures and altitudes. In case of a deviating altitude and/or ambient temperature, the reduction factors k shown in the diagram below must be used.

$$M_{permiss.} = k * M_N$$
$$P_{permiss.} = k * P_N$$



Fastening the machine

Note

The rope force can be applied to the lift machine in any direction.

The machine or base frame should be mounted on rubber pads for vibration damping.

The machine is fastened using 4 M24 bolts (strength class 12.9; tightening torque: 1,150 Nm).

The permissible uneveness 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.

Danger

After completing the adjusting work or after a breakdown, tighten all the fastening bolts of the machine, using the specified torque.

Warning

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 could destroy the bearings and the magnets.

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 1.5 mm.

7. Electrical connection

7.1. General


Danger

The electrical connection may only be made by a qualified electrician.

Before starting any work on the machines, ensure that the lift machine or system is properly isolated.

Before making any connections check that

- the connecting cables are suitable for their specific application and for the relevant voltages and currents.
- the sufficiently dimensioned connecting cables and torsion, strain and shear relief as well as anti-kink protection are provided
- the protective conductor (Protection Class I only) 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 or water.


Note

The insulation system of the motors is designed such that they can be connected to a converter with a maximum d.c. link voltage $U_{link\ max}$ up to max. 700 Volt.

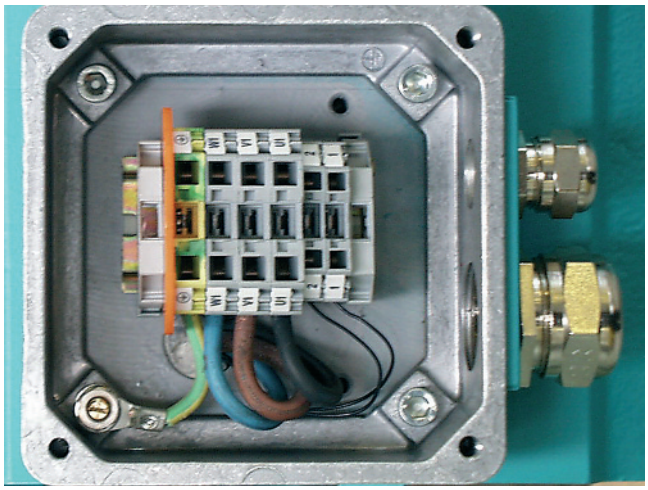
Note: $U_{link\ max}$ is the maximum value of the d.c. link voltage which is only transient and approximately equivalent to the inception voltage of the braking chopper or of the energy recovery unit.

The maximum permissible rate of voltage rise (dU/dt) at the motor terminals may be max. 4 kV/µs.

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. Motor connection / Winding protection

The electrical connection of the motor and the winding monitoring devices is made in the terminal box on top of the machine.



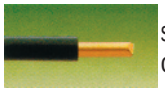
Terminal box for motor connection

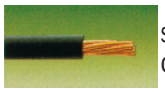

Caution

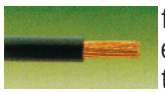
The motor cable must be shielded. Ensure that the cable shield contacts the frame over a large area at both ends.

The motor phases U1, V1 and W1 must be connected correctly to the corresponding phases of the converter; they must not be interchanged.

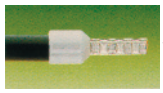
The WAGO terminal strips are suitable for the following types of copper conductors:


single-core conductor


stranded conductor


fine-stranded conductor


fine-stranded compacted conductor


fine-stranded with ferrule conductor [1)]


fine-stranded with terminal pin conductor

[1)] When using the nominal cross-sections with ferrules, the usable cable cross-section is reduced!

Technical data:

Cable cross-section: ...**4** mm² (**6** mm² with WSG-08.4)

Stripping length required: 9...10 mm

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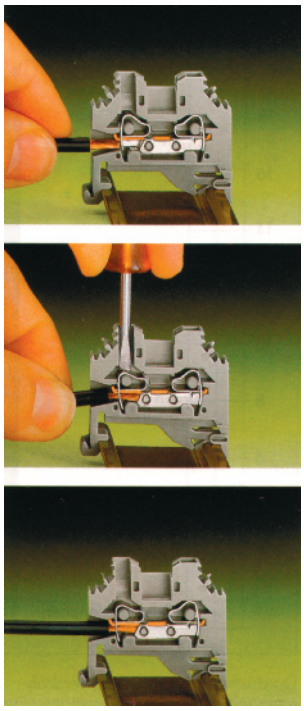
Handling



- Hold the bared conductor against the terminal.
- Force down the spring and push the conductor into the terminal.
- Relieve the spring - the conductor is securely clamped

Handling the terminal strip

Cable cross-section required:

Note

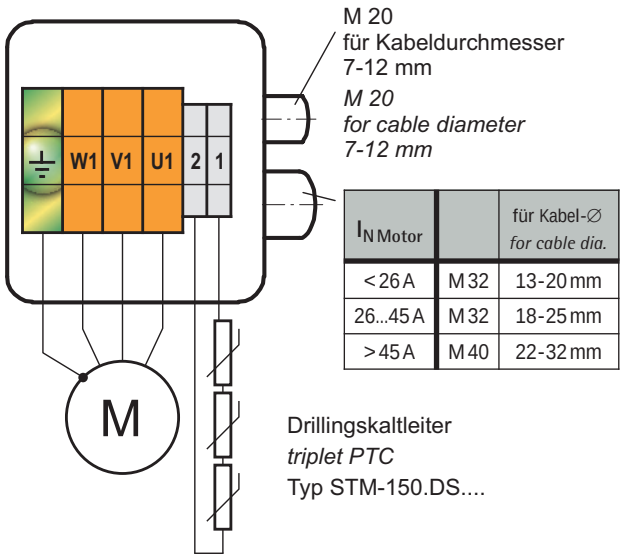
The currents specified under the machine data for the series WSG-08 refer to duty type S3-40%. This must be taken into account when selecting the cable cross-section required. The continuous Ir.m.s. value required for the selected cable is approximated from:

$$I_{r.m.s.\ (cable)} \approx I_{N\ (motor,\ S3\text{-}40\%)} \ / \ 1.58$$

The following table gives the recommended values for the current-carrying capacity of PVC cables at a maximum ambient temperature of 40 °C:

Cable cross-section	Permissible max. current (r.m.s. value)	Permissible max. motor current I_N (S3 - 40%)
1.0 mm²	13.1 A	20.7 A
1.5 mm²	15.7 A	24.8 A
2.5 mm²	22.6 A	35.7 A
4.0 mm²	29.6 A	46.7 A
6.0 mm²	38.3 A	60.5 A

Motor connection diagram



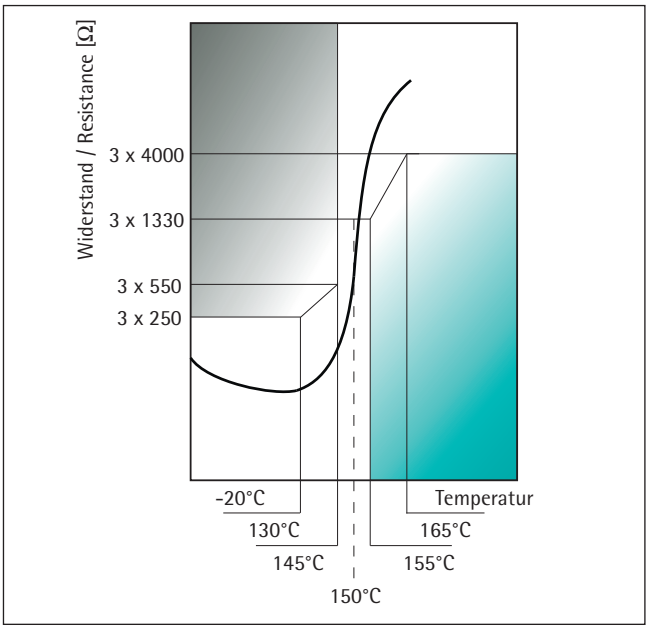
I_N Motor		für Kabel-∅ for cable dia.
< 26 A	M 32	13-20 mm
26...45 A	M 32	18-25 mm
> 45 A	M 40	22-32 mm

PTC-thermistor

Caution

The thermocouples installed in the winding such as PTC thermistor detectors and thermostatic switches must be evaluated in the control system or frequency converter to protect the motor from overtemperature.

The operating voltage of the PTC thermistors is not allowed to exceed 25 V DC.



Earthing

For safety reasons, it is very important that the motor be properly and carefully earthed.

Warning

It is essential to use the earthing terminal in the terminal box. In addition, an earthing screw is provided on the motor frame for the connection of a protective or earthing conductor as specified in VDE 0100 and VDE 0141 respectively.

When using shielded power cables, make sure the cable shield metal contacts the motor frame over a large area. This is achieved, for example, by special cable glands provided for shield contact.

Short-circuiting

Note

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

7.3. Speed/Position measuring system

The basic version of the lift machines is equipped with a ECN 1313 sine-cosine encoder from Heidenhain GmbH. The encoder is connected via a 17-pole signal plug connector which is fitted to the measuring system housing.

Alternatively, the machines can be equipped with the encoder types ERN 1387 also from Heidenhain GmbH. These measuring systems are connected via a 17-pole signal coupling fitted to the motor.

We can also provide other measuring systems on request.

Note

We recommend the use of an appropriate cable set to connect the measuring system to the converter system. Cable sets can be supplied as accessories.

Warning

The measuring system of the WSG-08 lift machines is matched to the associated converter. Do not change the adjustment as this may make it impossible to use the motor.

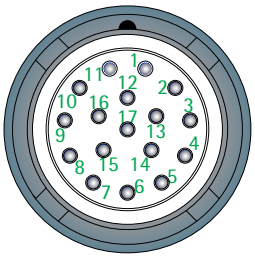
On the measuring system housing there is a label showing the "offset angle" determined at the factory.

Note: This value depends on the converter.

7.3.1. Measuring system ECN 1313

Number of sine-cosine periods per rotation: 2048
Operating voltage: 5 V
Data interface: SSI or ENDAT

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 -
plug casing	inner shield

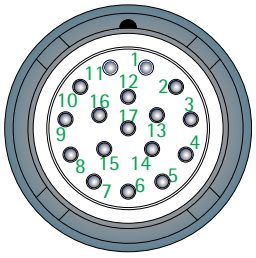


Pin contacts of signal coupling (exterior)

7.3.2. Measuring system ERN 1387

Number of sine-cosine periods per rotation: 2048
Operating voltage: 5 V
Commutation signals: 1 sine and cosine signal with 1 period/rotation (Z1 track)

Pin	Signal
1	A +
2	A -
3	R +
4	D -
5	C +
6	C -
7	0 V (U_p)
10	U_p
11	B +
12	B -
13	R -
14	D +
15	0 V Sensor
16	U_p Sensor



Pin contacts of signal coupling (exterior)

7.4. Brake

The brakes are supplied with d.c. voltage by an overexcitation rectifier which is installed in the terminal box for the brakes.

The connecting contacts for the micro-switches which monitor the brakes are also accommodated in this terminal box.

Note

To reduce the switch-off time, switching can be effected from the d.c. side. However, it is also required to provide switching from the a.c. side at the same time)!

The overexcitation rectifier is supplied as standard with a bridge installed between contacts 3 and 4, meaning that a.c. side switching is preset.

Caution

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 during an inspection or commissioning drive.

Note on the use of d.c./a.c. side switching:

Note

A.c. 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 d.c. side, since this ensures a faster braking effect with the car being stopped earlier.

It is therefore recommended to use 2 separate contactors for the brake control circuitry, one of which switching at the d.c. side, the other one at the a.c. side.

Monitoring the brakes

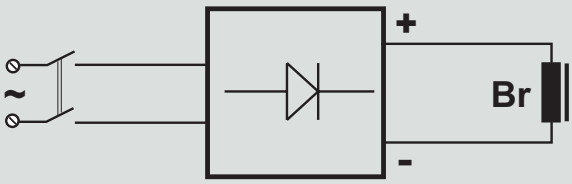
The switching state of the brakes is monitored using dust-proof micro switches with gold contacts. The contacts are designed as n.c. contacts, i.e. the contact is opened if the armature is attracted (brake released). It is possible to change the micro switch contacts into n.o. contacts, if required.

Danger

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

A.c. side switching

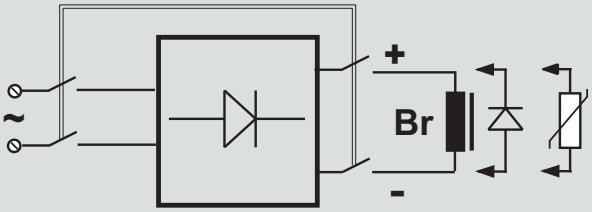
- Low-noise switching of the brake
- No protective measures required for switching contact
- Slow application of the brake.



Attention: schematic diagram!

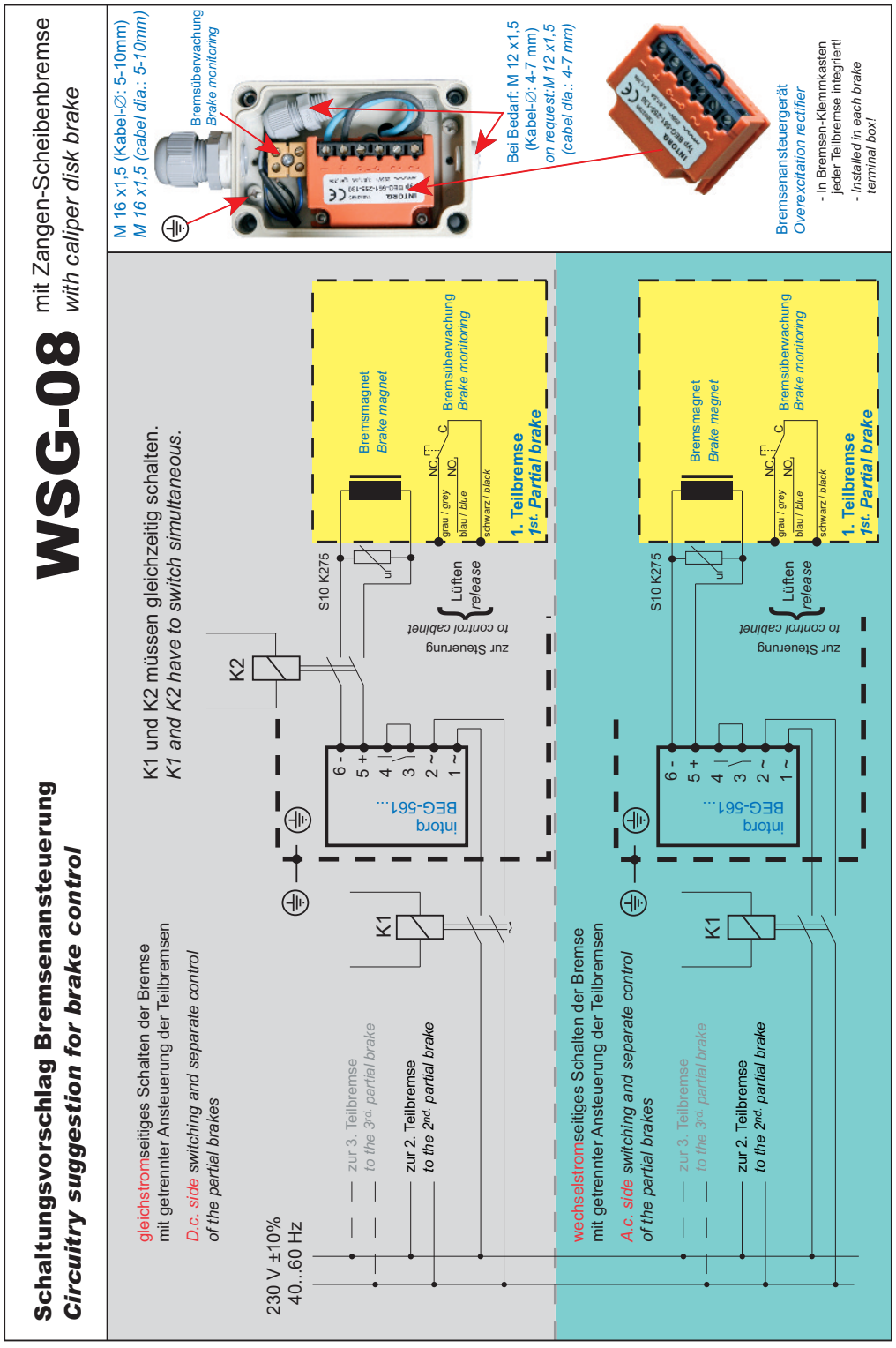
D.c. side switching

- Noisy switching
- Burn-up protection for switching contact required (e.g. varistor, free-wheeling diode)
- Fast application of the brake.



