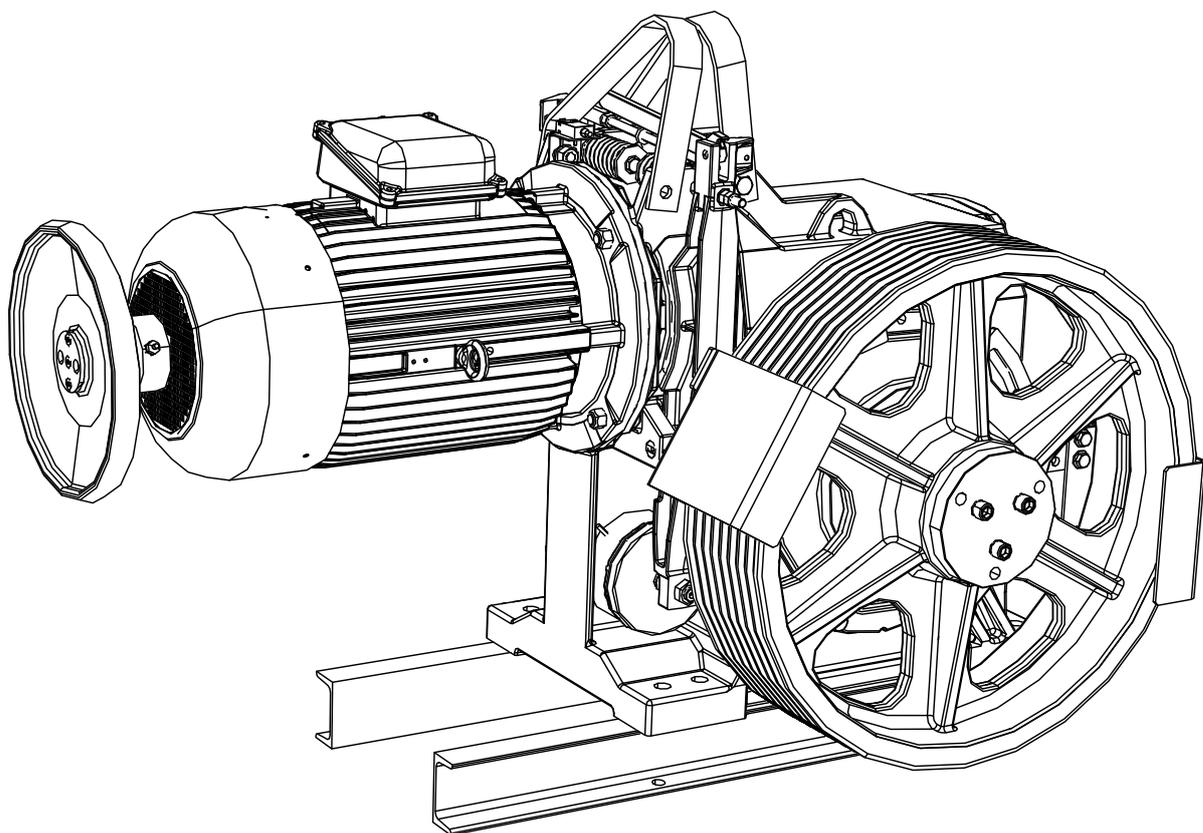


# OPERATING MANUAL

## TW160

Drive  
07/2025



6234002860

**TKE**

# Company and contact information

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To improve readability, plural pronouns are used here to refer to a singular subject of any gender.

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# 1 About these instructions

## 1.1 Guide to layout

### Sequence of actions involving several steps

✓ Requirement for the sequence of actions (optional).

1. First action step.
2. Second action.
  - ▷ Interim result (optional)
3. Third action step.
  - ▷ Result of action (optional)

### Sequence of actions involving independent steps

- Action step.
- Action step.
- Action step.

### Information



Information must always be read and followed.

---

### Reference

[↗Chap. 1 P. 6](#)

### List

- Top item of a list
  - Sub-item of a list
  - Sub-item of a list
- Top item of a list
- Top item of a list

## 2 Safety

### 2.1 Warning notes

- Warning notes are intended for the protection of persons and property.
- Warning notes must be read and observed by every person who works on the product.
- Warning notes precede activities that pose a hazard for people and the product.

#### 2.1.1 Structure

##### SIGNAL WORD AND SIGNAL COLOUR



###### Type and source of danger

Consequences if danger disregarded.

→ Measures to avert the danger.

#### 2.1.2 Indications of danger to persons

##### DANGER



###### Danger with a high degree of risk!

If ignored, leads to death or serious injury.

→ Read and comply with the warning.

##### WARNING



###### Danger with a high degree of risk!

If ignored, may lead to death or serious injury.

→ Read and comply with the warning

##### CAUTION



###### Danger with a low degree of risk!

If ignored, may lead to minor or moderate injury.

→ Read and comply with the warning.

#### 2.1.3 Indication of possible damage to property

##### NOTICE



###### Hazard with possible damage to property!

May lead to product function impairments or function loss.

→ Read and comply with the warning.

## 2.2 Safety requirements

This document contains important information for safe operation of the product.

- Keep this document and all other applicable documents at the location of use for the entire working life of the product.

### 2.2.1 Area of applicability

This document applies only to the product described here.

#### Other applicable documents

- International occupational health and safety regulations

### 2.2.2 Basic requirements for safety

- All existing safety devices are to be tested regularly in accordance with the maintenance schedule.
- This document, in particular the chapter entitled "Safety", together with the warnings and all other applicable documents, must be followed by all persons who work with the product.
- In addition to this document, the rules at the location of use with regard to environmental protection and the occupation health and safety and accident prevention regulations must be followed.
- All safety and hazard warnings on the installation must be kept in legible condition.
- Safety information and instructions required by law must be displayed to users in such a way that they are clearly visible.
- A requirement for safe handling and non-disruptive operation of this product is knowledge of the fundamental safety regulations.

### 2.2.3 Obligations of the operating company and installation firm

- Only deploy trained and instructed qualified personnel.
- Provide personnel with the required personal protective equipment.
- Check personnel at regular intervals to ensure that they follow safety-conscious work practices and comply with national provisions.
- Make all other applicable documents as well as this document available to personnel.

### 2.2.4 Duties of personnel

- Clearly establish all areas of responsibility prior to any activity.
- Always wear the personal protective equipment made available to you.
- Prior to work, make people aware of the dangers of electrical current.

## 2.2.5

## Dangers in handling the drive

### DANGER



#### **Residual voltage after switching off the elevator installation!**

Electric shock that can lead to death or severe injury.

- Perform work on energised parts of the drive only after the waiting period and/or when the DC link voltage is less than 60 V (check with a measuring instrument)

### WARNING



#### **Inadequate connection**

Electric shock. Damage to drive.

- Earth the motor and brake magnet in accordance with country-specific regulations.
- Electrical connections must correspond to at least the protection class in accordance with the name plate and/or required country-specific protection class.

### WARNING



#### **Contact with rotating or moving parts!**

Entanglement of clothing or body parts can lead to crushing or even loss of limbs.

- Maintain an adequate distance to rotating and moving parts, for example traction sheave, ropes.
- Wear tight-fitting clothing.
- Make sure you assume a firm stance.

- The drive may only be operated in a closed machine room or secured shaft.
- The machine may only be operated with the cover and rope guard fitted to the traction sheave.
- The drive is not suitable for operation in explosive or aggressive atmospheres.
- On entering the machine room, adequate safety clearance to all rotating parts is to be maintained.
- In the event of improper use of the machine, there is a risk of personal injury or to the life of the user or third parties, or impairment on the assembly or other assets can arise. Malfunctions that can adversely affect safety must be rectified immediately.
- It must be ensured that a fault generated by the encoder, the brake or the brake control system is detected by the elevator control system or frequency inverter. The control system must immediately place the elevator in a safe state.
- The elevator installation must ensure that emergency braking by the mechanical brake system takes place in the following cases:
  - Uncontrolled movement out of the stopping zone

- Failure of the inverter (due to short circuit with triggering of the fuse)
- The elevator installation must be fitted with a safety device complying with EN81 or A17 that detects exiting the elevator car with the door opened and initiates suitable measures.

## 2.3 Warranty and liability

The "General Terms of Sale and Delivery" of TK Aufzugswerke GmbH apply.

Warranty and liability claims in the event of personal injury and material damage shall be excluded if they arise due to at least one of the following causes:

- Improper use that is not in line with the intended purpose of the product
- Incorrect installation, commissioning, operation and maintenance of the product
- Operation of the product with defective or inoperative safety and/or protection devices
- Non-observance of the instructions in the operating manual with regard to transport, storage, installation, commissioning, operation and maintenance
- Structural modification to the product without agreement or approval
- Modification to product features without agreement or approval
- Inadequate monitoring of parts that are subject to wear
- Repairs that are carried out improperly
- Cases of catastrophe due to third-party interference or force majeure
- Use of non-approved auxiliary materials and operating fluids

### 2.3.1 Structural modification of the product

The product is configured in the factory and delivered ready for operation.

If changes are made to the product, the entire warranty of TK Aufzugswerke GmbH shall become null and void.

### 2.3.2 Use in line with intended use

The product has been constructed using state-of-the-art technology and in line with the recognised technical safety regulations. It may only be used in accordance with its intended use and when the technical safety devices are free from defects. Any other or additional form of use shall be regarded as **non-compliant** with the intended use. TK Aufzugswerke GmbH shall **not** be liable for any damage arising from such use and any damage arising due to operator errors.

In order to comply with the intended use of the product:

- Use the product as a Drive of elevators only
- Read and comply with the document, in particular the chapter entitled "Safety", together with the warnings and all other applicable documents
- Comply with the commissioning instructions, the installation description as well as the required inspection and maintenance work

2.4

10 rules for health and safety at work

**TKE**

Field

**10 RULES PREVENTION OF AN ACCIDENT**

**Lock Out – Tag Out (LOTO)**

*Always test & verify.*

Ensure there are no passengers in the cab. All doors are closed and mechanically locked.

Guard any circuit that may not be de-energized on a locked out controller: e.g 110 V lighting.

Always have the unit personally locked before working on the unit if it is not to be moved.



**Fall Protection**

*Always tie-off when a fall hazard of 1.8m or more exists.*

Always wear proper work attire: full body harness.

Inspect your full body harness before each use.

Always be aware of your surroundings, especially at heights of more than 1.8m and with a gap of more than 300mm.



**Jumpers**

*Always count jumpers before and after use.*

Inspect jumpers for damage. Only use approved jumpers.

Jumpers may not be installed on the safety circuit when the elevator is in automatic operation. Always notify co-workers when jumpers are being used.



**Personal Protective Equipment (PPE)**

*Always wear the proper Personal Protective Equipment.*

Always wear proper work attire and if necessary: safety shoes, helmet, eye protection, hearing protection and protective gloves.



NO JOB IS SO IMPORTANT OR URGENT THAT IT CANNOT BE DONE IN A SAFE WAY.



OSH  
BECAUSE WE CARE

**Car Top And Pit Access**

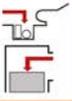
*Maintain control of the elevator at all times.*

Access: Car top - Send the car up/down, open the door (Door-Lock) and fix with door stopper. Independently verify door safety, stop switches and inspection switch.

Pit - Activate pit stop switch and use ladder safely.

Egress: ensure stop switches are activate when exiting car top or pit.

Pit - Deactivate stop switch(es) and use ladder or step aids safety.



**Live Electrical/Troubleshooting**

*Use certified tools and prevent incidental contact with live electrical circuits.*

*Probe with only one hand.*

Lock Out and Tag Out if power is not required.

Inspect tools before use.

Always guard live circuits.

Test meter on a known source before use.



**Mechanical Stored Energy**

*Avoid pinch points of materials and tools.*

Avoid loose clothing and be careful when wearing gloves near moving machinery.

Ensure all loads are stable and secure.

Avoid the red zones (leaning over to adjacent shaft etc.).



**Rigging & Hoisting**

*Verify stability & capacity.*

Inspect rigging equipment before each use.

Ensure load slings are properly sized.

Ensure load will clear all obstructions.

Do not stand or walk under load being hoisted.



**False Cars & Running Platforms**

*Operate with two means of safety.*

Always use safeties and governor if hoisting with original machines.

When using a temporary cable climbing hoist a secondary Blocktop is required.

Governor and/or safety foot pedal is required.

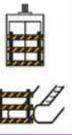


**Barricading**

*Secure workplace properly with barricades.*

When swing doors, automatic doors, steps, stepreads, pallets, comb-plates, comb-plate teeth, floor plates or trap doors have been removed or have not been installed leaving an open fall hazard, the unit has to be secured with barriers (for escalators at both ends).

Barricades are to be secured to the unit when work is not being performed in the area.



The international rules for occupational health and safety can also be found on our online platform ELI for download at: <https://eli.tkelevator.com/support/occupational-safety-health>

## 2.5 Personal protective equipment

Danger	Cause	Risks	Remedy	Equipment
	<ul style="list-style-type: none"> <li>Unprotected shaft</li> <li>Unprotected cabin roof</li> </ul>	Falling		Safety harness
 	<ul style="list-style-type: none"> <li><b>WARNING!</b> <b>Do not walk underneath suspended loads</b></li> <li>Falling tools</li> <li>Transport of heavy loads</li> <li>Sharp-pointed objects</li> </ul>	Head injury		Head protection
 	<ul style="list-style-type: none"> <li><b>WARNING!</b> <b>Do not walk underneath suspended loads</b></li> <li>Falling tools</li> <li>Transport of heavy loads</li> <li>Sharp-pointed objects</li> </ul>	Danger of crushing in the foot area Cut or stab injury in the foot area		Foot protection
  	<ul style="list-style-type: none"> <li>Sharp objects</li> <li>Mechanical parts</li> <li>Sharp-pointed objects</li> <li>Caustic substances</li> </ul>	Danger of crushing in the hand area Stab injury in the hand area Acid/alkali burns		Protective gloves
	<ul style="list-style-type: none"> <li>Severe noise pollution</li> </ul>	Noise damage		Ear protection
 	<ul style="list-style-type: none"> <li>Flying parts</li> <li>Flying particles</li> <li>Laser beams</li> <li>Emissions of optical rays</li> </ul>	Eye injury Loss of sight/blinding		Protective goggles
	<ul style="list-style-type: none"> <li>Electrical voltage</li> </ul>	Electric shock		Enable source of energy

## 3 Description

### 3.1 Standards and legal requirements

The product complies with the following regulations:

- Directive 2014/34/EU
- DIN EN 81-20:2020-06
- DIN EN 81-50:2020-06
- DIN EN 81-77:2023-02



For operation in line with standards, the elevator installation must comply with each standard.

---

### 3.2 Product Group TW Machines

The designation of this series (successor generation of W series) is composed of the combination of TK Elevator, Wormgear (TW) and a figure for the main performance point (e.g. Q = 1600 kg → 160) of the machine, as well as an indicator of the generation (e.g. "B").

As part of further technical development, these machines are designed completely with low-friction rolling bearings.

The use of a synthetic gear oil (polyalkylene glycol with additives) not only increases the power density and the gear efficiency, but also extends the oil change intervals.

### 3.3 Product

The machine TW160 (**TK Elevator Wormgear**, Q=1600 kg) is used for traction elevators within the framework of the TW series (machines with worm gear, anti-friction bearings, lubrication with synthetic gear oil).

Conceived for installations with rated load 1600 kg at 1.0/1.6 m/s , machine TW160 consists of a worm gear with integrated operational brake, overhung traction sheave, flange-connected three-phase motor in design IMB5.

- The machine is exclusively available with frequency-controlled motors (VVVF).

TW160 machine in standard version (machine shown with traction sheave position on right)

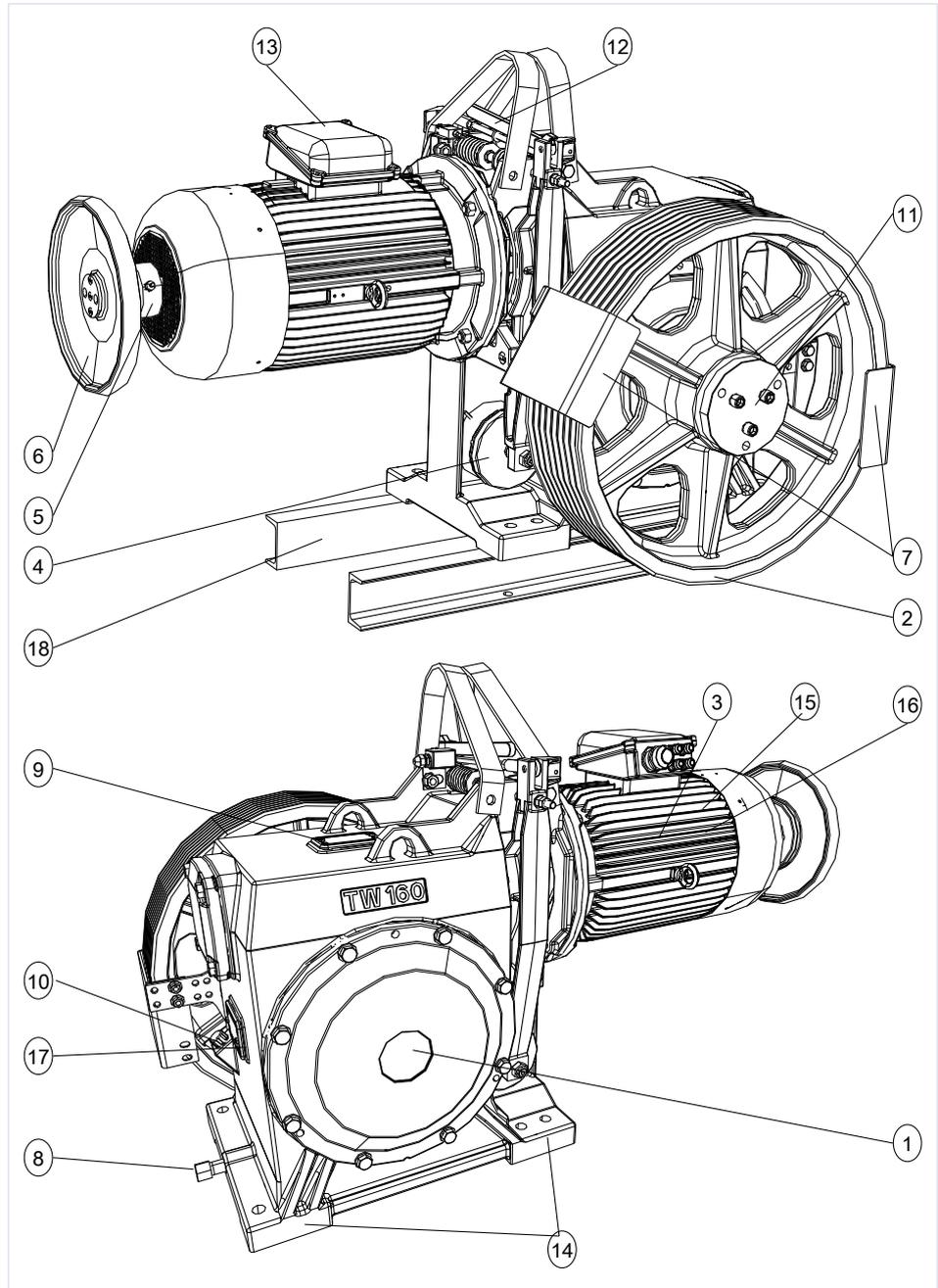


Fig. 1

ATR\_2\_21\_0187\_0

Item	Designation	Item	Designation
1	Driving gear	2	Traction sheave (standard version)
3	Motor	4	Operational brake
5	Encoder (type WDG100)	6	Handwinding wheel (D360)
7	Rope guard (adjustable)	8	Oil drain (3/4")
9	Oil filling hole with cover	10	Oil level monitoring (dipstick) and ventilation
11	Traction sheave mount	12	Brake release lever (mounted)

Item	Designation	Item	Designation
13	Motor terminal box with connection	14	Mounting surface for machine base frame
15	Internal ventilator for motor cooling	16	Air vents for motor
17	Inspection opening with cover for gear teeth check	18	Support

TW160 machine with NBS emergency brake system (machine shown in traction sheave position on right)

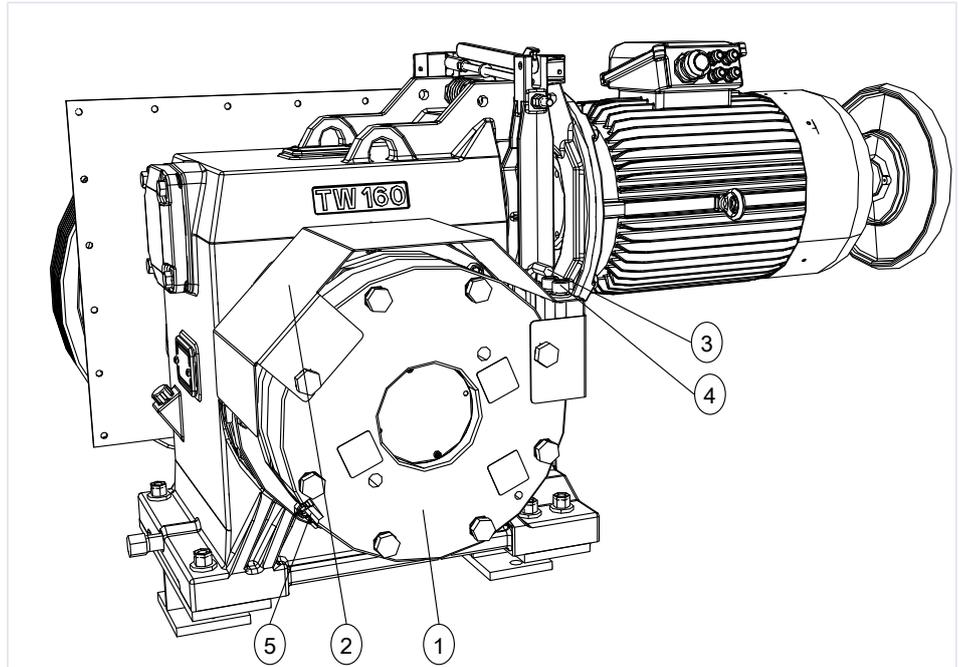


Fig. 2

ATR\_2\_21\_0183\_0

Item	Designation	Item	Designation
1	Disc brake – emergency brake system	2	Cover plate for brake
3	Socket wrench for manual release	4	Screws for manual release (screw head marked in red)
5	Brake test switch with connection line		

TW160 machine with traction sheave position in the shaft – SA9  
(machine shown with traction sheave position on right and upward support on outside bearing)

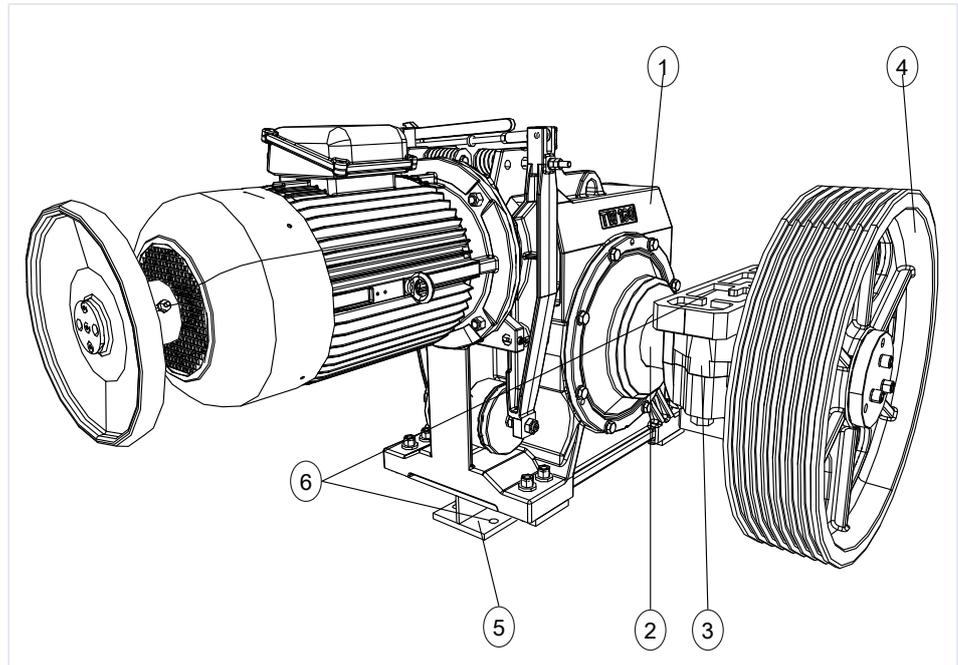


Fig. 3

ATR\_2\_21\_0184\_0

Item	Designation	Item	Designation
1	TW130 SA9 machine	2	Traction sheave shaft, SA4/9 version
3	Outside bearing (bearing housing with self-aligning bearing on adapter sleeve)	4	Traction sheave, SA4/9 version
5	Compensating support (for statically defined machine mounting)	6	Mounting surfaces for machine base frame

TW160 machine with vapour-proof partition wall – SA4 (machine shown with traction sheave position on right and downward support on outside bearing)

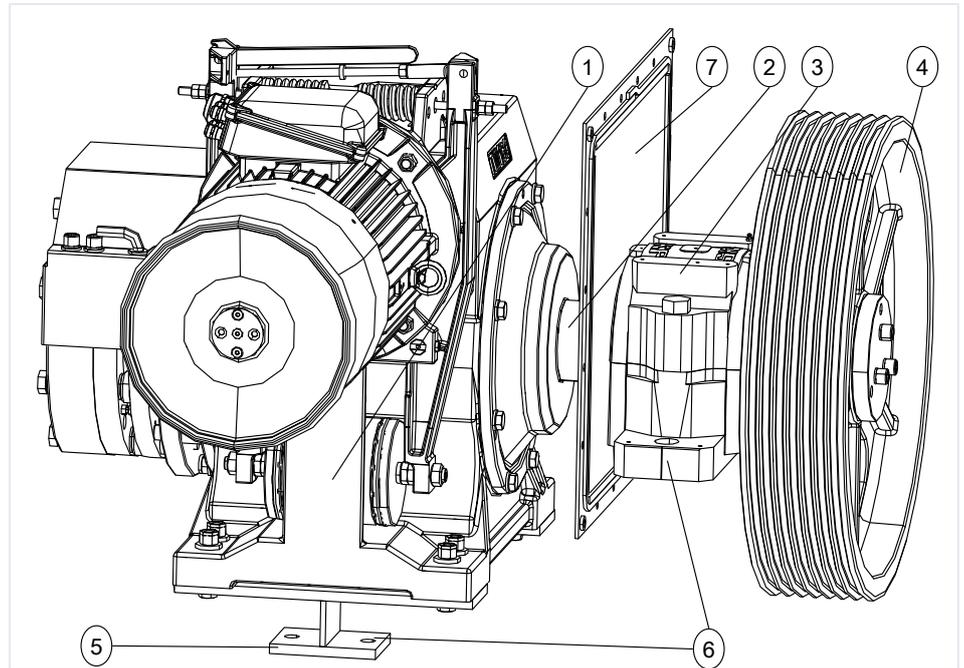


Fig. 4

ATR\_2\_21\_0185\_0

Item	Designation	Item	Designation
1	TW160 SA4 machine	2	Traction sheave shaft, SA4/9 version
3	Outside bearing (bearing housing with self-aligning bearing on adapter sleeve)	4	Traction sheave, SA4/9 version
5	Compensating support (for statically defined machine mounting)	6	Mounting surfaces for machine base frame
7	Partition wall with seal for TW160 machine base frame SA4		

TW160 machine with vapour-proof partition wall – SA4 in combination with emergency brake – NBS (machine shown in traction sheave position on right and downward outside bearing support)

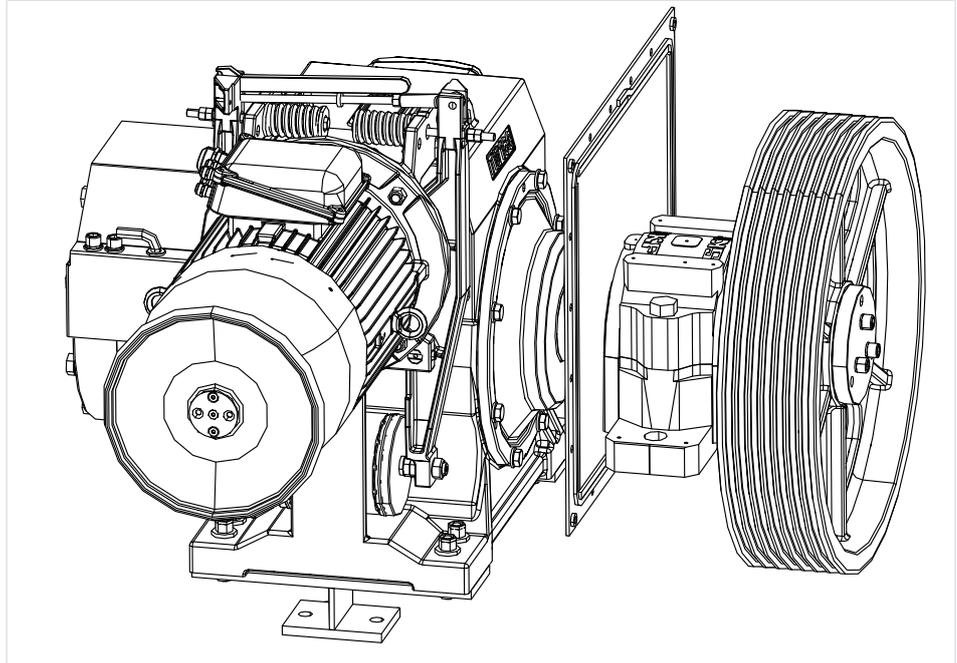


Fig. 5

ATR\_2\_21\_0186\_0

TW160 machine with traction sheave position in the shaft – SA9 in combination with emergency brake – NBS (machine shown in traction sheave position on right and upward support of outside bearing)

