haacon

Operating Manual

(Translation)

Lifting, rolling and loading system

with

Electric drive (optional)

Type 1350.FR
Part-no. 231776

Certified in accordance with DIN EN ISO 9001, Member of the DWT

haacon hebetechnik gmbh
Josef-Haamann-Str. 6
D-97896 Freudenberg/Main

Tel: +49 (0) 93 75/84-0
Fax: +49 (0) 93 75/84-66
e-mail: haacon@haacon.de
Internet: www.haacon.de

These operating instructions apply to the type 1350.FR lifting, rolling and loading system and containers with ISO corner fittings on the top and bottom.
These operating instructions may only be duplicated for internal use.

E.C. Declaration of Conformity

to 2006/42/EC IIA

haacon hebetechnik gmbh
Josef-Haamann-Straße 6
D-97896 Freudenberg/Main

haacon

Name and address: haacon hebetechnik gmbh
Josef-Haamann-Straße 6
D-97896 Freudenberg / Main

Telefon: +49 (0) 9375 / 84-0
Telefax: +49 (0) 9375 / 8466

We hereby declare that the product

Designation:	Shelter Lifting, Rolling and Loading System – electric drive		
Type:	1350.6,5	1350.10	1350.FR
Capacities:	– 6,5 t	– 10 t	– 10 t

as delivered corresponds to the following
relevant directives.

2006/42/EC	EC-machinery directive

Harmonised standards:

DIN EN ISO 12100-1/-2	Safety of machines

National standards and technical specifications:

9.GPSGV	Neunte Verordnung zum Gerätesicherheitsgesetz
DGUV-V 1	Unfallverhütungsvorschriften (Grundsätze der Prävention)
DGUV-V 54	Unfallverhütungsvorschriften (Winden, Hub-Zuggeräte)
DIN VDE 0470-1	Schutzarten durch Gehäuse (IP-Code)

If the product is changed significantly, it will lose this conformity declared by the manufacturer.

The manufacturer agrees to submit the specific documentation pertaining to this product to individual state institutions electronically, if so requested.
The specific technical documentation as outlined in Appendix VII Part B were compiled.

Responsible for the documentation: haacon hebetechnik gmbh, Construction
Josef-Haamann-Straße 6, D-97896 Freudenberg / Main

Signed:

Freudenberg, 09.11.2017

i.V. Holger Birkholz	i.V. Theo Müller
(Head of Construction)	(Head of Quality Management)

gb issue 7; 11/17	090053 dated 09.11.2017

H:\bbs\Managementsystem\formulare\100021 konformitätserklärung .doc erstellt: hck-cd; Stand: 28.02.17

CONTENT

1. USER GROUPS

	Duties	Qualifications
Operator	Assembly, disassembly, operation, visual inspection	Instruction by means of the operating instructions; Authorised person
Specialist personnel	Repair, maintenance	Mechanic; if necessary, an electrician
	Tests	Authorised person per TRBS-1203 (Technical expert)

2. SAFETY INSTRUCTIONS

This symbol is used where failure to follow or to precisely follow operating or work instructions, as well as stipulated working processes and similar, could result in damage to the machine or injury, possibly life-threatening.

Handling notice
This notice is used to draw attention to a particular feature.

Where to use this winch

The 1350.FR device allows you to load and unload transport aircraft - e.g. Transall C160 or Hercules C130 - with containers, lift or lower a container from a carrier vehicle with additional equipment, as well as for rolling containers on a level, paved surface.

- Appropriate mounting on containers according to ISO 668 with corner fittings according to ISO 1161.
  At a variant connection consider the drawing in the annex!
- Operate the equipment in accordance with the information in these operating instructions.
- Use only in the intended manner.
- Only use to lift, lower and pull freely-movable loads.
- Only use when in perfect working order.
- Only allow to be operated by personnel instructed on how to do so.
- Only use the equipment on a substrate with sufficient load-bearing capacity.

Safe working practices

- First read the operating instructions.
- Always be conscious of safety and hazards when working.
- Observe device and load during all movements.
- Immediately report any damage or defects to the person in charge.
- Repair equipment first before continuing work!
- Do not leave the load suspended without supervision.
- Transport device protected against impacts and shocks, falling over or toppling.

Do not:

- Overload (–> 3. technical data, type plate, payload plate)
- Impacts, blows.
- carriage persons.
- Remaining in or on the lifted load if it is lifted more than 400 mm from the ground.
  Exception: When an additional safety device is used!
- people are not allowed to stand under the raised load without additional support.
- Exceed the maximum angle (–> 2. entitled other instructions).
- Not to depose at wind speed over:
  10 ft – max. 70 km/h
  20 ft – max. 64 km/h
  30 ft – max. 52 km/h
  40 ft – max. 45 km/h
- Lash the load over components of the lifting, rolling and loading system.

You must also ensure that if you wish to lift the maximum load the centre of gravity of the load is positioned as centrally as possible between the supports.

The length, width and height of the vehicle carrying the container including the lifting device must be within the allowed dimensions during transport.

Use exclusions

– Not suitable for permanent operation and vibration stress.
– Not approved for use in explosive areas/environments.
– Not suitable for aggressive environments.
– Not suitable for lifting hazardous loads.
– Not suitable for lifting liquids.

Organisational measures

– Ensure that these operating instructions are always at hand.
– Ensure that only suitably qualified and authorised personnel is allowed to operate, service and repair the lifting device.
– Ensure that this personnel is instructed at regular intervals in all matters of industrial safety and environmental protection and that they are familiar with the operating manual and the safety instructions contained there in.
– Ensure that all the safety and warning notices on the device remain and are kept in legible condition.
– Checked regularly the fully functional.
– Check at regular intervals whether it is being used in a safety and hazard conscious manner.
– Store clean, dry and protected.
– Use only under normal lighting conditions!

Installation, service and repair

– Only by specialist personnel!
– Only use original spare parts for repairs.
– Do not modify or alter safety-relevant parts, this particularly applies to welding work on load-bearing parts!
– Additional attachments must not impact safety.
– All planned modifications must be approved in writing by haacon hebetechnik gmbh.
– The maintenance work set out in the operating manual (cleaning, lubrication, servicing, inspection, etc.) must be completed on schedule.

Further regulations to be observed are

– German Industrial Health and Safety Ordinance (BetrSichV).
– Country-specific regulations.
– German Accident prevention regulations (DGUV-V 54).
– Flugzeugspezifische Ladevorschriften.
– Notice signs / identification plates.

Other instructions

1. Drive under the container with great care. Do not bump anything with the truck since otherwise there is a danger that the device will buckle.
   Ask another person to guide you as you drive the truck under the container.
2. Nobody is permitted to be in, on or under the bulk container during lifting, set down and levelling of the container.
3. People may stand on and in the raised container if it is no more than 400 mm off the ground.
4. The device with a container must not be made to vibrate by means of crank impulses.
5. The container may only be placed on solid ground by the device.
6. The area on which the container is placed or from which it is lifted must be as flat as possible.
7. The maximum permissible incline of 5° in cross direction (corresponsing to a height difference of 210 mm for a cabine width of 2438 mm) or 2.6° lengthwise (corresponding to a height difference of 270 mm for a cabine length of 5982 mm) must not be exceeded.

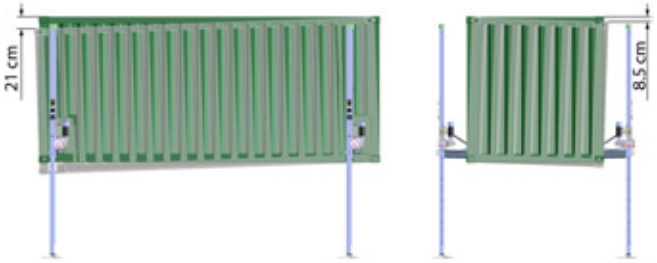


fig. 2-1

8. If the site incline is greater than 5°,
   – all four supports must be loaded uniformly.
   – the container must be aligned horizontally.
   To eliminate the bending stress on the gear rack tubes, the stress must be removed form the supports individually.
   – the sag of the gear rack tubes must be observed.
   It must be even.
9. The maximum permissible rolling speed of 6 km/h must not be exceeded and should be reduced depending on the ground conditions. The rolling area must be obstacle-free.
10. If the raised container is parked on the lifting, rolling and loading system for an extended period, the base plates must be used instead of the wheel units.
11. Do not set up the device in storms.

Technical instructions on the lifting device

To prevent accidents and damage, notice signs are affixed to the landing gear, and the instructions there on must be followed:

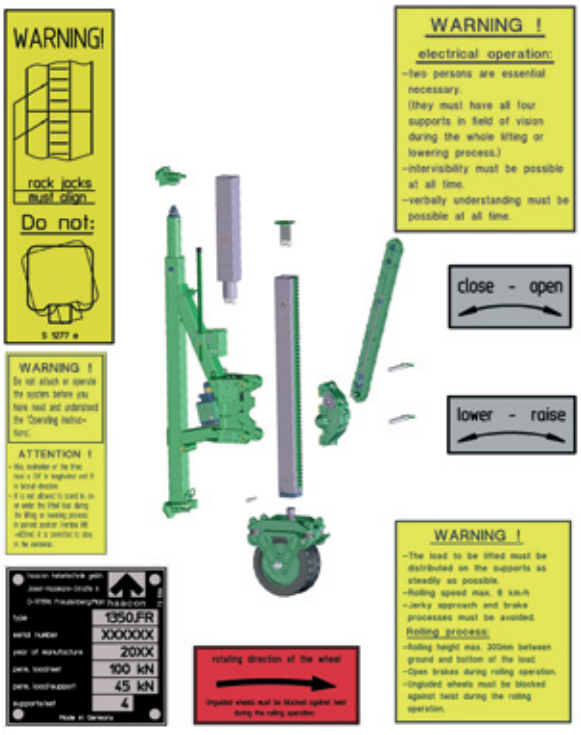


fig. 2-2

optional:

fig. 2-3

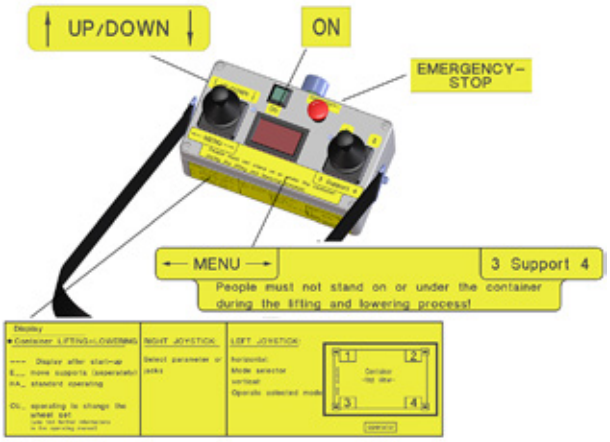


fig. 2-4

The contents of the notices is depend on the type and variant of the device in question and its associated technical data.