Attention: schematic diagram!

Circuitry suggestion for brake control



8. Commissioning

The following points should be checked or completed:

- Remove all securing, auxiliary and installation tools from the danger area.
- Check that the lift machine is used for its intended purpose and that the permissible ambient conditions are met.
- Check that the lift machine is properly fastened.
- Are all bolts tightened with the specified torque and secured?
- Check the motor connection, especially the earthing.
- Check that the temperature monitoring devices are properly connected and functioning.
- Check that the brakes are properly connected and that the brake monitoring switches are functioning properly.
- Is the measuring system properly connected?
- Check that the offset value indicated on the measuring system agrees with the value set on the converter.
- Check the proper functioning of the brake; perform a braking test using one (or two with the WSG-08.4) partial brake(s).
- Is the rope slip-off guard properly tightened and adjusted?
- Check the remote control of the brake using the Bowden cable, if provided.

Note

An initial functions test of the motor and the brake, together with the converter, should be performed before the ropes are put in place.

9. Operation and maintenance

9.1. General

The regulations concerning operation, maintenance and inspection in accordance with the applicable safety regulations in lift construction such as DIN EN 81 "Safety rules for the construction and installation of lifts", Part 1: "Electric lifts" and other relevant regulations are to be strictly observed.

The operator is responsible for the proper installation of the motor with regard to safety requirements as well as for its inspection and maintenance as specified in the applicable regulations.

Danger

The proper maintenance of gearless lift machines requires adequately trained specialist personnel and specialised 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

Warning

When doing 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]		
strength class	8.8	10.9	12.9
M4	2,8	4,1	4,8
M5	5,5	8,1	9,5
M6	9,6	14	16
M8	23	34	40
M10	46	67	79
M12	79	115	135
M16	195	290	340
M20	395	560	660
M24	680	970	1150

9.2. Maintenance intervals

Check the thickness of the brake linings	every six months	see section 9.6.
Relubricate the bearings	see section 9.3.	
Check the bearing noise	every six months	
Check the brake air gap	every six months	see section 9.6
Check the proper functioning of the brakes and the brake monitoring switches	every six months	see section 9.6
Check the traction sheave for wear	every six months	
Check the traction sheave for tight seating	every six months	see section 9.5
Check the electrical cables	every six months	see section 7.
Check the rope slip-off guard	every six months	
Check the guards and safety devices for their condition and safe functioning	every six months	
Check the tightening torques of the frame, brake and traction sheave fastening bolts/screws	every six months	see section 9.1.
Clean the external machine surfaces	as required	

9.3. Lubricating instructions

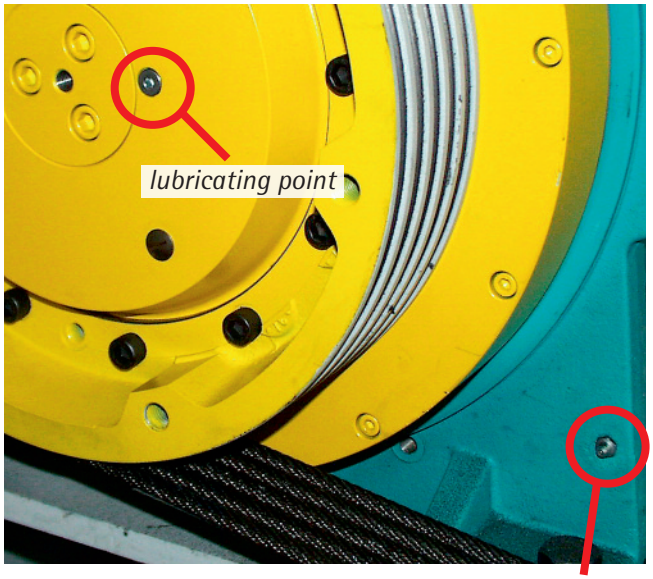
The main bearing (DE self-aligning roller bearing) has been filled at the factory with a quantity of grease sufficient for the nominal service life of the machine.

No regreasing is required or recommended under normal service conditions.

Note

In special cases, e.g. under extreme conditions (max. utilisation of permissible axial forces at max. nominal speeds), the regreasing device provided can be used. For this purpose, screw the grease nipple which is "parked" in a dummy hole on the right motor foot (view on traction sheave) into the regreasing hole which is located near the rotor centre (see picture below).

Before doing this, remove the plug screw DIN 908-B-M10x1 which protects the regreasing hole. Use a KP 2 N-30 grease to DIN 51 502 (e.g. Wälalit LZ2 or Klüberlub BE 41-542). The refilled grease should exert only slight pressure on the grease column. Therefore use only a small quantity, max. 0.5 cm³. We recommend "parking" the grease nipple back in its hole and closing the regreasing hole after the regreasing.



lubricating nipple in "parking position"

The (NDE) secondary bearing is life-lubricated and not provided with a regreasing device.

9.4. Emergency evacuation

Note

The lift design engineer must always provide for an electric return motion control or for a manual rewinder (please note EN 81-20).

Should a failure occur with the car at rest, the car can be moved with the drive connected to the mains or to an uninterruptible power supply (UPS) or mechanically under its own load with the emergency brakes temporarily released.

These brakes are released electrically either from the mains or using a UPS.

They can, however, also be released manually.

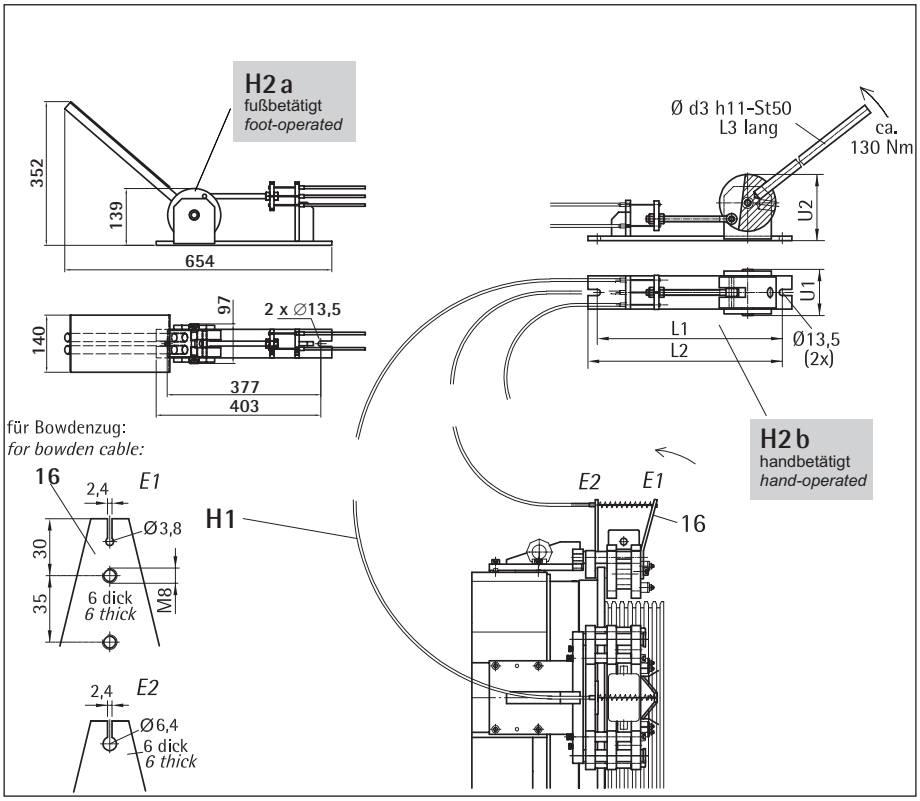
For this purpose the brakes are equipped with a lever plate (16) into which two ring bolts (e.g. M8 to DIN 580) spaced 35 mm apart can be screwed (see *"Release lever set with remotely controlled bowden cable"*). By inserting lever rods (dia. max. 20 mm), the brakes can be released manually.

The brake lever plates and the associated counter plates also have holes and slots to which Bowden cables can be attached. By using special lever devices, the brakes can then also be released remotely by hand within certain limits. Such devices are shown in the figure and table *"Release lever set with remotely controlled bowden cable"* This "lever system" with 3 m Bowden cables (preferred length 3 m, max. length 6 m) can be supplied on special order.

If the brakes are released with the motor deenergised, the motor windings should be short-circuited. This prevents the lift from accelerating in an uncontrolled manner since the short-circuiting produces a speed-dependent braking torque.

		WSG-			
		08.1/2/3 (two brakes)		**08.4** (three brakes)	
Item in figure	Assembly	Number	Item no.	Number	Item no.
H1	bowden cable	2	505 656-2 (preferred length 3 m)	3	505 656-2 (preferred length 3 m)
H2 a	lever support	1	505 045 900	1	505 045 900
H2 b	lever support	1	505 666	1	505 045
	L1	220		390	
	L2	250		430	
	U1	76		98	
	U2	93		140	
	d3 / L3	∅ 16 / 300		∅ 20 / 400	

Release lever set with remotely controlled bowden cable

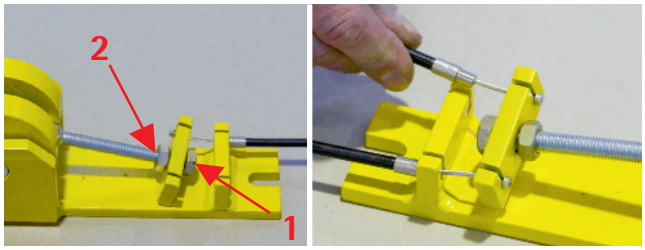


Release lever set with remotely controlled bowden cable

Installation

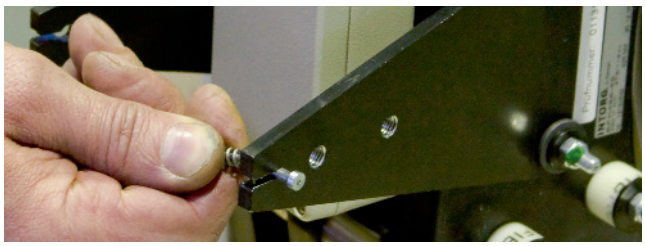
Install the manual brake releasing device while the brake is disconnected from the power supply.

1. Lock the car and the counterweight. Ensure that the required safety measures are observed for the lift system.
2. Install the lever block.
3. Insert all Bowden cables into the lever block, making sure that the nut (1) is screwed flush onto the stud bolt (2).



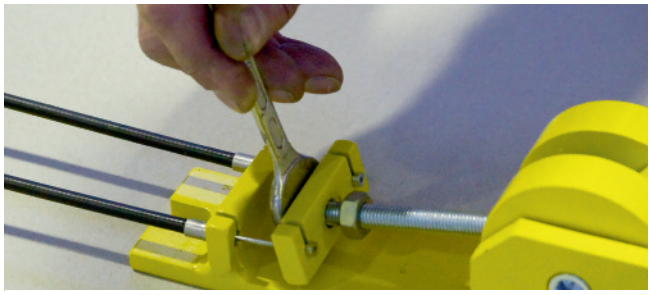
Caution: Mount Bowden cable symmetrically for round holders (see pictures below). Differences between 2 or 3 brakes must be considered!

4. Insert the ends of the Bowden cables into the machine.

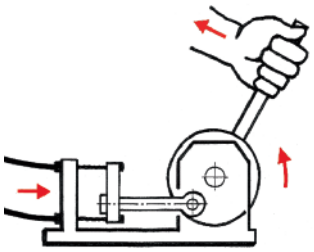


5. Then insert the sleeve ends. A certain amount of effort is needed, as the cables require some preloading. Note: The Bowden cables should be kept straight and not wound.

6. Preload the Bowden cables by turning the nuts on the stud bolts (2). The brakes must not yet release (check this!).



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



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

Gearless Lift Machine

WSG-08 with caliper disk brake
Operating Instructions

A mechanical return motion device can be fitted at the operator's own responsibility if the lift needs to be moved manually in case of a breakdown or if the car is caught by a safety device. The use of the return motion device is shown in the drawing.

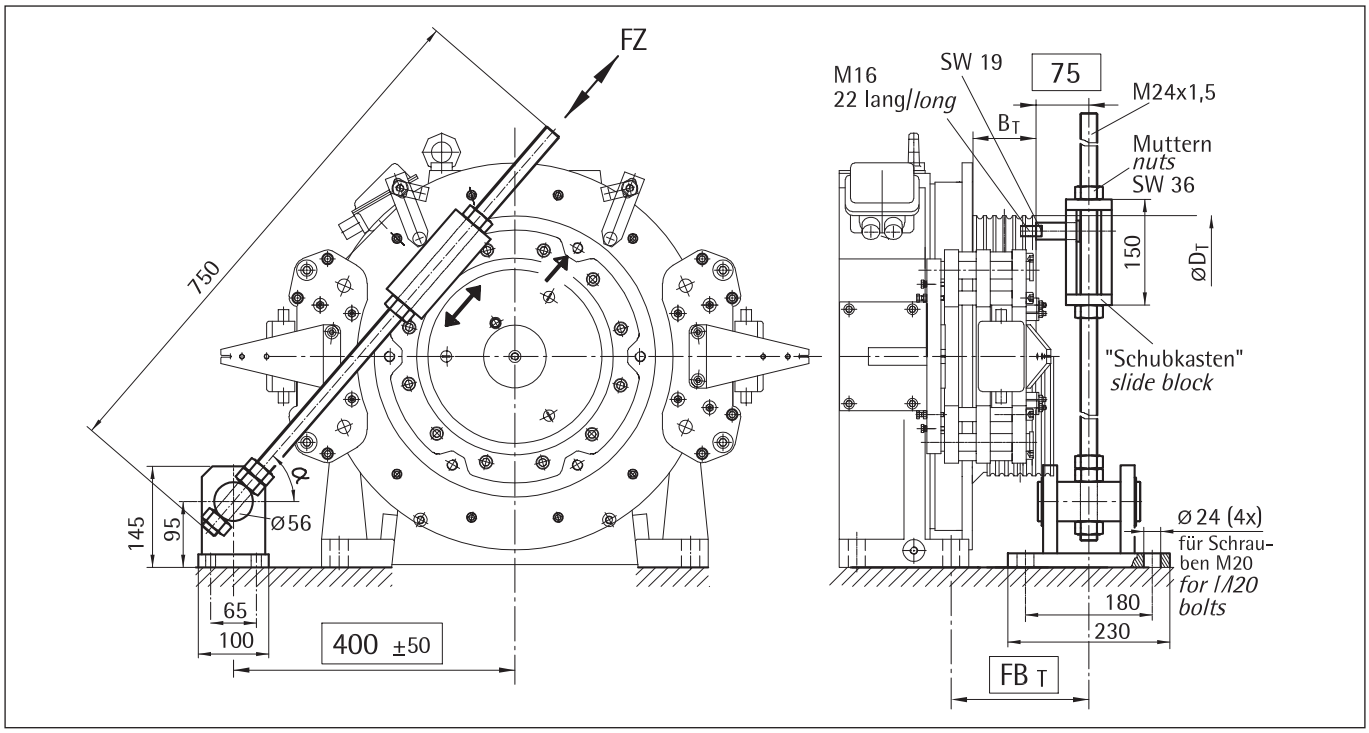
Note

Bolt the bearing block to a cross-beam at the recommended spacing. The cross-beam is firmly connected to the lift machine. When fitting the device, a switching command "electrical supply disconnected" must be activated.

The specific conditions resulting from the different traction sheave types and brake arrangements must be taken into account in regard to the arrangement of the return motion device.
Then screw the threaded bolt into an appropriately positioned threaded hole in the traction sheave using a spanner. While releasing the brake magnets, either electrically or using the brake lever plates, the slide block can be displaced by turning the corresponding nuts. This turns the traction sheave.
The bolt can then be moved to a new hole in the traction sheave, if required.