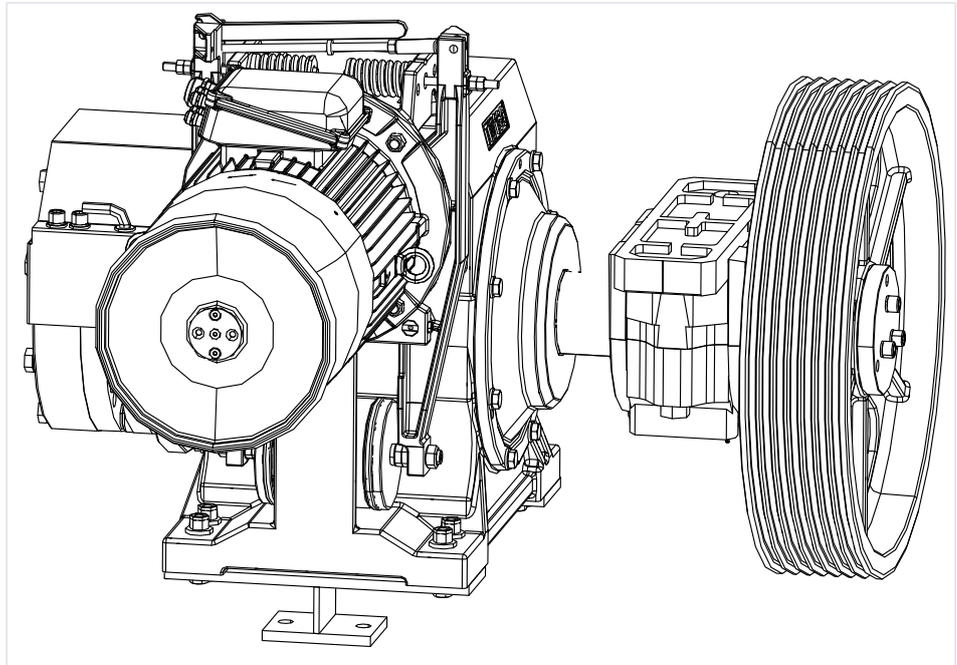


Fig. 6

ATR\_2\_21\_0187\_0

### Special version SA1

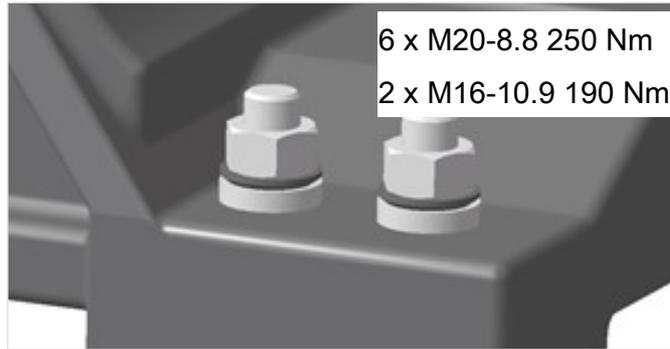


Fig. 7

ATR\_2\_21\_0189\_0

### Special versions SA3.1/SA15

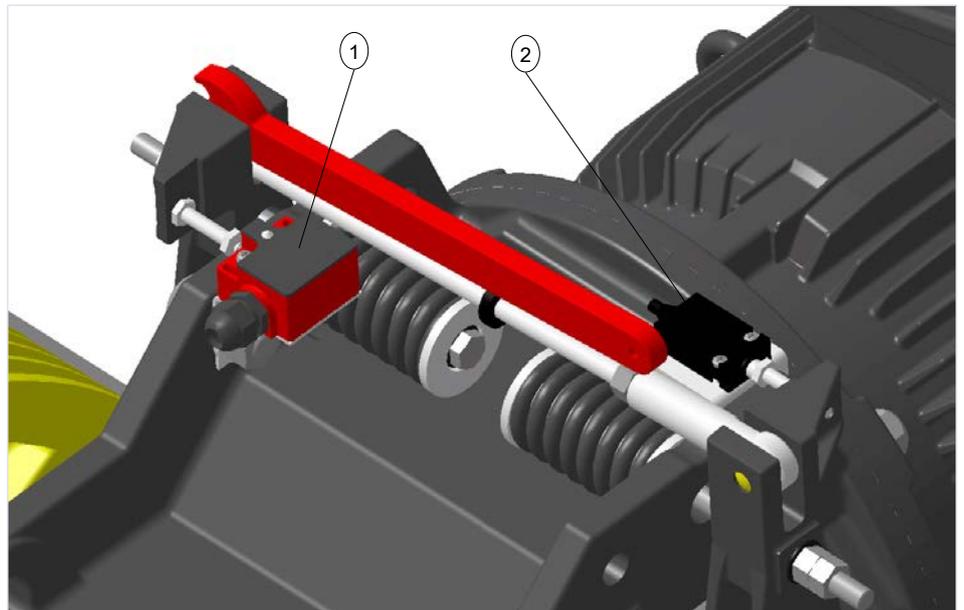


Fig. 8

ATR\_2\_21\_0188\_0

Item	Designation	Item	Designation
1	Brake monitoring SA3.1	2	SA15 brake monitoring

### Version with safeguard measures in accordance with EN81-77

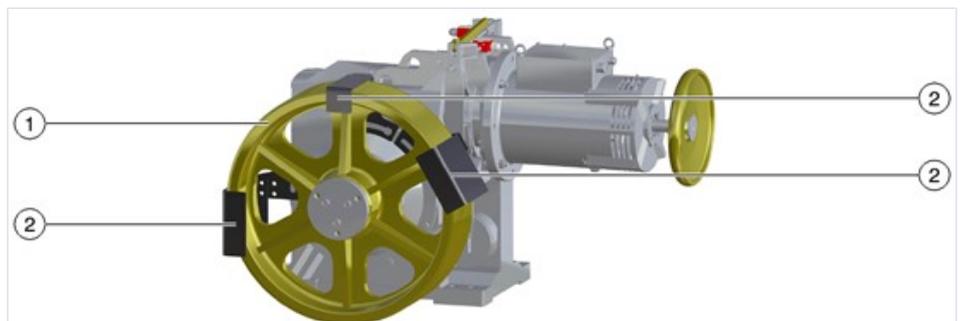


Fig. 9

ATR\_2\_21\_0190\_0

Item	Designation	Item	Designation
1	Traction sheave (D640/D720/D800)	2	Earthquake safeguard in accordance with EN81-77

The safety measures in accordance with EN81-77 shall be provided for the D560 traction sheave depending on the order.

### 3.3.1

## Machine base frame

Various machine base frame versions are possible. Consult the general arrangement drawings.

The machine base frames with / without rope pulley described below are intended for installation of the machine in the machine room above the shaft.

### TW160 machine base frame AY without rope pulley

Machine base frame version without rope pulley for use in:

- Installations with 1:1 rope suspension and direct rope departure for an elevator car/counterweight rope distance ASL diameter (DT + 100) mm depending on the traction sheave diameter 560, 640, 720 and 800 mm
- Installations with 2:1 or 4:1 rope suspension

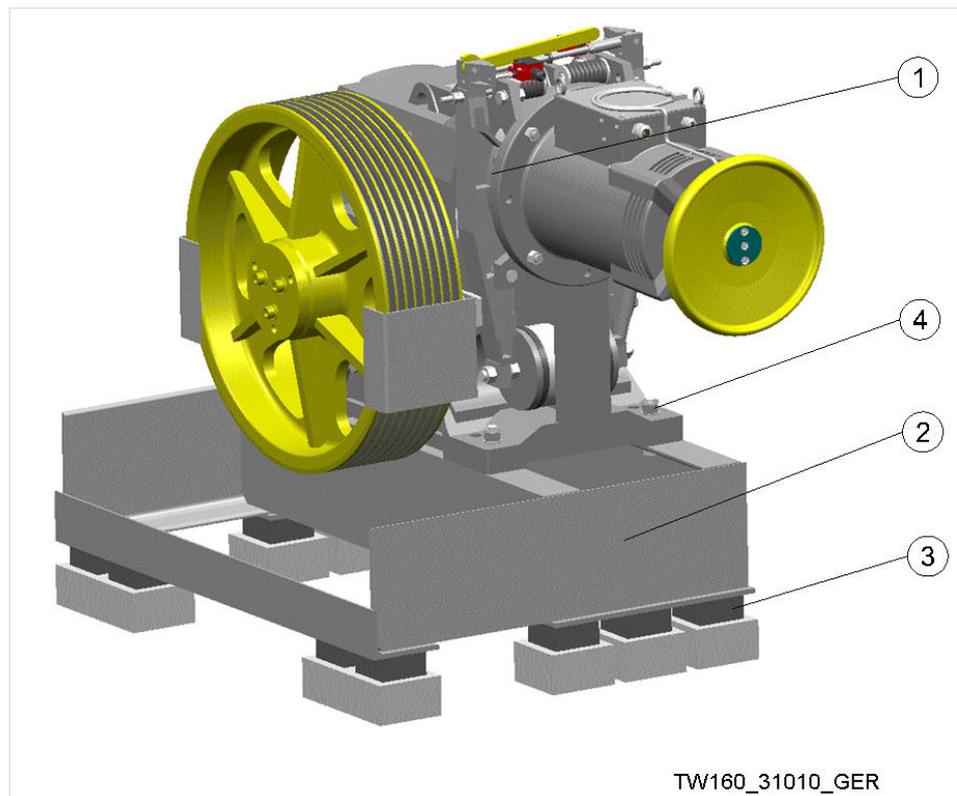


Fig. 10

ATR\_2\_21\_0197\_0

Item	Designation	Item	Designation
1	TW160 machine	2	TW160 machine base frame
3	Insulation elements	4	Mounting parts for machine/ base frame

The complete machine base frame comprises the following components:

- Machine base frame made from welded rolled profiles
- Hole pattern for machine fastening according to order, depending on DT and ASL
- Weight of the machine base frame: Approx. 150 kg

- Project planning dimensions for the [↗ Chap. 4.2.2 P. 47](#)

### TW160 machine base frame AY with rope pulley

Machine base frame in version with rope pulley on supports, depending on the pulley hub position in left-hand or right-hand configuration for use with:

- Installations with 1:1 rope suspension and elevator car/counterweight rope distance ASL = 795 ÷ 1400 mm in conjunction with traction sheave diameters 560, 640, 720 and 800 mm
- The versions D450 - 7/8 x 10. D540 - 7/8 x 13 and D640 are used for the rope pulley (rope pulleys, see product description for mechanical elevator parts 6072012000). The rope pulleys have maintenance-free roller bearings.

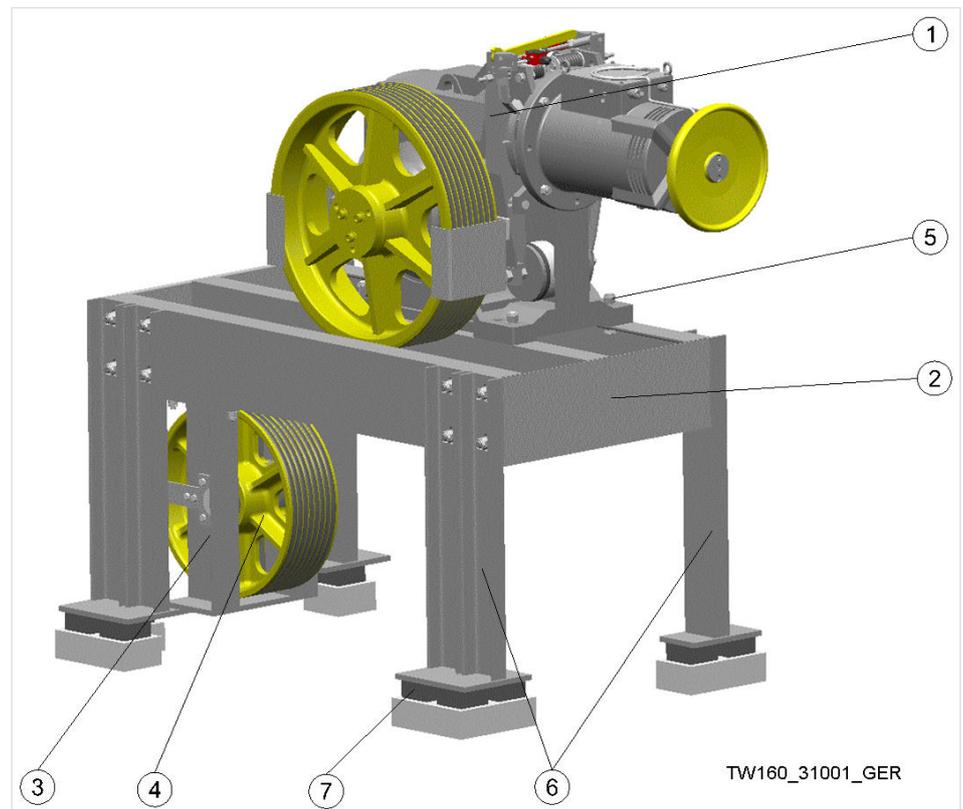


Fig. 11

ATR\_2\_21\_0198\_0

Item	Designation	Item	Designation
1	TW160 machine	2	Upper section, machine base frame
3	Pedestal bearing for rope pulley	4	Rope pulley
5	Mounting parts for machine/ base frame	6	Supports for insulation elements
7	Insulation elements		

The complete machine base frame comprises the following components:

- Machine base frame upper section made from welded rolled profiles
- Hole pattern for machine fastening according to order, depending on DT and ASL
- Pedestal bearing (bolted) for the rope pulley holder with axle; version based on the rope pulley used

- D450, 540 or 640 rope pulley
- Supports (6 pcs. screw-connected) for mounting the insulation elements.

By mounting the bolted supports appropriately, it is possible to configure the pulley hub position on the right- or left-hand in the machine base frame.

Rope pulley version [mm]	Weight, including rope pulley [kg]
D450	420
D540	470
D640	550

- Project planning dimensions for the [↗ Chap. 4.2.2 P. 47](#)

### TW160 machine base frame AY – "partial Ex"

Machine base frame for "partial Ex" installations with vapour-proof wall duct (SA4) in a version without a rope pulley for use in:

- Installations with 1:1 rope attachment and direct rope departure for an elevator car/counterweight rope distance ASL diameter (DT + 100) mm depending on the traction sheave diameter 560, 640, 720 and 800 mm.
- Installations with 2:1 or 4:1 rope suspension

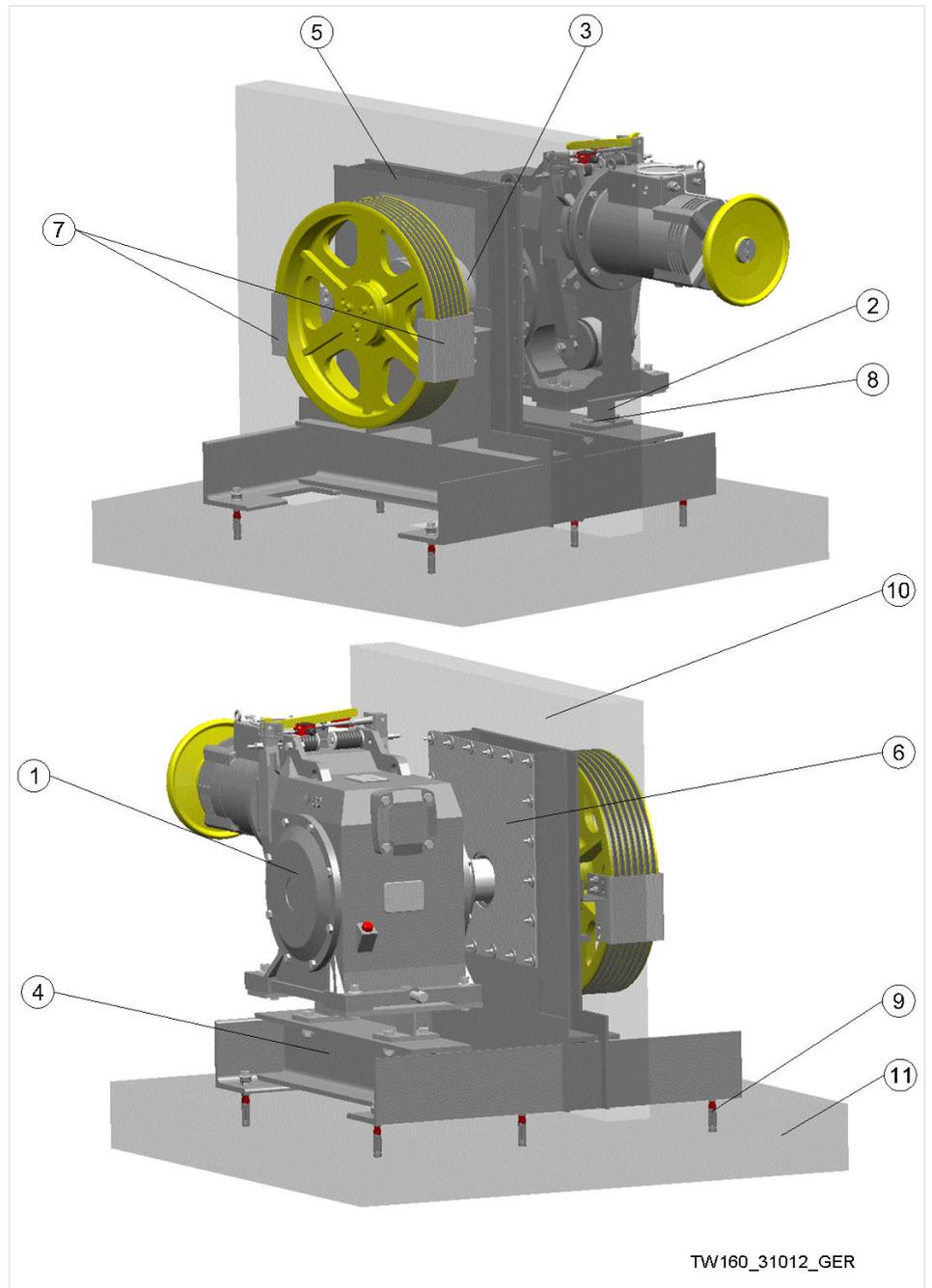


Fig. 12

ATR\_2\_21\_0200\_0

Item	Designation	Item	Designation
1	TW160 machine – SA4	2	Compensating supports
3	Pillow block housing (outside bearing)	4	Base frame
5	Frame yoke	6	Sealing plate
7	Rope guard	8	Mounting parts for machine/ base frame
9	Mounting parts for machine base frame	10	Vapour-proof partition wall (supplied by the customer)
11	Machine room floor		

The machine base frame consists of a base frame with welded bearing bracket and a frame yoke for holding the rope guards and the screw-connected sealing plate. The hole pattern for mounting the machine and the position of the frame yoke are dependent on the traction sheave diameter – DT and the traction sheave position – left or right.

It is possible for the customer to provide a vapour-proof enclosure of the entire machine base frame by using side plates on the base frame and by using the profile section of the frame yoke (U140).

The base frame is screw-connected to the machine room floor with heavy-load anchors (six units supplied). This is sealed against the machine room floor by the customer.

- Weight of the machine base frame: Approx. 350 kg

### BT base frame-mounted machine

A set of screw connection elements (4 x M20-8.8) is available for mounting the TW160 machine and standardised TW160 machine base frame with/without rope pulley machine, including outside bearing.

A reinforced mounting SA1 (6 x M20-8.8 / 2 x M16-8.8) is required for individual applications of the TW160 machine with upward horizontal or vertical rope departure – except for the special versions SA4/9.

### Instructions for setting up machine base frames in the machine room

The machine base frames are erected using impact soundproof elements (rubber block 100 x 100/50 mm high) in the machine room.

- Insulation elements without packing for machine room without floor pavement and/or erection of machine base frame directly on floor pavement
- Insulation elements with packing for machine room with floor pavement ( $\leq 60$  mm high); support made from Multiplex laminated wood 140 x 140/80 mm high

### Version with earthquake safeguard in accordance with EN81-77

Optional components are available for the TW160 O SR and TW160 M SR base frames; these meet the requirements for protection devices in accordance with EN81-77.

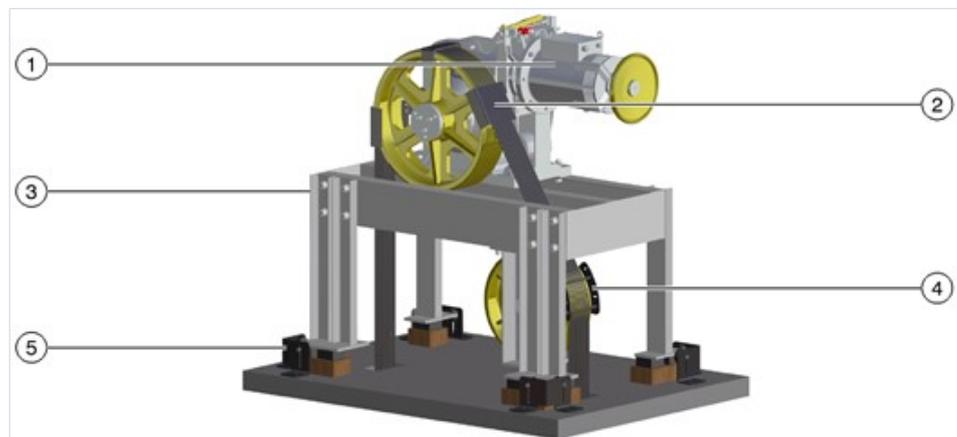


Fig. 13

ATR\_2\_21\_0201\_0

Item	Designation	Item	Designation
1	TW160 machine	2	Rope guard in accordance with EN81-77 for traction sheave diameters 640, 720 and 800 mm (for diameter 560, according to order)
3	TW160 M SR machine base frame	4	Rope guard in accordance with EN81-77 for rope pulley, diameter D450, D540, 640
5	Shift protection device in accordance with EN81-77		

The safeguard measures are only suitable for machine base frames with locations in the machine room.

The protection device consists of a modified rope guard for rope pulleys of diameters D450, D540 or D640 which prevent the ropes departing from the grooves.

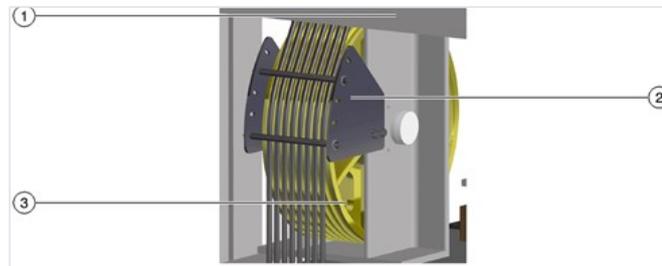


Fig. 14

ATR\_2\_21\_0202\_0

Item	Designation	Item	Designation
1	TW160 M SR machine base frame	2	Rope guard in accordance with EN81-77 for rope pulley, diameter D450, D540, 640
3	Rope pulley diameter D640		

The safeguard measure also consists of shift protection devices that prevent the machine from changing its position.

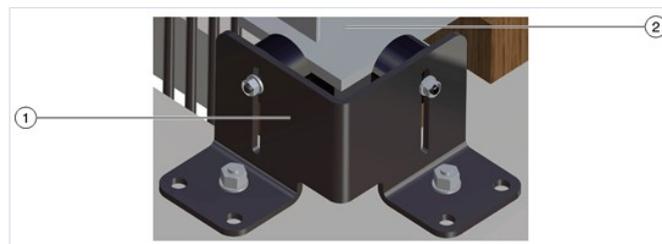


Fig. 15

ATR\_2\_21\_0203\_0

Item	Designation	Item	Designation
1	Shift protection device in accordance with EN81-77	2	TW160 M SR machine base frame

In the case of deployment of the machine in earthquake categories 2 and 3, additional safeguard measures in accordance with EN81-77 are necessary.

### 3.3.2 Standard version for machine in the machine room

The standard version of the machine TW160 comprises the following components:

- Driving gear (incl. oil filling; horizontal motor position; left/right traction sheave position)
- Service brake 2 x 245 Nm (for deployment complying with EN81-20/50, including brake monitoring SA3.1)
- Motor type IMB5
- Flexible coupling between motor and driving gear
- Encoder and handwinding wheel or flywheel rim
- Traction sheave (standard version)
- Rope guard components
- Blocking clamp

### 3.3.3 Special versions

- SA 1 Reinforced machine mounting (including compensating sheave) pointing upwards horizontally or vertically as a result of the rope pull direction.
- SA3.1 Brake monitoring (microswitch).
- SA 4 Partial Ex protection (vapour-proof partition).
- SA 9 Traction sheave position in the shaft (extended traction sheave shaft with pedestal bearing and machine on compensating supports for statically defined mounting/mounting of the drive shaft).
- SA15 "Full Ex" protection (including microswitch for brake monitoring).

#### Brake monitoring (special version SA3.1 / SA15)

For monitoring the service brake (function and wear), it is possible to configure the machine with optional brake test switches (version with microswitch - SA3.1) (one switch for each brake circuit).

## i

Brake monitoring is generally to be provided in order to use the machine in combination with TKE frequency inverters of type RPI/MFR. Brake monitoring SA3.1 (microswitch) is generally to be provided in order to use the machine complying with EN81-20/50. Exception: In the case of Full Ex machines, this is already a constituent part of SA15.

Description	Unit	Technical data	
Version		Standard SA3.1	Full Ex (SA15)
Manufacturer		Bernstein	Steute
Switching principle		Switch with contacts (1 break contact / 1 make contact)	
Switching display		-	-
Operating voltage	[V]	240 (AC) / 24 (DC)	250 (AC)
Max. switching current	[A]	3	6
Type of protection		IP65	IP67

Description	Unit	Technical data	
Explosion protection		-	EX II 2G Ex db IIC T6, T5 Gb
			EX II 2D Ex tb IIIC T80°C, T95°C Db
Type approval certificate		-	PTB 03 ATEX 1070 X
Cable entry point		Cable gland M16 x 1.5	Cast connection line 4 x 0.75 mm <sup>2</sup> 5 m length

Tab. 1

ATR\_1.21\_0038\_0

### "Partial Ex" protection (SA4)

The "Partial Ex" machine version is used in installations in potentially explosive atmospheres in which there is a possibility of dividing the machine room by means of a partition wall into an area for the machine (machine area) and an area which accommodates the traction sheave and the suspension ropes (shaft area).

The partition means that no specially prescribed measures or markings for explosion protection are required for the area housing the machine.

For this version, the machine has an extended traction sheave shaft with an outside bearing, two compensating supports underneath the machine for statically defined mounting, and a special machine base frame (SA4) with a wall duct.

The machine base frame is inserted in the area of the outside bearing into the partition wall, and walled in and sealed by the customer. The machine therefore cannot be erected so that it is insulated to prevent transmission of structure-borne noise to the machine room.

The structural sealing elements on the machine base frame and on the outside bearing and the measures taken by the customer help to provide a vapour-proof partition of the area for the machine.

In addition, suitable ventilation measures must be provided on the installation side to prevent explosive media (gases or dust) from getting into the area housing the machine.

The machine components which are located in the area containing the explosive media (shaft area) and which have been assessed as ignition sources in accordance with DIN EN ISO 80079-36 comply with the requirements of Directive 2014/34/EC.

This part of the machine designated "traction sheave unit" in accordance with Directive 2014/34/EU is given the following marking depending on the layer thickness of the paint:

**Ex groups IIC-IIIC** for layer thickness  $\leq 0.2$  mm (standard version):

- II 2 G Ex h IIC T4 Gb
- II 2 D Ex h IIIC T135°C Db

**Ex groups IIB-IIIB** for layer thickness  $> 0.2$  mm /  $\leq 2$  mm:

- II 2 G Ex h IIB T4 Gb
- II 2 D Ex h IIIB T135°C Db

(Equipment group: II = other than mining; category: 2 = Zone 1,21; Ex-atmosphere: G = Gases and D = Dust; Ignition protection type: h (c = constructional safety); gas-explosion-endangered area: Ex groups IIB or IIC; area with danger of dust explosions: Ex groups IIIB or IIIC; temperature class: T4 and/or max. 135°C)

In the case of special paintwork for increased corrosion protection, e.g. C5-M with layer thickness  $\geq 0.24$  mm, only a rating according to IIB and/or IIIB is possible!

The maximum permitted rope speed at the traction sheave is limited to 3.2 m/s.

Related to the rated speed, this means a maximum of 3.2 m/s with 1:1, a maximum of 1.6 m/s with 2:1 and a maximum of 0.8 m/s with 4:1.

### Traction sheave position in the shaft (SA9)

For this version, the machine has an extended traction sheave shaft with an outside bearing and two compensating supports underneath the machine for statically defined mounting. The outside bearing is mounted in a position to suit the rope pull direction (normally in the upward direction).

This version is standardised for traction sheaves with diameters  $DT = 560, 640, 720$  and  $800$  mm.

The components for the rope guard are not an integral part of the machine in this version. Note on the machine base frame (not standardised): The permitted tolerance for the horizontal offset between the plane for the compensating supports and the mounting surface for the outside bearing is  $\pm 1$  mm.

### "Full Ex" protection (special version SA15)

The "Full Ex" machine version is used in installations in which the entire machine room is located in the potentially explosive atmosphere.