All the safety signs and operating instruction signs on the device are to be kept clearly legible at all times. Damaged or illegible signs are to be replaced without delay.

3. TECHNICAL DATA

Lifting, rolling and loading system type 1350.FR		
Maximum load / set	100 22 500	kN lbf
Maximum load / support – on base plate –	50 11 250	kN lbf
Maximum load / support – on wheel unit –	32 7 200	kN lbf
Weight / set – without options –	~ 1295 ~ 2 855	kg lb
Weight / corner unit – without options –	~ 320 ~ 705	kg lb
Maximum lift	1 750 69	mm in
O/A height	2100 82,7	mm in
Crank force / support pair – fast gear – for maximum load –	~ 80 ~ 18	N lbf
Crank force / support pair – low gear – for maximum load –	~ 160 ~ 36	N lbf
Lift / turn of crank – fast gear	14,7 0,58	mm in
Lift / turn of crank – low gear	2,4 0,09	mm in
Lift ~ – fast gear	580 22,8	mm/min in/min
Lift ~ – low gear	85 3,3	mm/min in/min
Working temperature	- 40 ... 70 - 40 ... 158	°C °F
Ground pressure – 50 kN / base plate –	37,5 55	N/cm² psi
Max. wind speed for container length 10 ft container length 20 ft container length 40 ft	 70 64 45	 km/h km/h km/h
Set down and rolling mode		
max. rolling height	300 11,8	mm in
max. rolling speed	6 3,7	km/h mph

4. GENERAL

The 1350.FR device allows you to load and unload transport aircraft - e.g. Transall C160 or Hercules C130 - with containers, lift or lower a container from a carrier vehicle with additional equipment, as well as for rolling containers on a level, paved surface.
Current containers are containers of the cabine type ATB, ATS or standard cabins 8' (2.10 m) to 8 ½' (2.33 m) according to ISO 668.
The maximum weight of the load being moved must not exceed 10 t.

The device consists of:
- Four interchangeable corner units.
  A corner unit consists of one bar, rack, rack extension, gear unit, steering rod, adapter, wheel unit or base plate.
- one tow bar for rolling option.
- Four crankcases and four cranks to drive them.

The device is mounted to the ISO corners of the container.
All components required for the operation of the lifting, rolling and loading system are included in the system. For the transport of the cabine on the cargo area of a carrier vehicle, the lifting, rolling and loading system is rotated and secured in an designated transport position. Disassembly is not required.

The device has a self-locking spur gear, which holds the load securely at any height. (It is still necessary to observe the safety instructions!). The lifting system is driven by cranks.

The device complies with DGUV-V 54 and the EC Machine Directive 2006/42/EEC and subsequent directives.

5. SAFETY DEVICES

The mechanical components of each corner unit are adequately dimensioned for the specified permissible loads. If there is an impending overload of the corner unit, and where the upper or lower limit position is reached, the force required on the crank increases considerably.

Where an electrical drive is used, the mechanical components are protected against overload by a safety clutch.

Each corner unit has mechanical limit stops. If the mechanical limit stops are reached, the gear unit and motor are protected by the safety clutch. However, a subsequent inspection of all parts which are subjected to forces is necessary.

Dimension the supporting structure at least for 150 % of the maximum load.

6. DELIVERY / WEIGHT

1 Lifting, rolling and loading system set Type 1350.FR consists of:

Item no.	Designation	DP no.	support	set	
4	Corner pillar	208650	77 169,8	308 679,2	kg lb
4	Gear unit	208651	23 50,7	92 202,8	kg lb
4	Wheel unit	208652	110 242,5	441 970	kg lb
4	Rack	208653	40 88,2	160 352,8	kg lb
4	Rack extension	208654	19 41,9	76 167,6	kg lb
4	Fastener	208655	1,7 3,7	6,8 14,8	kg lb
4	Crankcase	208656	13 28,7	52 114,8	kg lb
4	Top receptacle	208657	7 15,4	28 61,6	kg lb
4	Crank	208658	1,6 3,5	6,4 14	kg lb
4	Base plate	208659	9,5 21	38 84	kg lb
8	Bolt	129325	0,3 0,7	2,4 5,6	kg lb
8	Bolt	208661	1,5 3,3	12 26,4	kg lb
4	Adapter	208662	16 35,3	64 141,2	kg lb
4	Steering rod	208660	2,1 4,6	8,4 18,4	kg lb
4	lowering safety device	216110	3 6,6	12 26,4	kg lb
1	Tow bar	209733	---	47 103,6	kg lb
1	Transportable pallet	000117	---	121,5 267,9	kg lb
Total weight			app. app.	1464 3220	kg lb
optional electric drive					
1	Electric drive total	215916	---	106,35 234,35	kg lb
2	Gear motor 1&2	137615	13,8 30,4	27,6 60,8	kg lb
2	Gear motor 3&4	137588	13,8 30,4	27,6 60,8	kg lb
2	Dispenser housing 1&4	137617	2,5 5,5	5 11	kg lb
2	Dispenser housing 2&3	137591	2,5 5,5	5 11	kg lb
1	Control box	137589	---	12,5 27,6	kg lb
1	Operating device	137587	---	1,75 3,85	kg lb
1	Cable set	137590	---	26,9 59,3	kg lb
more options					
1	Mounting winch	209735	---	34,5 76	kg lb
1	Air loading pallet	129900	---	435 959	kg lb
1	Packing crate				

7. OPERATING MODES

The type 1350.FR device has multiple uses in the area of container handling. The following operating modes are distinguished between for operation:

Parking and set down mode

This operating mode is used to lift and set down the container from or onto a carrier vehicle, as well as to park a container, which has been raised up to operating height and positioned, for an extended period of time.

For this usage, the corner units are positioned on the long sides of the container and provided with base plates. This allows the carrier vehicle to drive under and out from under the raised container, while also ensuring optimum stability.

Rolling mode

This operating mode is used to roll the container when it is raised to rolling height. In this case, the base plates on the support legs must be replaced with wheel units. The track width is approx. 2500 mm. Corner units are perpendicular to the sidewall or backside of the container. If the container is positioned at rolling height and the tow bar is mounted, it can be rolled at a low speed.

If the container is to remain raised on the device for an extended period, then the wheel units must first be replaced with base plates.

Loading mode

This operating mode is used for loading the container into the cargo bay of the transport aircraft, e.g. Transall C160, Hercules C130, etc.

Standard rolling operation or narrow-gauge rolling operation is also possible to do this. The track width is 1700 mm here. The corner units are at an angle of approx. 50° to the front or back side of the container. The container can be adjusted to roller height. A pulling rod that is installed on the wheel units enables the lifted container to be pulled in to the aircraft via the sloping loading ramp.

During loading of the container into the transport aircraft, the respective applicable loading regulations must be observed.

If a loading operation is intended to take place via a „Level Loading“ horizontal ramp, the lifting, rolling and loading system with the type 1350.10 is referred to here.

8. LAYOUT, FUNCTION AND ASSEMBLY OF THE INDIVIDUAL COMPONENTS

The following chapter describes the device‘s individual components. It provides information about the layout and function of the components. The item numbers for the components are used consistently within the operating instructions. This means that each component is always numbered with the same item number. Elements identified with letters, on the other hand, are specific to a particular section.

8.1 Top receptacle

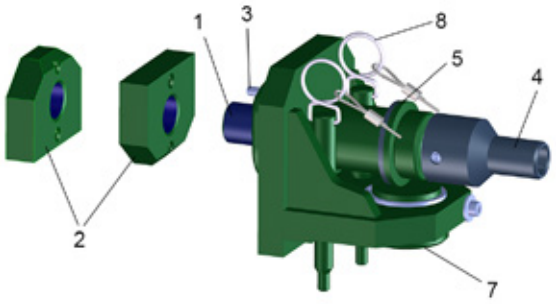


fig. 8-1

The top receptacle is used for the adaptation between the lifting, rolling and loading system and the top ISO corner of the cabine. It reaches in a form-fitting manner into the top ISO corner and is form-fitting secured using a locking bolt (1) and a loose clamping plate (2). The mounting position of the clamping plate is determined by a cylinder pin (3). Using the square drive of the nut (4) the connection is tightened with the crank handle (chapter 8.8). The tightening torque of 90 Nm required is achieved with the torque wrench. Please observe position and alignment of the spring assembly between nut (4) and guide (5). The ball socket (7) at the bottom side is the interface to the corner pillar (chapter 8.2) and enables its pivoting. The top receptacle is also used for storage of the two adjustment tools (8) for the ball coupling of the pivotable corner pillar (chapter 8.2).