Danger

The lift must be braked when changing the bolt.



Return motion device

	traction sheave X5 X6 X7	ØDT	BT	FBT	
	40X7	400	60	166	505 382 002
	4SX7		70	176	
WSG-08.1	4EX7		82	188	
WSG-08.2	4NX7		90	196	
WSG-08.3	3SX7	340	70	196	
	3NX7		95	221	
WSG-08.4	4TX7		124	284	

Other recommended values for the use of the return motion device:
Angle α: ca. 30° to 50°
max. permissible traction force
FZ: 9 kN

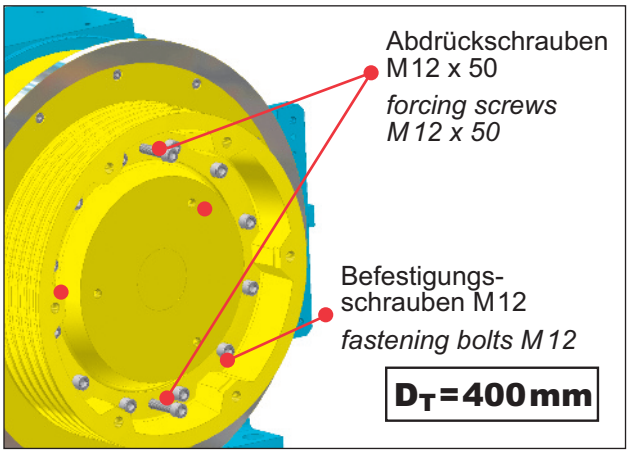
9.5. Replacing the traction sheave

Danger

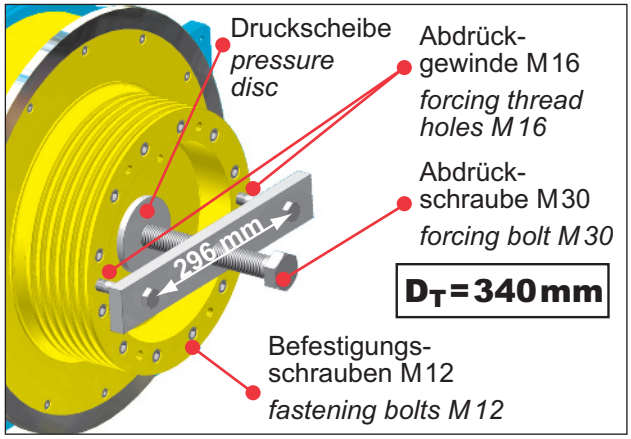
The traction sheave can work loose if it is not properly installed.

Disassembly

- Power off the system and safeguard against unintentional reclosing.
- Secure the car and the counter-weight.
- Remove the rope slip-off guards 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 12 fastening bolts.
- **for $D_T = 400$ mm:** Insert the M12x50 bolts into the two threaded forcing holes and force off the traction sheave.



- **for $D_T = 340$ mm:** Insert a suitable extracor tool into the two threaded forcing holes M16x25 and remove the traction sheave.



Assembly

- Clean the traction sheave and the rotor flange.
- For better assembly heat up traction sheave.
- Slide the traction onto the rotor flange as far as possible.
- Insert the fastening bolts and tighten diagonally opposite bolts. Use "omnifit 100" or a similar adhesive to secure the bolts. Tighten them along the bolt hole circle ($M_A = 115$ Nm) with a torque spanner.
- Replace the ropes and reinstall the rope slip-off guard.

9.6. Replacing the brakes

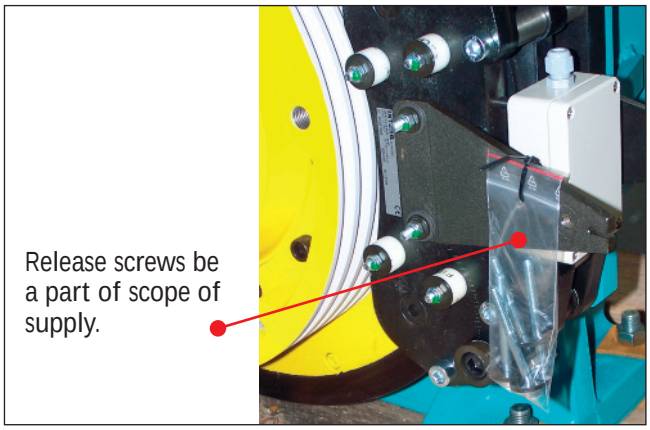
Disassembly

- Remove the two M6 x 40 spring bolts.
- Release the brake manually using the two M6 x 65 release screws supplied (see figure).

Caution

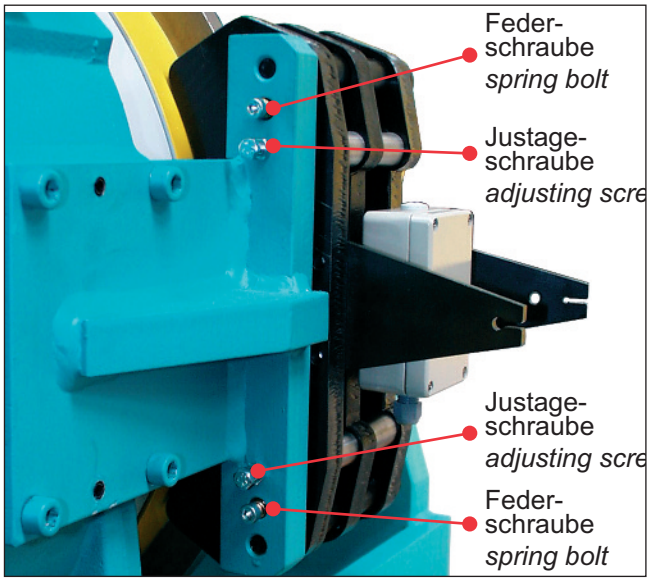
Ensure the brake unit is not dropped.

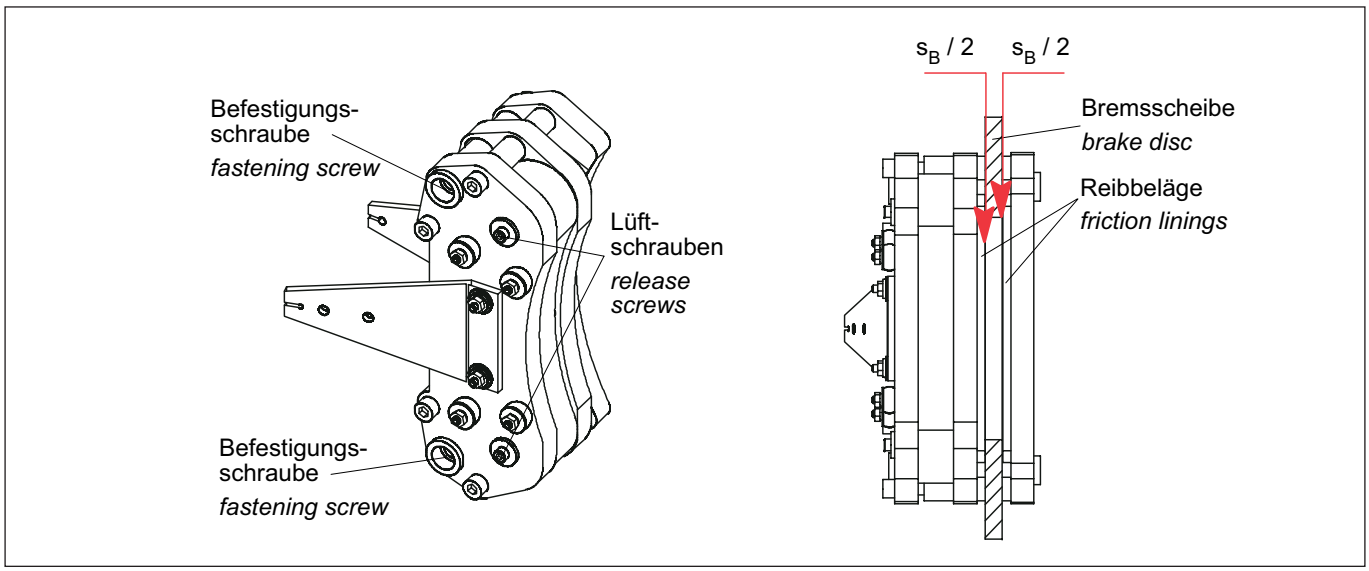
- Remove the M12x140 fastening bolts; remove the brake.



Assembly

- Fasten the brake using the M12 x 140 M fastening bolts. Secure the bolts with *"omnifit 100"* or a similar product. Tighten them with a torque spanner using a torque of $M_A = 115$ Nm.
- Remove the M6 x 65 release screws.
- Insert the M6x40 spring bolts.
- Release the brake electrically and adjust the brake air gap by means of the adjusting screws ($s_B = 0{,}5^{+0{,}1}$ mm). Make sure that the two friction linings and the brake disc are symmetrical (using a feeler gauge).
- Switch the brake on and off several times and check the air gap.





9.7. Modification of brake arrangement WSG-08.1-3

Danger

The modification may only be made by a qualified personnel. Life-threatening situation in case of misapplication!

Note

To adapt the brakes to special rope guidance, the brake variants "RHS + LHS", "RHS + top-mounted" or "LHS + top-mounted" are available.

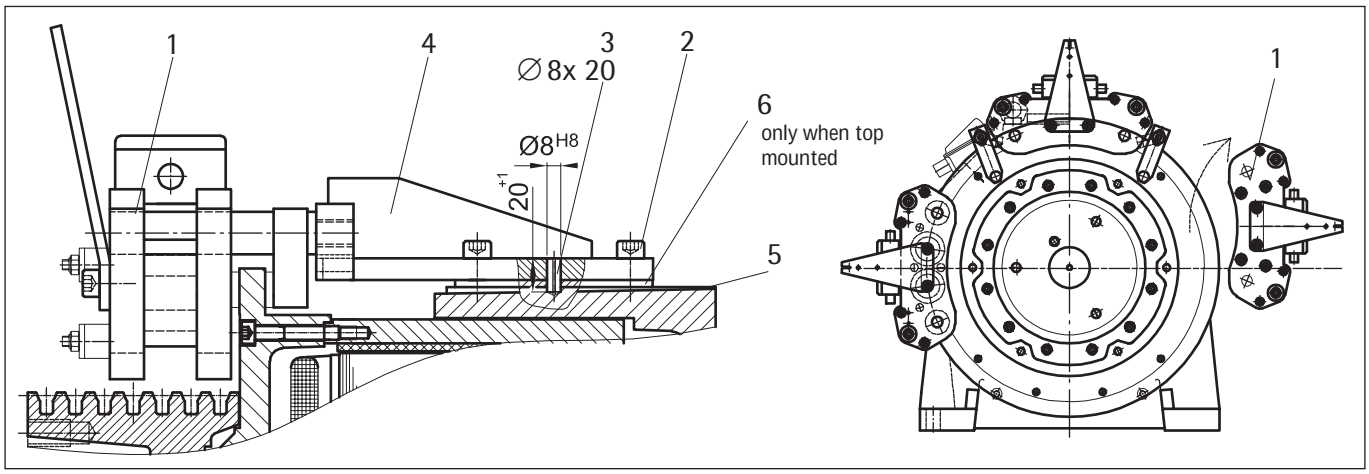
If a subsequent change is required, proceed as follows:

Removing the brake with flange (1)

- 4 Slacken the 4 Allen screws (2) M10.
- Release the brake manually using the two M6 x 65 release screws supplied (see chapter „Replacing the brake“)
- Remove the screws (2).
- Force off the pinned (3) flange (4) using a suitable tool.
- Take off the brake carefully and remove the pins.

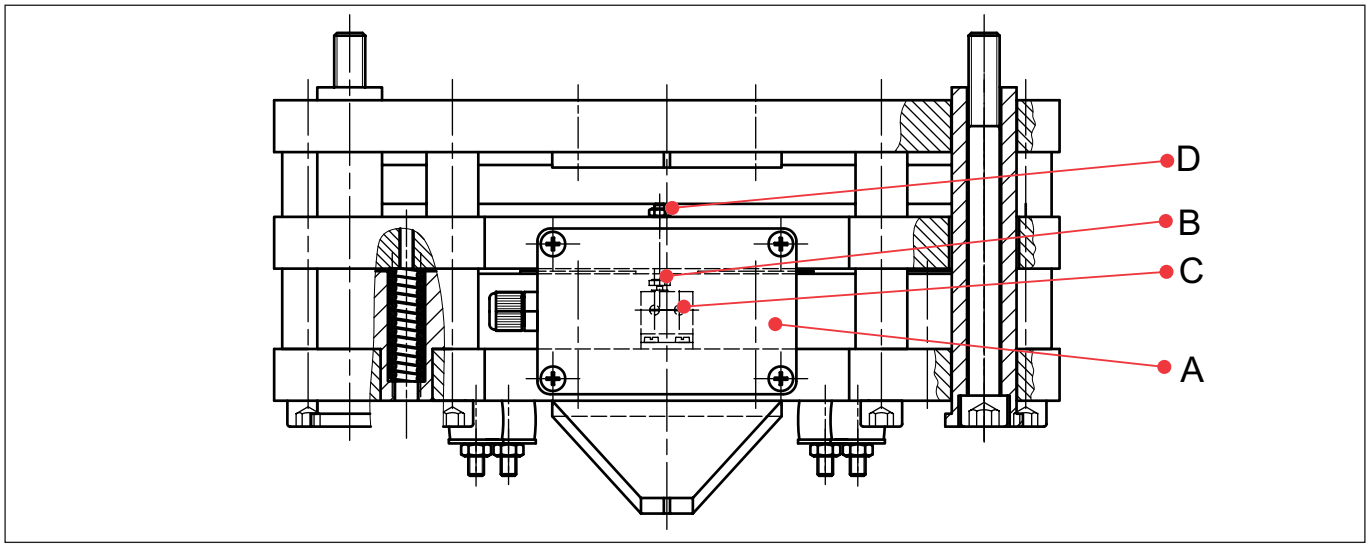
Fitting the brake with flange (1)

- Release the brake manually with the release screws and place it carefully on the brake disc (5). When fitting the brake on top, add the 4mm shim (6).
- Screw in loosely the 4 screws M10x25, on top M10x30 (2).
- Remove the release screws (causing it to brake) and tighten the screws (2) using a torque of 48 Nm.
- Release the brake electrically and adjust the brake gap (see chapter „Replacing the brake“)
- Disconnect the brake from the mains (causing it to brake) and locate the flange (4) on (5) as shown in the figure using the 2 straight pins (3). When drilling into (5) use the predrilled holes in (4).



9.8. Switch-adjusting for monitoring the brake

- Remove the brake terminal box (A)
- Switch on the brake magnet; s_B has to be 0 mm.
- Turn the hexagon head screw (B) until to the switch-point in direction of the microswitch (C). For definition of the switch-point, the hexagon head screw has to be turned very slowly!
- Following the hexagon head screw (B) has to be screwed additional 60° in direction of the microswitch.
- Secure the hexagon head screw (B) with hexagon nut (D). While securing please mind, that the position of the hexagon head screw may not be changed.
- Hexagon nut and fastening-screws of the mocroswitch have to be secured with screw-lock-lacquer.
- Check that the switch-point is between $s_B = 0$ mm and 0.3 mm.



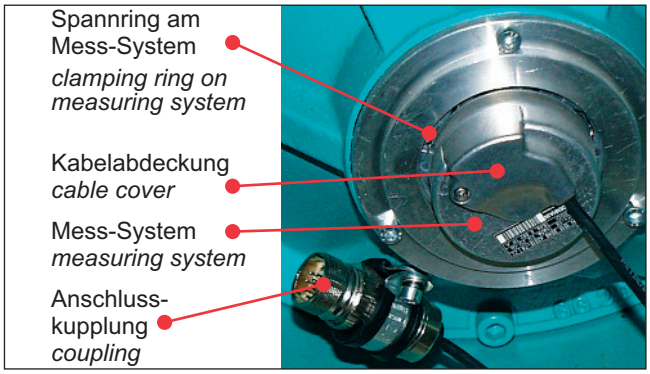
9.9. Replacing the measuring system

Note

The measuring system is only accessible from the rear side of the motor.