The machine (not including the electrical components) has been assessed for potential ignition sources in accordance with DIN EN ISO 80079:-36 and complies with the requirements of Directive 2014/34 EU. The machine (not including the electrical components) is assigned the following identification in accordance with Directive 2014/34/EC:

**Ex groups IIC-IIIC** for layer thickness  $\leq 0.2$  mm (standard version):

- Ex II 2 G Ex h IIC T4 Gb
- Ex II 2 D Ex h IIIC T135°C Db

**Ex groups IIB-IIIB** for layer thickness  $> 0.2$  mm /  $\leq 2$  mm:

- Ex II 2 G Ex h IIB T4 Gb
- Ex II 2 D Ex h IIIB T135°C Db

(Equipment group: II = other than mining; category: 2 = Zone 1, 21; Ex atmosphere: G = Gases and D = Dust; Ignition protection type: h (c = constructional safety and k = liquid encapsulation); area with danger of gas explosions: Ex groups IIB or IIC; area with danger of dust explosions: Ex groups IIIB or IIIC; temperature class: T4 and/or max. 135°C)

- The maximum permitted angle of inclination of the machine in relation to the horizontal is  $2^\circ$  to ensure the type of ignition protection "k" in compliance with DIN EN ISO 80079-37.

- In the case of special paintwork for increased corrosion protection, e.g. C5-M with layer thickness  $\geq 0.24$  mm, only a rating according to IIB and/or IIIB is possible!
- The maximum permitted rope speed at the traction sheave is limited to 3.2 m/s. Related to the rated speed, this means a maximum of 3.2 m/s with 1:1, a maximum of 1.6 m/s with 2:1 and a maximum of 0.8 m/s with 4:1.

The service brake is generally monitored by brake test switches.

Layout of electrical components:

- Brake magnets in Ex data [↗ Chap. 4.1.2 P. 32](#).
- Brake test switch in Ex [↗ Chap. 3.3.3 P. 26](#) (Note: These brake test switches are general constituent parts of SA15).
- The motor and any encoders as well as an additional terminal box for the magnetic clamps depend on the project specs.

### 3.3.4

#### Version with emergency brake, NBS

The optional version of the emergency brake (NBS) meets the requirements for the protection device that prevents overspeed in the upward-moving elevator car in accordance with EN81-1:1998 / 9.10 and/or EN81-20/5.6.6 and unintended elevator car movements in accordance with EN81-1:2010-06 / 9.11 (EN81-1/A3) and/or EN81-20/5.6.7.

Alongside the service brake, an additional braking device is fitted on the drive shaft, consisting of the components:

- Type-approved electromagnetic disc brake in accordance with [↗ Chap. 4.1.6 P. 38](#)
- Driving gear in emergency brake NBS version (bearing bracket NBS, brake flange NBS for fitting the brake)
- Traction sheave / worm wheel shaft NBS (including components for sealing)

The braking device is located on the machine side opposite the traction sheave and directly affects the traction sheave shaft.

A certificate with respect to the calculation of the traction sheave shaft for the machine TW160 with emergency brake system (NBS) shall be enclosed with the technical documentation.

The emergency brake is activated via a separate control unit including terminal box and connecting lines as well as an additional safety switch at the overspeed governor (made by TK Elevator) to activate the facility in the event of overspeed.

The emergency brake is released manually (e.g. emergency rescue in the event of a power failure) via screws that are screwed into the brake in the event of triggering, thus releasing the brake/armature base plate of the disc brake. During normal operation, the screws and a socket wrench are kept in the guard plate of the brake.

For installation of the manual emergency ventilation screws, a minimum distance of 100 mm is to be set between the emergency brake and the adjoining wall of the machine room or similar.

Retrofitting of the emergency brake, NBS, on existing machines TW160 is not possible.

### 3.3.5

#### Version with earthquake safeguard complying with EN81-77

The optional version of the rope guard complying with EN81-77 enables compliance with the requirements for protection devices in earthquake regions up to earthquake category 1 as standard.

The rope guard fitted as standard is replaced with the modified rope guard which, in the event of an earthquake, prevents the ropes from leaving the groove of the traction sheave. Attention should be paid to ensuring that the rope guard is installed in accordance with the installation instructions.

The rope guard complying with EN81-77 is standardised for the traction sheaves of diameters D640, D720, D800. The rope guard is designed in such a way that all standard gaps between the ropes on the rope departure can be covered with the TW160 O SR and TW160 M SR base frames.

## 3.4

### Combination of versions / options

Combination	SA1	SA3.1	SA4	SA9	SA15	Emergency brake system (NBS)	EN81-77
SA1							
SA3.1	X						
SA4	O	X					
SA9	O	X	O				
SA15	X	O	X	X			
Emergency brake system (NBS)	X	X	X	X	O		
EN81-77	O	X	O	O	X	X	

Tab. 2

ATR\_1\_21\_0061\_0

X Combination possible

O combination not possible

SA... special versions

NBS Version with emergency brake-NBS

EN81-77 earthquake safeguard complying with EN81-77

# 4 Technology

## 4.1 Mechanical data

### 4.1.1 Gear unit

Single-stage worm gear with:

- Monoblock housing made of EN-GJL 250 with separate AS and BS bearing brackets; motor flange (construction size A400) integrated
- Drive shaft made of tempering steel (C60 and/or 42CrMo4 for emergency brake system NBS and Mayr brake RSO1800/5500Nm), on roller bearings (oil lubrication)
- Extended drive shaft version possible for traction sheave in the shaft SA9 or for a vapour-proof partition wall SA4 (partial Ex), including outside bearing
- Contact pattern position of gear teeth adjustable; backlash not adjustable
- Gear teeth run with oil delivered from the oil sump via worm wheel gear teeth
- Inspection openings with covers for checking the contact pattern and for oil filling
- Oil level monitoring by dipstick with casing ventilation; oil drain (R3/4")
- Worm shaft made of case-hardened steel (16MnCrS5), roller bearings (grease/oil lubrication); worm wheel made of centrifugally case bronze (CuSn12Ni-C-GZ) with screw-connected hub
- Machine type plate

Version	Unit	TW160
Axle distance	[mm]	225
Ratio		50:1/41:1/35:1/51:2/45:2/41:3
Oil filling	[L]	approx. 16.5
Oil grade		Synthetic gear oil (polyalkylene glycol with additives)
Designation		SM1
Backlash	[°]	0.015-0.06
Weight	[kg]	approx. 540

Tab. 3

ATR\_1\_21\_0005\_0

The rope guard components are adjustable for rope departure directions of the relevant rope line up to 90° upwards and 45° downwards in relation to the vertical tangent. For the version with the traction sheave in the shaft (SA9) or in the case of rope departure directions outside the adjustable range, installation-specific rope guard measures must be taken in accordance with EN81-1 / 9.7EN81-20/5.5.7 EN81-77.

In conjunction with the standardised machine base frame for the version with vapour-proof partition wall SA4, the components for the rope guard are an integral part of the machine base frame.

## 4.1.2

## Brake

Redundant electromagnetic dual-circuit outside shoe brake on the motor/worm shaft integrated in the gear or motor flange. The electric release of the brake circuits takes place via magnetic clamps. The magnetic clamps are available in standard and in explosion-proof versions.

A flexible coupling must be integrated on the brake disc to connect the motor and worm shafts.

Designation	Unit	Technical data
Manufacturer		TK Aufzugswerke GmbH
Type		TW160
Braking torque	Nm	Max. 2 x 245
Braking torque adjustment		Possible
Design		Dual-circuit outside brake shoe
		With brake disc made of EN-GJL 250
Brake linings		Made without asbestos
Brake disc diameter	mm	275
Air gap	mm	0.3
Air gap setting		Possible
Electrical release		1 magnetic clamp per brake circuit
		(2 magnetic clamps connected in series)
Nominal force – magnetic clamps	N	5000
Operating voltage	VDC	180 – overexcitation
		90 – holding voltage
Rated current	A	1.8/1.79 <sup>1)</sup>
Monitoring devices		Brake test switch
Manual release		Brake release lever (mounted)
Protection type, magnetic clamps		IP65 (standard version)
		II 2 G Ex mb IIC T4 Gb <sup>1)</sup>
		II 2 D Ex mb IIIC T105°C Db <sup>1)</sup>
Type approval sign		Not on standard version
		IBExU17ATEX1137 X <sup>1)</sup>
Length of connection cable	m	1.5/1.5 <sup>1)</sup>

Tab. 4

ATR\_1.21\_0058\_0

<sup>1)</sup> Version for explosion protection

## Version with NBS emergency brake

Designation	Unit	Technical data
Manufacturer		Chr. Mayr GmbH
Type		Mayr RSO1800/5500 Nm
Braking torque	[Nm]	5500
Braking torque setting		not possible
Design		4-surface disc brake

Designation	Unit	Technical data
Version of brake linings		Asbestos-free
Brake disc diameter	[mm]	320
Air gap	[mm]	0.65 -0.15 / +0.15
Air gap setting		not possible
Electrical release		1 magnetic clamp with armature base plate
Operating voltage	[VDC]	207 - overexcitation
		104 - holding voltage
Operating current	[A]	3.06 - over-excitation
		1.54 - holding current
Performance data	[W]	633 - over-excitation
		160 - stopping power
Monitoring devices		Release monitoring (microswitch)
Manual emergency release		2 x M16 screws
Connection cable length	[m]	approx. 1.0
Type of protection		IP54
Weight	[kg]	approx. 141
Type approval sign		EU-BD 892 <sup>2)</sup> and/or ABV 892 <sup>3)</sup>
Type approval sign		EU-BD 892 <sup>2)</sup> and/or ESV 892 <sup>3)</sup>
Times: t10 / t50 / t90 <sup>1)</sup>	[ms]	115 / 230 / 400
Certificate for traction sheave shaft test number:		TW160-RSO1800/5500 Nm

Tab. 5

ATR\_1.21\_0059\_0

<sup>1)</sup> DC - direct current cut-off (emergency stop)

<sup>2)</sup> Complying with EN81-20/50 and EN81-1:1998+A3:2009

<sup>3)</sup> Complying with EN81-1:1998+A3:2009

### 4.1.3

### Encoder

The following hollow shaft encoders are available:

Number of pulses	Version	Connection
2x1024	TTL	Line and connector hard-wired
2x4096	TTL	Line and connector hard-wired

Tab. 6

ATR\_1.21\_0072\_0

### 4.1.4

### Traction sheave

Different versions of traction sheave are used, depending on the location of the machine.

- Standard version – traction sheave position in the machine room
- Special version SA9: Traction sheave position in the shaft

The traction sheaves for the standard versions differ from the SA9 versions in the dimensional assignment of traction sheave middle to cone position. The use of SA9 versions in machines for the machine room - and vice versa - is not possible.

The one-part traction sheaves are secured overhung on the traction sheave shaft using a cone (1:15) and a mounting plate, including three screws (M16-8.8 microencapsulated with locking washer).

Designation	Unit	Technical data							
Machine version		Standard				SA 4/9			
Diameter – DT	[mm]	560	640	720	800	560	640	720	800
Rim width – B	[mm]	180				160			
Max. possible number of grooves z x d <sup>2)</sup>		11 x 10 (10 x 10)				10 x 10 (9 x 10)			
		10 x 11				9 x 11			
		10 x 12 (9 x 12)				8 x 12			
		9 x 13 (8 x 13)				8 x 13 (7 x 13)			
		8 x 1/2"				7 x 1/2"			
		8 x 14				7 x 14			
		-	8 x 15 (7 x 15)			-	7 x 15 (6 x 15)		
		-	7 x 16			-	6 x 16		
		-	7 x 5/8"			-	6 x 5/8"		
Groove type		Seat/vee groove <sup>1)</sup>							
Vee groove angle	[°]	Depends on project specs <sup>1)</sup>							
Weight	[kg]	110	140	160	190	105	130	150	180
Material		Specially alloyed EN-GJL 250 / EN-GJL-300							

Tab. 7

ATR\_1\_21\_0014\_0

<sup>1)</sup> Version in accordance with the product description "Groove profiles" with hardened groove flanks (at least 50 HRc)

<sup>2)</sup> With minimum groove clearance – RAmin – in accordance with the product description for groove profiles for seat grooves (for vee groove, if deviating)

## 4.1.5

## Performance chart

### Applications in the standard

r	v <sub>n</sub>	n <sub>1</sub>	Dt	i	v <sub>n1</sub>	Q' <sub>max</sub>	P' <sub>max</sub>	x%
1:1	0.63	840	720	50:1	0.63	2300	3000	45
		940	640			2200	3300	50
		1080	560			2500	3300	45
	0.80	870	720	41:1	0.80	2700	3500	
		980	640			2450	3000	50
		1360	560			50:1	2600	3000
	1.00	840	800	35:1	1.00	2400	2800	45
		930	720			2200	3000	
		1220	640	41:1		2000	3000	50
		1400	560			2250	3000	45
	1.25	1330	720	50:1	2400	3000		
		1310	640	35:1	1800	2700		
					1.25	1800	2800	50

r	$v_n$	$n_1$	Dt	i	$v_{n1}$	$Q'_{max}$	$P'_{max}$	x%		
2:1						2000	3000			
		1490	560			2300	3000			
		1360	720	41:1		1850	2800			
	1.60	860	800	45:2		1.60	1800	3000	45	
			720				2000	2800		
		1340	800	35:1			1600	2550		
			720				1700	2600		
		1670	640	51:2			1600	2500	50	
			640				1800	2500	45	
	1390	560			2000	2800	50			
	1.75	1340	640	51:2		1.75	1650	2650		
			560	45:2			1750	2800		
		1460	800	35:1			2200	2800		45
			720				1500	2500		
	2.00	1190	720	45:2		2.00	1700	2500		
			640				1700	2600		50
		560	1800				2900	45		
	2.00	1350	720	51:2		2.00	1550	2500		
			800	35:1			1350	2400		
	2.50	1020	640	41:3		2.50	1800	2500	45	
			560				2000	2800		
		1340	800	45:2			1450	2300		
			720				1550	2300		
		1680	640				1450	2300	50	
1650	2300	45								
0.30	900	640	50:1		0.30	4700	5500			
		560				5000	6000			
	0.40	870	720	41:1	0.40	4400	5500			
			640			4750	6000			
		560	5100			6000				
	0.50	930	720	35:1		0.50	4300	5000	50	
			720	50:1			3350	4200		
		1330	640	41:1			3600	4500		
			560				4500	6500		
	0.63	1170	720	35:1		0.63	3800	5000		
			640				4000	5200		
		1320	560	41:1			4400	6000	45	
720			4200				5500	50		
1360	720			3600	4500					

r	v <sub>n</sub>	n <sub>i</sub>	Dt	i	v <sub>n1</sub>	Q' <sub>max</sub>	P' <sub>max</sub>	x%		
2:1	0.80	960	720	45:2	0.80	3800	4800	50		
		1070	640			4000	5000			
		1230	560			4500	5000			
		1340	800	35:1		4300	5500			
		1490	720			3150	4000			
		1220	640	51:2		3300	4100			
	1.00	1190	720	45:2	1.00	3400	4000	50		
		1340	640			3500	4500			
		1540	560			3900	4800			
		1220	800	51:2		3800	4500			
		1350	720			2800	4000			
	1.25	1020	640	41:3	1.25	3500	4000	50		
		1170	560			3750	4500			
		1340	800	45:2		2750	3600			
		1490	720			2900	3800			
	4:1	1.6	1160	720	41:3	1.6	2800	4000	50	
			1305	640			3100	400		45
							3000	4000		50
1490			560	45:2	3300		4000	45		
1720			800		3200		4000	50		
1.75		1270	720	41:3	1.75	2500	3100	50		
		1430	640			2400	3200			
		1630	560			3100	4000		45	
						3000	4000		50	
2.0		1310	800	41:3	2.0	2350	3300	50		
		1450	720			2600	3300		45	
						2500	3000		50	
		1630	640			2750	3400		45	
2.5		1630	800	41:3	2.5	2600	3000	50		
						2900	3400		45	
	2000					3300	50			
4:1	0.25	1090	720	41:1	0.25	8000	9000	50		
		1220	640			8500	9000			
		1400	560			9000	10000			
	0.30	1310	720	41:1	0.30	7200	8500			
		1250	640			35:1	8200		9500	

r	$v_n$	$n_1$	Dt	i	$v_{n1}$	$Q'_{max}$	$P'_{max}$	x%
		1430	560			8700	9500	
	0.40	1490	720	35:1	0.40	6500	8000	
		1220	640	51:2		7250	8500	
		1390	560			7750	8500	
	0.50	1190	720	45:2	0.50	6700	8500	
		1340	640			7000	9500	
		1540	560			7500	9500	
	0.63	1350	800	45:2	0.63	5500	7500	
		1500	720			5800	8000	
		1690	640			6000	8000	
		1180	560	41:3		7500	9000	
	0.80	1160	720	41:3	0.80	5800	7000	
		1310	640			6000	8000	
		1490	560			6500	8000	
	1.00	1310	800	41:3	1.0	4800	6000	
		1450	720			5000	6000	
		1630	640			5250	6500	
	1.25	1630	800		1.25	4100	5000	

Tab. 8

ATR\_1\_21\_0063\_0

r – Rope suspension  
 $v_n$  fpm (m/s) rated speed  
 $n_1$  (rpm) motor speed  
Dt in (mm) Diameter of traction sheave  
i – Gear ratio  
 $Q'_{max}$  lbs (kg) rated load (maximum)  
 $F'_{max}$  lbs (kg) mass of car (maximum at  $Q'_{max}$ )  
x (%) counterweight compensation

Performance data, including suspension rope weight MSR for travel height:

- H = 20 m for  $v_n$  to 0.63 m/s
- H = 40 m for  $v_n$  to 1.25 m/s
- H = 100 m for  $v_n$  to 2.50 m/s

as well from  $v_n = 1.6$  m/s suspension rope compensation MCR (counter ropes etc.)

All specified performance data in [↗ Chap. 4.1.5 P. 34](#) apply to the following application conditions:

- Operating data max. 180 c/h at 50% duty cycle
- Ambient temperature + 5°C to + 40°C

For types of performance not shown in the chart or deviating installation data, there is the possibility to use a calculation program (e.g. TK Liftdesigner) to check the operational safety of the machine.

The machines are conceived for a service life of at least 15 years and/or 20,000 hours of operation.

The maximum permitted rope speed at the traction sheave is limited to 3.2 m/s for versions with EX protection (SA15).

Related to the rated speed, this means a maximum of 3.2 m/s with 1:1, a maximum of 1.6 m/s with 2:1 and a maximum of 0.8 m/s with 4:1.

## 4.1.6

### Motor versions

Frequency-controlled three-phase motors of the IMB5 type are used as standard.

The motor shaft/worm shaft connection is provided by a flexible coupling (make: Centaflex A size 50).

All motors provide the option of intermediate clamping for the magnetic clamps in the motor terminal box.

Designation	Unit	Technical data		
Version		Frequency-controlled (frequency inverter)		
Make		Orange1	Motorlift	EMOD
Type		DTE132 – DTL180	CMRF160	BG180L/4, BG180L/4a, BG225SM/4, BG225M/4
Voltage/frequency		1)		
S5 – operation data		240 c/h/50% ED		
Speed range	[rpm]	1250–1650	1000–1650	1250–1650
Nominal power	[kW]	11–42	10.5–13	18.5 - 40
Design		IMB5		
Type of protection		IP21	IP54	IP55
Ventilation		Internal ventilator 2)		
Handwinding wheel	[mm]	D270 3)/360 (plastic)	D270 (plastic)	D360 (plastic)
kproj.	[mm]	1)		
Actual-value sensor		WDG100-38-1024/4096 TTL		

Tab. 9

ATR\_1\_21\_0054\_0

1) [Product catalogue for elevator motors](#)

2) Type DTL180 with forced ventilation

3) Only with type DTE132

The specified electrical data applies to the following site conditions:

- Max. altitude 1000 m amsl
- Max. temperature + 40 °C at max. 50% air humidity
- Max. relative air humidity 70% at 20 °C

If the conditions stated above are exceeded, the deratings in accordance with VDE0530 apply.

Please refer to the product catalogue [Product catalogue for elevator motors](#) for detailed technical data for the motors and encoders.

The encoders include a 10 m long connection cable, including connector (types 1024/4096 TTL) for connection to TKE frequency inverters.

### Special motors

For areas of application in which a standard version motor cannot be used, a custom-order type IMB5/motor is used, e.g.:

- Special motors for e.g. explosion-proof versions or special customer-requested motors, etc.
- The mechanical layout (flange dimensions, AS/BS shaft ends, encoder, handwinding wheel, etc.) is executed in accordance with building code BV 6530-05 / Pages 3-7.
- In the case of Ex motors, if required, a suitable terminal box for the magnetic clamps is to be provided depending on the order.

#### 4.1.7

### Load data - traction sheave shaft

The load value  $F_{tzu}$  listed below is the limit value of the permitted radial stress for the traction sheave shaft calculated from the overall mass present on the installation.

The overall mass of the installation is determined and the load is checked as part of the calculation program TK LiftDesigner.

- Traction sheave shaft - standard version:  $F_{tzu} \leq 97 \text{ kN}$
- Traction sheave shaft - emergency brake, NBS  $F_{tzu} \leq 97 \text{ kN}$
- Traction sheave shaft - SA4/9 (with outside bearing):  $F_{tzu} \leq 77 \text{ kN}$
- Traction sheave shaft SA4/9 + NBS:  $F_{tzu} \leq 80 \text{ kN}$

#### 4.1.8

### Load data for rope pull direction – vertical upwards or horizontal

For the configuration of the machine with the standard version of the traction sheave shaft or in the version for the emergency brake system, NBS, there are restrictions due to the housing strength for the permitted load  $F_{t_{zul-stat}}$  depending on the installation data for the upward horizontal or vertical rope pull direction.

#### TW160 with motor position – horizontal

- Horizontal rope pull:  $F_{t_{zul-stat}} = 176 \text{ kN} \leq F_{t_{stat-max}}$
- Upward vertical rope pull:  $F_{t_{zul-stat}} = 152 \text{ kN} \leq F_{t_{stat-max}}$

The load  $F_{t_{stat-max}}$  present for the static overload case is determined via the TK-LiftDesigner, etc.

The values for upward horizontal and/or vertical rope pull directions can be used up to +/- 45° respectively for rope pull directions between upward horizontal and vertical.

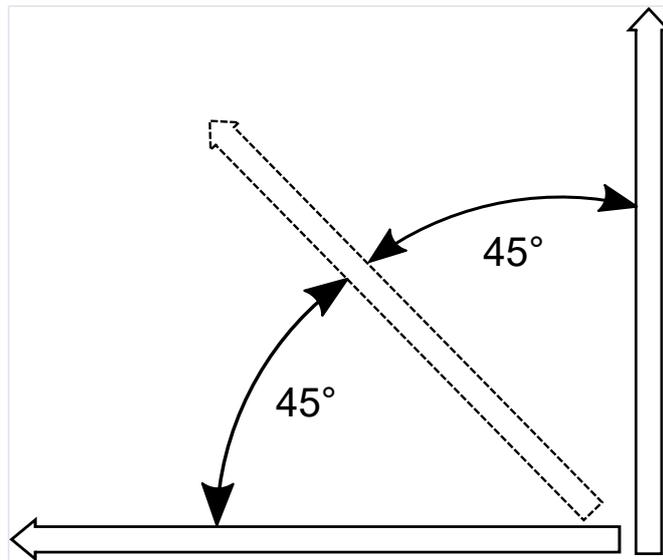


Fig. 16

ATR\_2\_12\_0168\_0

For installations on which  $F_{t_{stat-max}}$  is  $> F_{t_{zul-stat}}$  the permitted load and possible constructive measures must be clarified with TK Aufzugswerke GmbH on request.

With the special version SA4/SA9 and horizontal rope tension (+/- 45°), the outside bearing must be turned in the load direction. The intended machine base frame must be appropriately dimensioned and prepared to accommodate the outside bearing so that the occurring forces can be absorbed.

Additional struts must be provided at the feet of the gear box housing in order to relieve the supports under the housing and their screwed connection.

With the special version SA4/SA9 and vertical rope tension upwards (+/- 45°), the outside bearing must be turned in the load direction. The intended machine base frame must be appropriately dimensioned and prepared to accommodate the outside bearing so that the occurring forces can be absorbed.

### 4.1.9

### Gear efficiency

The specified gear efficiencies  $\eta_G$  and  $\eta_G'$  are extreme values which are to be applied for dimensioning the motor, frequency inverter and braking resistor, etc. The rated efficiency  $\eta_n$  provides information on the value  $\eta_G$  that can be achieved under optimum operating conditions.

The efficiencies  $\eta_{an}$  and  $\eta_{an}'$  describe the state of gear starting (overcoming static friction or build-up of lubricating film in the gear teeth; with  $\eta_{an}$  values  $< 0.5$  - the gear, when stopped, must be viewed as self-inhibiting).

- $\eta_g$ : minimum design efficiency, driving
- $\eta_g'$ : maximum design efficiency, driven (braking)
- $\eta_n$ : rated efficiency - driving
- $\eta_{an}$ : starting efficiency – driving
- $\eta_{an}'$ : starting efficiency – driven

Ratio / Speed (rpm)	$\eta_g$		$\eta_g'$		$\eta_n$	$\eta_{an}$	$\eta_{an}'$
	800 - 1249	1250 -1800	800 - 1249	1250 -1800	1250 -1800	-	-
50:1	0.71	0.74	0.79	0.83	0.83	0.42	0.03
41:1	0.73	0.76	0.81	0.85	0.85	0.44	0.13

Ratio /	$\eta_g$		$\eta_{g'}$		$\eta_n$	$\eta_{an}$	$\eta_{an}'$
35:1	0.75	0.78	0.83	0.86	0.86	0.46	0.18
51:2	0.77	0.80	0.86	0.89	0.89	0.56	0.46
45:2	0.78	0.81	0.87	0.90	0.90	0.57	0.49
41:3	0.80	0.83	0.89	0.92	0.92	0.68	0.69

Tab. 10

ATR\_1\_21\_0065\_0

#### 4.1.10 Mass moment of inertia

The value for the mass moment of inertia includes the driving gear with brake disc and coupling element as well as a proportion for the traction sheave.

- Mass moment of inertia:  $J_{rot} = 0.158 \text{ kgm}^2$

Not included are the mass moments of inertia for the motor with handwinding wheel.

The values for the mass moment of inertia of non-standardised motors can be found in the lists of motors (e.g. Koncar, etc.).

#### 4.1.11 Weight

Designation	Weight [kg]	Machine version without motor				Machine version with motor DTE180 <sup>2)</sup>			
AY TW160 winch <sup>1)</sup>	540	x	x	x	x	x	x	x	x
Additional parts for SA9	60		x		x		x		x
Additional parts for NBS emergency brake system	150			x	x			x	x
Traction sheave D720 <sup>2)</sup> and <sup>3)</sup>	160	x	x	x	x	x	x	x	x
DTE180 motor <sup>4)</sup>	225					x	x	x	x
AY complete machine [kg]		700	760	880	940	925	985	1105	1165

Tab. 11

ATR\_1\_21\_0010\_0

<sup>1)</sup> without motor.