A proper connection between the part and the ISO corner must be checked before each operation.

The connection between the part and the container is loosened in the opposite sequence.

8.2 Corner pillar - pivotable -

The pivotable corner pillar is the carrier component of the lifting, rolling and loading system. It defines the connection between the cabine and all movable individual components. Installation is done by a form-fitting connection of the lower receptacle (1) with the lower ISO corner of the cabin, which is secured force-fitting using a locking bolt (2). For this, the positions unlocked or locked are assigned to the locking bolt (2) by the means of a cylinder screw (3). Using the square drive of the nut (4) the connection is tightened with the crank handle (refer to chapter 8.8). The tightening torque of 90 Nm required is achieved with the torque (chapter 9.1 and 9.2). A disc spring (5) between nut (4) and guide (6) serves as screw retention.

The lower receptacle must be **checked** prior to each operation of the system and must be tightened if necessary!

In order to adjust the system to four different cabin heights, the pivotable corner pillar is designed telescopic. The telescopic pipe (7) is locked in place in the respective positions using a loss-proof socket bolt (8). A ball coupling (9) functions as connection to the upper receptacle (refer to chapter 8.1), which is adjustable via a thread in order to compensate for tolerances and remove backlash from the system. It is secured using a lock nut (10), which must be manually tightened after the adjustment of the ball coupling (9). A ball raster increases the safety. An adjustment tool is provided and lorried on the upper receptacle, for tightening and mainly loosening of the connection between ball coupling (9) and lock nut (10) (chapter 8.1).

The ball coupling (9) reaches into the upper receptacle (chapter 5.1) The lower receptacle (1) functions as the counter bearing for the pivotable corner pillar. The entire corner unit is pivotable.

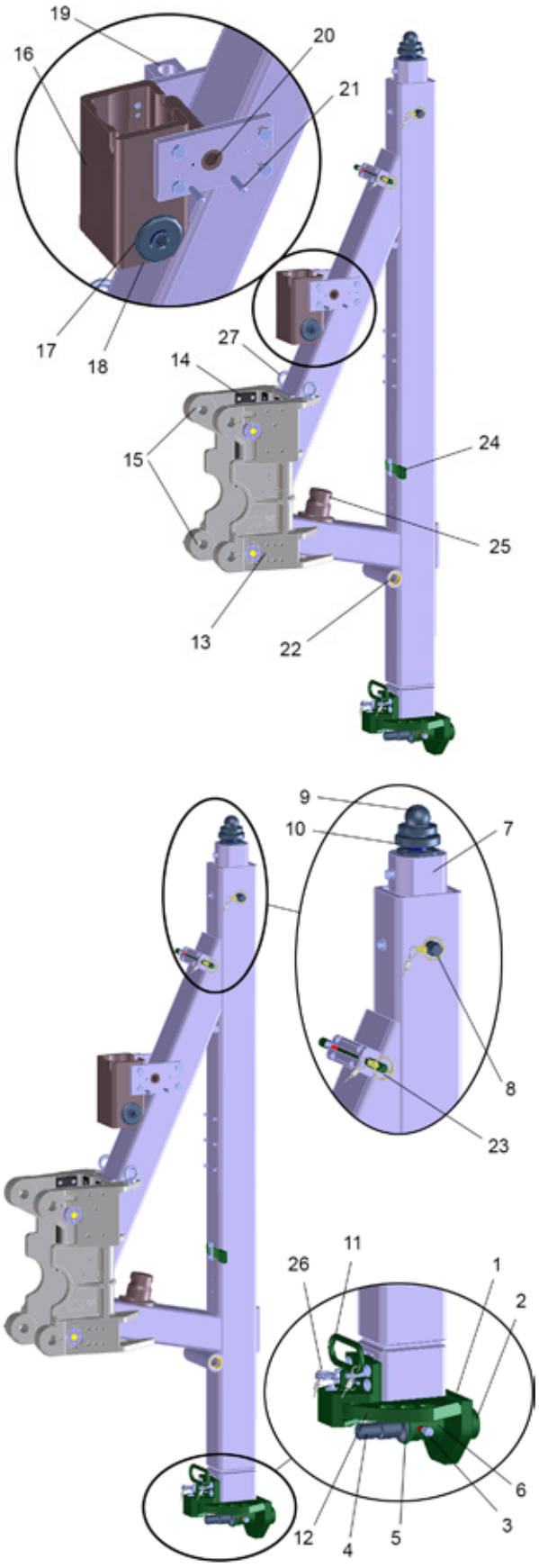
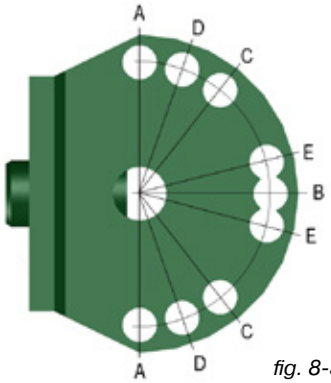


fig. 8-2

In order to lock the required pivot positions in place, the pivotable corner pillar is clamped to a ratchet disk (12 / fig. 8-3), which is located on the lower receptacle (1) using a loss-proof mounted socket bolt (11) and secured using a clip connecter (26). The different pivot positions are pictured in fig 8-3 and in the table aside.



A = lowering operation
B = rolling operation
C = rolling on the sloped ramp (narrow gauge)
D = stowage position near front side
E = stowage position by various additions at the front side of the container

fig. 8-3

The beam (13) defines the front part of the pivotable corner pillar. It is the connection to the components gear rack (chapter 8.3) and gear box (chapter 8.4) The guide plates (14) screwed to the beam (13) enable the gear rack (chapter 8.3) to move up and down at a low relative speed without additional lubrication. They must be inspected for wear in regular intervals and replaced of necessary (refer to chapter 11/12). The boreholes (13) in beam (15) are used to accomodate the gear box (chapter 8.4).

In addition to load transmission, the pivotable corner pillar also enables the accommodation of all components in the system, which are not used depending on the individual case. To accommodate gear rack extension or gear rack fastener (refer to chapter 8.3) a receptacle (16) with locking mechanism is available on the pivotable corner pillar. Utilizing the ratchet crank (refer to chapter 8.8) a cone (17) is screwed in or out in the receptacle (16) to lock the item to be lorried into place. The cone (17) is secured using a lock nut (18), which is tightened hand-tight. Ratchet crank (chapter 8.8) and steering rod (chapter 8.3) are accomodated on the receptacle (16) of the pivotable corner pillar.

A mounting hole (19) exists sideways on the pivotable corner pillar to accomodate the steering rod. The lorry position is secured by loss-proof mounted clip connectors. The ratchet crank is stored in a horizontal receptacle socket (20), which defines and secures the position of the crank together with the crank‘s ball raster and two inserted cylinder pins (21).

Receptacle socket (22) in the lower area and retaining bolt (23) enable storage of the crankcase (chapter 8.6) at both sides of the pivotable corner pillar, according to the requirements of the respective swivelling position. The crankcase is secured by loss-proof mounted clip connectors and a tie-down strap (24) attached to the pivotable corner pillar.

The pivotable corner pillar is equipped with a lorry/storage pin for the adapter (chapter 8.10), which is arrested in its position with a safety bolt (chapter 8.7).

The secure accommodation of the individual components lorried on the pivotable corner pillar must be **checked** and confirmed prior to each transport!

Two eye bolts (27) are intented to attach the assembly crane to the corner pillar (chapter 10.1), when the container is located on the cargo area of the lorry.

8.3 Rack, rack extension, rack fastener

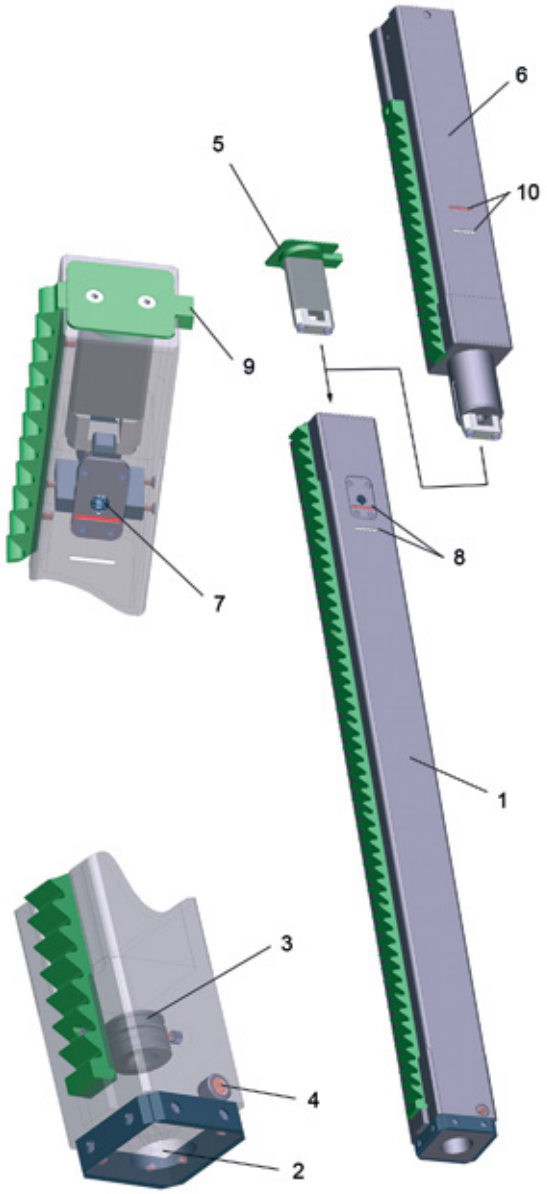


fig. 8-4

The rack (1) enables the connection with the gear box (chapter 8.4), the conversion of the rotational movement generated by the ratchet crank (chapter 8.8) into a linear movement, and thus the lifting and lowering of the cabin. There is a borehole (2) at its lower end to accomodate the wheel set (chapter 8.5) or the support plate (chapter 8.1). In order to turn the wheel set under load in the mounting hole (2), force is introduced into the rack (1) via a ball bearing (3). The cross hole (4) accomodates the safety bolt (chapter 8.7), which secures the fit of wheel set or support plate in the rack (1).