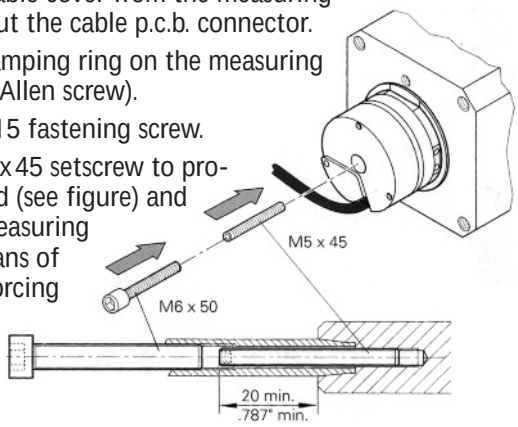
Warning

Disassemble the measuring system only if this is necessary because of a defect. Remember to readjust the offset value after reassembly (see the converter operating instructions).



Disassembly

- Remove the cable cover from the measuring system; pull out the cable p.c.b. connector.
- Loosen the clamping ring on the measuring system (2 mm Allen screw).
- Remove the M5 fastening screw.
- Insert the M5x45 setscrew to protect the thread (see figure) and remove the measuring system by means of the M6x50 forcing screw.



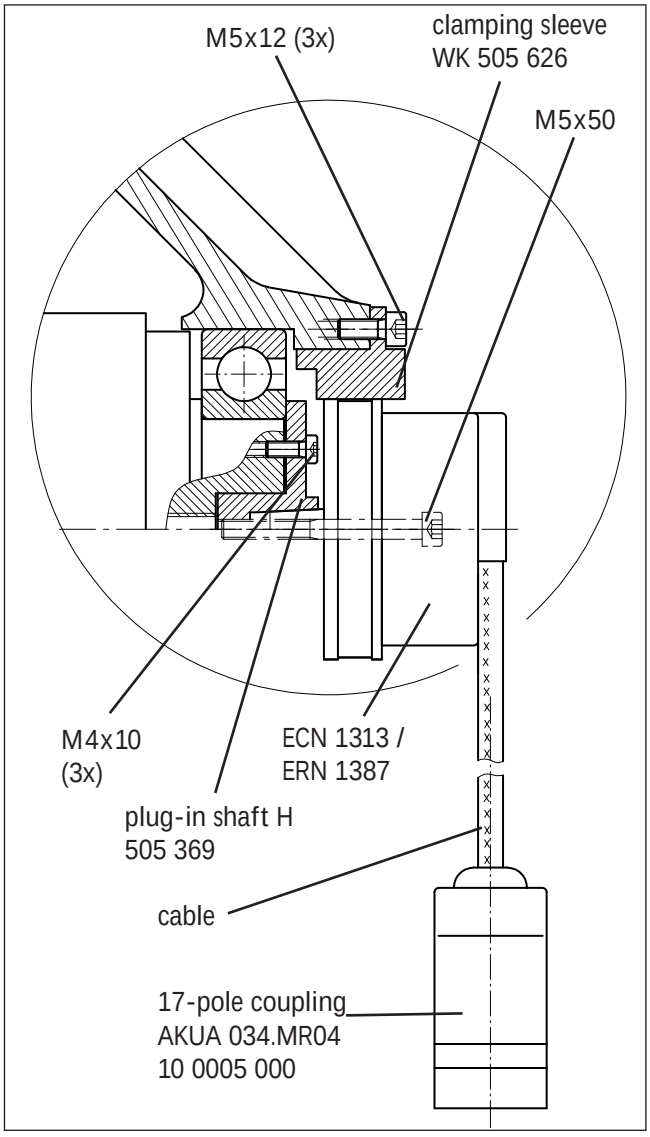
Assembly

- Check the true running on the stud (plug-in shaft H) (permissible runout max.0.02 mm).
- Clean the stud and the measuring system shaft end; do not grease them.
- Remove the cable cover from the measuring system.
- Plug in the measuring system, insert the M5x50 fastening screw in the hollow shaft and tighten the screw (M_A = 5,2 Nm)
- Turn the measuring system so that the cable can be suitably routed.
- Tighten the clamping ring on the measuring system (M_A =0,65 Nm)
- Insert the cable p.c.b. connector (observing the designation "TOP" or the guiding nose).

Note

The ECN 1313 and ERN 1387 require different cables. Please take this into consideration when replacing the measuring system.

- Reinstall the cable cover.
- Fasten the coupling using the clamp and the M5x16 screw.



9.10. Testing the brake system to EN 81

Note

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 preferably be done using suitable electric circuitry, but can also be performed manually.

This state must not be maintained in the long term.

Note

Observe the lift during this test. If it does not decelerate, close the open brake circuit immediately.

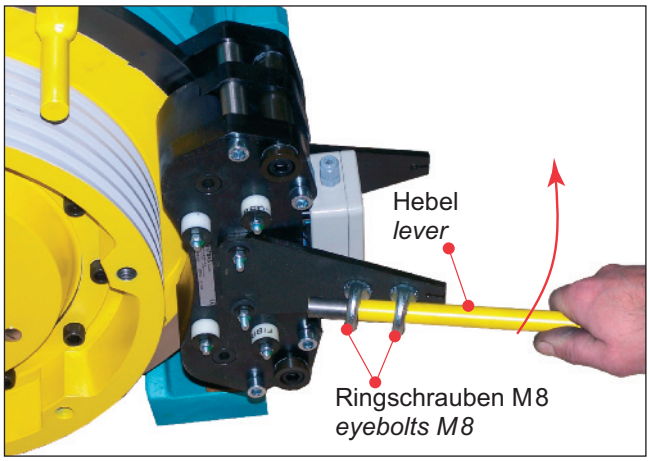
Monitoring the brakes

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

Separate operation of the individual brakes

There are several possible ways of operating the brakes separately:

- The preferred method is separate electrical control of the brakes. The individual brakes can be activated/deactivated quickly by individual control buttons.
- Remote control by Bowden cable as described in section 9.4. (The other Bowden cables must be removed. The Bowden cable of the brake to be tested should be attached to the central hole in the lever support to avoid diagonal tension.)
- Use of two M8 eyebolts and a lever (see picture *"Manual release"*).



Manual release

9.11. 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
	• Converter parametrisation incorrect	• Check converter parametrisation
	• EMC disturbance	• Carry out shielding and earthing measures as described by the converter manufacturer
	• Measuring system offset angle incorrectly set	• Check measuring system offset angle
	• Measuring system defective	• Replace measuring system
Motor noise	• Bearing defective	• Notify customer service
	• Converter parametrisation incorrect	• Check converter parametrisation
Braking system does not release	• Braking system is not supplied with voltage	• Check electrical connection
	• Brake magnet voltage too low	• Check braking voltage supply voltage
	• Brake shoes mechanically blocked	• Remove mechanical blocking
	• Overexcitation rectifier defective	• Replace overexcitation rectifier
Delay in braking system release	• Overexcitation rectifier defective	• Replace overexcitation rectifier
Braking system does not engage	• Brake shoe mechanically blocked	• Remove mechanical blocking
Delay in engaging of braking system	• Switch-off time too short with a.c. side switching	• Brake control using d.c. side switching of the overexcitation rectifier
Brake makes loud switching noise	• Brake air gap too large	• Adjust brake air gap
	• D.c. side switching of the brake in "normal operation"	• Change over to brake control by a.c. side switching in "normal operation"
Braking torque too low	• Brake friction surface or brake linings dirty.	• Clean friction surface / brake linings
	• 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	• Replace brake lining, clean brake drum thoroughly
	• Load torque too high	• Reduce load torque

10. Type code

Example:	W	S	G-	08	.	3	-	0		0	0	9	/	4	0	A	-	Z	E
	W	**S**	**G-**	**08**	**.**	**Z3**	**-**	**X1**		**X2**	**X3**	**X4**	**/**	**X5**	**X6**	**X7**	**-**	**X8**	**X9**

Customer specific identifier

S = Synchronous motor

G = Gearless
U = Gearless; UL-CSA approved

Frame size

Z3: Overall length:
4 overall lengths are available;
identified by: 1, 2, 3, 4

X1: Customer specific identifier
- *R: WSG-08.1-3 - brakes „on top" and „right" (see dimension drawing)*
- *L: WSG-08.1-3 - brakes „on top" and „left" (see dimension drawing)*
- *S: WSG-08.4 - brakes „on top" (see dimension drawing)*

X2: Motor voltage:
- *0: suitable for converter supply using a link voltage of 500 .... 620 V*
- *6: suitable for converter supply using a link voltage of 260 .... 350 V*

X3 X4: Rated speed:
e.g.:
- *06: 60 min^{-1} (with D_T = 400 mm v = 0.6 m/s, suspension 2:1)*
- *09: 95 min^{-1} (with D_T = 400 mm v = 1.0 m/s, suspension 2:1)*
- *15: 153 min^{-1} (with D_T = 400 mm v = 1.6 m/s, suspension 2:1)*
- *19: 190 min^{-1} (with D_T = 400 mm v = 2.0 m/s, suspension 2:1)*
- *24: 240 min^{-1} (with D_T = 400 mm v = 2.5 m/s, suspension 2:1)*
- *06: 67 min^{-1} (with D_T = 340 mm v = 0.6 m/s, suspension 2:1)*
- *11: 112 min^{-1} (with D_T = 340 mm v = 1.0 m/s, suspension 2:1)*
- *18: 180 min^{-1} (with D_T = 340 mm v = 1.6 m/s, suspension 2:1)*
- *22: 225 min^{-1} (with D_T = 340 mm v = 2.0 m/s, suspension 2:1)*

X5 X6 X7: Traction sheave design
(Traction sheave diameter; width, groove design, groove geometry)

X8 X9: Variant code (brake, measuring system, modifications)
- *ZE: caliper disk brake; measuring system ECN 1313-2048 incr. - SSI-interface*
- *ZF: caliper disk brake; measuring system ECN 1313-2048 incr. - ENDAT-interface*
- *ZG: caliper disk brake; measuring system ERN 1387-2048 incr.*

11. Technical data

Duty type:	S3 - 40 % ED
Traction sheave:	dia. 400 mm or dia. 340 mm
Traction sheave hardnesse:	min. 220 HB 30
Typical number of carrying ropes and dia.:	4 x dia. 8 mm; 5 x dia. 10 mm; (max. 8 x dia. 10 mm)
DE bearing:	self-aligning roller bearing
NDE bearing:	ball bearing or cylindrical roller bearing
Permissible shaft load:	up to 55,000 N
Drive motor:	synchronousmotor
Number of pole pairs:	11
Thermal class:	155 (F)
Degree of protection:	IP 41
Overload capability:	2.3fold (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 cendensation)

The table is applicable for an overall shaft efficiency of approx. 72...78 % (counterweight: 50 %). It lists a standard selection of machines. The lift and project data will be adapted to the actual site conditions and may deviate from the above values.

caliper disk brake

	WSG-08.1-3	WSG-08.4
Type:	BFK 466-55	
Max. braking torque:	2 x 925 Nm	3 x 925 Nm
Factory default setting:	2 x 925 Nm	3 x 925 Nm
Air gap s_B:	0.5 $^{\pm 0.1}$ mm (new air gap)	
Max. air gap $s_{B\,max}$:	1.0 mm	
Holding voltage:	103 V DC	
Holding current:	2 x 1.1 A	3 x 1.1 A
Overexcitation voltage:	205 V DC	
Overexcitation current:	2 x 2.3 A	3 x 2.3 A

Brake control unit

Type:	BEG-561-255-130 from intorq GmbH (accessories)
Operating voltage	U_N = 230 V AC (± 10 %), 40... 60 Hz
recom. pre-fues (per unit):	2 A

Brake monitoring contacts

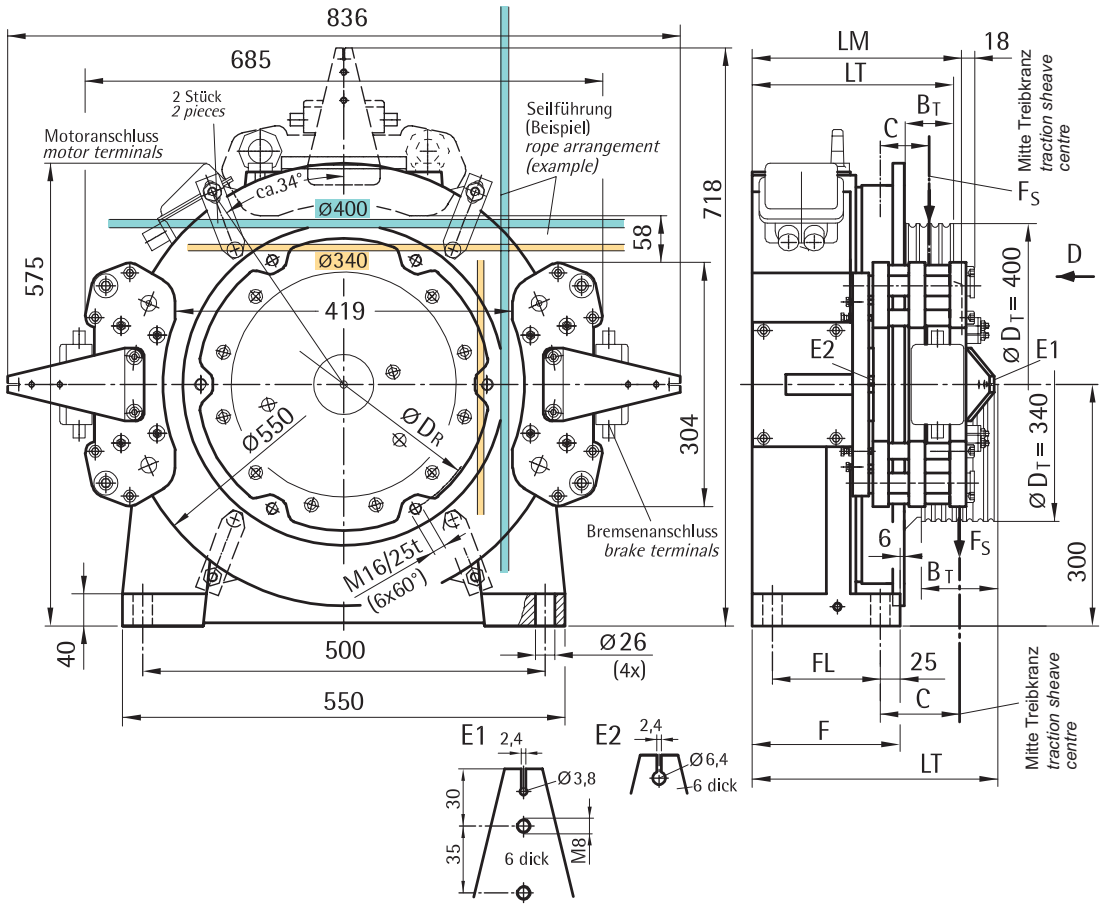
Loadability of contacts	...250 V AC / 1 mA...3 A (resistive load)
Mechanical life of contacts:	1 x 10^7 switching operations
Degree of protection	IP 67

Motor / *motor*		synchron / *synchronous* 22-polig / *22-pole*																					
		WSG-08.1						WSG-08.2						WSG-08.3						WSG-08.4			
Drehmoment / *torque* S3-40%, 240 S/h	M_N [Nm]	460						590						740						1100			
Treibscheibe / *sheave*	Ø D_T [mm]	340			400			340			400			340			400			400			
für Nennlasten / *for loads*	Q [kg]	bis / *up to* 800			bis / *up to* 630			bis / *up to* 1000			bis / *up to* 850			bis / *up to* 1300			bis / *up to* 1150			bis / *up to* 1600		
Aufhängung / *suspension*		Tabelle gilt für / *table applies for* 2:1																					
	v [m/s]	n_N [rpm]	P_N [kW]	I_N [A]	n_N [rpm]	P_N [kW]	I_N [A]	n_N [rpm]	P_N [kW]	I_N [A]	n_N [rpm]	P_N [kW]	I_N [A]	n_N [rpm]	P_N [kW]	I_N [A]	n_N [rpm]	P_N [kW]	I_N [A]	n_N [rpm]	P_N [kW]	I_N [A]
Motorströme gelten für 500...620 V Zwischenkreisspannung *Motor currents apply for 500...620 V d.c. link voltage*	0,6	67	3,2	12,0	60	2,9	12,0	67	4,1	14,8	60	3,7	14,8	67	5,2	18,5	60	4,6	18,5	60	6,9	28,5
	1,0	112	5,4	17,3	95	4,6	12,0	112	6,9	21,7	95	5,9	14,8	112	8,7	26,9	95	7,4	18,5	95	10,9	28,5
	1,25	140	6,7	17,3	119	5,7	17,3	140	8,6	21,7	119	7,4	21,7	140	10,8	26,9	119	9,2	26,9	119	13,7	43,0
	1,6	180	8,7	19,8	153	7,4	17,3	180	11,1	25,7	153	9,5	21,7	180	13,9	31,6	153	11,9	26,9	153	17,6	43,0
	1,75	197	9,5	25,0	167	8,0	19,8	197	12,2	31,7	167	10,3	25,7	197	15,3	41,3	167	12,9	31,6	167	19,2	46,0
	2,0	225	10,8	25,0	190	9,2	25,0	225	13,9	31,7	190	11,7	31,7	225	17,4	41,3	190	14,7	41,3	190	21,9	62,5
	2,5				240	11,6	25,0				240	14,8	31,7				240	18,6	41,3	240	27,6	62,5