<sup>2)</sup> Weight for traction sheave D560 approx. 110 kg / D640 approx. 140 kg / D800 approx. 190 kg

<sup>3)</sup> Weight for traction sheaves - SA9 minus 10 kg

<sup>4)</sup> Weight for other motor versions [↗ Chap. 4.1.6 P. 38](#)

The weight data for the motor type IMB5 can be taken from:

- [↗ Chap. 4.1.6 P. 38](#)
- custom-order motors from the manufacturers' motor lists

#### 4.1.12 Noise levels

The airborne noise levels in the machine room at a distance of 1 m for the standard version of the machine TW160 with operation at normal rating are:

ATR\_1\_22\_032\_0

Version	[dB(A)]
TW160 with motors of type DTE132 – DTE140	≤ 70
TW160 with motors of type DTE180 – DTL180	≤ 74
TW160 with motors of type EMOD BG180-225	≤ 70

Tab. 12

ATR\_1\_21\_0017\_0

## 4.2 Dimensions

### 4.2.1 Machine

TW160 machine – standard version (machine shown in traction sheave position on left)

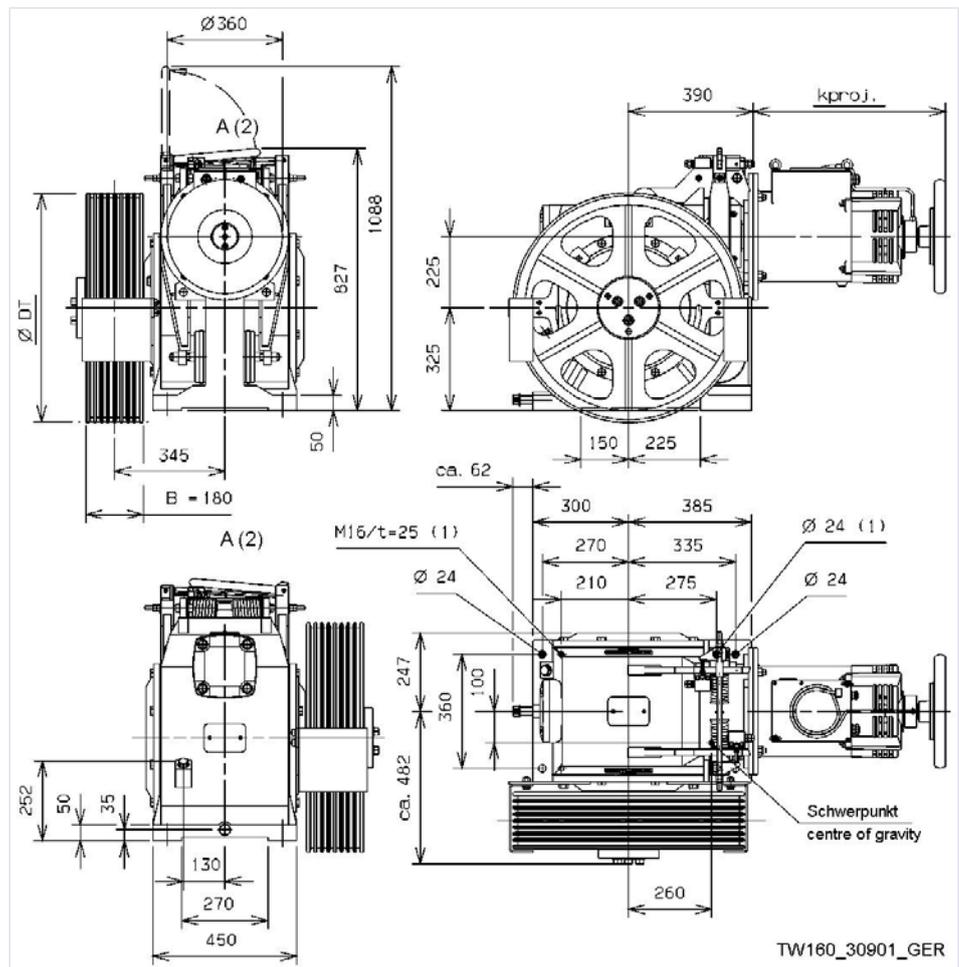


Fig. 17

ATR\_2\_21\_0191\_0

Item	Designation	Item	Designation
1	Additionally for SA1	2	Pictured: Traction sheave position left/ right mirror-inverted to A-A

TW160 machine – additional dimensions for version with emergency brake (NBS) (machine shown in traction sheave position on left)

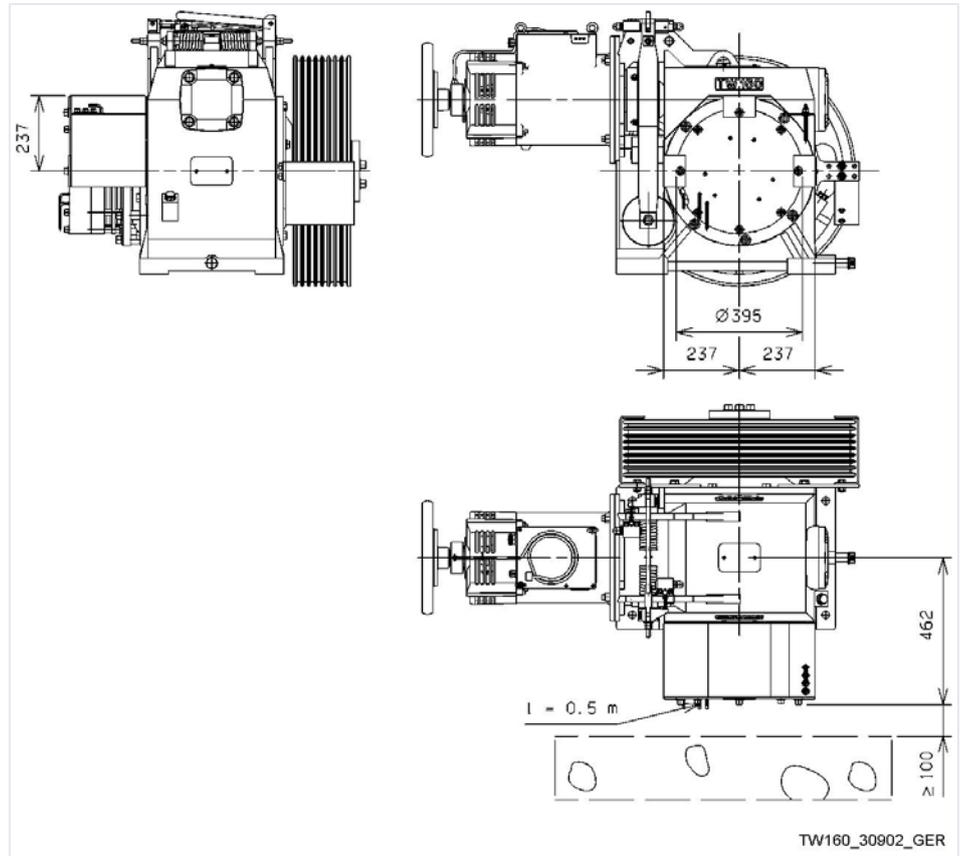


Fig. 18

ATR\_2\_21\_0192\_0

TW160 machine with traction sheave position in the shaft – SA9  
(machine shown in traction sheave position on left and upward support of outside bearing)

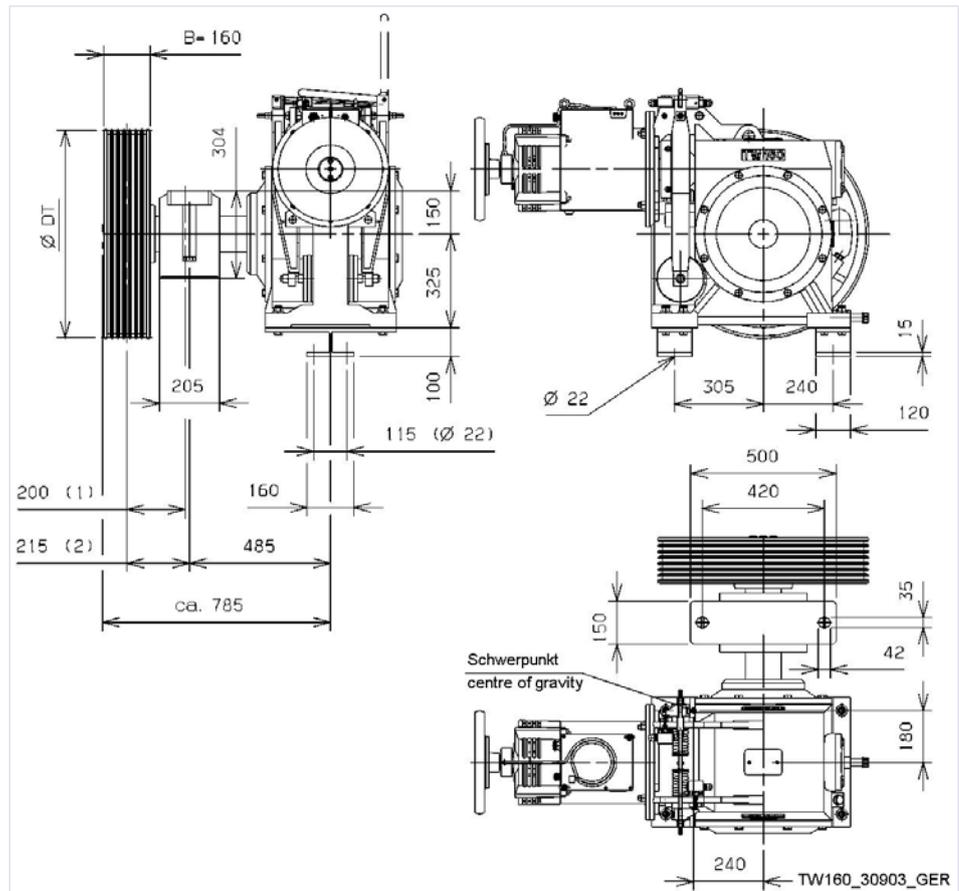


Fig. 19

ATR\_2\_21\_0193\_0

Item	Designation	Item	Designation
1	Centre, roller bearing	2	Centre, bearing housing

TW160 machine with vapour-proof partition wall – SA4 (machine shown in traction sheave position on left)

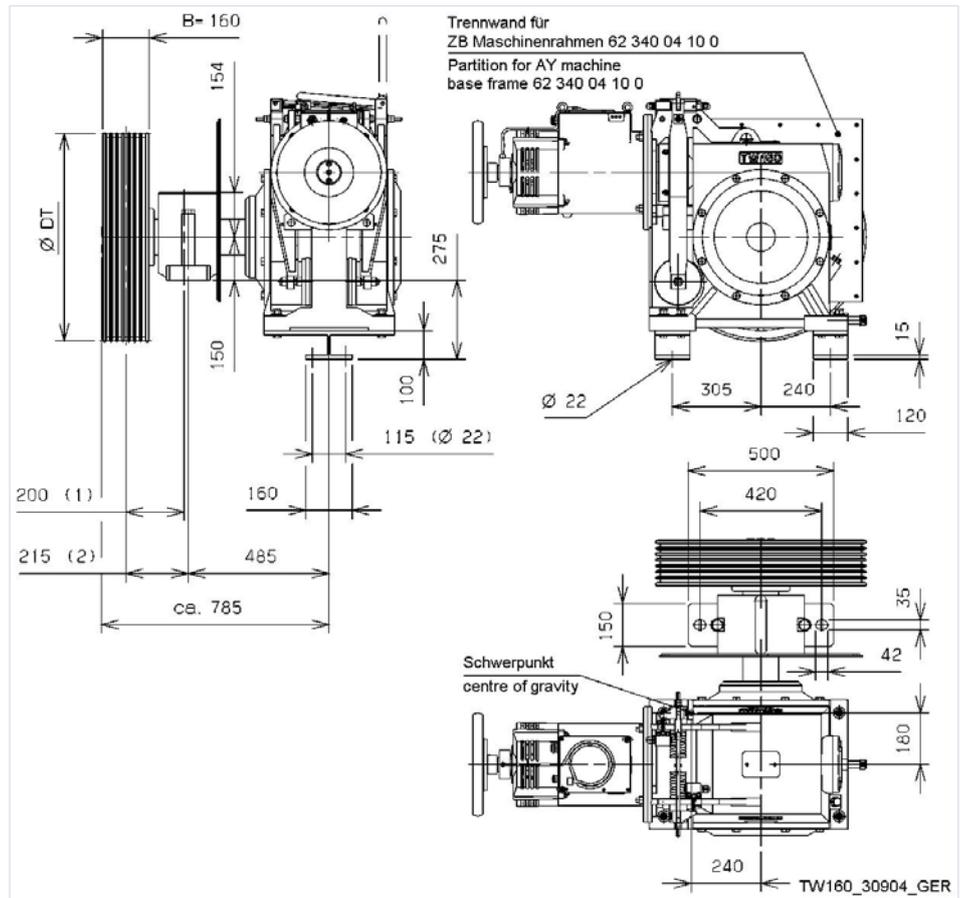


Fig. 20

ATR\_2\_21\_0194\_0

Item	Designation	Item	Designation
1	Centre, roller bearing	2	Centre, bearing housing

TW160 machine with vapour-proof partition wall – SA4 in combination with emergency brake – NBS (machine shown in traction sheave position on right and downward outside bearing support)

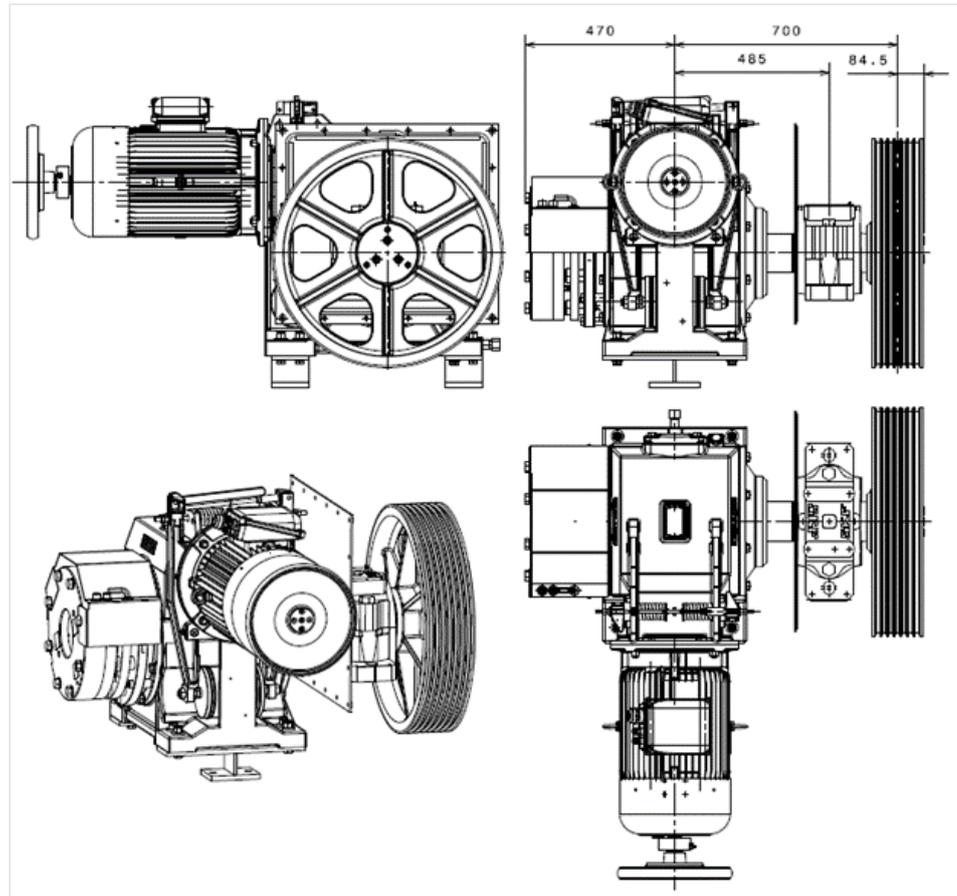


Fig. 21

ATR\_2\_21\_0195\_0

## 4.2.2 Machine base frame

### Machine base frame without rope pulley

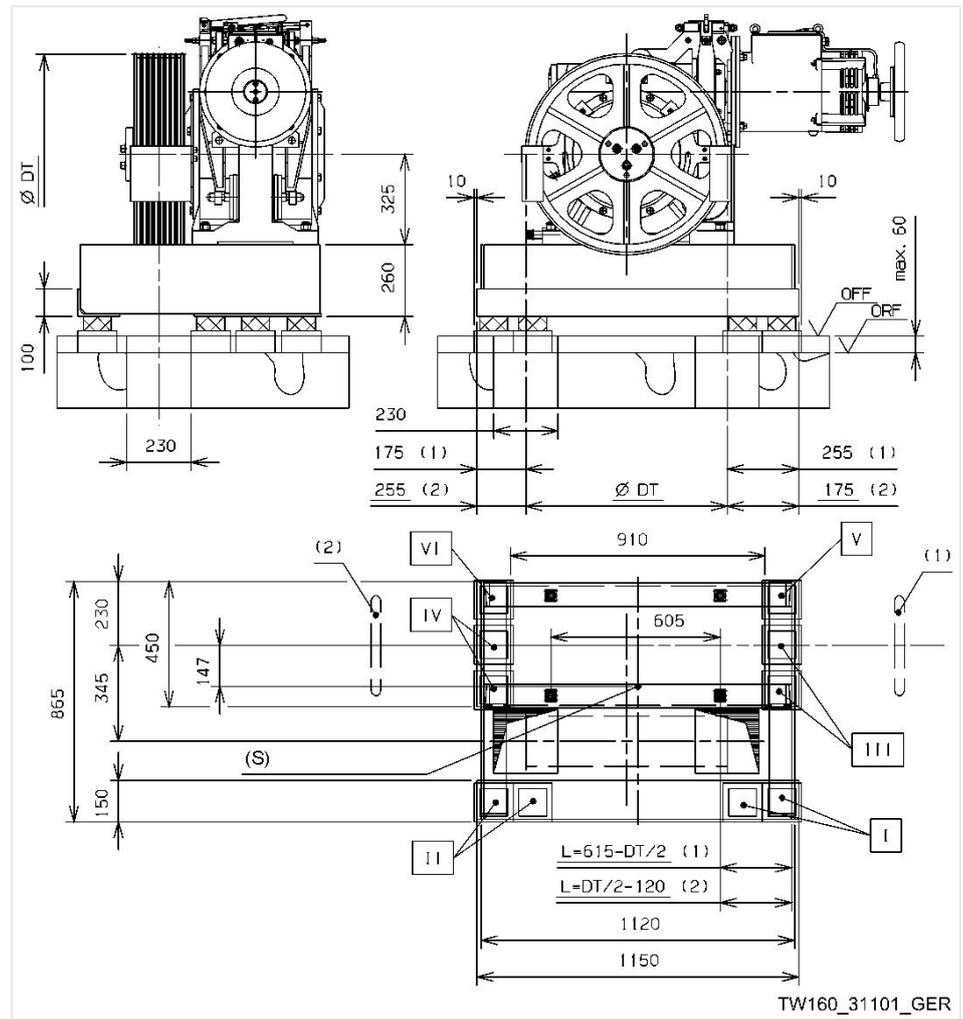


Fig. 22

ATR\_2\_21\_0204\_0

Item	Designation	Item	Designation
1	Machine with traction sheave position – left	2	Machine with traction sheave position – right
S	Centre of gravity		

### Project planning dimensions:

Version of traction sheave DT	Unit	Project planning dimension L Traction sheave position	
		left	right
560	mm	335	160
640		295	200
720		255	240
800		215	280

Tab. 13

ATR\_1\_21\_0066\_0

Project planning dimension L dependent on traction sheave diameter DT and traction sheave position (left or right of the machine).



Machine base frame with rope pulley and support - right-hand version of the rope pulley position

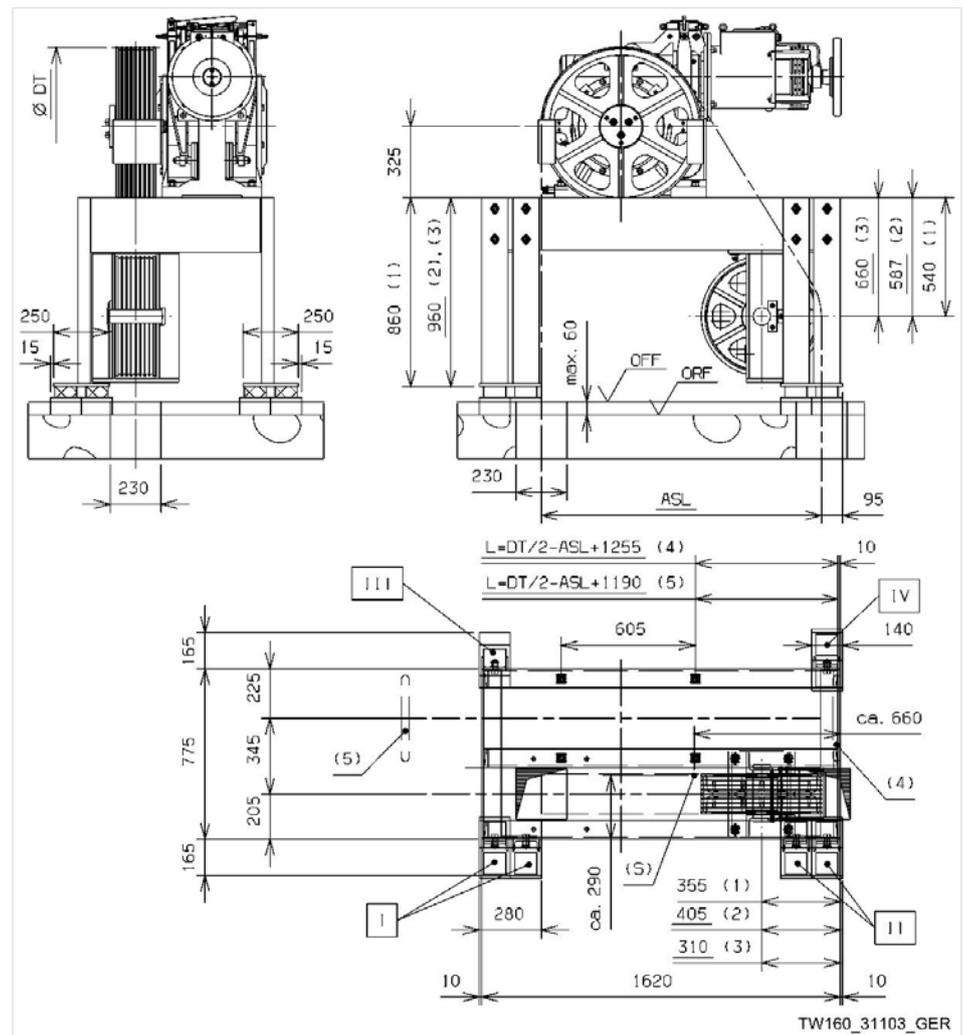


Fig. 24

ATR\_2\_21\_0206\_0

Item	Designation	Item	Designation
1	With D540 rope pulley	2	With D640 rope pulley
3	With D450 rope pulley	4	Machine with traction sheave position - left
5	Machine with traction sheave position - right	S	Centre of gravity, machine base frame

Project planning dimensions:

Version of traction sheave DT	Unit	Rope distance elevator car - counterweight	
		ASL <sub>min</sub>	ASL <sub>max</sub>
560	mm	715	1400
640		795	
720		875	

Version of traction sheave DT	Unit	Rope distance elevator car – counterweight			
800		955			

Tab. 14

ATR\_1.21\_0068\_0

Project planning dimension L dependent on traction sheave diameter DT and traction sheave position (left or right of the machine)

Position for Insulation element	Rope distance elevator car - counterweight ASL [mm]																
	800				1000				1200				1400				
	I	II	III	IV	I	II	III	IV	I	II	III	IV	I	II	III	IV	
	Number of insulation elements																
Static shaft load $F_t$ [kN]	90	2	4	1	2	3	4	2	2	4	3	2	2	4	2	2	1
	75	2	4	1	2	3	3	1	2	3	3	2	1	4	2	2	1
	60	2	3	1	2	2	3	1	1	3	2	1	1	3	2	2	1
	30	2	2	1	2	2	2	1	1	2	1	1	1	2	1	1	1

Tab. 15

ATR\_1.21\_0069\_0

Position and number of insulation elements depending on the static shaft load and rope pulley and traction sheave positions

Version with vapour-proof partition – left traction sheave position

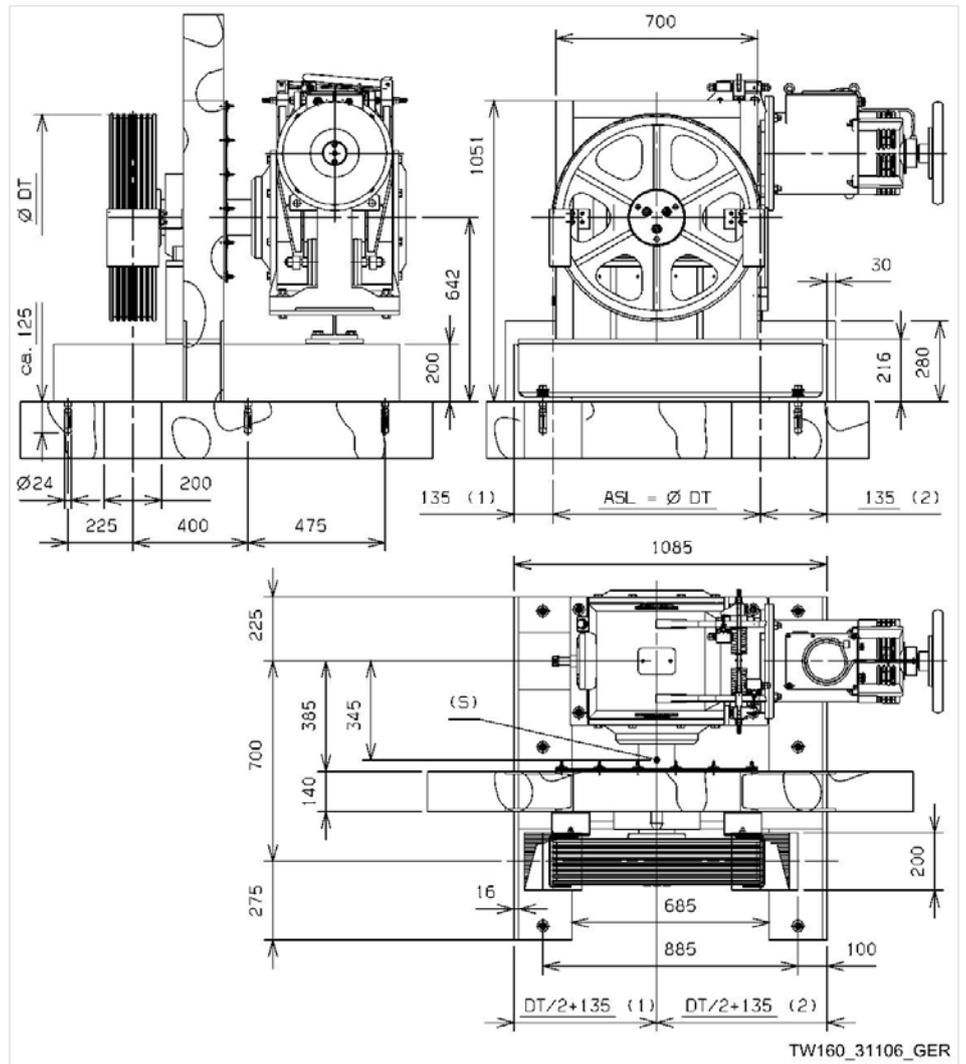


Fig. 25

ATR\_2\_21\_0212\_0

Item	Designation	Item	Designation
S	Centre of gravity		

# 5 Transportation and storage

## 5.1 Packaging

### NOTICE



#### Rust on components of the drive!

Damage and possibly loss of function of the product.

→ Check the "anti-corrosion foil" for damage.

The packaging varies depending on the version of the machine that is delivered. The illustration shows the vertical version:

- Standard version: Special pallet 1680 x 850 mm
- Version with emergency brake system, NBS: Special pallet 1680 x 1100 mm
- Special versions - SA4 / SA9 Special pallet 1700 x 1240 mm
- For special version SA4/SA9, the compensation supports are packaged separately and secured to the pallet.

In the case of larger traction sheaves, the gear box casing is bolted onto wooden blocks.

The gear box is screw-connected directly onto the pallet (special pallet 1200x800)

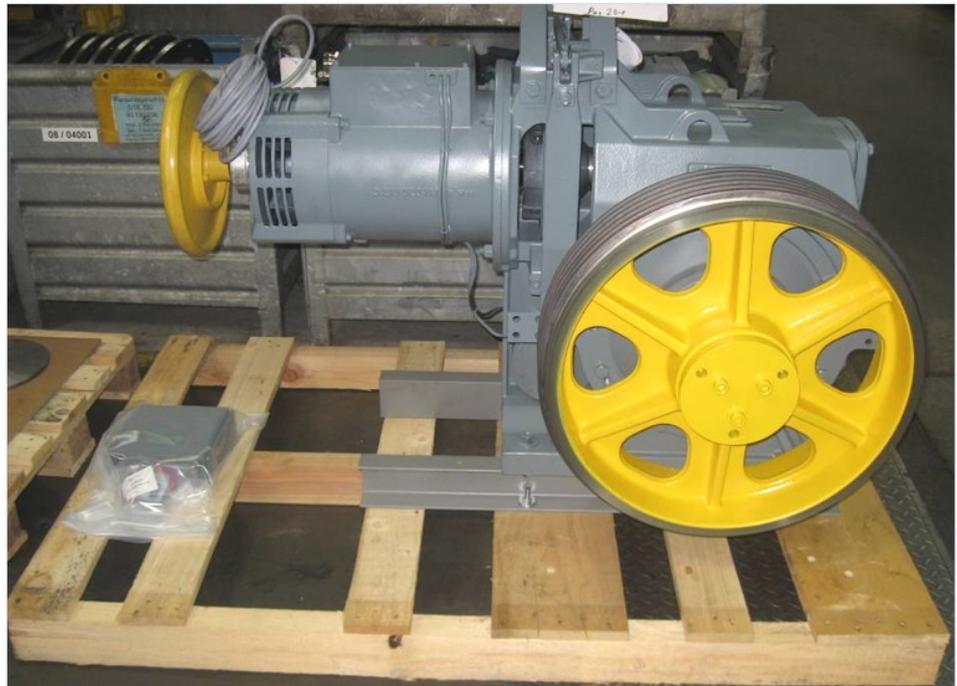


Fig. 26

ATR\_2\_21\_0225\_0

Further packaging depends on the order and is country-specific (air/sea/land freight).

- Refer to the delivery note for the dimensions and weight.
- Observe the symbols attached to the packaging or in visible locations.

- Dispose of used packing material in an environmentally responsible manner.



Specific transport equipment and shipping braces remain with the customer.

## 5.2

### Transport

#### NOTICE



##### Improper transport!

Damage and possibly loss of function of the product.

- Do not place heavy objects on the assembly when packaged.
- Protect it against impacts and falling.
- Protect it against water and extreme temperatures .
- Comply with safety regulations.
- Pay attention to the centre of gravity of the product.

## 5.3

### Fork-lift truck transport

#### ⚠ WARNING



##### Protruding or tilting parts.

In the event of impact, transported goods can lead to severe crushing injuries or cuts and possibly fatal injuries.

- When effecting transport with a fork lift, use adequately long forks to prevent tipping over.
- During transport, keep a safe distance to persons.
- Always pick up at the frame or transport pallet with the forks, not the machine itself.

## 5.4

### Crane transport

#### ⚠ WARNING



##### Suspended load!

Falling transported goods can lead to severe crushing injuries or cuts and possibly fatal injuries.

- Do not walk underneath suspended loads.
- Only use tested and adequately dimensioned lifting gear.
- The specified means of transport are only configured for transportation of the machine, the installed brake and traction sheave. Do not use them to transport any other loads.