On the upper end of the rack (1) the rack fastener (5) or the rack extension (6) are selectively mounted. Both are easily interchangeable. For this the locking mechanism (7) is released using the ratchet crank (chapter 8.8), the mounted assembly is removed, the new one is form-fitting inserted and the locking mechanism (7) is engaged again. The required tightening torque of approx. 55 Nm corresponds to the crank force of apporox 250 N. The not used assembly is stored in its lorry position on the respective receptacle on the pivotable corner pillar (chapter 8.2).

INormally the rack fastener (5) is mounted to the rack (1). This combination enables all rolling movements of the system, as well as lifting up to 1250 mm. Markings (8) on the rack indicate, when this height is reached. If these markings are crossed, then a stop (5) installed on the fastener limits the lifting movement. If this stop (9) is activated in the beam of the pivotable corner pillar (chapter 8.2), then the required crank force increases significantly.

⚠ In this case lifting movement must be stopped **immediately**.

If lifting heights up to 1750 mm are required, for example to load or unload the cabin from a carrier vehicle, then the rack fastener (5) is exchanged with the rack extension (6). For better handling of the rack extension, a handle is incorporated. The now available maximum lifting height of 1750 mm is indicated by markings (10) as well. If this marking is crossed, the crank force increases significantly due to gearing blocking.

⚠ In this case lifting movement must be stopped **immediately**.

⚠ The common rolling height is 300 mm (chapter 2) When loading an airplane loading operation is permitted up to 1250 mm.

8.4 Gear unit

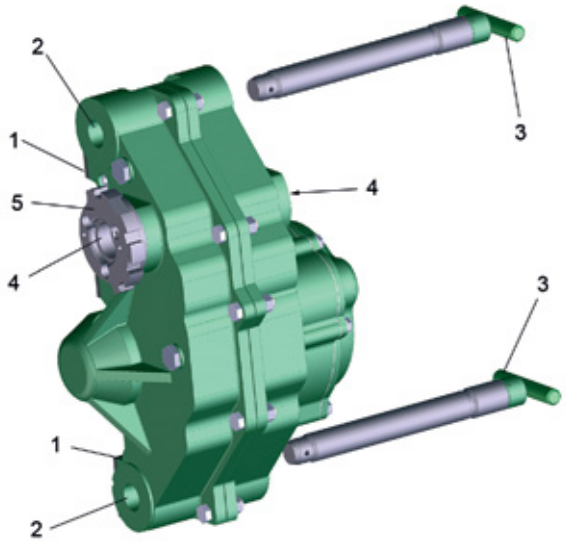


fig. 8-5

The enclosed spur gear unit is used to transmit the rotational movement generated with the ratchet crank (rchapter 8.7). This rotational movement is transmitted to the rack (chapter 8.3) with a gear transmission ratio of 1:48. The gear unit contains an internal load pressure brake as a safety device, which keeps the load safe in each situation. For guidance of the rack guide plates (1) are also screwed to the gear unit. They must be inspected for wear in regular intervals and replaced of necessary (refer to chapter 9).

Two through-holes (2) establish the stop to the pivotable corner pillar (rchapter 8.2), on which the gear unit is positioned and secured via two socket bolts (3). The two internal squares (4) are used to attach ratchet crank or crankcase (chapter 8.6). At one side, an additional ratchet disc (5) is attached to one of the squares (4), in order to arrest the crankcase in different positions.

Operation of the system with a ratchet crank directly inserted into the gear unit is possible. However, due to the missing second run-off protection (attached to the crankcase) it is **not permitted!**

8.5 Wheel unit

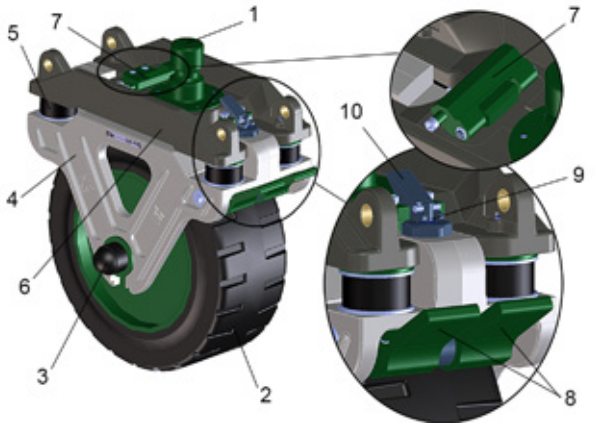


fig. 8-6

The wheel unit is mounted via the king pin (1) under the rack (chapter 8.3) and secured using safety bolts (chapter 8.7).
It enables moving the lifting, rolling and loading system with installed cabin. It consists of a solid rubber tire (2), which is screwed into wheel frame (4) using an axle (3). The wheel frame (4) is connected to the mounting bracket (6) and therefore the king pin (1) via rubber metal elements (5). The rubber metal elements (5) absorb shear forces and load peaks occuring during driving operation caused by bumpiness and reduce the system load. A disk mounted via a ball bearing underneath the king pin (1) limits sideways tilting of the wheel unit and is used as loss prevention device in the event, that the rubber metal elements (5) break unexpectedly.
Wheel axle (3) and king pin (1) are horizontally offset, this means, that the wheel unit is equipped with a castor and has a preferred wheel rotation direction. This is indicated by an information sign on the bracket.

Absolutely comply with the indicated wheel rotational direction when driving! Short reversing (max 10 m) with blocked wheels is permitted!
In cases of operation, where the wheel units are not force-steered, the rotating wheel units must be (rotation) blocked to rigid units. Therefore, the wheel unit can be locked in four positions, each 90° to the rack (chapter 8.3). For that locking (7) of the respective wheel setting is switched, so that it establishes together with the rack a form fit, which prevents rotational movement of the wheel unit.

The rotation of wheel units, which are not steered, must be blocked!
In order to prevent undesired rolling of the lifting, rolling and loading system, each wheel set is equipped additionally with a hand brake. To activate the brake, press the brake lever (8) down. The solid rubber tire (2) is clamped via a tappet area and the wheel centre is prevented from turning by friction fit. In order to secure the brake lever (8) in this position, a spring loaded raster (9) is mounted to the inside of the wheel frame (4). In order release the brake, a lever (10) must be actuated. It releases the raster (9) and the brake levers (8) are moved back into their starting position by reverse spring pressure.

Always engage the hand brake when parking.

8.6 Crankcase

The crankcase is not applicable in the design with the optional electrical drive.

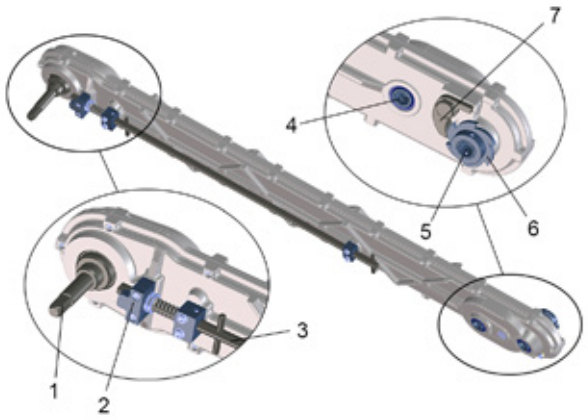


fig. 8-7

The crankcase transmits the rotation of the ratchet crank (refer to chapter 8.8) to the gear unit (chapter 8.4). This enables the operation of the lifting, rolling and loading system for greater lifting heights. The square drive shaft (1) is inserted into the gear unit and secured by the stop (2) via the ratchet disc. After pulling the locking bar (3) it can be pivoted and arrested in different positions.
In order to support ergonomic cranking, the crankcase is equipped with two different operating modes. For work in load-free operation, that is to extend or retract the support beams, the ratchet crank should be arrested in the fast speed receptacle (4). The generated rotation is transmitted with approx. 6-times speed to the gear unit. If the installed cabin performs lifting movements, then the ratchet crank must be arrested in the working speed receptacle (5). As a greater torque is required for lifting movements, the rotation is transmitted 1:1 to the gear unit. In both cases, the crank handle can be inserted from the left and from the right.
Besides the load pressure brake of the gear unit (chapter 8.4) a second, indepenent safety device exists on the crankcase. It consists of a ratchet wheel (6) and a spring-loaded catch (7). Ratchet wheel (6) and catch (7) are normally engaged and prevent the rotation of the drive shaft of the working speed in crank direction „AB“. The load is secured against undesired lowering by a form fit. When you want to crank in down direction, then the safety device must be released by manual disengagement of the catch (7). When you crank upwards, this is not required, as the catch (7) skips the engagement points (notches) of the ratchet wheel (6). A spring ensures the lock function and makes sure, that the catch jumps immediately back into the locking position, if is was not manually disengaged.