12. Dimension drawing

Dimensions (mm)

WSG-	→D Bremsen Anordnung *brake arrangement*	Kennung *subindex*
08.1 08.2 08.3	rechts+links *right+left*	0
	rechts+oben *right+on top*	R
	links+oben *left+on top*	L
08.4	3x	0
	3x 17,5° max.35°	S

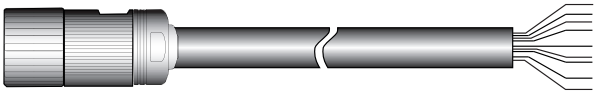
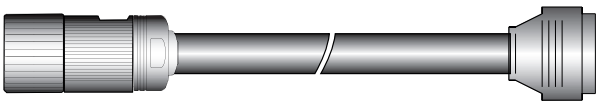
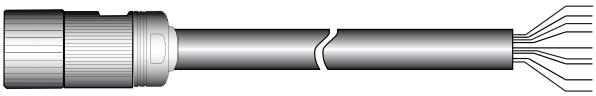
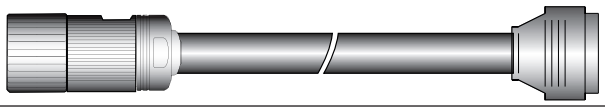
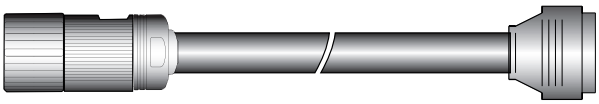
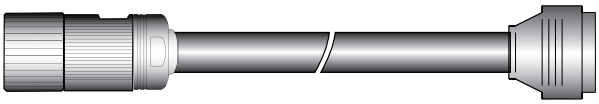
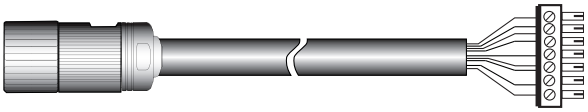
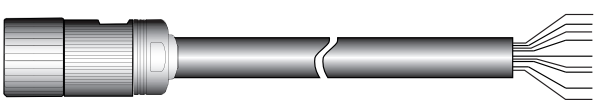


Treibscheibe / *traction sheave* Ø D_T	B_T	C	LT WSG- 08.1	08.2	08.3	08.4	Masse/*weight* m_T [kg]	Trägheitsmoment *inertia* J_T [kgm²]	F_S [kN] bis/ *up to* n_N [rpm] 153	240
400 D_R = 356	60	61	250	286	286	-	16	0,47	55	45
	70	66	260	296	296		17	0,52		
	82	72	272	308	308		18	0,57	50	
	90	76	280	316	316		22	0,63	45	40
	124	147	-	-	-	404	32	0,82		
340 D_R = 296	70	86	280	316	316	-	16	0,47	50	40
	95	98,5	305	341	341		22	0,63	45	

Motor / *motor*	WSG-	08.1	08.2	08.3	08.4
	F	184	220	220	220
	FL	134	170	170	170
	LM	260	296	296	350
Masse / *weight*	m_M [kg]	282	310	324	397
Trägheitsmoment *inertia*	J_M [kgm²]	2,8	3,0	3,2	3,3

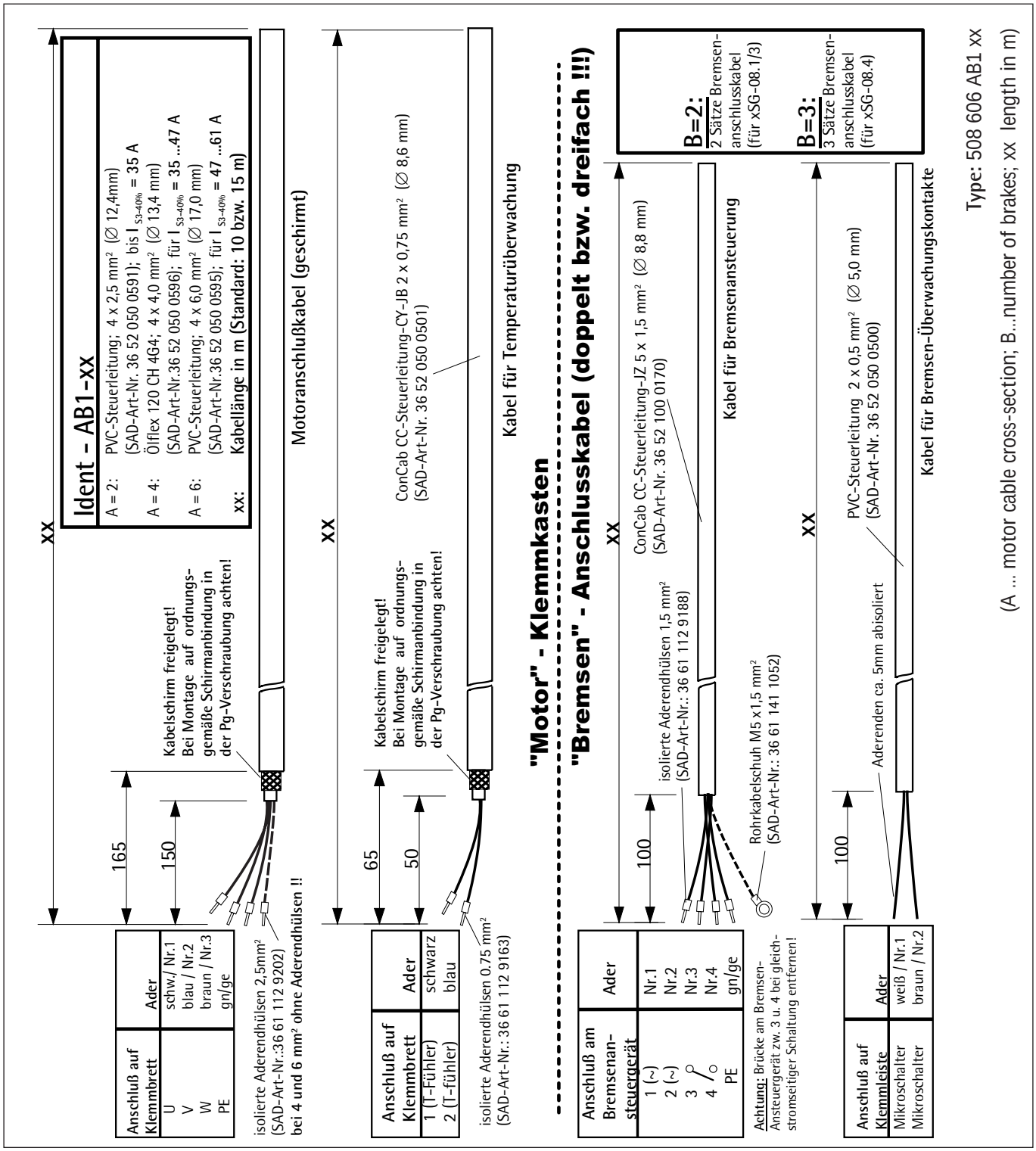
13. Accessories

13.1. Connecting cable for measuring systems

	Inverter type	recom. encoder system	recommended measurement system cable
	E-Pack Arkel ARCODE	ECN 1313 (EnDat or SSI)	503 325 021 xx
	D-Pack Arkel ADrive CT unidrive SP	ECN 1313 (EnDat or SSI)	502 452 021 xx
	emotron / Dietz DSV 5445	ECN 1313 (EnDat or SSI)	501 112 022 xx
	Fuji Frenic	ECN 1313 (EnDat)	502 679 022 xx
	KEB F5	ECN 1313 (EnDat)	502 363 022 xx
	LTi DRiVes Lust CDD 3000	ECN 1313 (SSI)	505 677 022 xx
	RST Elektronik FRC	ECN 1313 (EnDat)	508 752 022 xx
	GEFRAN (SIEI) AVY-L-M	ERN 1387	503 599 022 xx
	Vacon NXP	ECN 1313 (EnDat)	503 289 021 xx
	Yaskawa/ Omron L7 Telemecanique/ Schneieder Altivar 71	ECN 1313 (EnDat)	503 715 022 xx
	Ziehl-Abegg 2SY/3BF	ECN 1313 (EnDat or SSI)	508 749 022 xx

xx... cable length [m]

13.2. Cable set for motor and brake

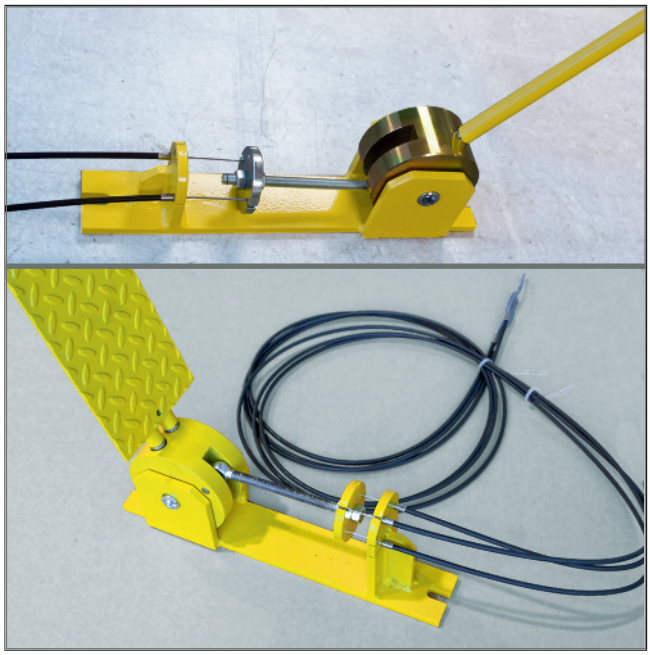


13.3. Release lever set with remotely controlled Bowden cable

The remote control of the brake by Bowden cable is used to release the brakes mechanically in the case of an emergency. For details of this method see section 9.4. "Emergency evacuation".

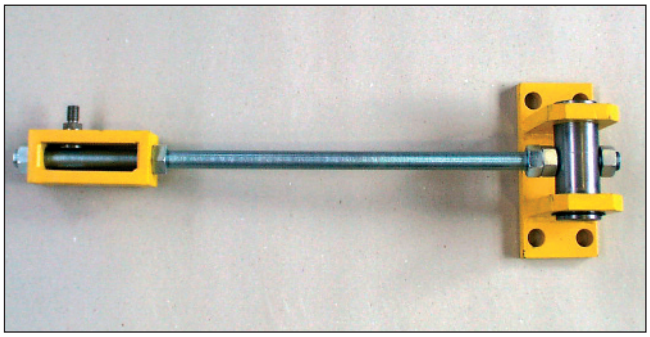
The standard length of the Bowden cable is 3m. Other lengths on request.

Release lever set with remotely controlled bowden cable, ***hand-operated***



Release lever set with remotely controlled bowden cable, ***foot-operated***

13.4. Return motion device



The return motion device is used to move the lift "manually" in the case of an emergency, for example if the car is caught by the safety device.

For details of this method see section 9.4. "Emergency evacuation".

14. Spare parts

Item	Part	Description
Motor		
01	Traction sheave	acc. machine nameplate type code X5 X6 X7
02	Hydraulic-type lubricating nipple	DIN 71 412 - AM 10 x 1
03	Dummy stopper	N-Pg 9 DIN 46320-Fs
04	Rope slip-off guard, cpl.	505 648
05	Measuring system (depending on spec.)	ECN 1313 / SSI / 2048 incr. / clamping ring ECN 1313 / ENDAT / 2048 Inkr. / clamping ring ERN 1387 / 2048 Inkr. / clamping ring
Brake system		
06	Overexcitation rectifier	32 17 320 A23 (from Binder GmbH) to 06/2006 BEG-561-255-130 (from intorq GmbH) as from 06/2006
07	Caliper disk brake	Type BFK 466-55
08	Release screws	M6 x 65

WITTUR Electric Drives GmbH

EU-Konformitätserklärung
EU Declaration of Conformity

im Sinne der EU-Richtlinie Niederspannung (2014/35/EU)
as defined by the EU Low Voltage Directive (2014/35/EU)

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:

Asynchronmotoren *Asynchronous motors*	DS☐ 1, DS☐ 3
Synchronmotoren *Synchronous motors*	DS☐ 2, DS☐ 4, DG☐ 4, DU☐ 4, DG☐ 6, DU☐ 6, WSG, K☐ 8, T☐ 8
Sondermotoren *Custom-made motors*	4HX, 6PX, QPX

den Bestimmungen der EU-Richtlinie 2014/35/EU entsprechen.
are in conformity with the specification of the EU Directive 2014/35/EU.

Erklärung zur EMV-Richtlinie (2014/30/EU)
Bei Netzbetrieb an sinusförmiger Wechselspannung erfüllen die Motoren die Anforderungen der EU-Richtlinie „Elektromagnetische Verträglichkeit" 2014/30/EU unter Berücksichtigung der Normen EN 61000-6-1..4.

Statement relating to EMC Directive (2014/30/EU)
When connected to a sinus-shaped a.c. voltage system, the motors conform to the requirements of the EC Directive "Electromagnetic compatibility" 2014/30/EU, including those specified in standards EN 61000-6-1...4.

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

EN / IEC 60 204-1:	Sicherheit von Maschinen; Elektrische Ausrüstung von Maschinen; Teil 1: Allg. Anforderungen *Safety of machinery - Electrical equipment of machines. Part 1: General requirements*
EN / IEC 60 034:	Drehende elektrische Maschinen *Rotating electrical machines*
EN ISO 12 100:	Sicherheit von Maschinen - Allgemeine Gestaltungsleitsätze, Risikobeurteilung und Risikominimierung *Safety of machinery - General principles for design, risk assessment and risk reduction*

Dresden, 2016-06-02
(Ort, Datum)
(Place, date)

Markus Weber
Geschäftsführer
Managing Director

i.V.
Steffen Mann
Leiter Entwicklung/Konstruktion
Head of Development/Construction

EC_06_2016

ZERTIFIKAT ◆ CERTIFICATE ◆ 認証証書 ◆ СЕРТИФИКАТ ◆ CERTIFICADO ◆ CERTIFICAT

Industrie Service

EU TYPE-EXAMINATION CERTIFICATE

According to Annex IV, Part A of 2014/33/EU Directive

Certificate No.:	EU-BD 715
Certification Body of the Notified Body:	TÜV SÜD Industrie Service GmbH Westendstr. 199 80686 Munich - Germany Identification No. 0036
Certificate Holder:	INTORQ GmbH & Co. KG Wülmser Weg 5 31855 Aerzen - Germany
Manufacturer of the Test Sample: (Manufacturer of Serial Production – see Enclosure)	INTORQ GmbH & Co. KG Wülmser Weg 5 31855 Aerzen - Germany
Product:	Braking device acting on 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
Type:	BFK466-55
Directive:	2014/33/EU
Reference Standards:	EN 81-20:2014 EN 81-50:2014 EN 81-1:1998+A3:2009
Test Report:	EU-BD 715 of 2016-03-18
Outcome:	The safety component conforms to the essential health and safety requirements of the mentioned Directive as long as the requirements of the annex of this certificate are kept.
Date of Issue:	2016-03-18
Date of Validity:	from 2016-04-20

TÜV SÜD Industrie Service GmbH 00 36 Notified Body

Werner Rau
Certification Body "lifts and cranes"

TÜV®

Annex to the EC Type-Examination Certificate
No. EU-BD 715 of 2016-03-18

Industrie Service

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 force and tripping speed

1.1.1 Permissible brake force when the braking device acts on the traction sheave while the car is moving upward — 3521 N

(Traction sheave and brake drum are a fix screwed unit)

The brake force refers to a single brake on the brake disk diameter effectively

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 brake disc maximum tripping speed (gliding speed) as outlined below taking into account the brake disk diameter effectively, traction sheave diameter and car suspension.

$$v = \frac{D_{TS} \times v_{BS}}{D_{BS} \times i}$$

v = Tripping (rated) speed (m/s)
D_{TS} = Diameter of the traction sheave from rope's center to rope's center (m)
D_{BS} = Diameter of the brake disk effectively (m)
v_{BS} = Gliding speed on the brake disk diameter effectively (m/s)
i = Ratio of the car suspension

Maximum tripping speed on the brake disk diameter effectively — 8.25 m/s

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

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

Nominal brake force* [N]	Maximum response times** [ms] without / with overexcitation		
	t_{10}	t_{50}	t_{90}
3521	38 / 42	62 / 69	87 / 96

Interim values can be interpolated

Explanations:

* **Nominal brake force:** Brake force 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 force, 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	single
Nominal air gap	0.35 mm
Damping elements	YES
Overexcitation	at double non-release voltage
Maximum tripping speed on the brake disc diameter effectively	8.25 m/s

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 single brakes have to be arranged symmetrically around the circumference of the brake disc. In order to comply with the redundancy required in section 5.6.6.2 of EN 81-20:2014 (D), at least two braking circuits (single brake actuator) must be used.