### Dimensions and weight

1. Specified weights, see packaging with label.
2. Dimensions, see delivery note.
3. Approximate specifications, see [↗Chap. 4.1.11 P. 41](#).
4. Machine without frame on rope with transport hanger.
5. In the case of a machine that is mounted on the machine base frame, attach a transport rope to the base frame.
6. Secure the machine against slipping and falling over.
7. In the case of machines without a machine base frame, attach a transport rope to the transport hanger.

#### **⚠ NOTICE!**

**Do not damage the handwinding wheel. Ropes or chains must not make contact with the handwinding wheel during transport.**



Fig. 27

ATR\_2\_21\_0226\_0

Item	Designation	Item	Designation
1	Transport hanger		

## 5.5

### Checking the delivery

#### **⚠ WARNING**



**Severe transport damage to the product.**

Can lead to a malfunction of the product and thus to death or serious injury.

- Before commissioning, ensure that there is no severe damage to the product.

1. Check delivery for completeness.
2. Compare with the ordering and delivery documents.

3. Check the packaging for damage and any other conspicuous anomalies.

### In the case of damage

1. Do not commission a damaged product.
2. Any damage that is determined is to be documented immediately by means of a sketch, photo or description of the damage.
3. Report damage to the manufacturer.

## 5.6

### Intermediate storage

- The product may be exposed to a maximum relative air humidity of 60% (at 20 °C).
  - Store the product carefully in a protected location:
    - Protect it against the formation of condensation and moisture.
    - Protect against dirt in the machine.
- In the case of downtimes of longer than one year, carry out standstill maintenance [↗ Chap. 9.1 P. 84](#) Standstill maintenance.

# 6 Installation

## 6.1 Setting up the machine base frame

To reduce noise and sound transmission, we offer insulation elements that can be inserted between the frame supports and floor. These differ according to the type of mounting:

- A rubber block 100 x 100 x 50 high without base is used to mount the drive on the machine room floor without a cement floor or directly surface-mounted on the cement floor.
- For installation on cement floor, packing cast into cement floor (thickness  $\leq 60$  mm). The packing component must be cast in when installing the cement floor. A rubber block 100 x 100 x 50 with additional packing 140 x 140 x 80 mm is used here.

The number and arrangement of rubber elements is based on the total load and the distance between the rope lengths (ASL dimension = distance between rope departures).

The individual load required here should be between 7 kN and 12 kN per element.

When arranging the supports, the overall centre of gravity must lie within the rubber elements.

The arrangement under the machine base frame should be such that the stress and/or buffering of the insulation elements (maximum difference 3–5 mm) is as even as possible.

## 6.2 Aligning the machine

The machine is to be set up according to the plan of installation. The rope departure from the traction sheave is to be aligned plumb to the elevator car mounting or the elevator car rope pulley and the counterweight according to the drawing. With load applied to the ropes, the machine should be aligned vertically on its installation surface. Irregularities must be balanced out by inserting shims under the floor support.

SA4 vapour-proof partition wall with extended traction sheave shaft and pedestal bearing for spatial separation of drive and shaft area.

SA9 traction sheave in the shaft, machine with extended traction sheave shaft and pedestal bearing.

1. Fitting and mounting of the compensating supports.
2. Horizontal alignment of the traction sheave shaft.
3. Align the bearings of the machine and the outside bearing exactly.

## Installation of the compensating support for SA4/SA9

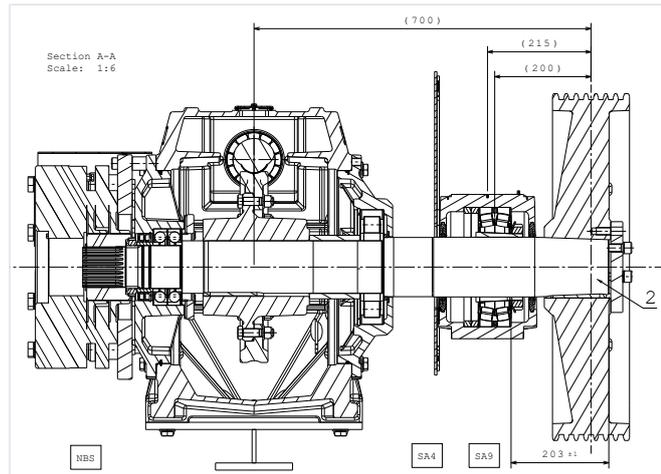


Fig. 28

ATR\_2\_21\_0244\_0

1. Mount the compensating supports on the machine housing from underneath.
  - ▷ Tighten 6x M16x100 -8.8/2x M16x40-8.8 to 190 Nm.

## 6.3

## Mounting the frame with rope pulley

### NOTICE



#### One-sided load on component and or drive set up on a slant!

Failure of the drive involving damage.

- The drive must be horizontal.
- Use a spirit level to check; add support if necessary.
  - ▷ Secure the drive on the machine base frame against shifting with adjusting screws or stops.
- Arrange the suspension ropes symmetrically on the suspension plate, traction sheave and rope pulleys.

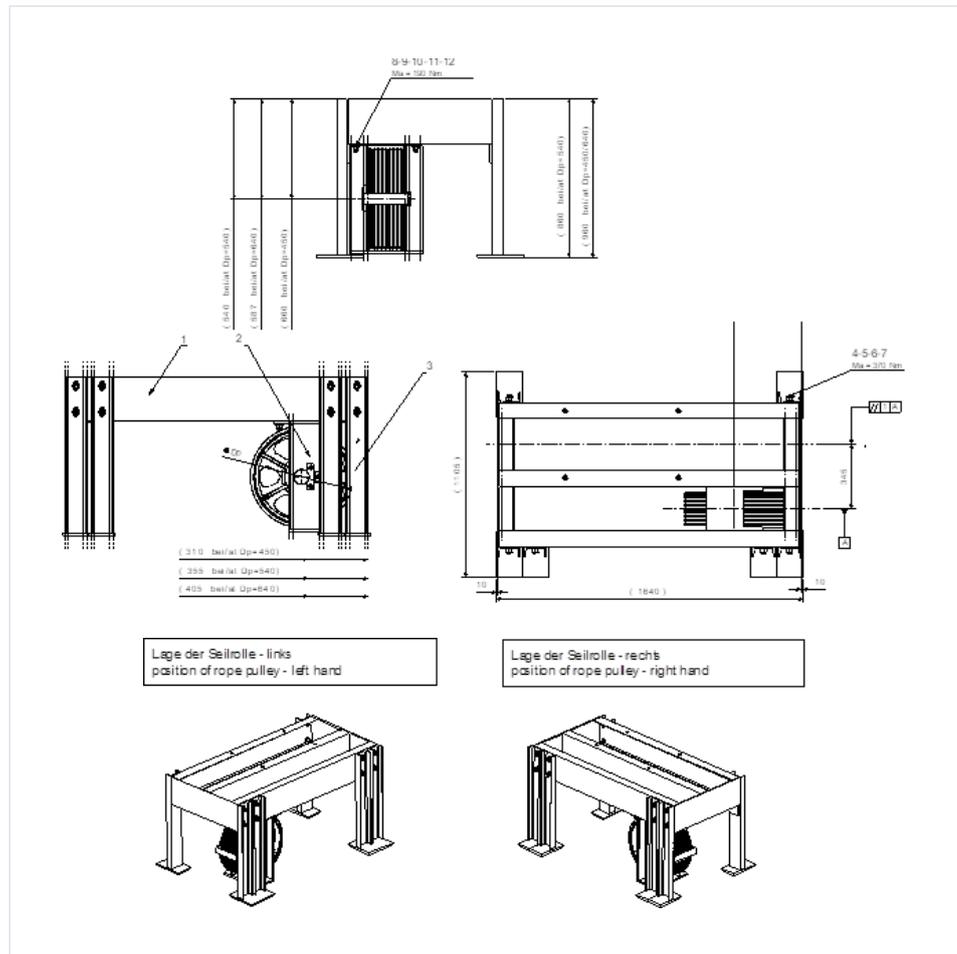


Fig. 29

ATR\_2\_21\_0224\_0

1. The version can be found in the plan of installation.
2. Mount the delivered frame (upper frame part, supports and pulley frame with rope pulley) loosely together in the machine room.
3. Tighten the connecting bolts (M20-8.8) of the supports to 370 Nm.
4. Tighten the connecting bolts for the pulley frame (M16-8.8) to 190 Nm.
5. Position the frame on the insulation elements in accordance with the plan of installation.
6. Lift the machine onto the frame using lifting tackle.
  - ▷ The traction sheave must rest on the diverter pulley side.
7. Bolt the machine onto the frame, whereby the machine housing must not be tensioned.
  - ▷ Use the supplied shims for compensation.
8. Align the rope grooves of the traction sheave and diverter pulley in parallel.
9. Tighten the screws to the required torque.
  - ▷ Tighten 4x M20-8.8 to 370 Nm.
10. Plumb the rope departure on the rope pulley and/or mounting on elevator car and counterweight.
11. An additional set of connecting elements (SA1 – 6x M20 + 2x M16) is used for horizontal rope departures.

## 6.4 Mounting the rope guard

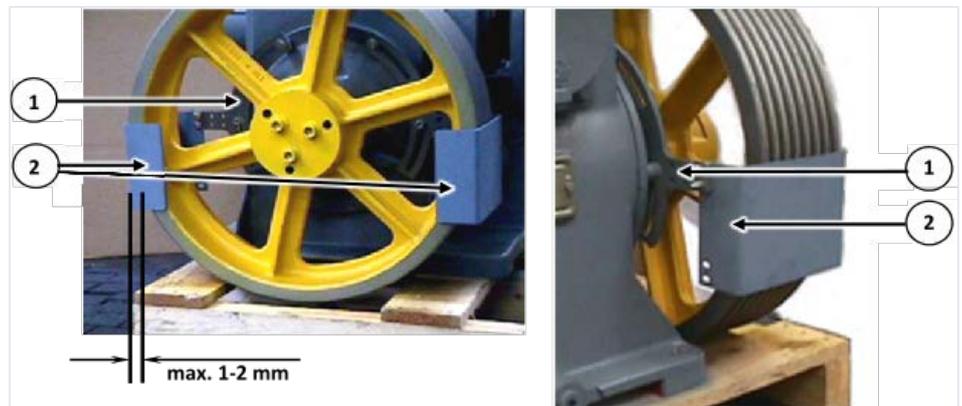


Fig. 30

ATR\_2\_12\_0091\_0

Item	Designation	Item	Designation
1	Rope guard carrier	2	Rope guard

1. Use the enclosed screws to bolt the rope guard onto the rope guard carrier.
2. Pivot the rope guard carrier to set the guard in such a way that the clearance between the rope and hoop guard on the rope run-in and run-out side of the traction sheave is as small as possible (1–2 mm).
3. Adapt the inclined pulling location of the rope guard carrier by remounting the changed rope pull direction.
4. Align the winch and tighten the securing bolts of the rope guard carrier to the prescribed torque ↗ [Chap. 10.1 P. 85](#).

### i

For machines with rope run-in direction of 0–90° above the horizontal (e.g.: machine arrangement up/down beside), an additional rope guard is required to prevent foreign bodies from entering between the rope and groove. If the rope run-in zone is protected within the machine base frame, the function "protection against injury" is not required.

## 6.5 Mounting the rope guard complying with EN81-77

1. Mount the rope guard carrier on the machine's pre-assembled rope guard carrier.
2. Align the rope guard carrier with the rope guard via the rope inlet and outlet.
3. Setting the distance between the rope guard and the rope outer diameter to approximately 2 mm.

## 6.6 Shift protection on the machine base frame

The entire shift protection consists of four units in total.

The fastening materials (Hilti HST M16/25 or Fischer M16/25 FAZ II) are included in the scope of supply and must be attached to the unfinished concrete floor.

- Comply with the installation instructions of the manufacturer.

**i**

In locations where the distance to the wall is  $< 250$  mm, the standard shift protection devices must be replaced by devices for low wall clearances.

The shift protection is configured for the following machine insulations:

- Insulation elements without underlay for machine room without floor pavement
- Insulation elements with underlay for machine room with floor pavement ( $\leq 60$  mm height); underlay made from Multiplex laminated wood 140x140x80 mm.

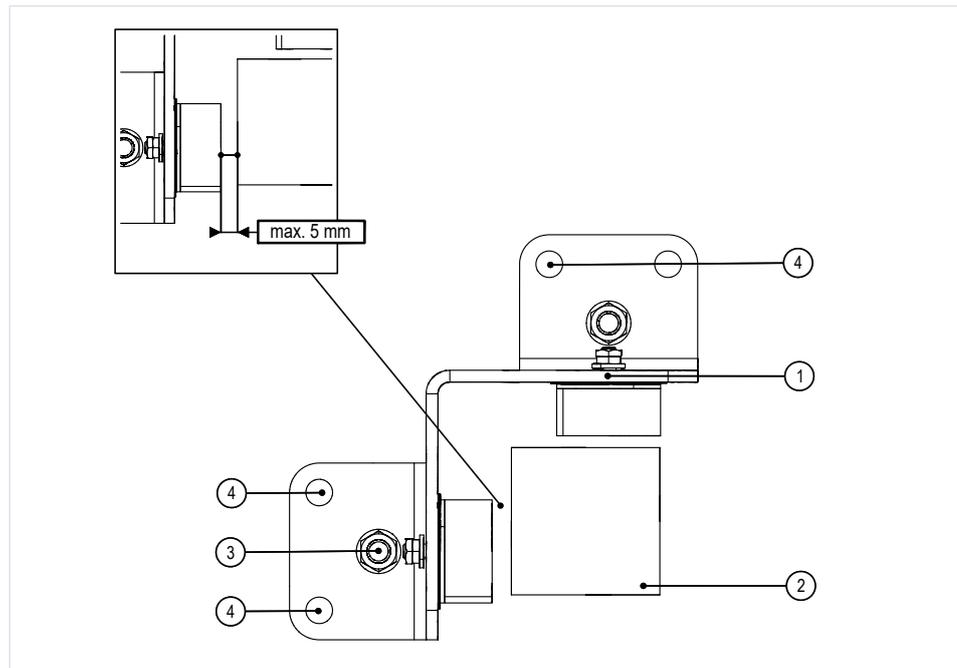


Fig. 31

ATR\_2\_00\_0002\_0

Item	Designation	Item	Designation
1	Shift protection	2	Machine base frame
3	Anchoring device	4	Alternative holes

1. Position the shift protection elements contact-free with a slight clearance (maximum 5 mm) to the machine base frame and make marks.
  - ▷ If there is steel reinforcement in the concrete, use alternative holes.
2. Drill holes for the anchoring devices at the marked positions.
  - ▷ Use 1 anchoring device per tab.
3. Secure the shift protection elements with two anchoring devices.
  - ▷ Use 1 anchoring device per tab.

## 6.7 Electrical connection

### WARNING



#### Inadequate connection

Electric shock. Damage to drive.

- Earth the motor and brake magnet in accordance with country-specific regulations.
- Electrical connections must correspond to at least the protection class in accordance with the name plate and/or required country-specific protection class.

### WARNING



#### Live parts!

Electric shock.

- When connecting the machine, comply with the relevant regulations. Never work when the voltage is switched on!
- Ensure reliable earthing (loop resistance).
- Here, configure connections in both terminal boxes.

## 6.7.1 Connecting the machine

### NOTICE



#### Incorrectly connected cables!

May lead to impairment or loss of function of the product.

- When connecting the motor, comply with the terminal connecting plan on the back of the cover on the motor terminal box and/or the motor connection terminal diagram.
- In the case of frequency-controlled machines, ensure EMC-compliant installation of the motor and posistor (use suitable shielding).

DTE/DTL motors

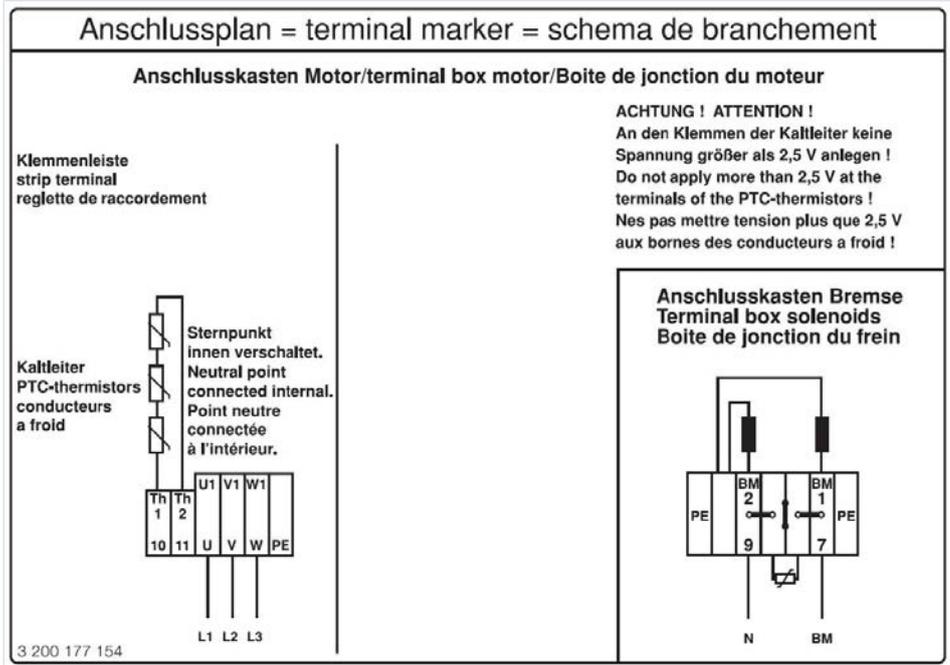


Fig. 32

ATR\_2\_12\_0139\_0

Motor lift for motors

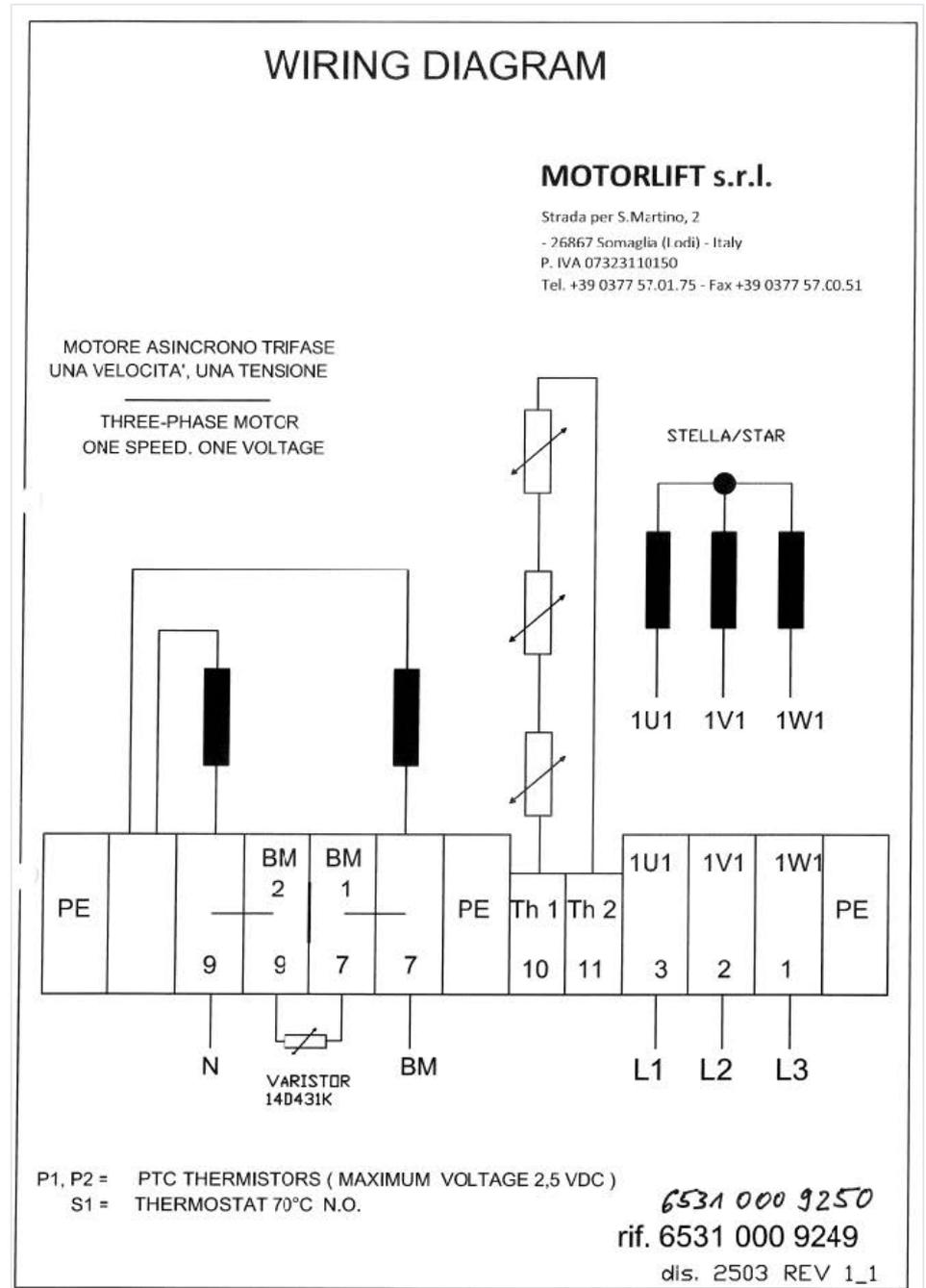


Fig. 33

ATR\_2\_12\_0140\_0

## DTE132/140/180, motor lift CMRF160L1 and motors made by EMOD

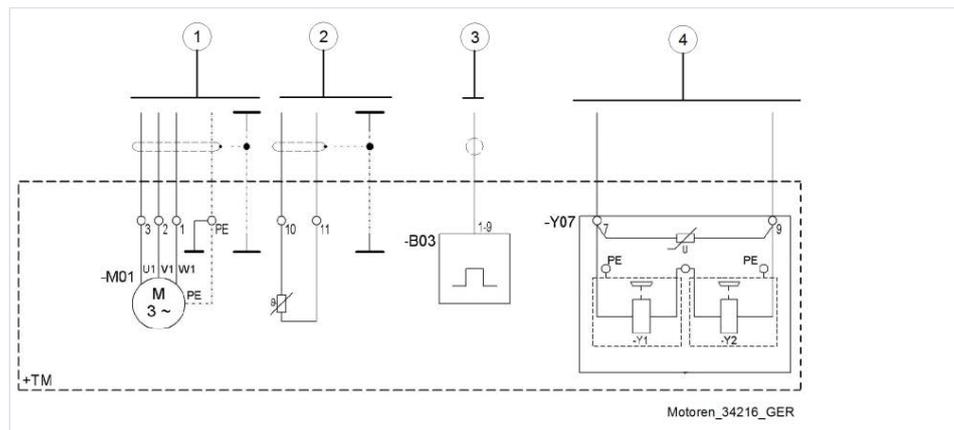
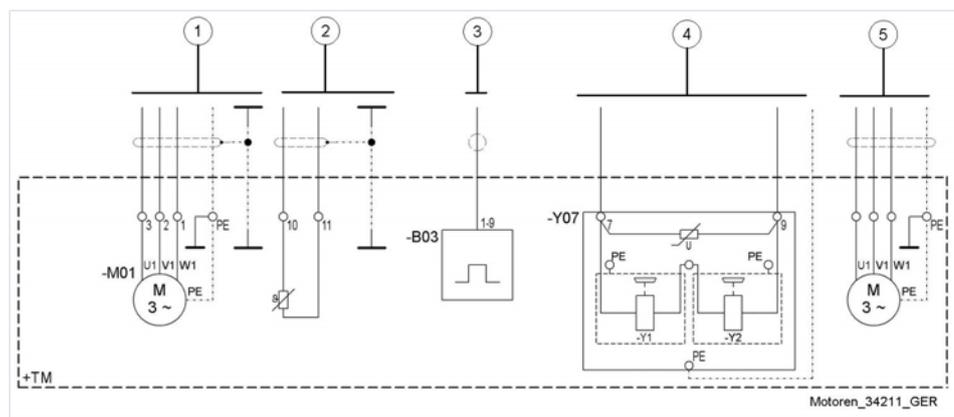


Fig. 34

ATR\_2\_12\_0141\_0

Item	Designation	Item	Designation
1	Motor	2	Posistor
3	Encoder	4	Brake (intermediate clamping)

### DTL



Item	Designation	Item	Designation
1	Motor	2	Posistor
3	Encoder	4	Brake (intermediate clamping)
5	External ventilation (only for DTL180)	6	

## 6.7.2

### Connecting the motor line

1. Strip the insulation from the connection line.
2. Route cable through the cable gland.
3. Connect the PE conductor to the screwed connection specifically designed for the purpose.
4. Connect the three motor wires to the terminals U, V and W as specified in the terminal connecting plan.
5. Pull the shielding braid evenly over the lamellar insert.
6. The braid must not protrude beyond the lamellar insert into the thread.
7. Pull the cable through the cap nut.

8. Push the cap nut over the shielding.
9. Tighten the cap nut with the recommended torque in accordance with manufacturer documentation [↗ Chap. 10.2 P. 85.](#)

### 6.7.3

## Connecting the posistor

### NOTICE



#### Overvoltage at the measuring device.

Defective posistor.

- Do not apply a voltage greater than 2.5 V.
- Observe the internal resistance on the measuring instrument.

---

A triggering device (motor protection device) is required for evaluation of the posistor temperature sensor installed in the motor.

1. Strip the insulation from the connection line.
2. Connect both wires in accordance with the terminal connecting plan.
3. Tighten the cap nut with the recommended torque in accordance with manufacturer documentation [↗ Chap. 10 P. 85.](#)

# 7 Work on the product

## 7.1 Replacing the brake shoes

With a remaining lining thickness of less than or equal to 3 mm or if the linings are damaged (e.g. glazing), the brake shoes incl. the brake lining must be replaced.

### Disassembly

1. Disconnect the power from the installation and secure it against reactivation.
2. Remove the nuts and spherical washer.
  - ▷ Take out the tension spring with add-on parts.



Fig. 35

ATR\_2\_21\_0228\_0

3. Remove the brake shoe bolt locking screws.



Fig. 36

ATR\_2\_21\_0229\_0

4. Slide the cover ring of the armature base plate over the magnetic clamp.
5. Remove the counter nut of the anchor bolt.
  - ▷ Press the anchor bolt and armature base plate together slightly.
  - ▷ The gap between the magnetic clamp and armature base plate is enlarged.

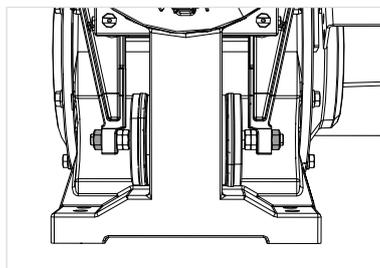


Fig. 37

ATR\_2\_12\_0101\_0

6. Pull the brake shoe bolt out of the housing using the locking screw.
7. Remove the compression spring, spring plate and screw.
8. Remove one brake shoe.

## Installation

1. Mount the armature base plate on the new brake shoe.
2. Check the ease of movement of the armature base plate; adjust if necessary.
  - ▷ It should be possible to move the armature base plate with low resistance.
  - ▷ If necessary, grease the rubbing surface between the armature base plate and anchor bolt.
3. Secure the settings of the armature base plate pre-tension with the counter nut.
4. Install brake shoes, bolts and locking screws for the bolts.
  - ▷ The end thread in the bolt must point outwards.
5. For maximum spring travel, preload the springs with the hexagon nut.
  - ▷ Pre-tension the compression spring to approx. 20.4 mm.
  - ▷ Secure the setting with the counter nut.

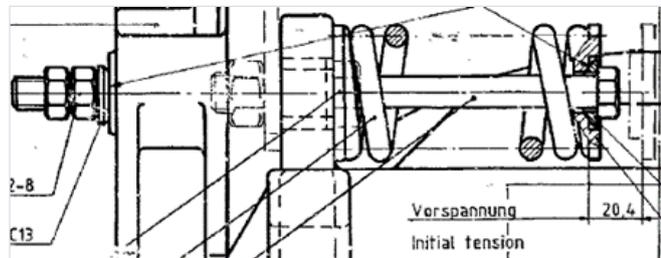


Fig. 38

ATR\_2\_21\_0230\_0

6. Set the brake shoe stroke by adjusting the armature base plate screw on the brake shoe.
  - ▷ Check the brake shoe stroke with electrical pick-up.
7. Push the rubber ring over the gap between magnetic clamp and armature base plate.
8. Modify, replace and set the second brake shoe in the same manner.
9. Set the operation position of the brake release lever at 5-10° above the horizontal.
10. Use electrical recall to move the elevator and observe whether both brake shoes open evenly.
11. Check the stroke paths and deceleration; if required, adjust.

## 7.2

### Setting the brake shoe stroke and armature base plate

- ✓ Before initial operation and during monitoring, the working stroke of the brake shoes, the initial tension of the brake springs and initial tension of the armature base plates must be checked.
1. Check the rubber disc between the armature base plate and the brake shoe.
    - ▷ Readjust the initial tension between the brake shoe and armature base plate.
  2. The armature base plate can be rotated with suction on the anchor bolt.

3. Align a dial gauge on the brake shoe at the height of the centre of the brake disc.
4. Switch on the drive and check the stroke of the brake shoes.
5. In the event of deviations, loosen the counter nut.
6. Readjust the anchor bolt and, on opening, ensure that the brake shoes have the same stroke.
7. Secure the setting.

A correct setting of the initial tension is only possible within the framework of a deceleration measurement. In doing so, do not exceed the maximum initial tension distance of 20.4 mm.