Operation of the lifting, rolling and loading system is possible without a crankcase. However, due to the missing second run-off protection it is **not permitted!**

8.7 Safety bolt

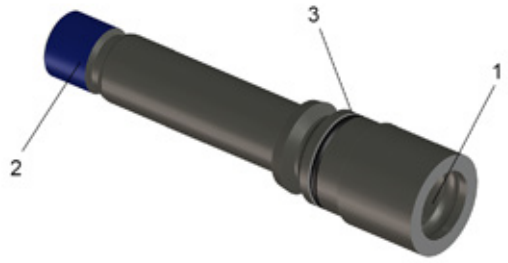


fig. 8-8

The safety bolt locks the position of the wheel unit (refer to chapter 8.5) or the support plate (chapter 8.9) in the rack (refer to chapter 8.3), as well as in the adapter (chapter 8.10). For installation it is attached to the ratchet crank (refer to chapter 8.8). The safety bolt is now screwed via a thread (2) into the respective mounting hole on the rack or the adapter. Next the ratched crank is pulled off. A rubber ring (3) attached to the bolt guide ensures by friction fit, that the bolt remains in the mounting hole.

The safety bolt must **not** potrude after being screwed into the rack.

8.8 Ratchet - crank

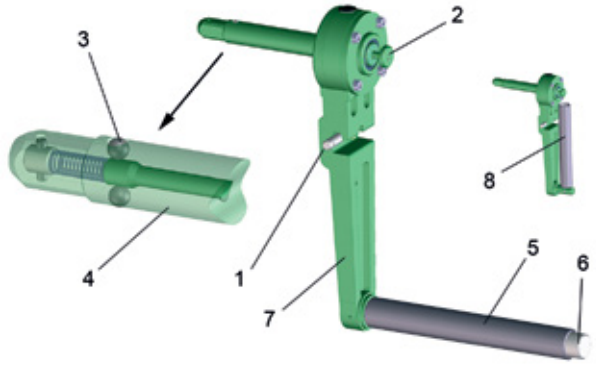


fig. 8-9

The ratchet crank initiates rotary motion required for lifting via the crankcase (chapter 8.6). Beyond that, it is an universal tool capable of managing all assembly sequences.

The rotational direction of the ratchet crank can be adjusted as needed by switching the ratchet bolt (1).If the ratchet bolt (1) is in the middle position, then cranking is possible in both directions.

Pull-off protection prevents the crank from slipping out while cranking. Pressing of the safety button (2) releases two balls (3) in the inside of the ratchet bolt (4) and releases the pull-off protection. The crank can now be inserted into its counterpart. After releasing the safety button (2) a form fit is established via the balls (3). Follow the same instructions to remove the crank.

Handle (5) of the ratchet crank can be tilted over for transportation and is thus protected against damage. In order to release the lock, press the button (6), pull the handle (5) away from the crank arm (7) and out of the engaged position and tilt by 90° (8).

The maximum permissible crank torque of 112.5 Nm must **not be exceeded**. This corresponds to approx. 500 N crank force at an available crank radius of 225 mm.

8.9 Support plate

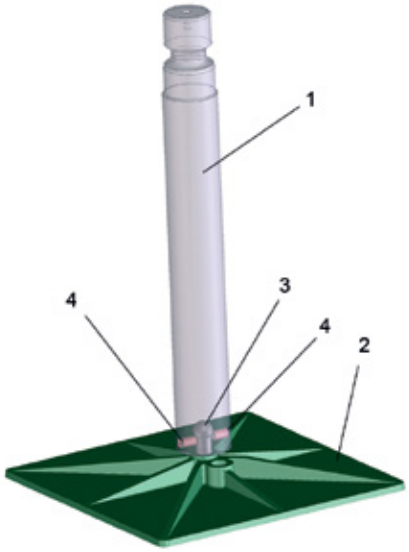


fig. 8-10

If the lifting, rolling and loading system is parked for a longer period of time on firm ground, the wheel units (chapter 8.5) should be interchanged with support plates. The support plates consist of a receptacle (1), in which a base plate (2) ismounted via a ball bearing (3) and held by two spring elements (4). With help of the ball bearing the support plates compensate for slopes iin the ground allowed by the system. In addition, due to the increased contact area resulting from the use of support plates (2), they reduce the surface pressure and therefore the applied load of the underground.

In general the cabine with the lifting, rolling and loading system is set up or down via the wheel units by the carrier vehicle (chapter 10.1) This function can also be accomplished using the support plates.

Furthermore, the support plates can be used to lift the cabine with the lifting, rolling and loading system and to install the previously deinstalled wheel units using the adapters (chapter 8.10) directly under the ISO corners of the cabin.

Mounting

The installation of support plates on the lifting, rolling and loading device is done similar to the installation of wheel sets (refer to chapter 9.5) That is, after deinstallation of the wheel sets, the support plates are inserted with the pin (1) into the mounting hole of the gear rack (chapter 8.3) and secured with the safety bolt (chapter 8.7). A possible installation of the support plates to the adapters (chapter 8.10) is following the same principle.

Loading /Storage

Due to their geometry the support plates cannot be stored in the transport position on the lifting, rolling and loading system. The support plates are therefore the only component of the system, which must be carried along separately.

8.10 Adapter

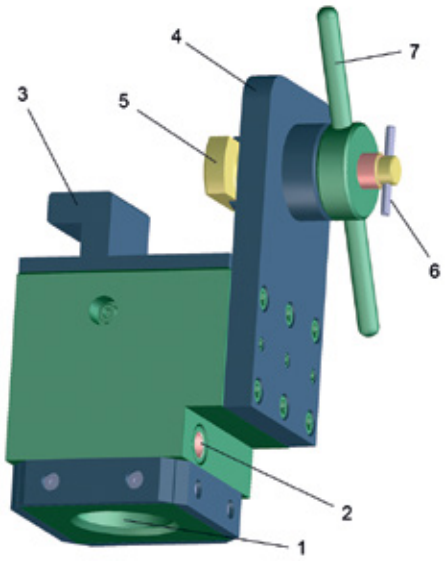


fig. 8-11

In case of use, the adapters can be directly mounted without any special tools under the ISO corners of the cabin. They are equipped with a mounting hole (1) for wheel units (chapter 8.5) or support plates (chapter 8.9). The wheel units or support plates are locked (2) following the same principle as the locking of the rack. (chapter 8.3)
After installation of the adapters and wheel units under the ISO corners of the cabin it is possible to roll the system without using any lifting components of the lifting, rolling and loading system.

⚠ When using the system with adapters, the rules of standard operation **must** be followed as well. (Chapter 10)

Mounting

Insert safety hooks (3) from the bottom into the ISO corner of the cabin. Push the adapter with clamping plate (4) against the sidewall of the cabin. The safety hook (3) is form-fitting with the ISO corner, whereas the locking bolt (5) enters from the side into the corner as well. - Next, turn the spring-strenghtened locking bolt (5) using the lever (6) by 90°. The locking bolt (5) engages with the clamping plate (4) and generates a form-fitting finish. Next establish the force-fitting connection between adapter and ISO corner by tightening of the nut (7). The tightening torque required is approx. 55 Nm. This corresponds to a manual force of approx 250 N on the nut (7).

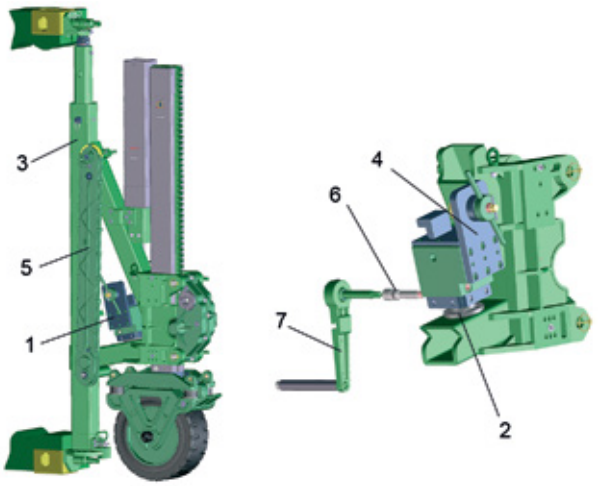


fig. 8-12

Loading /Storage

For loading/storage place the adapter (1) onto the storage pin (2) in the centre area of the pivotable corner pillar (3). Make sure, that the clamping plate (4) of the adapter (1) faces to the outside, hence into the direction of the stored crankcase (5). Attach safety bolt (6) to the crank (7), fasten the adapter (1) and lock its position in place. The tightening torque required is approx. 55 Nm. This corresponds to a crank force of approx. 250 N at an available crank radius of 225 mm. Afterward, remove crank handle (7) again.

8.11 Steering rod

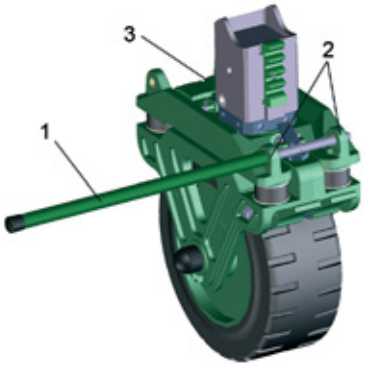


fig. 8-13

All wheel units (refer to chapter 8.5), whose rotation is not blocked or which are not force-steered while rolling, for example when using a tow bar (refer to chapter 8.13), must be manually steered. For this the steering rods are used, which are stored on each corner unit, and with which the wheel units are pivoted around the ball bearing in the racks (chapter 8.3) or adapters (chapter 8.10).

Mounting

Simply insert the steering rods (1) into the rowbar eyes (2) of the wheel unit mounting bracket (3).

Loading /Storage

For loading/storage insert the steering rod (1) into the mounting hole (3), which is located at the side of the pivotable corner pillar (2), and secure it using loss-proof mounted clip connectors (4).