2.4 Where more than two braking circuits are used, redundancy requirements necessitate that a sufficient braking effect as outlined in section 5.9.2.2.2.1 of EN 81-20:2014 (D) is still maintained if one of the braking circuit fails. It is not assumed that two braking circuits will fail simultaneously.

2.5 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.

2.6 The setting of the brake force has to be secured against unauthorized adjustment (e. g. sealing lacquer).

2.7 The identification drawing no. 5019001 including stamp dated 2016-03-18 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.

2.8 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 (using at least two single brakes), 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 Checking whether the requirements as per section 5.9.2.2 of EN 81-20:2014 (D) have been complied with is not part of this type examination.

3.3 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.

3.4 This EU type-examination certificate was issued according to the following standards:

- EN 81-1:1998 + A3:2009 (D), Annex F.7 and F.8
- EN 81-20:2014 (D), part 5.6.6.11, 5.6.7.13
- EN 81-50:2014 (D), part 5.7 and 5.8

3.5 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.

Enclosure to the EU Type-Examination Certificate
No. EU-BD 715 of 2016-03-18

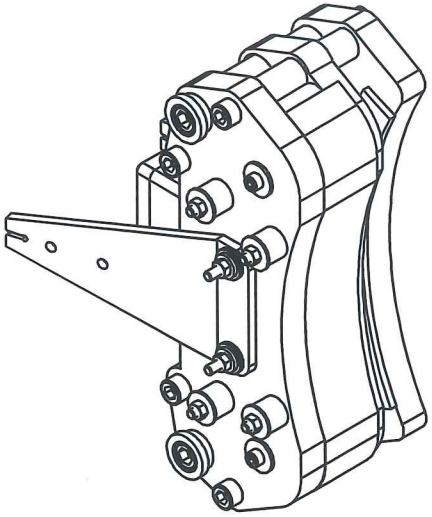
Industrie Service

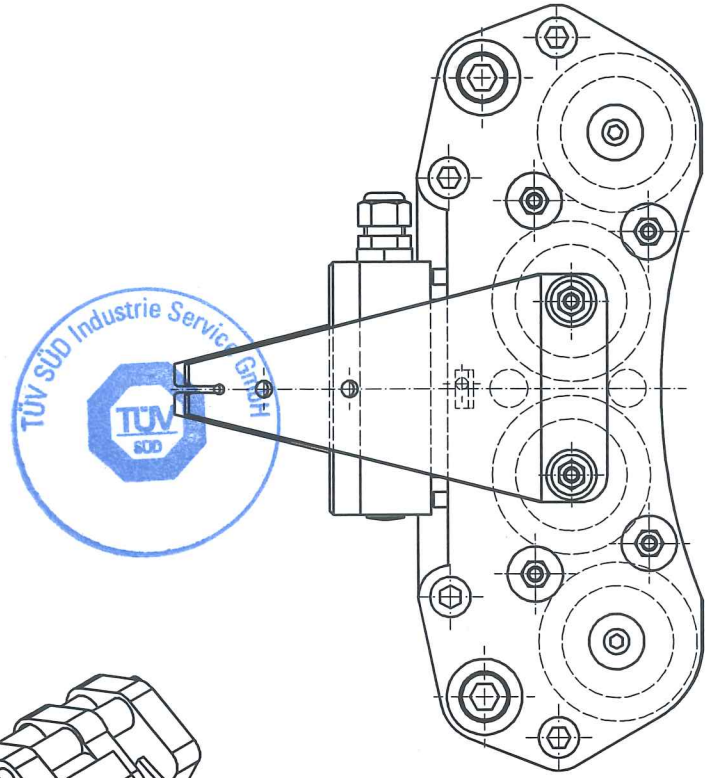
Authorised Manufacturer of Serial Production – Production Sites (valid from: 2016-03-18):

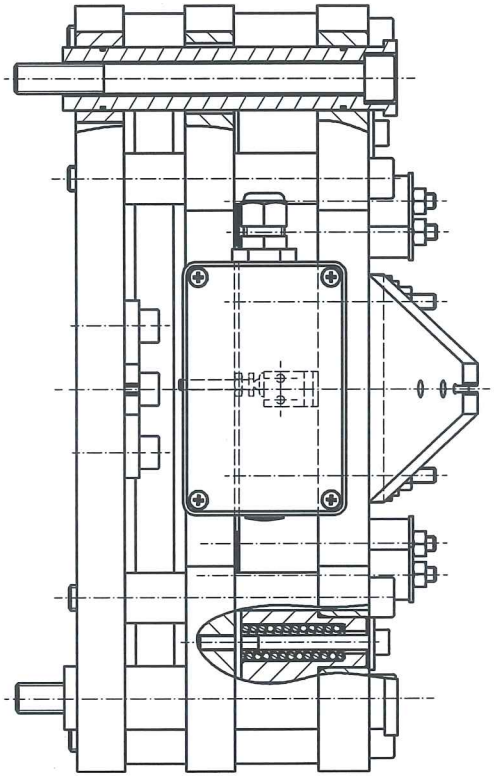
Company	INTORQ GmbH & Co. KG
Address	Wülmser Weg 5 31855 Aerzen – Germany

- END OF DOCUMENT -

INTORQ | User: QUADFASELW | 24.02.2016 | 15:25:49 | Status: 40 | IDW | 5019001 | AB | 000 | gueltig bis







TÜV SÜD Industrie Service GmbH

18. MRZ. 2016

GEPRÜFT / APPROVED
TÜV SÜD Industrie Service GmbH
Prüflaboratorium für Produkte der Fördertechnik
Westendstraße 199
80686 München
Sachverständige(r) / Expert

Type BFK466-55

SAP Ident-Nr. / ID.-no.		Projekt-Nr. / project-no.	Allgemeintoleranzen/ general tolerance	Oberflächen/ surface DIN ISO 1302 $\sqrt{x}=\sqrt{Rz\,25}$ $\sqrt{y}=\sqrt{Rz\,6,3}$ $\sqrt{z}=\sqrt{Rz\,1}$
Typ / type BFK466		Baugröße / design size 55		
Version / version AB		Status / status 40 released		

	Datum / date	Name / name
Bea / drn	10.02.2016	DITTRICH
Gepr / chkd	24.02.2016	QUADFASELW
Freig / appr	24.02.2016	QUADFASELW

Index / index.	Anz./ quan.	Änder-Nr./ revision no.	Datum/ date	Name/ name
7	-	601676	23.02.2016	STR

Maßstab / scale 1:2 | Gewicht / weight | Werkstoff / material | Werkstoff-Nr. / material-no.

Dokumentbeschreibung / document description
Federkraftbremse
Spring-op-brake

CAD INTORQ

Dokument-Nr. / document-no. 5019001

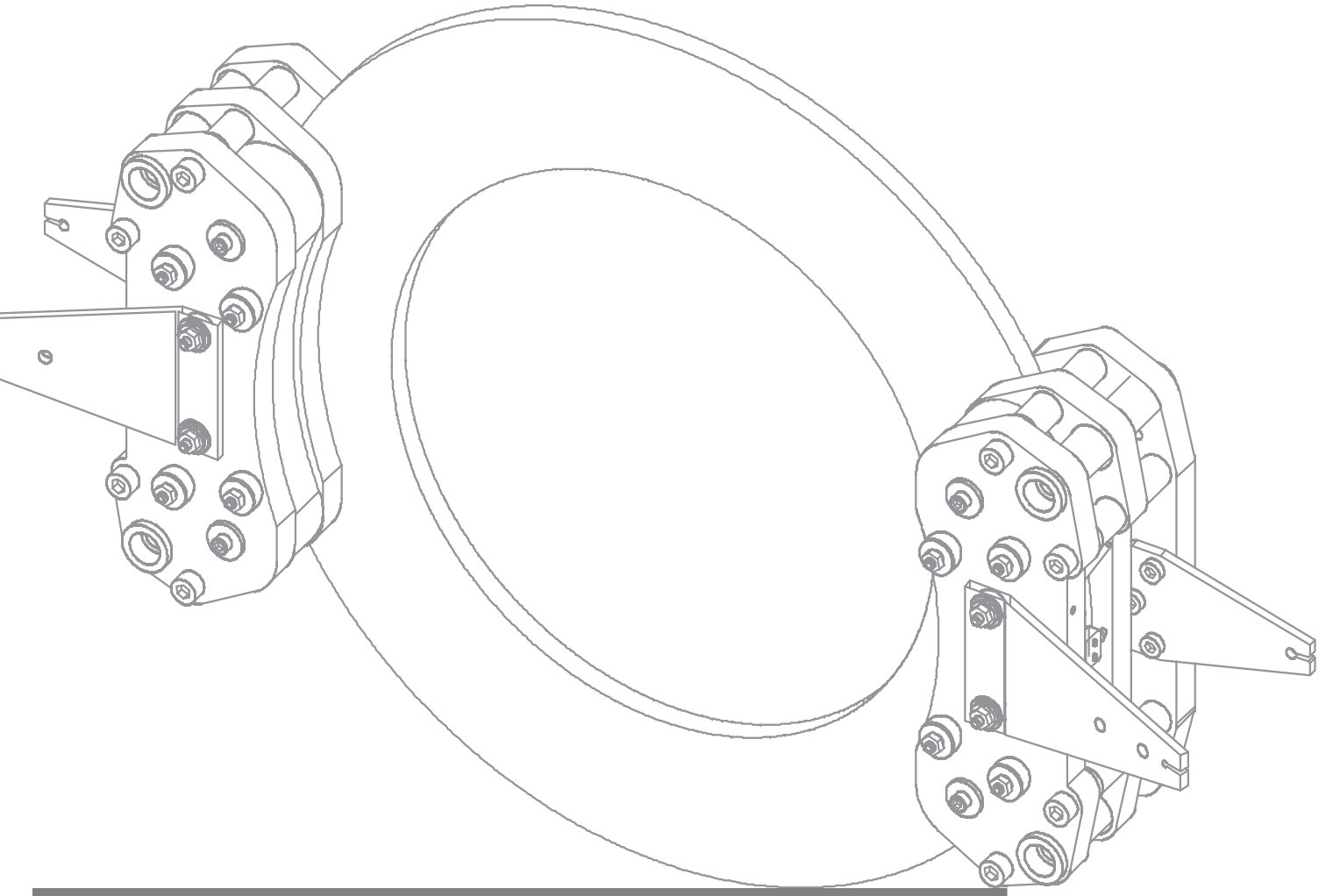
Blatt / sheet 3 von / of 3

Datei / file 5016914_IAM_000.iam

Ersatz fuer / back-up for BFK46655-001

INTORQ

setting the standard



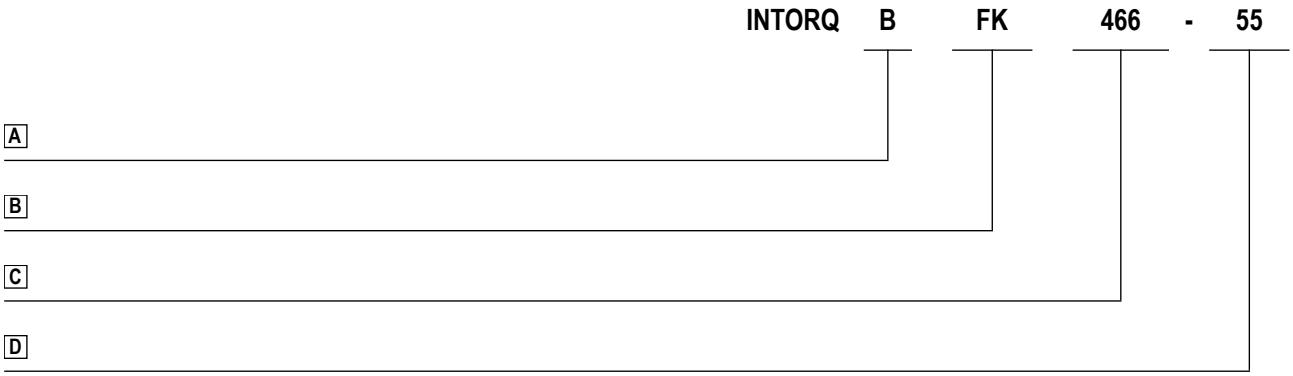
INTORQ BFK466-55

Multi-pole spring-loaded brake

Translation of the Original Operating Instructions

www.intorq.com

Product key



Legend for the product key

INTORQ BFK466

A	Product group	Brakes
B	Product type	Spring-applied brake
C	Type	466
D	Size	55

Not coded: Supply voltage, hub bore hole, options

Identification

Packaging label			**Example**
Manufacturer		Type No.	
Type		Bar code	
Designation		Qty. per box	
Rated/holding voltage	Rated torque		
Rated/holding power		Packaging date	
Model identification		CE mark	
Addition			

Nameplate			**Example**
Manufacturer		CE mark	
Type	Model identification		
Rated/holding voltage	Rated/holding power		
Type No.	Rated torque	Date of manufacture	

Product traceability sticker		Example
Type	QR code	
Type No.		
Serial number		
Manufacturer		

Document history

Material number	Version			Description
13054724	1.0	04/2016	SC	First edition for the series

Contents

1 Preface and general information

1.1 About these Operating Instructions

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

1.2 Terminology used

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

1.3 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 fixing 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

Letter symbol	Unit	Designation
Q_{Smax}	J	Maximally permissible friction energy for cyclic switching, depending on the switching frequency
R_m	N/mm^2	Tensile strength
R_N	Ohms	Rated coil resistance at 20 °C
R_z	µm	Averaged surface roughness
S_h	1/h	Switching frequency: the number of switching operations evenly spread over the time unit
S_{hue}	1/h	Transition switching frequency, thermal parameter of the brake
S_{hmax}	1/h	Maximum permissible switching 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 manual 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}
t_3	ms	Slipping time, operation time of the brake (according to t_{11}) until stand-still
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	Overexcitation time
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

1.4 Conventions in use

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

Spelling of numbers	Decimal separator	Point	The decimal point is always used. For example: 1234.56
Symbols	Page reference	🕮	Reference to another page with additional information For example: 🕮 16 = refer to page 16
	Note		Important notice about ensuring smooth operations or other key information.

1.5 Scope of delivery

- The spring-applied brakes are supplied pre-assembled, and the scope of supply does not include the brake disc or fastening screws.
- After receipt of the delivery, check immediately whether the items delivered match the accompanying papers. INTORQ GmbH & Co. KG. does not accept any liability for deficiencies claimed subsequently. You should make a complaint concerning:
  - visible transport damage immediately to the forwarder.
  - Visible deficiencies / incompleteness immediately to your INTORQ representative.