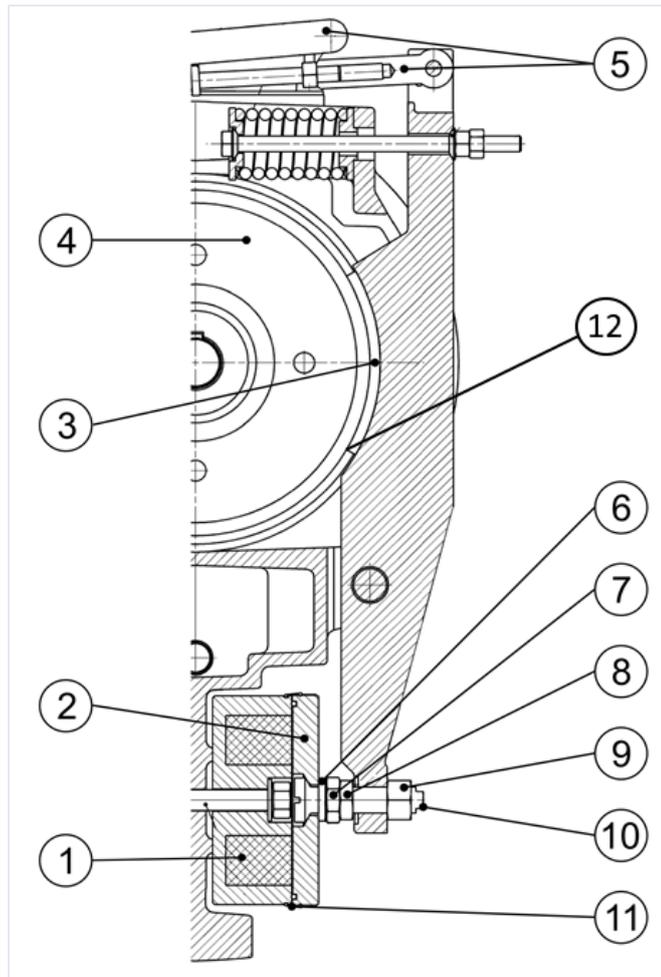


Fig. 39

ATR\_2\_21\_0231\_0

Item	Designation	Item	Designation
1	Magnetic clamp	2	Armature base plate
3	Working stroke of shoes 0.35 to max. 0.6 mm on the middle of the brake disc	4	Brake disc
5	Brake release lever, pressure piece with pressure rod	6	Rubber disc
7	Disc	8	Hexagon nut

Item	Designation	Item	Designation
9	Counter nut	10	Anchor bolt
11	Cover ring	12	Working stroke at the narrowest point 0.1 + 0.05 mm

If brake test switches are present, these must be checked or adjusted after brake adjusting [↗ Chap. 3.3.3 P. 26](#) [↗ Chap. 10 P. 85](#).

## 7.3

### Braking deceleration setting

The brake adjustment is to be carried out only with one effective brake shoe with the elevator car loaded with the rated load on a descending run (full down) or with an empty elevator car on an ascending run (empty up) according to the deceleration values in the table below. Brake shoe stroke at the narrowest point 0.1 + 0.05 mm. This corresponds to approximately 0.35 to max. 0.6 mm in the middle of the brake disc. The braking torque must be set by pre-tensioning the brake springs in relation to the system, evenly across both brake shoes.

Braking deceleration	Machine with handwinding wheel		
v in m/s	≤ 0.63	≤ 1.25	> 1.25
a in m/s <sup>2</sup> (full down)	≤ 0.3	≤ 0.4	> 0.50
a in m/s <sup>2</sup> (empty up)	≤ 0.5	≤ 0.6	> 0.75

Tab. 16

ATR\_1\_21\_0032\_0

If brake test switches are present, these must be checked and/or readjusted after a brake setting. [↗ Chap. 3.3.3 P. 26](#).

## 7.4

### Brake readjustment in the event of brake lining wear

With wear on the brake linings, the stroke of the brake shoes increases compared with the reference state. At a limiting value of 0.6 mm, the following settings on the brake are to be checked and, if necessary, corrected:

1. Armature base plate pre-tension: Check and, if required, adjustment of the pre-tension.
2. Stroke of the brake shoes: Setting to the reference value.
3. Bias voltage of the compression springs: Setting the reference value to max. 20.4 mm as well as checking the deceleration [↗ Chap. 7.3 P. 69](#).

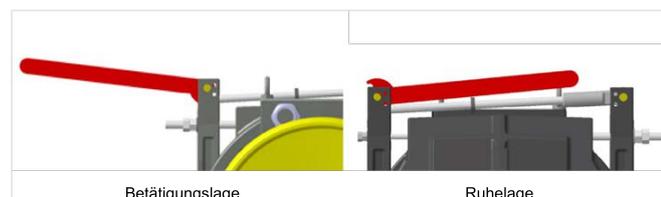


Fig. 40

ATR\_2\_22\_0023\_0

## 7.5 Test of one brake circuit

1. Manually open the brake shoe not being tested with a suitable tool.
  - ▷ For example, a nailing tool or a flat spanner on smaller machines.

### **⚠ WARNING**



#### **Brake malfunction!**

Malfunction/slipping of the brake being tested.

- The tool must not be secured in the brake's open position.
- The installation tool must be operated by a qualified person.
- The brake must be able to re-engage immediately.

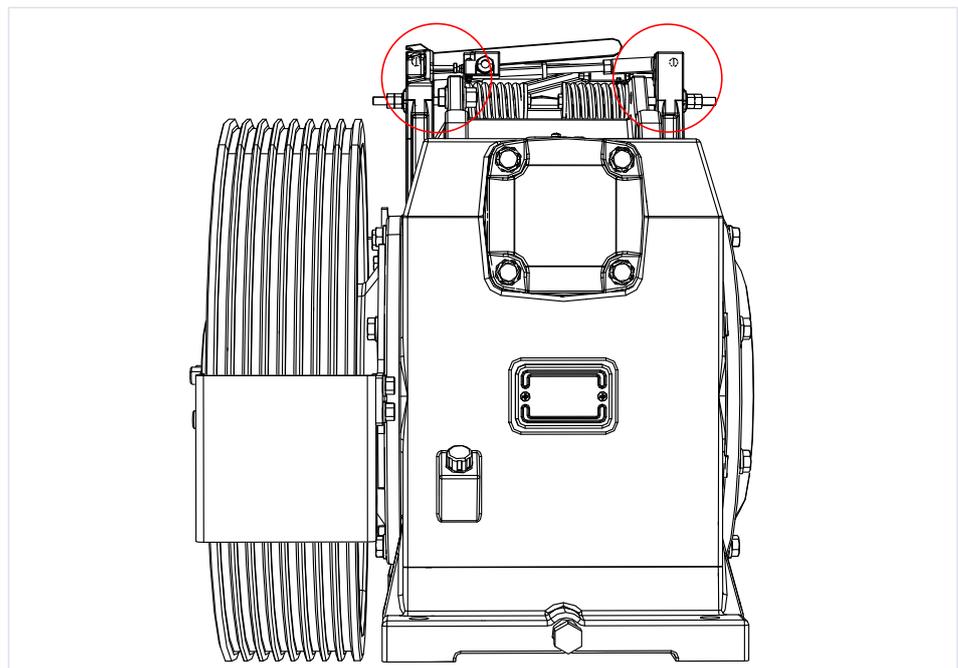


Fig. 41

ATR\_2\_21\_0239\_0

2. Carry out a brake test/emergency stop using the brake being tested.
3. Repeat the operation on the other brake.

## 7.6 Checking the oil level

- Check the oil level.
  - ▷ The oil level should be  $\pm 5$  mm outside of the centre.
  - ▷ To top up, the machine should be out of service for five minutes.

## 7.7 Lubrication

### **NOTICE**



#### **Possible bearing damage!**

Damage to the gear due to unsuitable lubricant.

- Only use the specified gear oil.



The machine is delivered full of oil.

Lubricant	Replacement interval	Motor position/filling quantity
Synthetic gear oil SM1	For the first time, after 3 years then every 6 years	Approx. 16.5 litres

Tab. 17

ATR\_1.21\_0024\_0

### WARNING



#### Danger of scalding

Long-term car operation heats up the oil!

→ During work on the drive, wait until the housing has cooled down, if necessary.

1. Heat the gear to operating temperature (approx. 35 °C) before changing the oil.
2. Drain off the gear oil by removing the cap on the oil drain pipe.
3. Collect the old oil in a container specifically designed for the purpose.
4. Empty the gear and close off the cap on the oil drain pipe with PTFE sealing tape.
  - ▷ Check for leakage.
5. Remove upper handhole cover and fill the gear housing until the prescribed oil quantity is reached.
6. Use the dipstick to check the level.
7. Never mix different types of oil
8. Do not dispose of oil where it can enter the groundwater.
9. Dispose of old oil as well as cloths contaminated with oil and grease according to prevailing regional regulations.
10. Use of gear oil approved by TK Aufzugswerke GmbH.
11. TK Aufzugswerke GmbH will not be held liable for damage resulting from the use of non-approved lubricants.

## 7.8

### Checking the backlash

If the running performance deteriorates, this might have been caused by excessive backlash in the worm gear toothing.

Wear on the worm wheel gear toothing changes the actual tooth thickness and this can be determined using the following measurement of the backlash.

**NOTICE****Backlash too great!**

Teeth on worm wheel worn; deterioration in running performance.

- If the running performance deteriorates (noises, jerking, etc.), measure the backlash.
- If a wear limit value (backlash) of 1.5 mm is reached, replace the gear teeth.

1. Disconnect the power from the installation and secure it against reactivation.
2. Secure the car and counterweight against movement.
3. Take the load off the traction sheave.
  - ▷ The traction sheave must be free to move.
4. Perform the measurement with the operational brake closed.
5. Release the emergency brake, if present.
6. Fit a measuring attachment to the traction sheave, e.g. screw clamp.
7. Specify the measured radius (M) and mark the measuring point.
  - ▷ The radius (r) for the TW160 = 186 mm.
8. Attach a dial gauge with magnet stator at the gear drive housing and align to the measuring point (M).
9. Turn the traction sheave by hand until the dial gauge pointer moves.
10. Move the traction sheave back and forth until resistance is felt.
11. Read the dial gauge (ME).
12. Use the formula below to calculate the backlash.
  - ▷ Backlash =  $(ME \cdot r) / M$

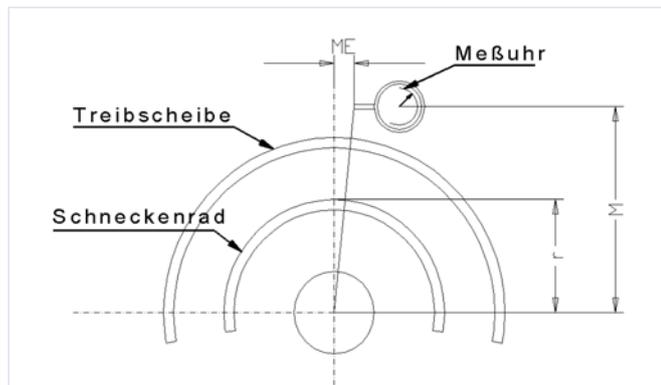


Fig. 42

ATR\_2\_22\_0027\_0

Item	Designation	Item	Designation
M	Radius	ME	Measurement result
r	Radius – worm wheel, all dimensions in mm		

## 7.9

# Replacing the traction sheave

### WARNING



#### Traction sheave not resting properly on cone (is loose)!

Traction sheave tumbles and can come loose. The elevator car can move in an uncontrolled manner through the shaft.

- Do not change the dimension of the feather key, groove, cone shaft or traction sheave bore hole under any circumstances.
- Avoid damage to and contamination of the cone shaft and traction sheave.
- Secure the traction sheave with a chain or ropes.
- Ensure correct installation.

1. Disconnect the power from the installation and secure it against reactivation.
2. Secure the car and counterweight against movement.
3. Remove the cover plate on the traction sheave.
4. Take the load off the traction sheave (slack rope).
5. Take off and secure the ropes.
6. Remove the mounting bolts with tension disc.
7. Secure the traction sheave using lifting tackle.
8. Loosely screw in the tension disc with screws in the outer circle of holes of the tension disc on the traction sheave hub.
9. Place a metal spacer (e.g. disc) of approx. 10 mm thickness between the tension disc and shaft end. The diameter of the spacer must be such that it does not protrude beyond the front face of the shaft.
10. By evenly and alternately tightening the screws, pull the traction sheave off the shaft (cone).

### Installation of the traction sheave

1. Clean the shaft end and traction sheave bore hole (free of oil, grease, paint)
  - ▷ Do **not** apply grease or oil to the shaft and hub!
2. Place the new traction sheave on the conical shaft end of the motor shaft.
3. Align the locations of the feather key and groove in relation to one another.
4. Push the traction sheave onto the motor shaft.

**⚠ WARNING!**

**Adhesion force of the microencapsulated screws has no effect! The traction sheave can come loose and the elevator car can move in an uncontrolled manner through the shaft. Use microencapsulated screws a maximum of twice.**

5. Use the supplied **new** microencapsulated screw and detent edged washers to attach the tension disc to the motor shaft at the inner circle of holes.
  - ▷ Retighten the screws several times to obtain the prescribed tightening torque on all three screws.
6. Comply with the prescribed tightening torque of 250 Nm.
  - ▷ Compare torque with drawing.

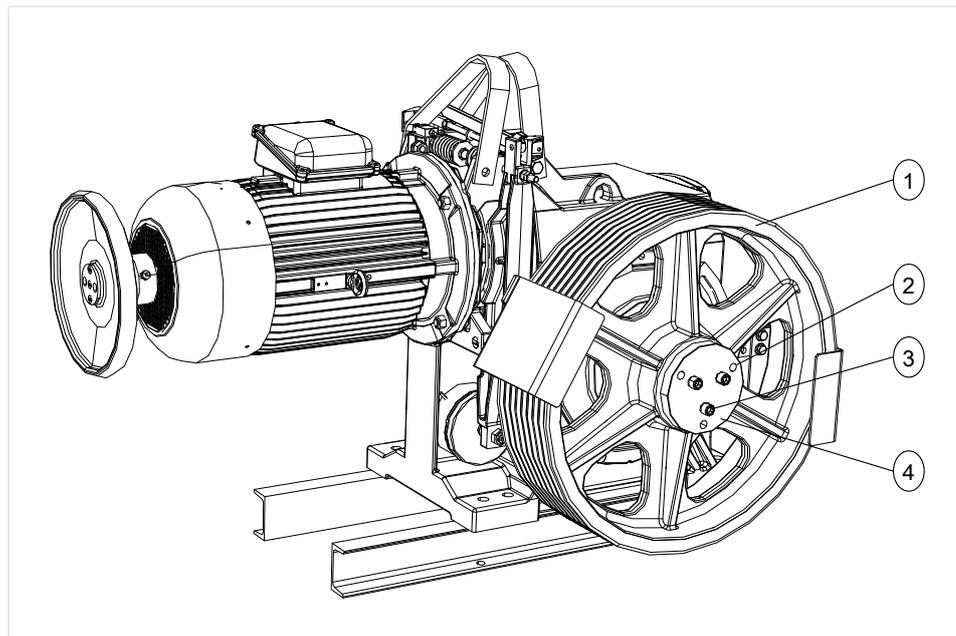


Fig. 43

ATR\_2\_21\_0188\_0

Item	Designation	Item	Designation
1	Traction sheave	2	Hole for forcing screw
3	Mounting bolt (3x)	4	Mounting plate

1. Release the mounting of the traction sheave from the lifting tackle.
2. Hang up the ropes on the traction sheave.
3. Mount the rope guard plates.
4. Align the rope guard plates.
5. Remove the safety devices from the car and counterweight.

## 7.10

## Replacing the motor

## Disassembly

1. Disconnect the power from the installation and secure it against reactivation.
2. Secure the car and counterweight against movement.
3. Attach and secure the motor to the lifting tackle.

4. Unplug the electrical connections and lines from the motor.
5. Undo the nuts of the motor mounting on the housing flange.
6. Release the radially arranged screws for the flexible coupling on the coupling groove.
  - ▷ In the case of the flexible coupling, the elastomer part of the coupling remains screw-connected to the brake disc.
7. Carefully pull the motor off the dog clutch coupling connection.
8. If the replacement motor was delivered without a handwinding wheel and encoder, remove these from the old motor and, including the encoder mount (clip nut), use them for the new motor.

### Installation

1. Place the replacement motor ready for use.
2. Compare the motor data.
3. Attach and secure the motor to the lifting tackle.
4. Align the motor to the coupling and housing flange of the gear.
5. The locations of the mounting holes must match those of the screws.
6. Push on the motor until the face of the motor contacts the gear flange or flange ring.
7. Mount the motor on the gear flange.
8. Tighten the nuts evenly alternately and cross-wise up to the prescribed tightening torque [↗ Chap. 10.1 P. 85](#).

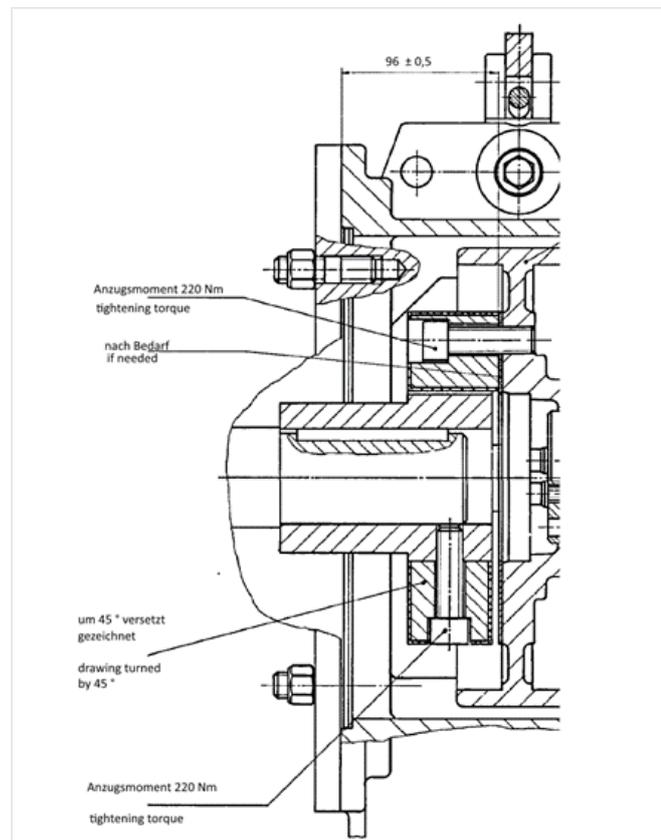


Fig. 44

ATR\_2\_21\_0218\_0

9. Connect the connection line in the terminal box.

10. Make the electrical connections as per terminal connecting plan Installation.
11. Establish the connections of the brake and encoder to the control system.
12. Check the function of the brake before starting up.

## 7.11

### Replacing the encoder

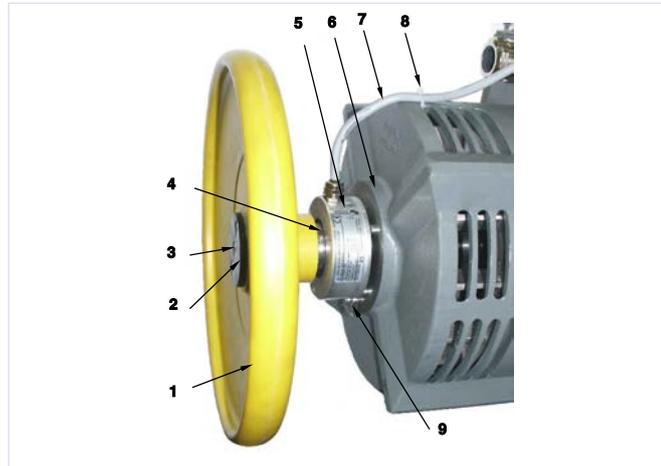


Fig. 45

ATR\_2\_22\_0026\_0

Item	Designation	Item	Designation
1	Handwinding wheel (D360 shown)	2	Locking washer
3	Flat countersunk nib bolt	4	Headless set screw
5	Encoder type WDG100	6	Motor
7	Encoder connection cable	8	Cable ties
9	Encoder mount		

### Disassembly

#### Preparatory measures

1. Disconnect the power from the installation and secure it against reactivation.
2. Unplug the encoder connection cable at the frequency inverter.
3. Remove the central screwed connection in the middle of the handwinding wheel hub or the handwinding wheel.
4. Pull the handwinding wheel with hub off the motor shaft.
5. Remove handwinding wheel D270 with the hub, or handwinding wheel D360 with the locking washer from the shaft.
6. Remove the feather key from the shaft on the D360 handwinding wheel.
7. Release the two headless set screws at the collar of the encoder inner ring (do not remove completely).
8. Unscrew the slotted pan head tapping screw at the bracket of the encoder mount.
9. Remove the cable ties holding back the cables.
10. Pull the encoder off the end of the motor shaft.

11. Check that the technical data of the new encoder matches

### Installation

1. Fit the encoder mount (spring plate) of the removed encoder onto the new encoder.
2. Push the new encoder onto the cleaned shaft end of the motor until it makes contact with the shaft collar.
3. The mounting collar must point towards the shaft end.
4. Screw on the encoder mount at the motor.
5. Secure the encoder inner ring by tightening the headless set screw on the motor shaft.
6. Disengage the feather key from the shaft on the D360 handwinding wheel.
7. Push the handwinding wheel with hub onto the shaft end.
8. Push handwinding wheel D270 with the hub, or handwinding wheel D360 with the locking washer onto the shaft.
9. Align handwinding wheel D270 with the hub to the axial pin in the shaft and mount the hub with the handwinding wheel by means of the central screw and disc, then tighten to 75 Nm.
10. Align the D360 handwinding wheel on the feather key and fit together with the disc then tighten to 20 Nm.
11. Secure the connection line to the motor using cable ties.
12. Connect the encoder connection cable to the frequency inverter.

## 7.12

### Checking for grease/oil leakage

#### WARNING



##### Loss of the brake function!

The elevator car can move in an uncontrolled manner through the shaft.

- Make sure the brake drum and other components of the brake are free of grease and oil.
- Rectify the cause of grease/oil leakage.
- Run the brake test.
- Replace the contaminated brake.

#### NOTICE



##### Danger when using commercially available brake cleaning agents!

Damage to the brake

- For cleaning work on the brake, only use the cleaning agent isopropanol (isopropyl alcohol). Observe the information provided by the brake manufacturer Appendix.

Degree of contamination	Procedure	
If a small amount of oil/grease leakage is determined	Clean and check regularly within the framework of maintenance	Every 3 months (and/or every 6 months in the case of low frequency of use: fewer than 50,000 runs per year)
If a large amount of oil/grease leakage is determined or brake disc/brake linings are already fouled with oil/grease	Clean the machine and, if necessary, the brake, and repair as quickly as possible. Before continuing operation until modification, run a brake test. If the braking effect is inadequate: Shut down installation. If necessary, check on a daily basis whether oil/grease is still leaking. If this is the case: Shut down installation.	Repair after 4 weeks at the latest

Tab. 18

ATR\_00\_0004\_0

See manufacturer's instructions [↗ Chap. 10 P. 85](#)

## 7.13

### Blocking clamp

#### NOTICE



#### Blocking clamp not removed.

May lead to impairment or loss of function of the product.

→ Remove the blocking clamp after completion of the installation work.

Each machine has a blocking clamp that matches the traction sheave.

#### Deployment of the blocking clamp

Use the blocking clamp to prevent movements due to slipping ropes during installation work on the elevator car or counterweight or during work where the rope traction of the installation is insufficient (e.g. pulling out of the safety gear).

The blocking clamp should be pre-tensioned by evenly tightening the hexagon nuts so that the ropes are unable to slip.

## 7.14

### Brake monitoring circuit

#### Installation

1. If not included in the scope of supply, make two lines of 0.75 mm<sup>2</sup> for SA3.1 (with PVC sheaths) for direct connection of the switches to the control system.
2. Install both hexagon adjusting screws with counter nuts into the brake shoes.
3. Removal of both transport hangers.
4. Secure the switch to the switch plate using M4 screws, discs and nuts.

5. The switch tappet must be opposite the adjusting screw, but should not make contact with it.
6. Knock out the relevant opening on the switch for the cable gland and install the cable gland.
7. Connect the cable to the switch.

### Terminal connecting plan for brake test switch SA 3.1

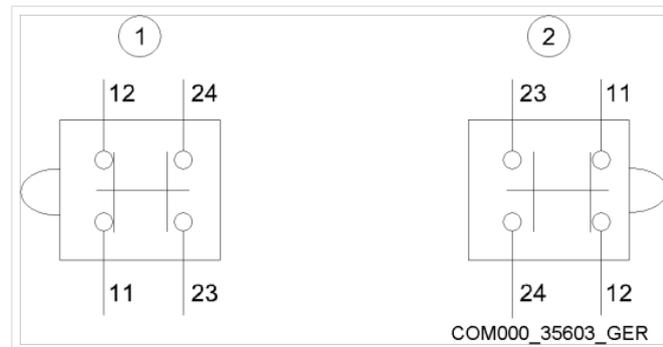


Fig. 46

ATR\_2\_22\_0042\_0

Item	Designation	Item	Designation
1	Button for brake circuit 1	2	Button for brake circuit 2

### Setting SA3.1 for monitoring the brake release with wear detection

The break contact with contacts 11 and 12 is used to monitor the position of the brake shoes. With the brake open, the switch is closed. The make contact only closes contacts 23/24 when the wear limit of the brake linings has been reached and the brake is closed. The contacts must be switched in such a way that, when one contact for both switches is closed, the drive is prevented from starting up. With correctly set brake test switches, all switch contacts must be interrupted with a closed brake. Before starting to set the switch, the stroke of the brake shoes must be adjusted.

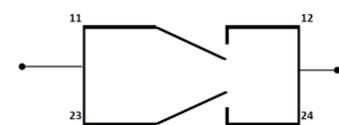


Fig. 47

ATR\_2\_22\_0058\_0

1. Switch on emergency operation switch and elevator control unit.
2. Connect the continuity test device to contacts 23–24.
3. Adjust the adjusting screw towards the switch until the continuity test device indicates continuity of 23–24.
4. Turn the screw back slowly until the continuity test device no longer indicates continuity of 23–24.
5. Move the adjusting screw by ¼ turn (corresponds to approx. 0.3 mm) in the direction of the switch and secure.
6. Continuity test device indicates constant continuity of 23–24.
7. Continue unscrewing the adjusting screw a further approx. 1/4 revolution.
8. Open and close the brakes by switching the motor
9. Check the switch change at the switches between the opened and closed brake.
10. Perform the setting on both switches in the same way.

### Setting SA3.1 for monitoring the brake release without wear detection

Before starting to set the switch, the stroke of the brake shoes must be adjusted.

1. Connect the continuity test device to contacts 11 and 12 of the break contact. The adjusting screw must not touch the switch tappet.
2. In the drive's home position (brake magnet without current), unscrew the adjusting screw for the brake test from the brake shoe in the direction of the switch tappet until opening of the contact is indicated by a signal interruption at the continuity test device.
3. Continue unscrewing the adjusting screw a further approx. 1/4 revolution.
4. Secure the setting by tightening the counter nuts.
5. Repeat the setting procedure at the second brake test switch.

### Checking the setting

Open and close the brakes by switching the motor. In doing so, observe whether the switch change at the contacts corresponds to the procedure described above. Push the feeler gauge between the adjusting screw and the switch tappet. Select the thickness of the feeler so that contact 23/24 is closed. If one of the contacts is closed, the drive must not be activated.

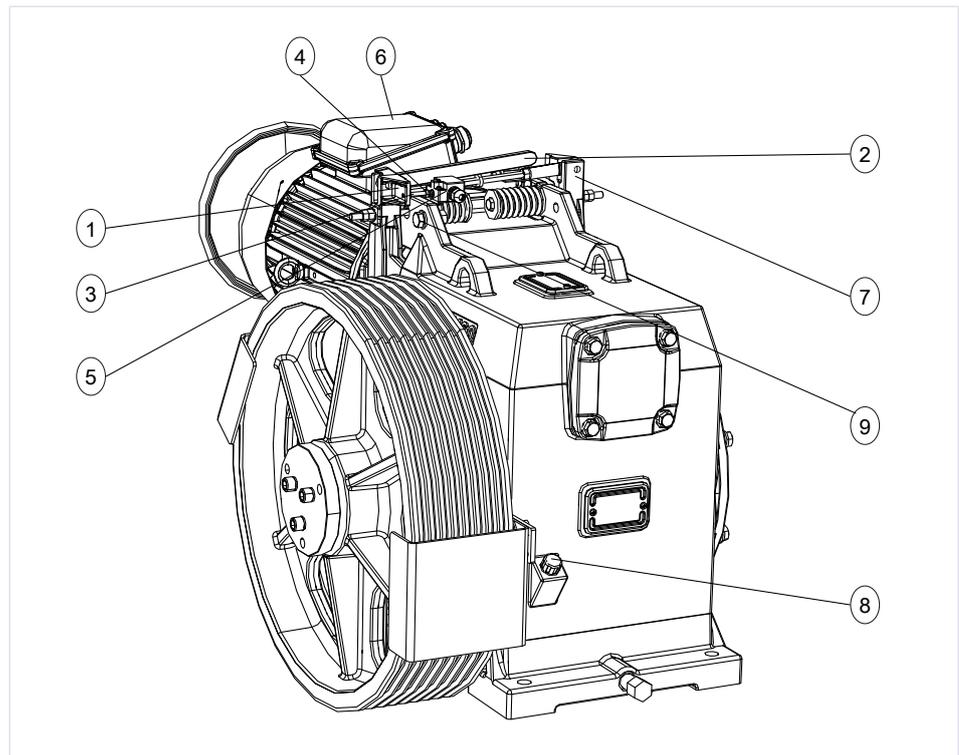


Fig. 48

ATR\_2\_21\_0243\_0

Item	Designation	Item	Designation
1	Mounting elbow	2	Brake release lever
3	Adjusting screw and counter nut	4	Switch tappet
5	Switch SA3.1	6	Motor terminal box

Item	Designation	Item	Designation
7	Brake shoes	8	Oil dipstick with ventilation opening
9	Fastening screws		

### Switch mounting and setting for SA15 (full Ex)



Fig. 49

ATR\_2\_22\_0043\_0

Item	Designation	Item	Designation
1	Button for brake circuit 1	2	Button for brake circuit 2

- Operation: Monitoring of the brake release **without** wear monitoring of the brake lining

Only contacts 23–24 are used for this function.