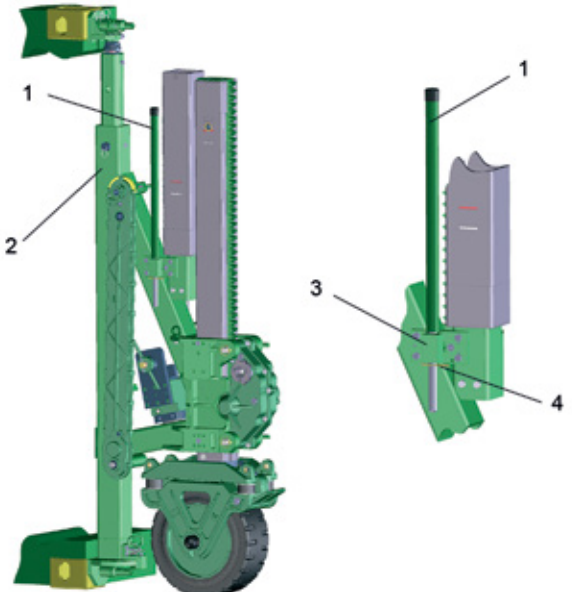


fig. 8-14

8.12 Tow bar

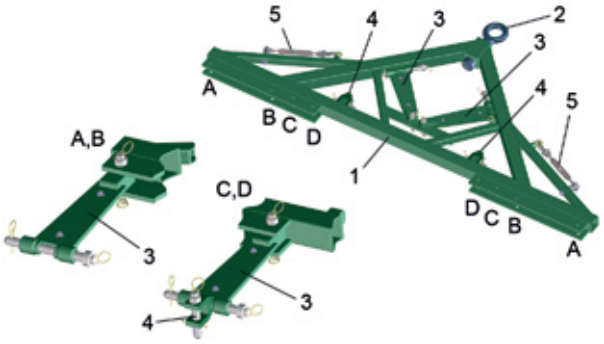


fig. 8-15

Tow bar aee used to connect the lifting, rolling and loading system to a towing vehicle for rolling operation. Adapters and different pivot points included in the delivery enable versatile use of the tow bar.

Technical data

Tow bar	unit	
Order number	-	209733
Weigth ~	kg	45
Permissible pulling force	kN	40

The tow bar consist of a robust aluminium weldment (1) A drawbar eye (2) is located at the front end, which is used to connect to a towing vehicle. It has an inner diameter of 76 mm and is 360° pivot-mounted. At the other end the pivot points (A-D) of the tow bar are located. Using different adapters (3,4) they are used to connect to the lifting, rolling and loading system or directly to the cabine.

Assembly and disassembly

Take the adapters (3) from their storage position by releasing the loss-proof mounted socket bolts and lock them in place on the respective pivot points as needed for the operational case.

Pivot point A is for standard rolling operation of the lifting, rolling and loading system. The corner units stand perpendicular to the front and back wall of the cabin. The Adapters (3) are mounted to the draw bar eyes of the wheel set mounting bracket. The rotation of the rear wheel sets is blocked; the front sets are force-steered by the tow bar.

Pivot point B is for narrow-track rolling operation of the lifting, rolling and loading system during airport/airplane loading. The corner units are pivoted to approx. 52° to the front or rear wall of the cabin. The Adapters (3) are mounted to the draw bar eyes of the wheel set mounting bracket as well. The rotation of the wheel sets cannot be blocked due to the bar position. Avoid steering movements via the tow bar. Minor corrections of the rolling direction must be done via steering of the rear wheel sets. For this installation type it is possible, to swing the tow bar via the adapters (3) upwards, around the draw bar eyes of the wheel set mounting; and to secure them in a storage position to the front corner units. For that the clamping screws (5) are inserted into tie-down rings of the front corner pillars.

Pivot point C is for rolling operation using wheel sets mounted directly under the ICO corners of cabin type ATS. The tow bar are connected to the drawbar eyes of the cabin, at which additionally the second adapter (4) must be interconnected. The rotation of the rear wheel sets must be blocked. The front wheel sets must be manually steered using steering rods in order to prevent uncontrolled turning of the wheels.

Für **Pivot point D** the same applies as for pivot point C, however with cabin type ATB and without using the second apapter (4).

System operation via pivot points A and B is preferred, even when the wheel sets are directly mounted under the ISO corners of the cabin. Operation via pivot points C and D should only occur in special cases.

Operating

In order to prevent danger to the operator, the tow bar, as well as the lifting, rolling and loading system, prior to or during pulling of the load it must be absolutely ensured, that

- all hand barkes of the wheel sets are released.
- rotation of all non-steering wheel sets is blocked.
- the permissible rolling speed of the pulling system is not exceeded.
- the premissible pulling force is not exceeded.
- fitful pulling and braking is avoided.

The lifting, rolling and loading system with cabin is set into motion and moved by careful pulling on the The lifting, rolling and loading system with cabin is set into motion and moved by careful pulling on the tow bar.

Inspection and maintenance

The tow bar must be inspected according to the operating conditions, however at least once a year by a technical expert (yearly occupational safety inspection according to Accident Prevention Regulation DGUV-V 54, §23, Section. 2). Technical experts are persons, who have sufficient knowledge based on their education and experience, in the areas of winchs, lift and pull systems and the relevant official occupational health and safety rules, accident preventation regulations, guidlines and generally accepted engineering rules (e.g EN standards), to evaluate the operational safety of winchs, lift and pull systems.

The tow bar design is mostly maintenance-free. The socket bolts and the corresponding mounting holes must be cleaned and lubricant Gleitmo 920 (Gleitmo, Munich) must be applied as required.

8.13 Lowering saftey device

The lowering safety device (1) is mounted at the gear box (2) to prevent a inadvertent lowering, respectively moving out of the rack pinion.

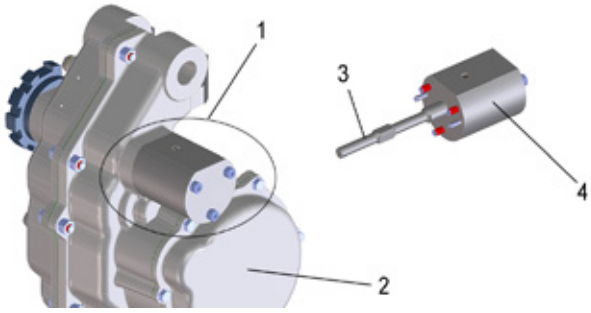


fig: 8-16

The shaft (3) inside the lowering safety device (1) is performed with a hexagon, which is form-fit fixed in the cover (4). Therefore the gear box is blocked.

When the crank or the crankcase are fixed in the gear box (2) the form-fix will become free and the gear box (2) is ready for operation.

8.14 Mounting winch (optional)

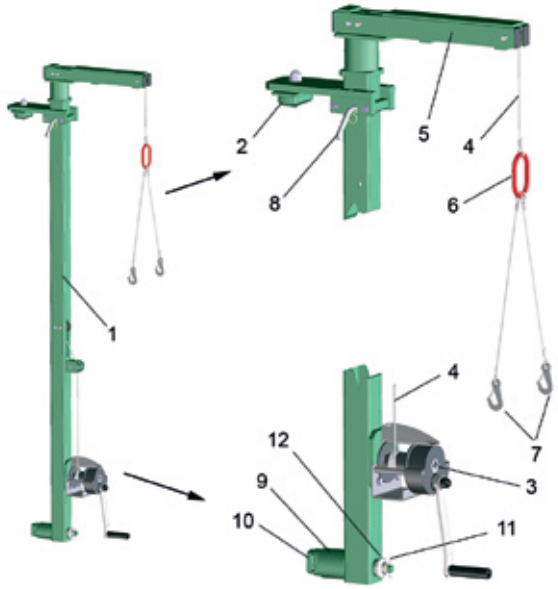


fig. 8-17

The assembly hoist is used as assembly support for all accessories of the lifting, rolling and loading system and simplifies their use. Due to partly high weights of the individual components it is hardly possible to install the lifting, rolling and loading system to a cabine standing on a carrier vehicle. If the cabine sits on the ground, then the use of an assembly hoist is not absolutely necessary. The load range of the assembly hoist is designed to enable the installation of a corner unit completely pre-assembled on the ground, to the cabine.

Technical data:

Mounting winch	unit	
Order number	-	209735
Perm. load, first rope layer	kN	3,5
Rope quality	Ø5 DIN3060 FE Zn k en 1770 SP	
Weight ~	kg	33
Crank force	N	120
Lift / turn crank	mm	46
Height ~	m	2600

The assembly hoist consists of a mounting bar (1), which must be used for cabine heights from 2100 mm to 2330 mm to accomodate the moveable top corner locking (2). A rope winch (3) used to lift the loads, is installed at the lower end of the mounting bar (1). The winch is equipped with a safety system to securely hold the lifted load in any height. The wire rope (4) is guided inside the mounting bar (1) and beam (5). The end of the wire rope (4) is equipped with suspension gear (6) and two hooks (7) to accept loads. The beam (5) is mounted to the mounting bar (1) and can be rotated by 360°. This enables installation of the lifting, rolling and loading system in the position ergonomically most suitable for each ISO corner.

Assembly and dissassembly

- Adjust the upper locking mechanism (2) to the respective cabin height and arrest using the loss-proof socket bolt (8).
- Mount the upper locking mechanism (2) from the top to the ISO corner of teh cabin.
- Insert the lower locking mechanism (9) form-fitting along the side wall of the cabine into the ISO corner. The swivel bearing in the upper locking (2) enables to first insert the assembly hoist from the front side while standing on the loading platform and to swivel it by 90° around the ISO corner of the cabin next.
- Turn the spring-strenghtened locking bolt (10) using the lever (11) by 90° . The locking bolt (10) engages with the lower locking mechanism (9) and generates a form-fitting finish.
- Establish the force-fitting connection between mounting bar (1) and ISO corner by manual tightening of the nut (12).
- Disassembly of the assembly hoist is done in reverse order of the above described assembly procedure.