1.6 Drive systems

1.6.1 Labelling

Drive systems and components are unambiguously designated by the indications on the name plate.

Manufacturer: INTORQ GmbH & Co. KG, Wülmser Weg 5, D-31855 Aerzen, Germany

1.6.2 Application as directed

- Drive systems
  - are to be used in machines and systems.
  - must only be used for the purposes ordered and confirmed.
  - must only be operated under the conditions prescribed in the Operating Instructions.
  - must not be operated beyond their corresponding power limits.

Any other use is considered improper!

1.7 Legal regulations

Liability

- The information, data and notes in these Operating Instructions met the state of the art 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 working on and with the drive system
  - operating faults
  - disregarding these Operating Instructions

Warranty

- Terms of warranty: Refer to the terms of sale and delivery for INTORQ GmbH & Co. KG.
- Please submit warranty claims to your INTORQ representative immediately after the deficiency or fault has been discovered.
- The warranty is void in all cases when liability claims cannot be made.

2 Safety instructions

2.1 Personnel responsible for safety

Operator

- An operator is any natural or legal person who uses the spring-applied brake or on whose behalf the spring-applied brake is used.
- The operator or his safety personnel must ensure
  - that all relevant regulations, notes and laws will be maintained,
  - that only qualified personnel will work on and with the spring-applied brake,
  - that the Operating Instructions will be available to the personnel working on and with the brake at all times,
  - that unqualified personnel will not be allowed to work on and with the spring-applied brake.

Qualified personnel

Qualified personnel refers to those who – due to their training, experience, instruction and knowledge of relevant standards and regulations, accident prevention regulations and operating conditions related to the safety of the facility – have been entitled by the person responsible for the safety of the system to work on and with the system and to recognize and avoid all possible dangers.

(Definition of qualified employees according to IEC 364)

2.2 General safety instructions

- We make no claim to completeness concerning these safety notices. Please contact your local INTORQ representative if you have questions or problems.
- The spring-applied brake corresponds to the state of the art at the time of delivery and is generally safe to operate.
- The spring-applied brake is hazardous to persons, the spring-applied brake itself and other properties of the operator if
  - non-qualified personnel work on and with the spring-applied brake.
  - the spring-applied brake is used inappropriately.
- The spring-applied brakes must be designed so that they perform their function and do not cause danger for persons if they are installed correctly and used as intended in error-free operation. This also applies to the interaction with the overall system.
- Do not operate the spring-applied brake unless it is in perfect condition.
- Retrofittings or changes of the spring-applied brake are generally prohibited. They always require prior consultation with INTORQ GmbH & Co. KG.
- The friction lining and the friction surfaces must never contact oil or grease since even small amounts reduce the braking torque considerably.
- The brake torque will usually not be influenced if the brake is used under the environmental conditions that apply to IP54. 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.

2.3 Operating range for an INTORQ BFK466-55 spring-applied brake

- No explosive or aggressive atmosphere
- Humidity: no restrictions
- Ambient temperature:
  -5 °C to +40 °C (standard)
- At high humidity and low temperature:
  - Take measures to protect the armature plate and rotor from freezing.
- Protect the electrical connections against any contact or touching.

2.4 Safety instructions and notices

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

Safety instructions
Structure of safety instructions:

	 **SIGNAL WORD**
 	**Icon** Indicates the type of danger **Signal word** Characterises the type and severity of danger **Note** Describes the danger **Possible consequences** ▮ List of possible consequences if the safety instructions are disregarded **Protective measure** ▮ List of protective measures to avoid the danger

Danger level

	**DANGER**
	DANGER indicates a hazardous situation which, if not avoided, will result in death or serious injury.

	**WARNING**
	WARNING indicates a potentially hazardous situation which, if not avoided, could result in death or serious injury.

	**CAUTION**
	CAUTION indicates a hazardous situation which, if not avoided, could result in minor or moderate injury.

	**NOTICE**
	Notice about a harmful situation with possible consequences: the product itself or surrounding objects could be damaged.

3 Technical specifications

3.1 Product description

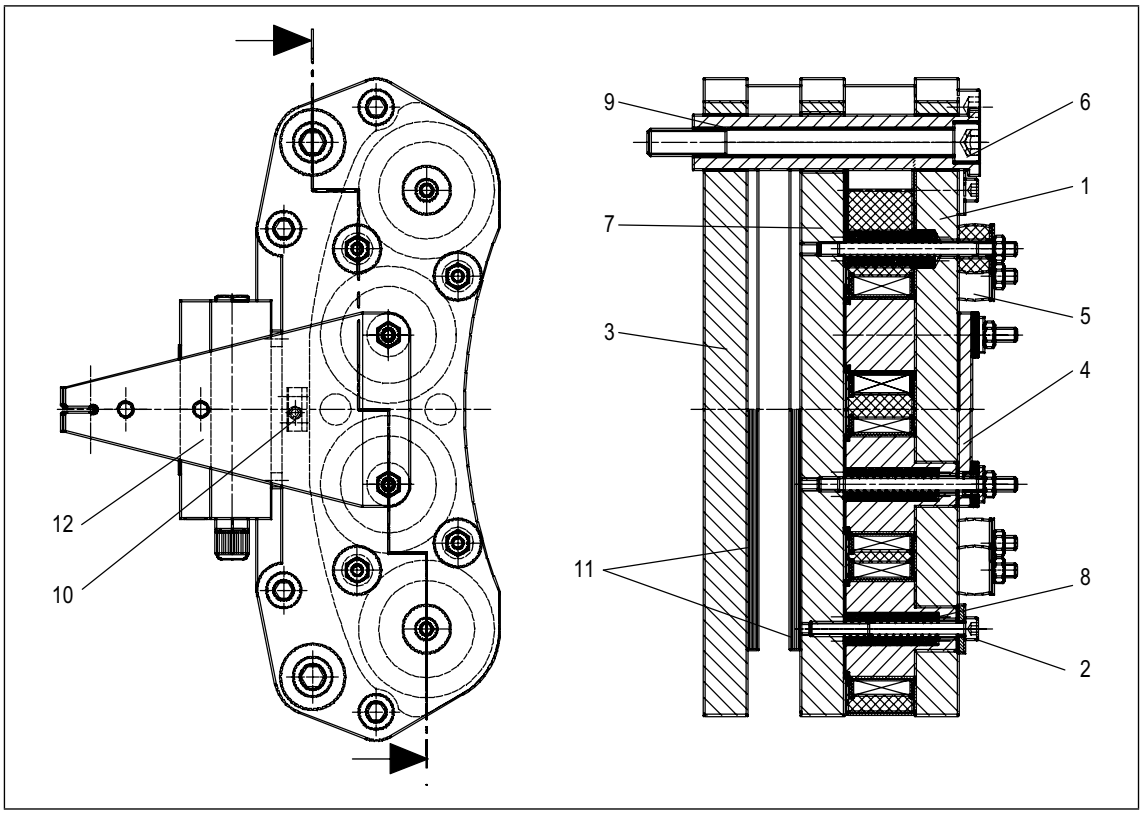


Fig. 1 Design of an INTORQ BFK466-55 spring-applied brake with noise reduction

1	Stator	6	Cylinder head bolt	11	Friction lining
2	Cylinder head bolt (remove after installation)	7	Armature plate	12	Terminal box
3	Flange	8	Pressure spring		
4	Lever	9	Guide sleeves		
5	Pressure spring	10	Microswitch		

3.1.1 General information

The INTORQ BFK466-55 spring-applied brake is designed as a floating caliper brake for mounting on direct drive motors. The brake disc is not included in the scope of supply. By using two or more spring-applied brakes on one brake disc, the demand for redundancy can be fulfilled for special applications such as lift and stage technology.

The braking torque is generated by the pressure of several compression springs (8) via friction locking between the two friction linings (11) of the friction lining support (7) and the flange (3) and the brake disc. The brake is released electromagnetically. The suitable switching device rectifies the supply voltage (AC voltage) and decreases it after a short time when the brake is released. This results in a reduction of the average electrical power of the brake. Optionally, the switching device can be installed into the terminal box.

The INTORQ BFK466-55 spring-applied brake is designed for converting mechanical work and kinetic energy into heat energy, at a slipping speed of 12 m/s. Due to the static braking torque, loads can be held at standstill.

Emergency braking at higher speeds is possible. Here, the maximum permissible speed must not be exceeded (refer to 🕮 14).

The stator (1) is supplied in heat class F. The temperature limit of the coil is 155 °C.

The brake is designed for a maximum switching time (duty cycle) of 60%.

Certificate

Type	EC-type examination certificate		
	Directive 95/16/EC	UCM	Directive 2014/33/EC
BFK466-55	ABV 715/2	ESV 715/1	EU-BD 715

3.1.2 Brakes

During braking, the friction lining carrier (7) and the affixed friction lining are pushed against the axially fixed brake disc. Almost simultaneously, the caliper moves in the opposite direction on the guide sleeves (9), so that the friction lining on the flange (3) is also pushed against the brake disc. The braking torque is supported by the mounting flange via the guide sleeves (9). The asbestos-free friction linings ensure high braking torque and low wear.

3.1.3 Brake release

When the brake is being applied, there is an air gap "s_L" between the friction lining carrier (7) and the pole faces of the stator (1). To release the brake, the coils of the stator (1) are supplied with DC voltage from the associated switching device. The resulting magnetic force pulls the armature plate (7) to the pole faces of the stator (1) against the spring pressure. The caliper can then be on the guide sleeves (9) to the extent that the brake disc (2) is released and is free to rotate again.

3.1.4 Emergency release option

An optional manual release (4) is available for briefly releasing the brake. This allows the load to be lowered in the event of a power failure.

3.1.5 Release monitoring

The INTORQ BFK466-55 spring-applied brake is equipped with a microswitch (changeover contact) which monitors the switching status. When the brake is released, the microswitch (10) toggles. This means that it is possible to prevent the drive from being operated when the brake is closed.

3.2 Rated data

Type	Rated torque M_K [Nm]	Brake disc diameter d_a [mm]	Max. Speed $n_{max.}$ [min^{-1}]	Voltage[1] U [V] DC	Power[2] P_{20} [W]	Coil resistance R_{20}±5% [Ω]	Max. current $I_{max.}$ [A]
BFK466-55	730	450	500	205	473/118	88.80	2.31
	925	550	400				
	1270	750	300				

[1] With 230 V AC rectifier installed in terminal box: 230V AC

[2] Coil power at 20 °C during the release/holding

Type	Air gap s_{LN} [mm]	Max. air gap s_{Lmax} [mm]	Fixing screws	Tightening torque M_A [Nm]	Max. perm. switching energy Q_E [J]	Transitional switching frequency S_{hue} [h^{-1}]	Weight (without brake disc) m [kg]
BFK466-55	0.4 ±0.1	1.0	2 x M12 - 10.9	115	24000	30	16.8

3.3 Switching times

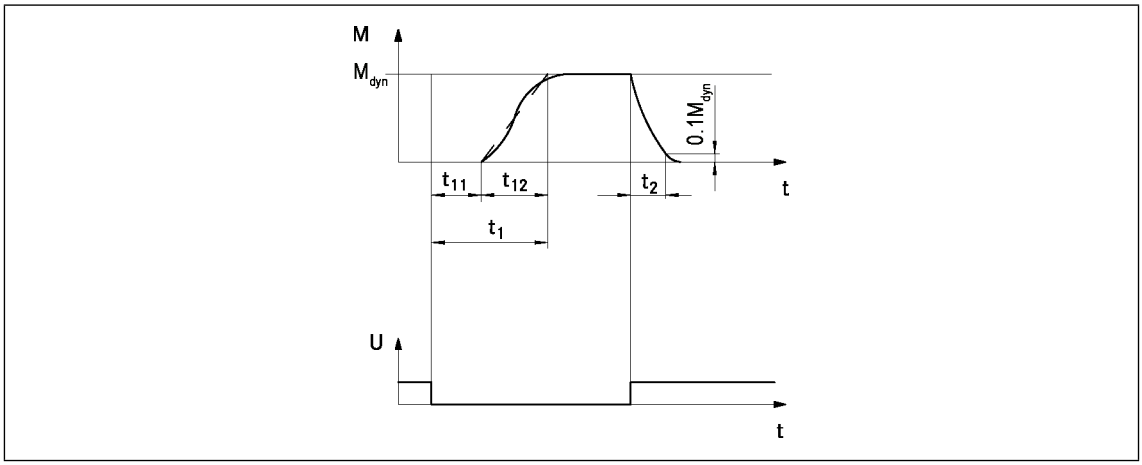


Fig. 2 Operating/switching times of the spring-applied brakes

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

Type	Switching times [ms] at s_{LN}			
	Engage			Disengage
	t_{11}	t_{12}	t_1	t_2
INTORQ BFK466-55	13	20	33	60

Tab. 1: Switching energy - switching frequency - switching times

The transition from the state without brake torque to the steady brake torque is not without delay. The engagement times are valid for switching on the DC side with a spark suppressor (📖 16) when the inductive voltages are five to ten times the rated voltage. The diagram shows the delay time for engagement t_{11}, the rise time of the brake torque t_{12}, the engagement time $t_1 = t_{11} + t_{12}$ and the disengagement time t_2.

Disengagement time

The disengagement time is not influenced by DC or AC switching operations.

Engagement time

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

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). In this case, the engagement times increase approximately by a factor of 5.

3.4 Switching energy / switching frequency

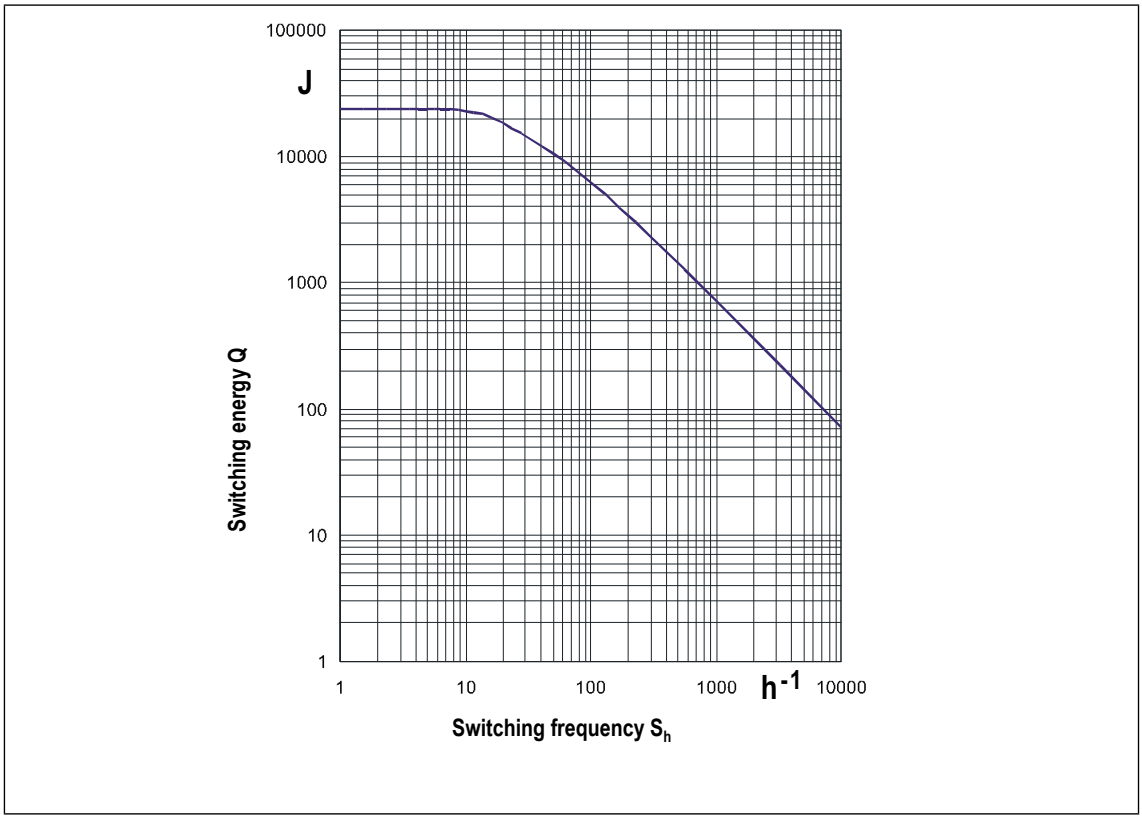


Fig. 3 Switching energy as a function of the switching frequency

$$S_{hzul} = \frac{-S_{hue}}{\ln\left(1 - \frac{Q}{Q_E}\right)} \qquad Q_{zul} = Q_E\left(1 - e^{\frac{-S_{hue}}{S_h}}\right)$$

The permissible switching frequency S_{hzul} depends on the switching energy Q. At a pre-set switching frequency S_h, the permissible amount of switching energy is Q_{zul}.