The break contact with contacts 23–24 is used to monitor the position of the brake shoe. With the brake open, the switch is also open.

- Operation: Monitoring of the brake release **and** wear monitoring of the brake lining

The break contact with contacts 11–12 is used to monitor the position of the brake shoe. With the brake open, the switch is closed. The make contact only closes contacts 23–24 when the wear limit of the brake linings has been reached and the brake is closed. The contacts must be switched in such a way that, when one contact for both switches is closed, the drive is prevented from starting up. With correctly set brake test switches, all switch contacts must be interrupted with a closed brake.

Circuitry of the contacts:

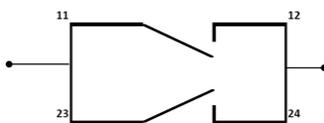


Fig. 50

ATR\_2\_22\_0058\_0

# 8 Commissioning

## 8.1 Work steps

Check the following points:

1. Check the machine, traction sheave and base frame.
2. Check the rope guard.
3. Check the distance to the traction sheave.
4. Check the setup of the machine, base frame, pedestal and rope departure.
5. With a side or oblique rope departure, secure the gear box casing against moving using steady plates and set screws.
6. Tighten the screws to the required torque [↗ Chap. 10.1 P. 85](#).
7. Check the oil level.
8. Check the installation of the filling and/or ventilation screw.
9. Check the power connections and grounding at the motor.
10. Check the connection of the magnetic clamp and the brake test switch.
11. Check the connection values (voltage, frequency) against the manufacturer specifications.
12. Check the function of the monitoring devices (encoder, thermal element).
13. Check the parking brake and emergency brake NBS (if present).
14. Check the brake function.
15. Attach the direction arrow (up/down) according to the direction of travel and clearly visible on the motor near the handwinding wheel.
16. Remove safety, auxiliary and installation tools from the danger zone.



For assembly and repair, use only original parts from TK Aufzugswerke GmbH, as otherwise no warranty can be provided.

---

## 8.2 Emergency operation

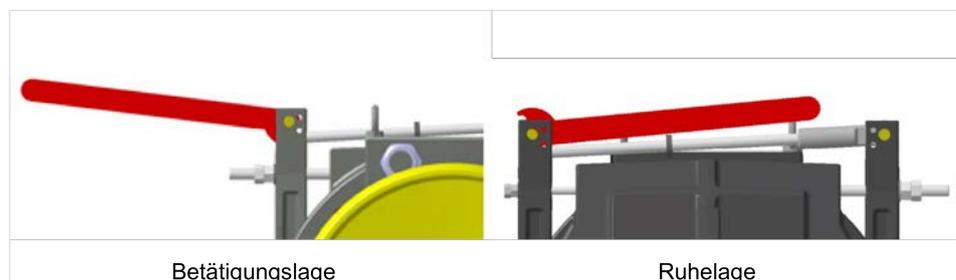


Fig. 51

ATR\_2\_22\_0023\_0

## Emergency rescue of trapped persons

### ⚠ CAUTION



#### Rapid movement of the elevator car!

Abrasion injuries.

- Only use the handwinding wheel for assembly and maintenance purposes with a safe stance.
- In the event of uncontrolled elevator car movement, let go of the handwinding wheel immediately.

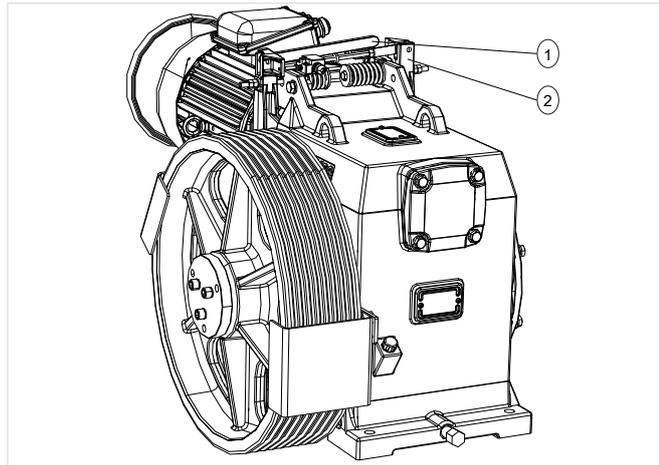


Fig. 52

ATR\_2\_21\_0243\_0

Item	Designation	Item	Designation
1	Pivot the brake release lever to open the brake	2	Brake shoes

1. To open the brake, check that the brake release lever is in the direction of the motor.
2. The handwinding wheel might also have to be moved to bring the elevator car into the nearest landing.
3. Depending on the load, the elevator car can begin to move quickly after opening the brake.
4. Immediately let go of the handwinding wheel and control the speed of the elevator car by pressing the brake release lever with varying degrees of force.
5. Following the rescue operation, put the brake release lever back in the rest position.

### Drive with emergency brake (NBS)



Mounting the emergency brake, NBS, fundamentally changes the procedure and sequence for emergency operation. Comply with the separate NBS operating manual. The operating manual for drives with emergency brake system equipment is delivered separately. ↗ [Emergency brake system, NBS](#).

# 9 Maintenance

## 9.1 Maintenance

Measurements must be taken annually:

1. Check the oil level; top up if necessary.
2. Change the oil at the prescribed intervals.
3. Check the gear and bearings for leakage
4. Check the brake setting of the shoe stroke.
5. Check the brake function
6. Check the braking deceleration
7. Check the worm gear toothing for wear
8. Check the groove profile on the traction sheave for damage and wear
9. Check that the screws of the traction sheave mount are securely seated
10. With the drive on the machine base frame, check the mounting of the machine, supports and rope pulley carriers.
11. Check the rope pulley grooves for damage and wear.
12. Check that the electrical connections are in proper and adequate condition, and check that they are securely attached.
13. Check that protective and safety devices are present and correctly set.
14. Check the seals at the shaft in the area of the brake and at the bearing for grease and/or oil leakage.

## 9.2 Standstill maintenance

Standstill maintenance must be carried out on stored machines that have been at a standstill for over a year.

Standstill maintenance must be carried out on stored machines that have been at a standstill for over a year. Release the operational brake by means of the brake release lever and (if available) release the emergency brake manually via the emergency release screws.

The traction sheave is rotated (clockwise and anticlockwise) via a handwinding wheel on motor 3.

Depending on the storage conditions, replace the corrosion protection of the bare parts (for example with Rivolta KSP 317 corrosion protection wax).

## 9.3 Maintenance instructions

- Oil change: After 4 years for the first time, then every 8 years
- Greasing: Re-lubrication of outside bearing on SA9 annually
- Other components: Maintenance free

# 10 Appendix

## 10.1 Tightening torques

### DANGER



#### Insecure threaded connection.

Death or severe physical injury due to parts coming loose.

- When working on the machine or replacing parts, care must be taken to ensure that the prescribed bolt/screw strength and tightening torques are complied with.
- Only use suitable tools (torque wrench).

The values listed below apply to screwed connections with **regular threads** (not fine threads):

- Slotted pan head tapping screws DIN 912 ISO 4762
- Hexagon head bolts DIN 931/933 ISO 4014/4017
- These specifications do not apply to microencapsulated bolts/nuts. The specifications of the manufacturer apply here.



If other tightening torques are specified in the drawings or elsewhere in the document for each screw size, these are to be complied with.

Tightness	8.8	10.9	12.9
Screw/bolt size	Tightening torque [Nm]		
M4	2.6	-	-
M5	5.3	-	-
M6	9.0	12	15
M8	20	30	35
M10	40	60	75
M12	75	105	130
M14	120	170	205
M16	190	265	320
M20	370	520	620
M24	640	900	1080
M30	1300	1800	2150

Tab. 19

ASY\_1.00\_0001\_0

## 10.2 Manufacturer information

Also see about this

[↗ Verification of traction sheave calculation P. 87](#)

- ↗ Verification of traction sheave shaft calculation SA4/SA9 P. 88
- ↗ SKINTOP MS-SC Mounting instructions P. 89
- ↗ Wachendorff encoder WDG100H--xx-yyyy-ABN-I05-K3-D56 - assembly instructions P. 90
- ↗ Encoder Wachendorf WDG 100H-38-1024-AB-R05-K3-J66-100 P. 91
- ↗ Wachendorff WDG encoder 100H-XX-YYYY-ABN-I05-K3-D56 P. 92
- ↗ Centaflex P. 93
- ↗ Bernstein data sheet BI2-U1ZW 6085103100 P. 95
- ↗ Bernstein 6085103100\_Bi2 P. 97

## Certificate concerning the examination of traction sheave shaft calculation including shaft to collar connections

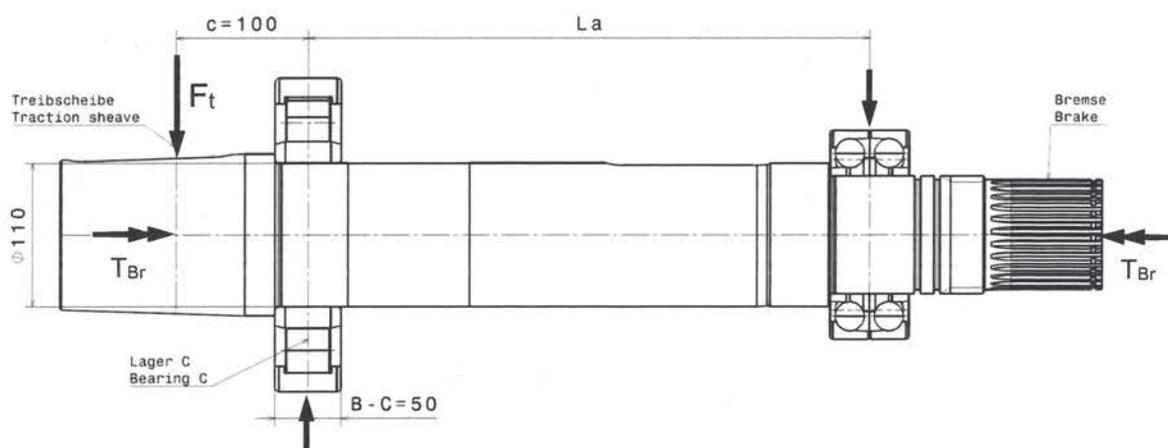
Lift machine, type: TW160

Brake type: RSO 1800 - 5500Nm  
according EC-Type Examination EU-BD 892/X

Manufacturer: TK Aufzugswerke GmbH  
Bernhäuser Str.45, 73765 Neuhausen a.d.F.

Object examined: Calculation of traction sheave shaft including shaft to collar connections

Examination basis: DIN743, machine elements Niemann/Winter/Höhn (2005)



Design drawing: 6234 000 9201

Material: 42CrMoS4+QT (1.7227) or 42CrMo4+QT (1.7225)

Load data:

Machine	Max. shaft load $F_t$	Nominal brake torque $T_{Br}$	Max. brake torque $1.6 \times T_{Br}$	Distance traction sheave C	Bearing distance $L_a$
	(kN)	(Nm)	(Nm)	(mm)	(mm)
TW160	97	5500	8800	100	425

### Examination result:

For the examination calculations were carried out based on the examination basis. The result was that the traction sheave shaft and the shaft to collar connections were designed according the maximum load data. The remarks in the maintenance instructions are to be observed.

The conditions mentioned in annex of the EC-Type-Examination Certificate EU-BD 892/X are herewith fulfilled

  
.....  
(Head of PDC Neuhausen, TKE IaO)

  
.....  
(Cluster Lead TM, TKE IaO)

## Certificate concerning the examination of traction sheave shaft calculation including shaft to collar connections

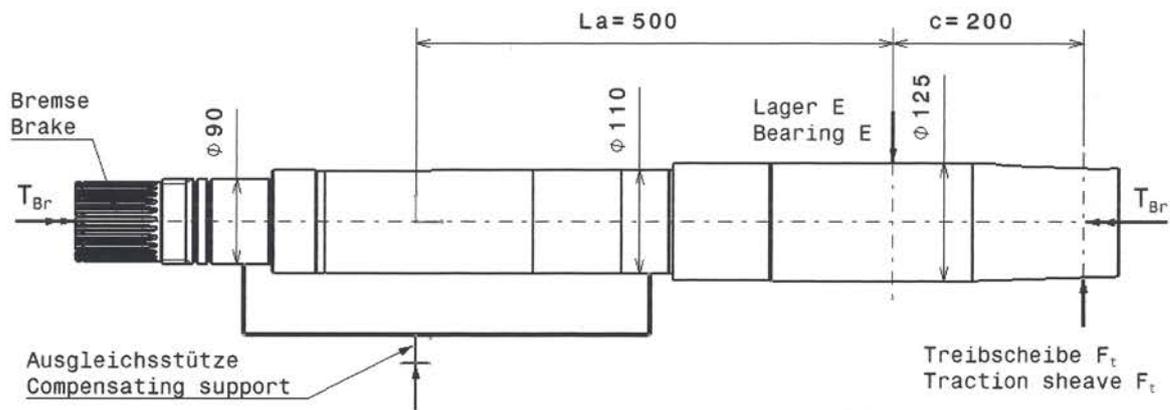
Lift machine, type: TW160 (special design SA4 / SA9)

Brake type: RSO 1800 - 5500Nm  
according EC-Type Examination EU-BD 892/X

Manufacturer: TK Aufzugswerke GmbH  
Bernhäuser Str.45, 73765 Neuhausen a.d.F.

Object examined: Calculation of traction sheave shaft including shaft to collar connections

Examination basis: DIN743, machine elements Niemann/Winter/Höhn (2005)



Design drawing: 6234 000 9247

Material: 42CrMoS4+QT (1.7227) or 42CrMo4+QT (1.7225)

Load data:

Machine	Max. shaft load $F_t$	Nominal brake torque $T_{Br}$	Max. brake torque $1.6 \times T_{Br}$	Distance traction sheave C	Bearing distance $L_a$
	(kN)	(Nm)	(Nm)	(mm)	(mm)
TW160 (SA4/SA9)	80	5500	8800	200	500

### Examination result:

For the examination calculations were carried out based on the examination basis. The result was that the traction sheave shaft and the shaft to collar connections were designed according to the maximum load data. The remarks in the maintenance instructions are to be observed.

The conditions mentioned in annex of the EC-Type-Examination Certificate EU-BD 892/X are herewith fulfilled

  
 (Head of PDC Neuhausen, TKE IaO)

  
 (Cluster Lead TM, TKE IaO)

U.I.LAPP GmbH  
 Schulze-Delitzsch-Straße 25  
 D-70565 Stuttgart  
 Tel.0711/7838-1010  
 Fax.0711/7838-2640  
 Internet:www.lappkabel.de

# GEBRAUCHSANWEISUNG INSTRUCTION SHEET

SKINTOP® MS-M, MSR-M, MS-M-XL, MSR-M-XL  
 MS-SC-M, MS-SC-M-XL

Bezeichnung Product		Klemm- und Dichtbereich Clamping and Sealing range					Approbationen Approvals	
		EN 50262		UL 514 B				
Größe/Size M		Kat.der Zug- entlastung	Anzugsdreh- momente Nm	Klemm- bereich Ø mm	Diameter inch	Ø mm		
12x1,5	MS-M, MS-M-XL	A	8	3,5 - 7	.12 - .27	3,5 - 7		
	MSR-M, MSR-M-XL			3,5 - 5	.04 - .20	1 - 5		
	MS-SC-M, MS-SC-M-XL			3,5 - 7	.12 - .27	3,5 - 7		
16x1,5	MS-M, MS-M-XL	A	10	4,5 - 10	.17 - .35	4,5 - 10		
	MSR-M, MSR-M-XL			3,5 - 7	.08 - .27	2 - 7		
	MS-SC-M, MS-SC-M-XL			4,5 - 9	.17 - .35	4,5 - 9		
20x1,5	MS-M, MS-M-XL	A	12	7 - 13	.27 - .51	7 - 13		
	MSR-M, MSR-M-XL			5 - 10	.20 - .04	5 - 10		
	MS-SC-M, MS-SC-M-XL			7 - 12,5	.27 - .49	7 - 12,5		
25x1,5	MS-M, MS-M-XL	A	12	9 - 17	.35 - .65	9 - 17		
	MSR-M, MSR-M-XL			6 - 13	.23 - .51	6 - 13		
	MS-SC-M, MS-SC-M-XL			9 - 16,5	.35 - .65	9 - 16,5		
32x1,5	MS-M, MS-M-XL	A	18	11 - 21	.43 - .83	11 - 21		
	MSR-M, MSR-M-XL			7 - 15	.27 - .59	7 - 15		
	MS-SC-M, MS-SC-M-XL			11 - 21	.43 - .83	11 - 21		
40x1,5	MS-M, MS-M-XL	A	18	19 - 28	.75 - 1.1	19 - 28		
	MSR-M, MSR-M-XL			15 - 23	.59 - .9	15 - 23		
	MS-SC-M, MS-SC-M-XL			19 - 28	.75 - 1.1	19 - 28		
50x1,5	MS-M, MS-M-XL	A	20	27 - 35	1.06 - 1.38	27 - 35		
	MSR-M, MSR-M-XL			22 - 29	.87 - 1.14	22 - 29		
	MS-SC-M, MS-SC-M-XL			27 - 35	1.06 - 1.38	27 - 35		
63x1,5	MS-M	A	20	34 - 45	1.34 - 1.77	34 - 45		
	MSR-M			28 - 39	1.1 - 1.53	28 - 39		

**Bemerkungen/ Remarks**

- SKINTOP ins Gehäuse schrauben oder mit Gegenmutter festziehen  
*Screw SKINTOP into housing or tighten with locknut*
- Leitung durchziehen  
*Put cable through*
- Hutmutter mit empfohlenem Drehmoment festziehen  
*Tighten nut with recommended tightening torque*

**Schutzart:**

IP 68; 5bar/30min.nach EN 60 529  
 IP 69K nach DIN 40 050

Ohne Gegenmutter:  
 NUR IN GEWINDEBOHRUNGEN  
 VERWENDEN!

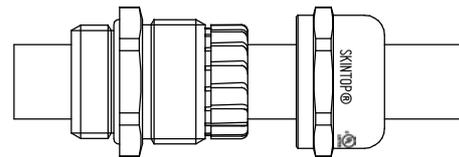
*Usage without Locknut:  
 ONLY IN THREADED  
 HUB!*

1 inch = 25,4mm  
 Temperaturbereich: -25 bis +100°C  
 Temperature range: -25 up to +100°C

UL File No. E 79903, Control Number 54 B 2

**Hinweis / Note:**

Sollte der Inhalt dieser Verpackung auf neue Verpackungen verteilt werden, so muss jeder neuen Verpackung eine Kopie dieser Betriebsanleitung beigelegt werden.  
*If the content of this bag will be split on two or more units, a copy of this instruction sheet must be placed in every packing units.*



Art.Nr. 91100008

BS 04/2889-5

Druckfarbe: schwarz, Papierfarbe: hellgelb "CARNEVAL" 80g/qm (igepa Art.Nr.323-31)

Größe angepasst auf DIN A5, Falzung Kreuzbruch, Druck aussen

Toleranzen / tolerances: DIN		Werkstoff / material: Papier		Oberfläche / surface		Gewicht / weight:		Volumen / volume:		Farbe / color:	
Bearb. edited	Datum / date 27.05.04	Name / name M. Schmid	Geprüft checked	Datum / date 23.04.08	Name / name D.Müller	Maßangaben in dimension units mm					
Projektion / projection: 		Maßstab / scale: 1:1		Benennung / name: SKINTOP MS-M Beipackzettel SKINTOP MS-M operating instuction							
05	500000001032	Mast1	26.03.2009			Zeichnungs-Nr. / drawing no: BS04_2889		Blatt sheet: 1/1		Dok. Art doc. type LBZ	
Ind. vs	Änderungs-Nr. change number	Datum / date Bearb./edited		Gepr./check.		Ersatz für / substitute for: BS04_2889-3		DIN A 4			

Copyrights according to DIN ISO 16016  
 This drawing has to be changed by CAD only

Urheberschutz nach DIN ISO 16016  
 Diese Zeichnung darf nur mittels CAD geändert werden.

### Montageanleitung Hohlwellengeber, D56

Assembly instructions hollowshaft encoder, Notice de montage codeur rotatif à arbre creux, Instrucciones de montaje encoder ad albero cavo, istruzioni di montaggio encoders de eje hueco

Operating temperature: -30 °C ... +80 °C (-22 °F ... +176 °F)  
Storage temperature: -20 °C ... +70 °C (-4 °F ... +158 °F)

**Montage nur qualifiziertes Personal**  
 Assembly only qualified personnel  
 Montage par qualifié personnel  
 Montaje solamente personal calificado  
 Montaggio solo personal qualificato

**DIN EN 100015-1**

Kabel ø cable, Câble, Cable, cavo	R1	R2	Temperatur Temperature, Température, Temperatura, Temperatura
6,3 mm	31,5 mm	94,5 mm	T > -20 °C (-4 °F)
8,3 mm	41,5 mm	124,5 mm	T > -20 °C (-4 °F)

	Kabel, cable, Câble, Cable, cavo
	SUBD9 9-pin
	K3
Minus U-	7
Plus U+	9
A	2
B	3
N	5
A inv.	1
B inv.	4
N inv.	6
n. c.	-

**Steckergehäuse/Schirm mit Gebergehäuse leitend verbunden**  
 Connector housing/shield electrically connected to encoder housing  
 Bâtier de connexion/Ecran avec boîtier d'ementeur liés de manière conductrice  
 Caja de conector/Pantalls conectada en conductancia con caja de transmisor  
 scatola prese/Schemo con scatola trasmettitore collegata da condurre

**WH: weiss**, white, blanc, bianco  
**BN: braun**, brown, brun, marrón, marrone  
**GN: grün**, green, vert, verde, verde  
**YE: gelb**, yellow, jaune, amarillo, giallo  
**GY: grau**, grey, gris, gris, grigio  
**PK: rosa**, pink, rose, rosa, rosso  
**RD: rot**, red, rouge, rojo, rosso  
**BK: schwarz**, black, noir, negro, nero  
**BL: blau**, blue, bleu, azul, blu  
**VT: violett**, violet, violet, violeta, violetto  
**Litze: Litze**, Flex, Toron, Cordon, Cavetto

**100H**

d/mm	WDG 100H
25,25.4,28,30,38,40,42,45	

$\frac{t_L}{T} = \frac{t_H}{T} = 50\% \pm 4,2\% *$

$360^\circ \text{el} = \frac{360^\circ \text{mech}}{n \text{ Imp.}}$

**alle % bezogen auf 360°el**  
 all % refer to 360°el  
 tous les % se réfèrent à 360°el  
 todos los % se refieren a 360°el  
 tutta la % riferita a 360°el

	Vcc	I <sub>supply</sub>	Output TTL / RS422	I <sub>OUT,max</sub>
<b>G05, H05, I05, R05</b>	4,75...5,5VDC	≤70mA	V <sub>H</sub> >2,5V <sub>DC</sub> V <sub>L</sub> <0,5V <sub>DC</sub>	40mA
<b>Bemerkungen</b> Remarks Notas Observaciones osservazioni			<b>Ohne Last</b> Without load resistance Sans charge Sin carga senza carico	<b>Pro Kanal</b> Per channel Par canal Por canal Per canale

**Abstand zu Störquellen!**  
 Distance to sources of interference!  
 Distance aux source des parasites!  
 Distancia a las fuentes de interferencias!  
 Distanza dalle fonti di disturbo!

$L \leq L_{MAX}$

**\*Nur, only, seulement, solamente, soltanto G24, H24, I24, R24, 245:**  
 hat Verpolschutz, ist kurzschlussfest;  
 Protection against polarity reversal, short circuit protection;  
 Protecion contro l'inversion de polarité, Protection court-circuit;  
 Protegido contra inversion de polaridad,protección contra cortocircuito;  
 protezione contro inversione di polarità, protezione contro corto circuito

**Technical Support**  
 Germany:  
 Tel.: +49 (0) 67 22 / 99 65 131  
 Fax: +49 (0) 67 22 / 99 65 70  
 email: support-wdgi@wachendorff.de

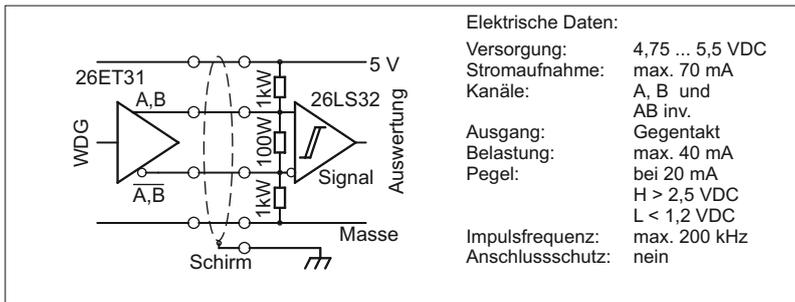
Other countries, please contact your distributor.  
 Autres pays, veuillez contacter votre distributeur.  
 Otros países, rogamos contacten a su distribuidor.  
 Per gli altri paesi si prega di contattare il vostro distributore.

**Hohlwellen - Drehgeber WDG 100H**

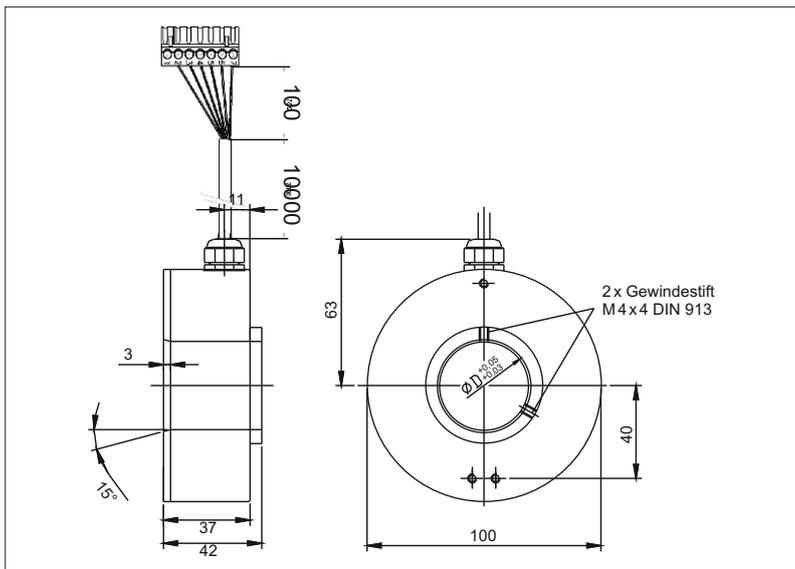
**Bestell-Nr.: WDG 100H-38-1024-AB-R05-K3-J66-100**

 Empfohlene Wellenanpassung:  
 für Hohlwellendurchmesser 38mm: 38m6 (k6, j6)  
 Max. Rundlaufabweichung der Antriebswelle: 0,05 mm

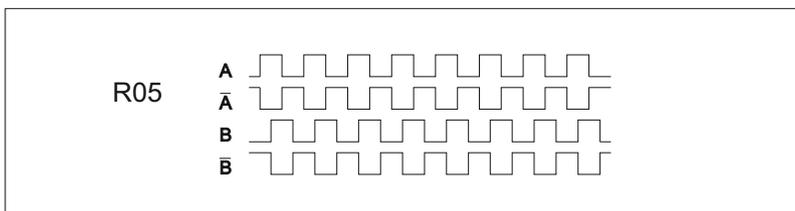
Thyssen-Sachnummer: 9950 001 1304



Ausgangsschaltung 5 VDC: R05



Maßzeichnung WDG 100 H, Angaben in mm



Impulsfolge bei Blick auf Nabe, Drehung im Uhrzeigersinn.

**Spezifikationen**
**Mechanische Daten**
**Gehäuse**

- Flansch: Aluminium
- Rückseite: Aluminium
- Durchmesser: 100 mm
- Tiefe: 42 mm
- Befestigung: über Hohlwelle mit 2 Gewindestiften M4

**Hohlwelle**

- Material: Edelstahl
- Durchmesser: 38 mm
- Belastung am Wellenende: max. 200 N radial  
max. 100 N axial
- Anlaufmoment: 1,5 Ncm
- Befestigung: 2 x M4, DIN 913

**Lager**

- Typ: 2 Präzisionskugellager
- Lebensdauer: 3 x 10<sup>10</sup> U bei 100% Lagerlast

- 4 x 10<sup>11</sup> U bei 40%
- 3 x 10<sup>12</sup> U bei 20%

max. 3.500 U/min

ca. 720 g

Anschluss: radialer Kabelabgang mit 10m Kabel und konfektionierter, 7-pol. Phönixklemme

**Elektrische Daten**

 Allgemeine Auslegung: gem. DIN VDE 0160  
 Versorgung/Ausgänge: ® Ausgangsschaltung  
 Kabellänge: max. 100 m

**Optik**

 Lichtquelle: IR - LED  
 Lebensdauer: typ. 100.000 Std.  
 Abtastung: differentiell

**Genauigkeit**

in % einer Periodendauer des Signals A

Phasenversatz: 90° ± 7,5%

Impuls-/Pausen - verhältnis: 50% ± 7%

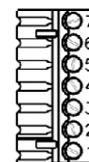
**Umwelt - Daten**

bei geerdetem Gehäuse und gegen im Eingebauten Zustand berührbare Teile.