Operating

In order to prevent danger to the operator, the assembly hoist, as well as to the lifting, rolling and loading system, prior or during lifting of a load must be ensured, that

- the load to be lifted or lowered must be flexibly movable.
- the lift capacity is not exceeded.
- always at least two rope enlacements remain on the drum of the ripe winch.
- no persons work under the lifted load.

After the assembly hoist is mounted to the cabin, individual components or a pre-assembled corner unit can be secured to the hooks. The components are lifted by operating the rope winch and placed into their assembly position. The installation of the lifting, rolling and loading system is executed as described in chapter 9.

Care and Maintenance

The assembly hoist must be inspected according to the operating conditions, however at least once a year by a technical expert (yearly occupational safety inspection according to Accident Prevention Regulation DGUV-V 54, §23, Section. 2). Technical experts are persons, who have sufficient knowledge based on their education and experience, in the areas of winchs, lift and pull systems and the relevant official occupational health and safety rules, accident preventation regulations, guidlines and generally accepted engineering rules (e.g EN standards), to evaluate the operational safety of winchs, lift and pull systems.
The gearbox parts of the rope winch (3) are filled in the factory with premium long running grease and the bearing points are equipped with maintenance-free slide bearings. Under normal operating conditions the lubrication is sufficient for approx. five years. Under extreme working conditions open the gearbox every two years and replace heavily worn parts and apply new lubricating grease (NATO Code G-421).

8.15 Air loading pallet (optional)

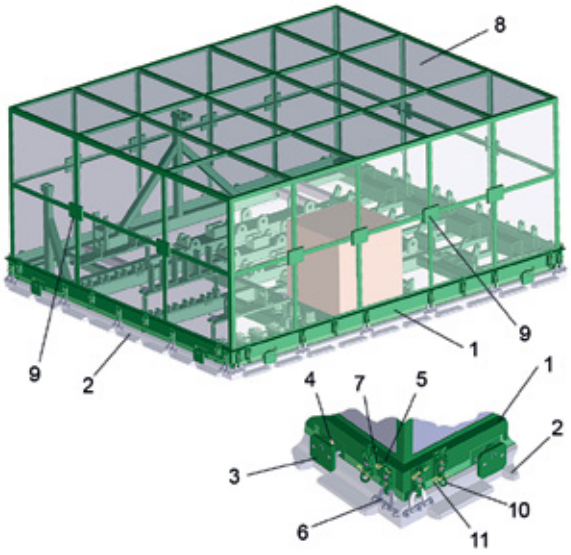


fig. 8-18

The air transport pallet is used to pack and store all individual components of the lifting, rolling and loading system including accessories and possible options safely for transport. The pallet can be mounted by performing a few actions onto a standard air transport pallet for airplanes of type C-160 Transall or Lockhead C-130 Herkules and enables the air transport of the system (without cover hood).

Technical data

Air loading pallet	unit	
Ordernumber	-	209732
Empty weight ~	kg	550
Total weigth (loaded) ~	kg	1920

The base frame (1) of the air loading pallet consists of a robust steel tubr construction, which should be mounted on a standard air transport pallet (2) according to MIL-P-27443E (88“x108“). For this adjust the adjustable stops (3) using a set screw (4) to the required dimensions and secure the base frame (1) using 22 hinged brackets adjustable in the clamping length, to the tie-down points (6) of the base. The hinged brackets (5) are secured with loss-proof mounted clip connector (7) against unintentional release.In order ro protect the packed individual components of the lifting, rolling and loading system against damage, the air loading pallet is covered with an Aluminium cover hood (8). For better handling of the cover hood (8), it is equipped with handles (9) on each side. The safe interlocking between cover hood (8) and base frame (1) is also ensured by adjustable hinged brackets (10), which are secured with clip connectors (11).

The cover hood is **not** designed for heavy loads. **It is neither suitable for flights nor stackable.**

Assembly and disassembly of individual components

In order to prevent danger to the system and its operator, careful handling of the partially heavy assemblies is absolutely required.

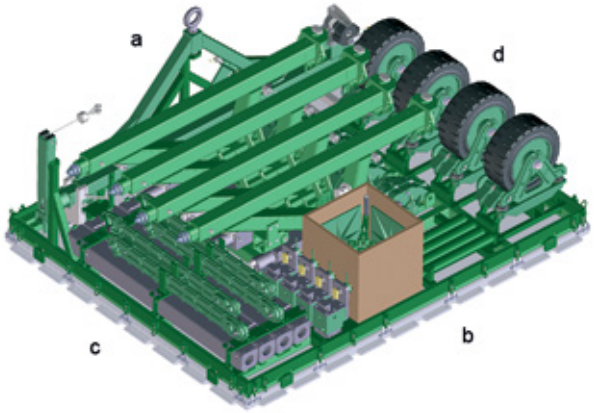


fig. 8-19

a = back side ; b = front side; c = left side; d = right side

The respective position of the individual components of the lifting, rolling and loading system, which should be stored for transport, are marked on the corresponding location on the base frame of the air loading pallet by appropriate information signs. It is absolutely necessary to follow the sequence described below when populating the air loading pallet:

1. **GEAR UNIT:** Place gearbox in the respective loading position with the ratchet disc facing the front. Insert socket bolts provided with the system from the back into the mounting holes, diconnect gearbox and secure socket bolts using clip pins attached to the base frame. **Start in front and continue step by step backwards.**
2. **RACK:** Insert rack with attached rack fastener form-fitting into the respective loading position, ensuring that the rack fastener faces backwards. **Start in front and continue step by step backwards.** After all racks are inserted, secure their position using the receptacles for the crankcases and the corresponding clamping screws. The two identical receptacles are loacted at the outside and face with the rounded side to the centre.
3. **CRANKCASE:** Hold crankcase vertically and insert the output square-end into the mounting holes. Pivot crankcase towards the gear racks and insert guides above the gear rack centre. Keep the locking bar pulled. Lock the crankcase in horizontal position by releasing the locking bar. **Start in front and continue step by step backwards.** After all crankcases are inserted, secure their positions with socket bolts and clip pins on the guide aove the gear rack centre.
4. **RACK EXTENSION:** Insert the rack extension form-fitting into the respective loading position ensuring that the handle faces to the right Push the pivotable corner pillar with the beam on top of the inserted rack extension, ensuring that the bottom corner locking faces to the right. Insert socket bolts attached to the base frame from the front into the mounting holes, secure corner pillar and secure socket bolts using clip pins. The steering rods remain stored on the pivotable corner pillar. **Start in the back continue step by step forwards.**
5. **WHEEL UNIT:** Roll wheel unit from the right towards the base frame, ensuring that the brake faces to the right. Tilt the wheel set and overlay the drawbar eyes of the wheel unit mounting plate with the right mounting holes. Insert socket bolts attached to the base frame from the front into the mounting holes, secure wheel unit on the drawbar eye and secure socket bolts using clip pins. Pivot wheel unit on top of the clamped drawbar eye and overlay opposite drawbar eyes with the mounting holes. Insert socket bolts attached to the base frame from the front into the mounting holes, clamp wheel unit on to the drawbar eye and secure socket bolts us-

ing clip pins. The brake faces to the left, the tires upwards. **Start in the back continue step by step forwards.**

6. **TOW BAR:** Lift tow bars form-fitting from the top into the respective loading position. Make sure, that the bar for storing the adapter in the centre area of the tow bars faces forward. If the rear part of the drawbar eye is guided, then the socket bolt, which is mounted to the vertical beam of the base frame, is inserted from the front into the mounting hole and the tow bars are secured. The socket bolts are secured with clip pins.
7. **MOUNTING WINCH:** Lift the mounting winch from the top into its loading position. Make sure that the rope winch faces to the right. Insert the beam of the mounting winch from the left form-fitting into the vertical beam of the base frame. Insert bottom corner lock of the mounting winch form-fitting into the receptacle and lock it in place similar to locking it onto a cabin. Insert socket bolts from the front on the steering of the mounting bar, secure mounting winch and secure socket bolts with clip pins.
8. **ADAPTER:** Attach adapter to the loading pin of the base frame. Make sure, that the clamping plate faces to the right. Fasten safety bolts into the mounting holes on the adapter using the crank handle and secure adapter in place. **Start in the back and continue step by step forewards.**
9. **RECEPTACLES OF THE SUPPORT PLATES:** Insert receptacles of the support plates from the left into the ball pins of the base frame. Engage them and insert them form-fitting into the respective position. After all receptacles are inserted, insert socket bolt attached to the base frame, from the front into the mounting holes and secure bolt with clip pins.
10. **BASE PLATE OF THE SUPPORT PLATES:**The base plate of the support plates, top receptacles as well as ratchet crank handles are packed into wooden boxes belonging to the air loading pallet. The closed wooden box is placed form-fitting onto the respective loading position, whereupon the clamping fasteners face forward. The wooden box is secured in its position by the means of a restraining strap attached to the base frame.
11. **UNLOADING**: When unloading the air loading pallet please follow the sequence in reverse order.

Care and maintenance

No special arrangements need to be made regarding care and maintenance. It must solely be ensured, that the plug connections are clean and the socket bolts can be inserted smoothly. That is, they must be cleaned and slightly greased if necessary. Equally, the hinged connections must be checked for functionality prior to each use and replaced if necessary.

8.16 Electric drive unit (optional)

An electric drive unit designed especially for the system saves time and reduces personnel requirements. This electric drive unit uses an operating voltage of 24 V DC and comes as an option.