3.5 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.

	DANGER
	Risk of burns on brake and brake disc!

Noise

The loudness of the switching noise during engaging and disengaging depends on the air gap "s_L" and the brake size. It is approximately 60 to 65 db [A].

Miscellaneous

Abrasion due to emergency braking occurs in the form of dust.

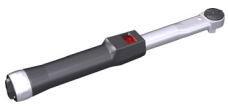
In case of high load, the friction face will become so hot that odours may occur.

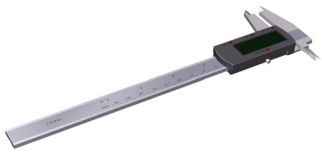
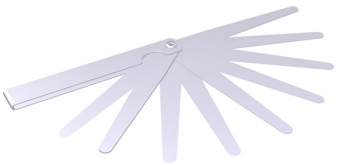
4 Mechanical installation

Important notes

	NOTICE
	Do not lubricate the screws with oil or grease.

4.1 Necessary tools

Type	Torque wrench	Insert for hexagon socket screws	Transport screw	Cross-tip screwdriver
				
	Measurement range [NM]	**Width across flats [mm]**	**Wrench width [mm]**	**Cross-tip size**
BFK466-55	250	14 x 1/2" square	6 x 1/4" square	2

Multi-meter	Calliper gauge	Feeler gauge
		

4.2 Assembly

4.2.1 Preparing the installation

1. Unpack the spring-applied brake.
2. Check for completeness.
3. Verify the nameplate data (especially the rated voltage).

4.3 Installation

The brake is delivered pre-assembled with two transport safety bolts (1 in Figure 4).

1. Position the brake radially over the brake disc (2).
2. Insert the mounting screws (3) and tighten using the specified torque (📖 14).
3. Check the clearance of the brake disc (2). Check the air gap "s_L" between the two friction linings (4) and the brake disc (2) using a feeler gauge (5).

	NOTICE
	The sum of the measured gaps may not be larger than "s_{Lmax}"!

4. Remove the transport safety bolts (1).
5. Switch the current on and off several times, checking the movability of the brake on the guide sleeves.

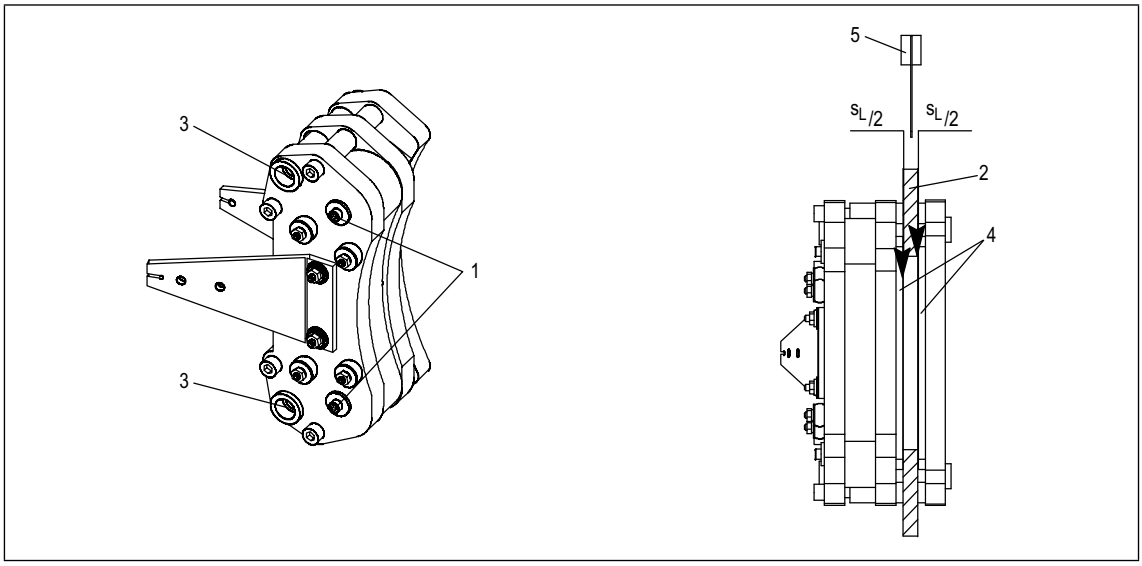


Fig. 4 Procedure for installing the BFK466-55 spring-applied brake

5 Electrical installation

5.1 Electrical connection

DANGER

There is a risk of injury by electrical shock!

- Perform electrical connection only when no voltage is applied.
- 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!

Switching on

- K2 must be closed prior to K1!

Switching off

- Normal (AC switching)
  - K2 remains closed
  - Open K1
- Emergency stop (DC switching)
  - K1 and K2 are opened at the same time

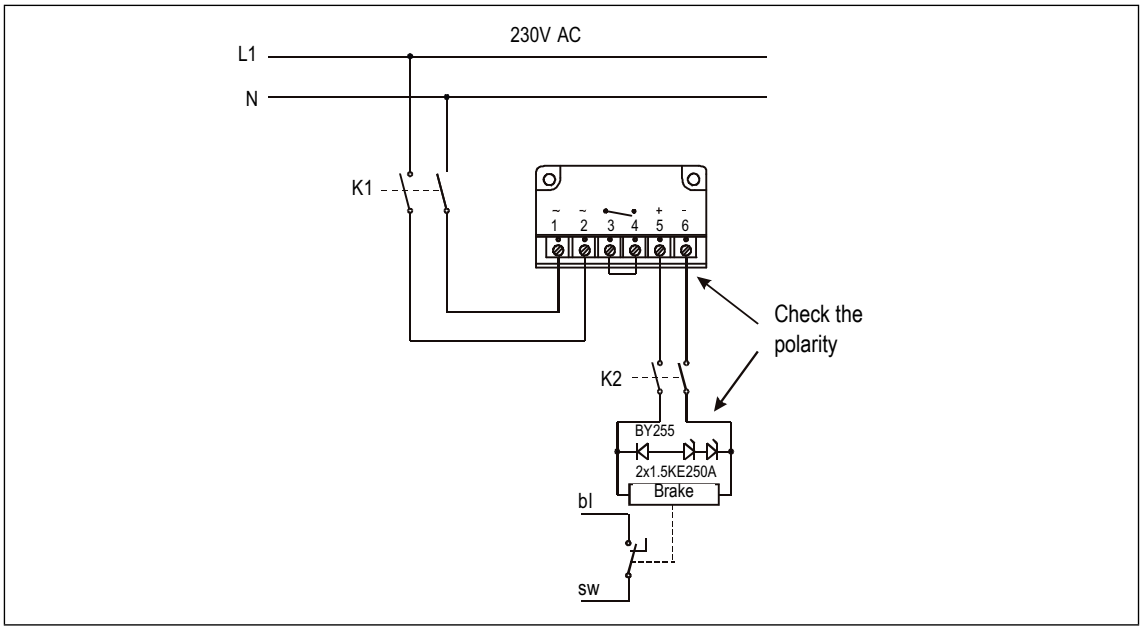


Fig. 5 Connection diagram for the BFK466 (circuit proposal for DC switching)

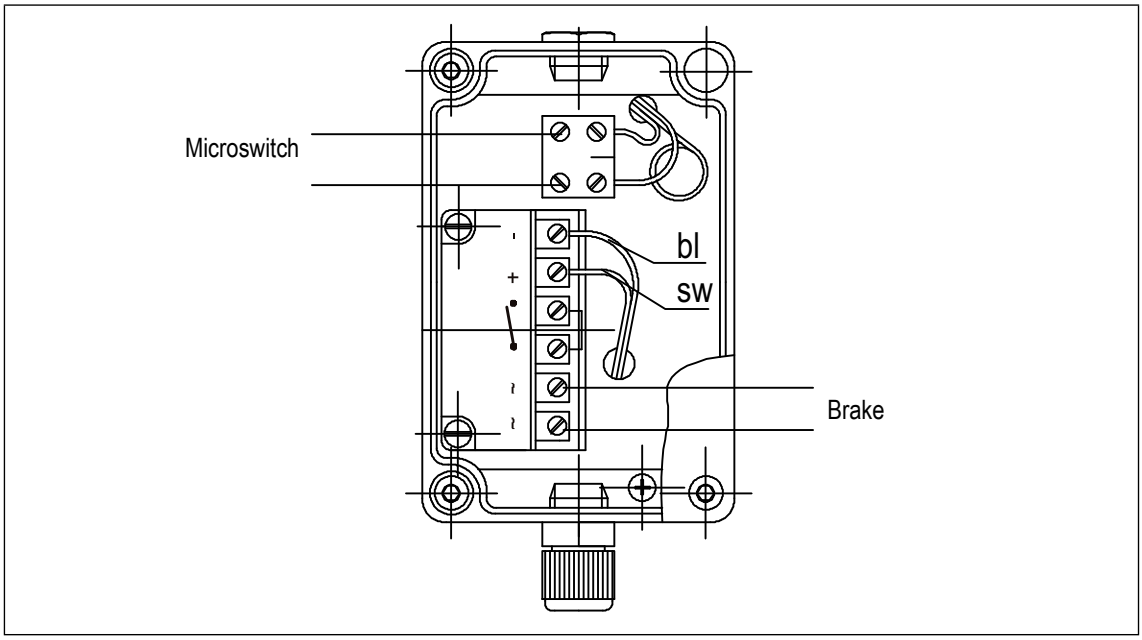


Fig. 6 BFK466 terminal box (optional)

Input connection	black
N/O contact	blue connection
NC contact	grey connection

When current is fed to the spring-applied brake, the armature plate is released. The microswitch (NO contact) is actuated and gives the signal “Spring-applied brake released".

6 Commissioning and operation

Important notes

	**DANGER**
	Danger: rotating parts! The brake must be free of residual torque. The motor must **not** be running!

	**DANGER**
	There is a risk of injury by electrical shock! Live connections must **not** be touched.

6.1 Performing functional tests

Refer to 24 Troubleshooting and fault elimination for more information on the errors.

6.1.1 Release / voltage control

1. Remove two bridges from the motor terminals. Do not switch off the voltage supply to the brake.
2. Measure the AC voltage at the motor terminals. The measured level must be zero.
3. Switch on the current for the brake.
4. Measure the AC voltage at the motor terminals. It must be the same as the mains voltage.
5. Check the air gap "s_L" between the brake disc and friction lining. It must be a total of 0.4 (± 0.1) mm. The brake disc must be able to be turned freely.
6. Switch off the power supply.
7. Screw the bridges onto the motor terminals.

6.1.2 Manual release

The installed manual release is designed to be activated using a Bowden cable. The support at the spring-applied brake is used to suspend the Bowden cable. If no Bowden cable is being used, the lever must be extended to a total length of approx. 500 mm.

⚠	⚠ **DANGER**
	Danger: rotating parts! The brake must be free of residual torque. The motor must **not** be running!

1. Pull lever with approx. 800 N (approx. 200 N with extension) until considerable increase in resistance is felt.
2. The rotor must turn freely. A low residual torque is permitted.
3. Release the lever.

6.2 During operation

- Checks must be carried out regularly during operations. Pay special attention to:
  - unusual noises or temperatures
  - loose fixing/attachment elements
  - the condition of the electrical cables.
- If a fault or malfunction occurs, look through the error search table (📖 26). If the fault cannot be fixed or eliminated, please contact the INTORQ customer service.

7 Maintenance and repair

7.1 Inspection intervals

The spring-applied brake must be checked during the prescribed inspections of the drive system in which it is installed.

The service life of the brake before replacement does not only depend on the number of emergency brakings. The wear of the brake friction linings varies depending on the operating conditions. The friction work possible before replacement decreases with every braking when the switching energy increases.

7.2 Inspections

7.2.1 Braking torque / delay check.

⚠	⚠ **DANGER**
	Make sure that you remove all loads from the drive. Otherwise, there is a risk of an accident. The motor must **not** be running when checking the spring-applied brake.

1. Switch on the power supply for the brake.
2. Use a feeler gauge to check the air gap "s_L" between the brake disc and friction lining. It should not exceed "$S_{Lmax.}$", according to the table (📖 14).
3. Switch off the power supply.

7.3 Maintenance

The brake does not require any maintenance when it is being used as a holding brake. The brake is replaced in the reverse order of the assembly (📖 18).

⚠	⚠ **DANGER**
	Make sure that you remove all loads from the drive. Otherwise, there is a risk of an accident. The motor must **not** be running when work is being carried out on the spring-applied brake.

1. Switch on the current for the brake **or** screw in the transport screws (M6x65 with Ø23 washer).
2. Loosen the fixing screws at the guide sleeves (Figure 1).
3. Remove the brake radially from the brake disc.
4. Switch off the power supply and disconnect the connecting cables.

7.4 Ordering spare parts

INTORQ BFK466-55 spring-applied brake

Order quantity	_____ Pieces	
Size	☐ 55	
Voltage	☐ 103 V	☐ 205 V
Cable length	☐ Standard	
	_____ mm	(from 100-1000 mm in 100 mm steps, from 1000-2500 mm in 250 mm steps)
Terminal box	☐ **installed**	
Manual release	☐ **installed**	
PTC sensor	☐	

Electrical accessories

Rectifier with overexcitation	☐

8 Troubleshooting and fault elimination

If any malfunctions should occur when operating the braking system, please check for possible causes based on the following table. If the fault cannot be fixed or eliminated by one of the listed measures, please contact customer service.

Fault	Cause	Remedy
Brake cannot be released, air gap is not zero	Coil interruption	▮ Measure coil resistance using a multimeter: - Replace the brake when the resistance is too high.
	Coil has contact to earth or between windings	▮ Measure coil resistance using a multimeter: - Compare the measured resistance with the nominal resistance. Refer to the rated data (14 📖). When there is insufficient brake resistance. ▮ Check the coil for short to ground using a multimeter: - Replace the brake in case of short circuit to ground. ▮ Check the brake voltage (refer to section on defective rectifier, voltage too low).
	Wiring defective or wrong	▮ Check the wiring and correct. ▮ Check the cable for continuity using a multimeter: - Replace defective cable.
	Rectifier defective or incorrect	▮ Measure rectifier DC voltage using a multimeter. If DC voltage is zero: ▮ Check AC rectifier voltage. If AC voltage is zero: - Switch on power supply - Check fuse - Check wiring If AC voltage is okay: - Check rectifier - Replace defective rectifier If AC voltage is too low: - Check rectifier - Diode defective - install an appropriate undamaged rectifier. ▮ Check coil for inter-turn fault or short circuit to ground. ▮ If the rectifier defect occurs again, replace the entire stator, even if you cannot find any fault between turns or short circuit to ground. The error may only occur on warming up.
	Incorrect microswitch wiring	Check the wiring of the microswitch and correct it.
Brake cannot be released, air gap is not zero	Microswitch incorrectly set	Replace the brake and complain about the microswitch quality to the manufacturer.
	Air gap too large	Replace the brake (📖 24)

Fault	Cause	Remedy
Brake disc cannot rotate freely	Wrong setting of manual release	▮ Check the dimension "$s+s_L$" with the brake energized. The dimension must be the same on both sides. Correct if required.
	Air gap "s_L" is too small	▮ Check air gap "s_L" and replace brake if necessary. (📖 24) ▮ Check the thickness of the brake disc and replace the brake disc if necessary. ▮ Check the movability of the brake on the guide sleeves and, if necessary, replace the guide sleeves.
Voltage not zero during functional test 📖 20	Incorrect microswitch wiring	Check and correct the wiring of the microswitch.
	Microswitch defective or incorrectly set	Replace the brake and send the defective brake 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 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 microswitch wiring	Check and correct the wiring of the microswitch.
	Microswitch defective or incorrectly set	Replace the brake and send the defective brake to the manufacturer.

Notes

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