- ESD (EN 61000-4-2): 8 kV
- Burst (EN 61000-4-4): 2 kV
- Schutzart (EN 60529): IP 54
- Vibration (IEC 68-2-6): 50m/s<sup>2</sup> (10-2000 Hz)
- Stoß (IEC 60068-2-27): 1000m/s<sup>2</sup> (6 ms)
- Arbeitstemperatur: -20 - +80°C
- Lagertemperatur: -30 - +80°C

**Steckerbelegung**
**Funktion Pin Farbe**

- Minus 6 weiß
- Plus 7 braun
- A 5 grün
- A inv. 4 grau
- B 3 gelb
- B inv. 2 rosa
- Schirm 6 Litze

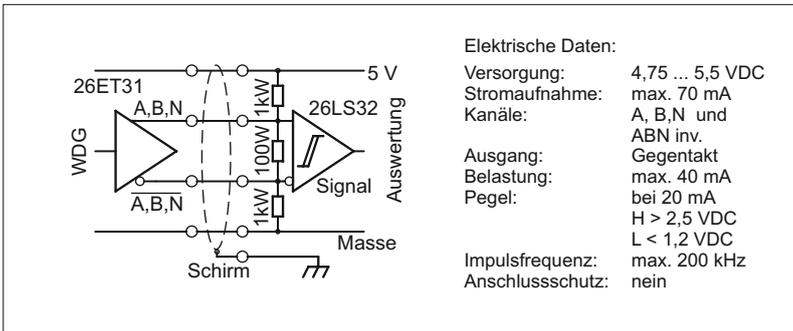


**Hohlwellen - Drehgeber WDG 100H**

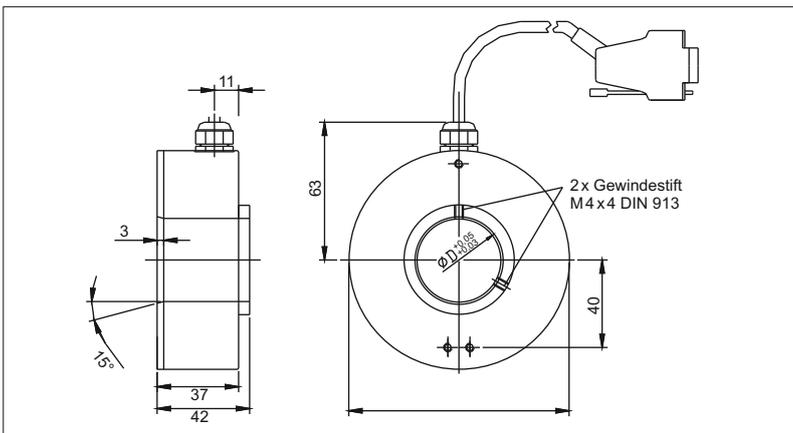
**Bestell-Nr.: WDG 100H-XX-YYYY-ABN-I05-K3-D56**

 YYYY = Impulszahl = 1024, 2048, 4096  
 XX = Hohlwellendurchmesser: 30, 38 mm

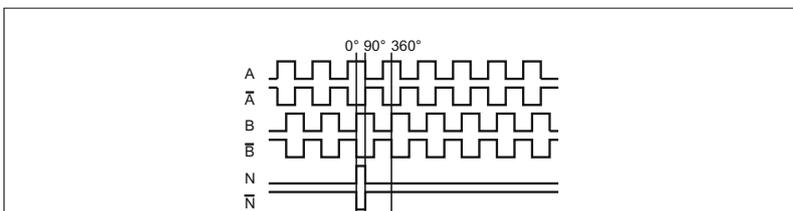
 Empfohlene Wellenanpassung:  
 für Hohlwellendurchmesser D (XX) = 38: 38m6 (k6, j6)  
 für Hohlwellendurchmesser D (XX) = 30: 30m6 (k6, j6)  
 Max. Rundlaufabweichung der Antriebswelle: 0,05 mm

 Thyssen-Sachnummer: 9950 000 6021 für 1024 Striche  
 9950 000 6022 für 4096 Striche


Ausgangsschaltung 5 VDC: I05



Maßzeichnung WDG 100 H, Angaben in mm



Impulsfolge bei Blick auf Nabe, Drehung im Uhrzeigersinn.

**Spezifikationen**
**Mechanische Daten**
**Gehäuse**

- Flansch: Aluminium
- Rückseite: Aluminium
- Durchmesser: 100 mm
- Tiefe: 42 mm
- Befestigung: über Hohlwelle mit 2 Gewindestiften M4

**Hohlwelle**

- Material: Edelstahl
- Durchmesser: 30, 38 mm
- Belastung am Wellenende: max. 200 N radial, max. 100 N axial
- Anlaufmoment: 1,5 Ncm
- Befestigung: 2 x M4, DIN 913

**Lager**

- Typ: 2 Präzisionskugellager
- Lebensdauer: 3 x 10<sup>10</sup> U bei 100% Lagerlast, 4 x 10<sup>11</sup> U bei 40%, 3 x 10<sup>12</sup> U bei 20% max. 3.500 U/min

**Drehzahl:**

- Gewicht: ca. 720 g
- Anschluss: radialer Kabelabgang mit 10m Kabel und konfektioniertem, metallisiertem 9-pol. SubD-Stecker mit Rändelschraube UNC 4-40

**Elektrische Daten**

- Allgemeine Auslegung: gem. DIN VDE 0160
- Versorgung/Ausgänge: ® Ausgangsschaltung
- Kabellänge: max. 100 m

**Optik**

- Lichtquelle: IR - LED
- Lebensdauer: typ. 100.000 Std.
- Abtastung: differentiell

**Genauigkeit**

in % einer Periodendauer des Signals A

- Phasenversatz: 90° ± 4,2%
- Impuls-/Pausen - verhältnis: 50% ± 4,2%

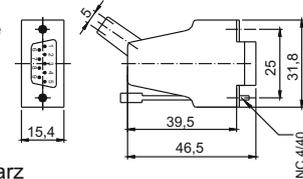
**Umwelt - Daten**

bei geerdetem Gehäuse und gegen im Eingebauten Zustand berührbare Teile.

- ESD (EN 61000-4-2): 8 kV
- Burst (EN 61000-4-4): 2 kV
- Schutzart (EN 60529): IP 54
- Vibration (IEC 68-2-6): 50m/s<sup>2</sup> (10-2000 Hz)
- Stoß (IEC 60068-2-27): 1000m/s<sup>2</sup> (6 ms)
- Arbeitstemperatur: -20 - +80°C
- Lagertemperatur: -30 - +80°C

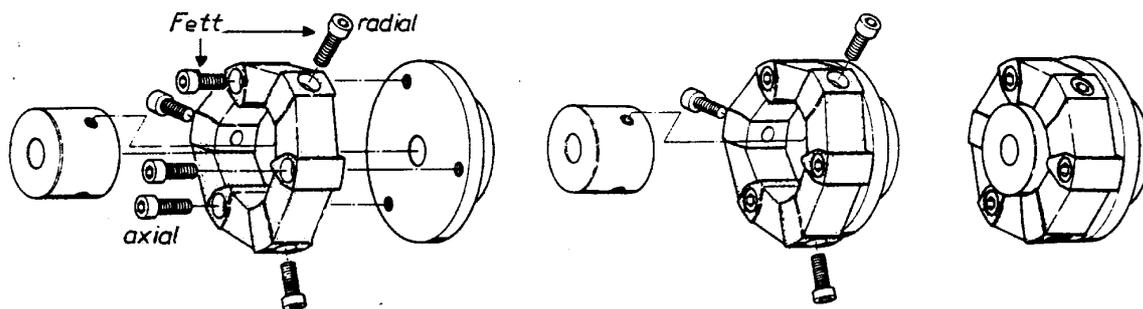
**Steckerbelegung**

Funktion	Pin	Farbe
Minus	7	weiß
Plus	9	braun
A	2	grün
A inv.	1	rot
B	3	gelb
B inv.	4	schwarz
N	5	grau
N inv.	6	violett
Schirm	8	Litze + Gebergehäuse + Steckergehäuse



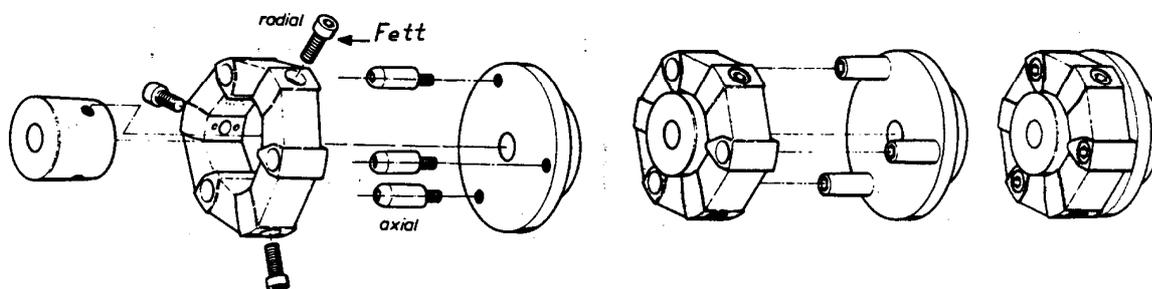
# Montageanleitung für Centaflex-Kupplungen Type A

## a) Normalbauform



- 1.) Naben auf Wellen bzw. Anschlußflansche an Schwungräder montieren
- 2.) Gummiteil zuerst mit Achsialschrauben an Flanschnabe, bzw. Flanschplatte, bzw. Schwungrad montieren
- 3.) Auf Welle montierte zylindrische Nabe heranschieben und dann das Gummielment mit radialen Schrauben darauf befestigen. Dabei wird das Gummielment radial zusammengezogen und erhält eine Druckvorspannung zur Erhöhung der Leistung.

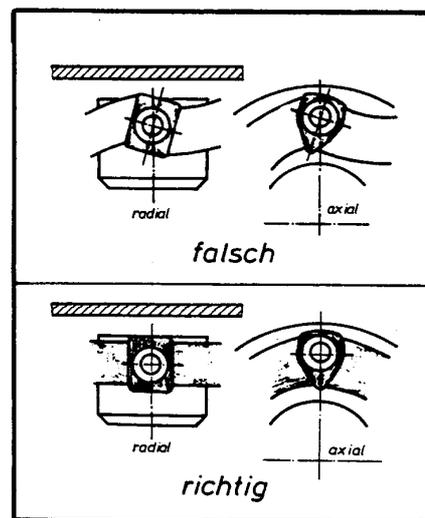
## b) Bauform "S" (steckbar)



- 1.) Naben auf Wellen bzw. Anschlußflansche an Schwungräder montieren
- 2.) Achsiale Steckbolzen an Flanschnabe bzw. Flanschplatte bzw. Schwungrad montieren
- 3.) Gummiteil mit radialen Schrauben auf zylindrische Nabe montieren. Dabei wird das Gummielment radial zusammengezogen und erhält eine Druckvorspannung. Danach die gekuppelten Aggregate zusammenschieben und dabei die Kupplung auf die Steckbolzen mit leichtem axialem Druck vorsichtig aufschieben. Dabei wird das Gummielment durch die Steckbolzen noch etwas mehr radial zusammengedrückt und die Druckvorspannung wird erhöht. Zuvor die axialen Bohrungen im Gummielment gut einfetten, damit die Steckbolzen besser gleiten.

## Wichtige Hinweise, unbedingt beachten!

- a) Schraubenlänge! Bei Bauform "S" und Gelenkwelle Bauform "GZ" sind die axialen Schrauben länger als die radialen Schrauben. Die kürzeren Schrauben also immer nur für die radiale Verschraubung mit zylindrischer Nabe bzw. Rohr (bei GZ) benutzen.
- b) Darauf achten, daß beim Anziehen der Schrauben die Alubuchsen im Gummielment nicht mit verdreht werden, sondern gerade sitzen. Daher zur Verringerung der Reibung zwischen Schraubenkopf und Aluteil unbedingt eine kleine Menge Fett vor der Montage unter den Kopf der Schraube geben. Nötigenfalls durch Gegen-druck mit geeignetem Werkzeug ein Verdrehen (Schiefstellen) des Gummielments beim Anziehen der Schrauben verhindern. Dieser Punkt ist besonders wichtig bei den radialen Schrauben, sonst tragen die zylindrischen Flächen zwischen Aluteil und Nabe nicht richtig vollflächig, sondern nur auf 2 Ecken. In diesem Falle erfolgt unweigerlich ein Lockern der Schrauben und nachfolgend die Zerstörung der Kupplung. Bei den Kupplungstypen, die in der zylindrischen Nabe Stifte aufweisen ergibt sich die richtige Position der radialen Aluteile automatisch. Falls die Kupplung bei Lieferung schon vormontiert ist, sollte sie keinesfalls mehr demontiert werden, sondern in diesem Zustand eingebaut werden.
- c) Die Schrauben, die das Gummielment mit der Nabe verbinden, müssen unbedingt alle (axial und radial) mit dem Drehmomentschlüssel auf das in der folgenden Tabelle angegebene Drehmoment angezogen werden. Das Anziehen mit Drehmomentschlüssel ist besonders wichtig bei den größeren Typen. Anziehen "nach Gefühl" genügt keinesfalls, da in diesem Falle erfahrungsgemäß die Anziehdrehmomente viel zu niedrig sind. Zu geringe Anziehdrehmomente führen unweigerlich zum Lösen der Schrauben und damit zur Zerstörung der Kupplung.



Centaflex Größe	1	2	4	8 / 12	16 / 22	25 / 28	30	50 / 80	90	140	200	250
Schraube DIN 912	M 6	M 8	M 8	M 10	M 12	M 14	M 16	M 16	M 20	M 20	M 20	M 20
Anzugsmoment Nm	10	25	25	50	85	140	220	220	500	500	500	500
mKp	1,0	2,5	2,5	5	8,5	14	22	22	50	50	50	50

d) Nur die mitgelieferten Schrauben der Qualität " Inbus Plus " verwenden, die durch eine farbige Masse ( z.B. blau ) auf dem Gewinde gekennzeichnet sind. Diese Masse enthält mikroverkapselten Klebstoff, der die Schrauben im Gewinde verklebt und damit zuverlässig gegen das Lösen sichert. Die Aushärtezeit dieses Klebstoffes nach dem Einschrauben beträgt bei Raumtemperatur ( 20°C ) ca. 4-5 Stunden für eine ausreichende Wirkung. Vorher sollte die Kupplung nicht in Betrieb genommen werden. Vollaushärtung ist nach 24 Stunden gegeben. Höhere Temperaturen beschleunigen die Härtung, z.B. beträgt die Härtezeit nur noch 15 Minuten bei 70°C ( Erwärmung durch Warmluftgebläse ). Inbus Plus ist temperaturbeständig von -80 bis + 90°C, und die Schrauben können max. 3mal wieder benutzt werden. Eventuell beim Einschrauben vom Gewinde abgestreifter Klebstoff setzt sich zwischen Nabe und Aluteil. Das ist nicht nachteilig, sondern sogar vorteilhaft, weil dadurch der Reibschluß zwischen diesen Teilen erhöht wird.

Achtung: Anaerobe Klebstoffe (wie Loctite, Omnifit usw.) lösen die Haftung des Gummis am Metall und zerstören somit die Kupplung. Daher sollten diese Klebstoffe nach Möglichkeit nicht benutzt werden. Wenn die Verwendung des Klebstoffes unumgänglich ist (z. B. zur Sicherung von Schrauben), dann sehr sparsam auftragen, damit kein überschüssiger Klebstoff das Gummi benetzt. Durch Klebstoffe defekt gewordene Gummiteile können wir nicht als Reklamation anerkennen.

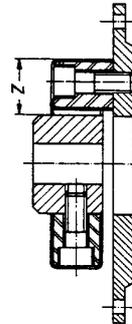
### Centaloc Klemmnabe

Falls die Naben mit Centaloc Klemmung ausgerüstet sind, müssen diese Klemmschrauben mindestens mit nachstehenden Drehmomenten angezogen werden:

Klemmschrauben	Anziehdrehmoment (Nm)
M 10	30
M 12	50
M 14	70
M 16	120
M 20	200

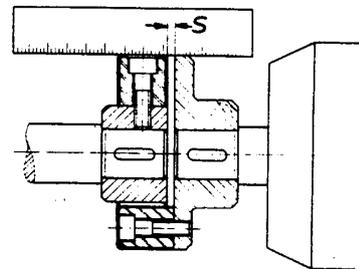
### Position der zyl. Naben:

Das längere Ende der zyl. Nabe, meistens durch eine starke Schräge gekennzeichnet, ist normalerweise gemäß den untenstehenden Zeichnungen angeordnet. Bei manchen Sonderausführungen muß die Nabe jedoch umgekehrt eingebaut werden. Daher muß sie im Zweifelsfall gemäß der speziellen Einbauzeichnung montiert werden.



e) Nach der Montage der Kupplung ist diese sorgfältig auszurichten, falls die gekuppelten Aggregate nicht bereits durch Zusammenflanschen gut fluchten. Je höher die Drehzahl der Kupplung, desto sorgfältiger sollte die Ausrichtung erfolgen im Interesse einer langen Lebensdauer der Kupplung. Bei der Bauform 2 kann die Fluchtung sehr leicht durch ein Lineal kontrolliert werden. Dabei muß der Außendurchmesser der Flanschnabe und der Außendurchmesser des Gummielementes an den Stellen, wo die Radialschrauben sitzen, miteinander fluchten; und zwar in verschiedenen Ebenen

f) Die Kupplung ist vollkommen wartungsfrei und erfordert keinerlei Schmierung. Die Benetzung mit Öl und ähnlichen Stoffen sollte vermieden werden, da Naturgummi nicht ölbeständig ist. Gelegentliche geringe Kontakte mit Öl oder Fett sind nicht schädlich, da dieses Öl beim Drehen der Kupplung wieder abgeschleudert wird.



g) Übersichtstabelle : Schraubenlängen und Maß " S " zwischen den Naben.

CF Größe	1	2	4	8/12	16/22	25/28	30	50/80	90	140	200	250
Normal-Bauf.	M6x10 M6x25	M8x20	M8x25	M10x30	M12x35	M14x40	M16x50	M16x50	M20x65	M20x65	M20x65	M20x80
Bauform „S“ Steckbolzen Schrauben	M6 M6x10	M8 M8x20	M8 M8x25	M10 M10x30	M12 M12x35	M14 M14x40	M16 M16x50	M16 M16x50	M20 M20x65	M20 M20x65	M20 M20x65	M20 M20x80
Gelenkwelle G	M6x10 M6x25	M8x20	M8x25	M10x30	M12x35	M14x40	M16x50	M16x50	M20x65	M20x65	M20x65	M20x80
Gelenkwelle radial GZ axial	M6x10 M6x30	M8x20 M8x25	M8x25 M8x30	M10x30 M10x35	M12x35 M12x40	M14x40 M14x45	M16x50 M16x55	M16x50 M16x55	M20x70	M20x70	M20x70	M20x80 M20x90
Maß „S“ mm	2	4	4	4	6	6	8	8/4	8	8	8	8
Maß „Z“ mm	13	22,5	27,5	30/31	40	42,5	50	50/52,5	67,5	67,5	77,5	90



**CENTA ANTRIEBE**  
**Kirschey GmbH**

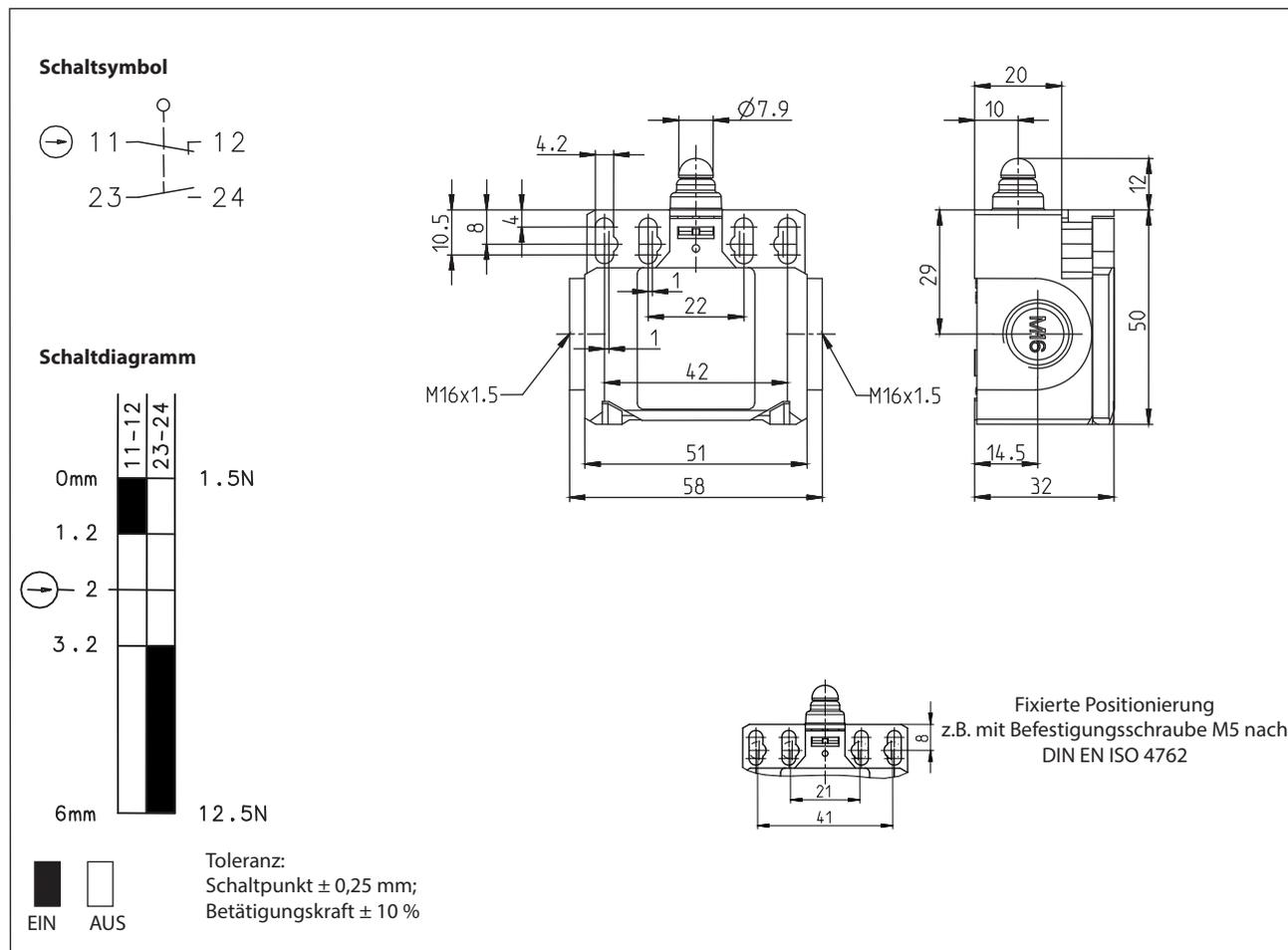
D-42755 Haan Postfach 11 25 Bergische Straße 7  
Tel.: 021 29-9 12-0 Fax: 021 29-2790

# Kunststoffschalter

## Baureihe BI2

Typbezeichnung **BI2-U1Z W**

Artikelnummer **6085103100**



Elektrische Daten		
Bemessungsisolationspannung	$U_i$	400 V AC
Konv. thermischer Strom	$I_{the}$	10 A
Bemessungsbetriebsspannung	$U_e$	240 V AC
nach $c_{CSA_{US}}$	$U_e$	300 V AC
Gebrauchskategorie		AC15 $U_e / I_e$ 240 V / 3 A
Zwangsöffnung	$\oplus$	nach IEC/EN 60947-5-1, Anhang K
Kurzschlusschutzeinrichtung		Schmelzsicherung 10 A gG
Schutzklasse		II (schutzisoliert)

Mechanische Daten	
Gehäuse	Thermoplast, glasfaserverstärkt
Deckel	Thermoplast, glasfaserverstärkt
Betätigung	Stößel (Thermoplast)
Umgebungstemperatur	-30 °C ... +80 °C
Kontaktart	1 Öffner, 1 Schließer (Zb)
Mechanische Lebensdauer	10 x 10 <sup>6</sup> Schaltspiele
Schalthäufigkeit	≤ 100 / min.
Befestigung	2 x M4 / 2 x M5 / 2 x M3 Frontbefestigung
Anschlussart	4 Schraubanschlüsse (M3,5)
Leiterquerschnitte	Eindrähtig 0,5 – 1,5 mm <sup>2</sup> oder Litze mit Aderendhülse 0,5 – 1,5 mm <sup>2</sup>
Kabeleinführung	2 x M16 x1,5
Gewicht	≈ 0,08 kg
Einbaulage	beliebig
Schutzart	IP65 nach IEC/EN 60529; DIN VDE 0470 T1

Kennzahlen für Sicherheitstechnik	
B10d	20 x 10 <sup>6</sup> Zyklen

Anfahrmöglichkeiten	
Die angegebenen Daten beziehen sich auf Betätigung in Stößelrichtung. Bei seitlicher Betätigung kann sich die Lebensdauer des Schalters verringern.	

Vorschriften	
	VDE 0660 T100, DIN EN 60947-1, IEC 60947-1
	VDE 0660 T200, DIN EN 60947-5-1, IEC 60947-5-1
	DIN EN ISO 13849-1

EU-Konformität	
	nach Richtlinie 2014/35/EU

Zulassungen	
	c <sub>CSA</sub> US A300, Q300
	CCC

Bemerkungen	
Spezifizierte Schutzart (IP-Code) gilt nur bei geschlossenem Deckel und Verwendung einer mindestens gleichwertigen Kabelverschraubung mit entsprechendem Kabel.	

## EU-Konformitätserklärung / EU Declaration of Conformity / Déclaration UE de conformité

Diese Konformitätserklärung entspricht der europäischen Norm DIN EN ISO/IEC 17050-1: Konformitätsbewertung – Konformitätserklärung von Anbietern – Teil 1: Allgemeine Anforderungen. Die Grundlage der Kriterien sind internationale Dokumente, insbesondere ISO/IEC-Leitfaden 22, 1982, Informations on manufacturer's declaration of conformity with standards or other technical specifications. Die deutsche Sprachfassung ist die Originalkonformitätserklärung. Bei anderen Sprachen handelt es sich um die Übersetzung der Originalkonformitätserklärung.

This Declaration of Conformity is suitable to the European Standard EN ISO/IEC 17050-1: Conformity assessment – Supplier's declaration of conformity – Part 1: General requirements. The basis for the criteria has been found in international documentation, particularly in: ISO/IEC Guide 22, 1982, Informations on manufacturer's declaration of conformity with standards or other technical specifications. The original Declaration of Conformity is the German language version. Other languages are a translation of the original Declaration of Conformity.

Cette déclaration de conformité correspond au Norme Européenne EN ISO/IEC 17050-1 : Évaluation de la conformité – Déclaration de conformité du fournisseur – Partie 1 : Exigences générales. La base des directives sont des documents internationaux répondant à ISO/IEC-Guide 22, 1982, Informations on manufacturer's declaration of conformity with standards or other technical specifications. La version allemande est la langue d'origine de la déclaration de conformité. Les autres langues ne sont qu'une traduction de la déclaration de conformité en langue allemande.

Wir / We / Nous

**BERNSTEIN AG**

(Name des Anbieters) / (Supplier's name) / (Nom du fournisseur)

**Hans-Bernstein-Straße 1  
D-32457 Porta Westfalica**

(Anschrift) / (Address) / (Adresse)

erklären in alleiniger Verantwortung, dass das (die) Produkt(e):  
declare under our sole responsibility that the product(s):  
déclarons sous notre seule responsabilité que le(s) produit(s) :

**Bi2-U1Z w Artikelnummer 608.5103.100**

(Bezeichnung, Typ oder Modell, Los-, Chargen- oder Serien-Nr., möglichst Herkunft und Stückzahl)  
(Name, type or model, batch or serial number, possibly sources and number of items)  
(Nom, type ou modèle, n° de lot, d'échantillon ou de série, éventuellement les sources et le nombre d'exemplaires)

mit folgenden Europäischen Richtlinien übereinstimmt (übereinstimmen):  
is (are) in conformity with the following directives:  
est (sont) conforme(s) aux directives européennes :

**Niederspannungsrichtlinie-Nr.: 2014/35/EU**

Dies wird nachgewiesen durch die Einhaltung folgender Norm(en):  
This is documented by the accordance with the following standard(s):  
Notre justification est l'observation de la (des) norme(s) suivante(s) :

**DIN EN 60947-1 : 2011-10  
DIN EN 60947-5-1 : 2010-04**

Porta Westfalica, 24.10.2016

(Ort und Datum der Ausstellung):  
(place and date of issue):  
(date et lieu d'établissement) :



Gisela Bernstein

Vorstandsvorsitzende/Chairwoman of the Board

(Name, Funktion) (Unterschrift):  
(name, function) (signature):  
(nom, fonction) (signature) :





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07/2025