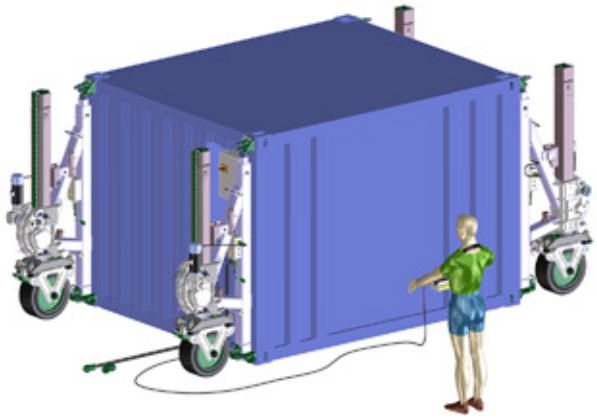


fig. 8-20

Technical data

Electric drive unit		**216036**
Operating voltage	V-DC	24
Rating	W	4x335
Protection class	-	IP65
type of duty	-	S1
Working temperature	°C	-40 / +70
for lifting, rolling and loading system		**1350.FR**
Gear ratio	-	20
Drive speed *)	1/min	100
Maximum load / set	kN lbf	100 22500
Maximum load / support	kN lbf	40 9000
Lifting speed	mm/min	240
Lifting time	min	7
Power consumption **)	A	48

*) The drive speed of the electric drive unit is the same as the input speed of the lifting gear.

**) measured value for dynamic load per system of 100kN

If faults occur on the electrical drive, you must fall back to manual operation (chapter 10). To do this, the gear motors are dismounted (chapter 8.15 „Installation of the gear motors“) and the lifting movements are carried out by the ratchet crank (chapter 8.8).

General

In the case of an electrical drive, all four corner units are driven electro-mechanically. The four motors of the corner units are connected to the main control unit via connection cables. The mobile manual control unit to control the lifting process is also connected to the main control unit. The energy is also connected in the main control unit. During the lifting process, the container must be lifted evenly so that it remains roughly level at all times. The maximum permitted load per support is reduced from 50 kN to 40 kN. A higher load on individual supports occurs when the container‘s tilt angle becomes greater and greater. When the load per system remains even, this results in the slip clutch of the affected support slipping instead and therefore counteracts too great a tilt angle.

Safety Instructions Electrical Equipment

Disconnect from the power supply when working on the electrical equipment.

Only permit authorised specialists to work on the electrical equipment. And electrical specialist is a person with suitable training and experience, as well as knowledge of the relevant regulations, who is able to recognize risks and avoid dangers, caused by electricity.

Always keep control cabinets closed.

Never:

Work on live parts.

Delivery

The electric drive unit consists of the following:

2 gear motor 1&2
2 gear motor 3&4
2 dispenser housing 1&4
2 dispenser housing 2&3
1 Control box
1 operating devicel
1 cable set
2 bar (rack)
2 bar (rack extension)

Mounting

If the optional electrical drive is also ordered at the same time as ordering the lifting, rolling and loading system, the parts are already mounted, with the exception of the main control unit.

If the electrical drive is retrofitted to the lifting, rolling and loading system at a later time, proceed as described below to mount the individual parts of the electrical drive.

The corner units are numbered from the point of view of the user. The corner unit on the left is corner unit 3, behind it is corner unit 1 (side 1). On the right, the corner unit at the front is corner unit 4, behind it is corner unit 2 (side 2). The gear motors of the electrical drive are installed on the gears of the four corner units. On side 1, the gear motors are mounted to the outside, on side 2, they are mounted to the inside.

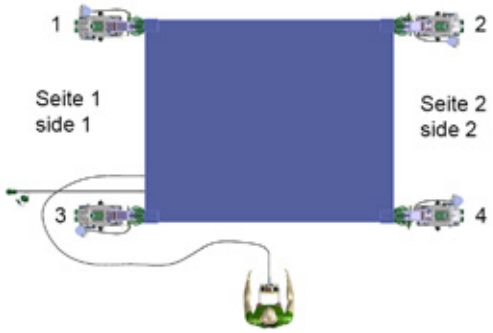


fig. 8-21

Installation of the bars

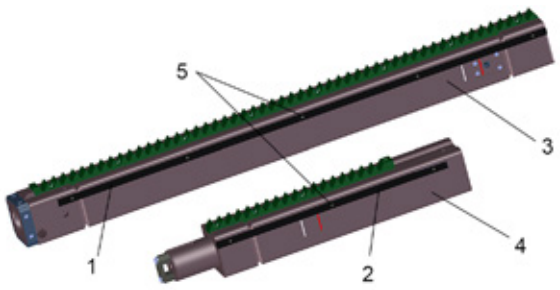


fig. 8-22

- Screw in the long bar (1) using nine countersunk screws (5) to all four gear racks (3).
- Screw in the short bars (2) using five countersunk screws (5) to all four gear rack extensions (4).

Installation of the dispenser housing

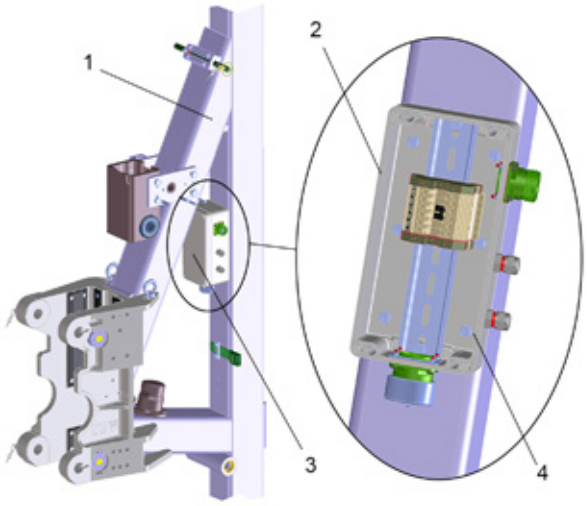


fig. 8-23 (Detail view depicted without cover))

- Mount the relevant dispenser housing (2) to all four corner pillars (1).

Adhere to the correct alignment of the dispenser housings. (Figure 8-20; outgoing cable always outside)

- Open the cover (3) of the dispenser housing (2) and use the cylinder screw (4) that is located on the pivotable corner pillar (1) to screw the dispenser housing to the relevant pivotable corner pillar.

Installation of the end limit switches

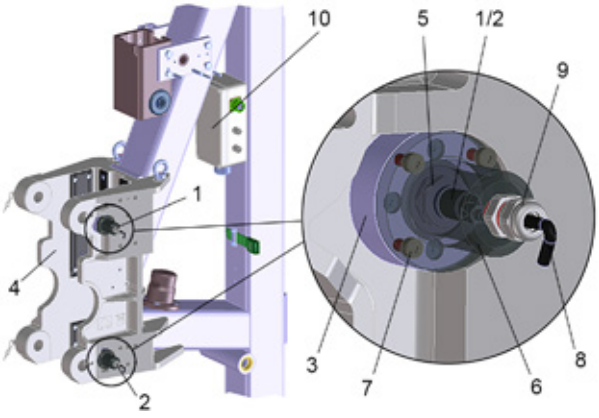


fig. 8-24

- Screw the top (1) and bottom (2) end switches into the receptacles provided for them (3) on the boom (4) and fix them with lock nuts (5).
- Fix the protective cap (6) with cylinder screws (7).
- Tighten the end switch cable (8) via the cable connection (9).
- Connect the end switch cable (8) of the top and bottom end switch in the dispenser housing (10). (Chapter 16 „Circuit diagrams“)

Installation of the gear motors

The gear motors (1/2) are each mounted in two mirrored designs. Only the position of the cable connections differs.
The gear motors can be mounted to both sides of the gear.
The gear motor (1/2) can be mounted directly to the side of the housing shield (4).

- Insert the drive shaft (5) of the gear motor (1/2) into the drive shaft (6) of the gear (3).
- Use the alignment pin (7) to align the motor.
- Tighten the hexagonal bolts (8).

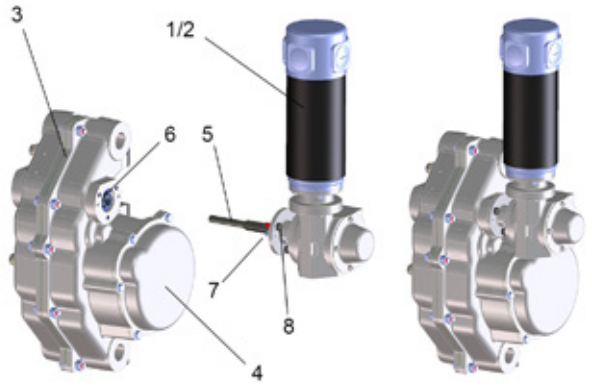


fig. 8-25

The ratchet disc (1) must first be demounted from the far side of the housing shield (4).

- To do this, unscrew the cylinder screws (2) and remove the ratchet disc from the gear (3).
- To assemble the gear motor, proceed as described in figure 8-24.

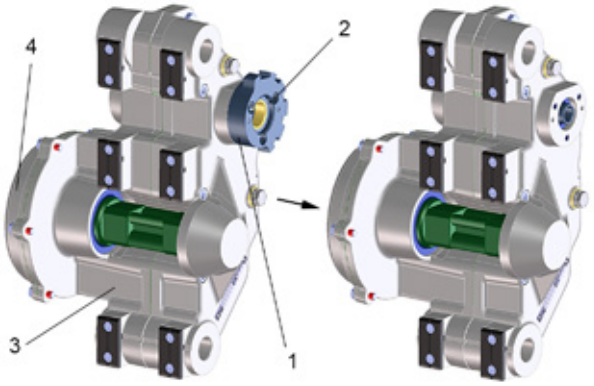


fig. 8-26

Installation of the control box

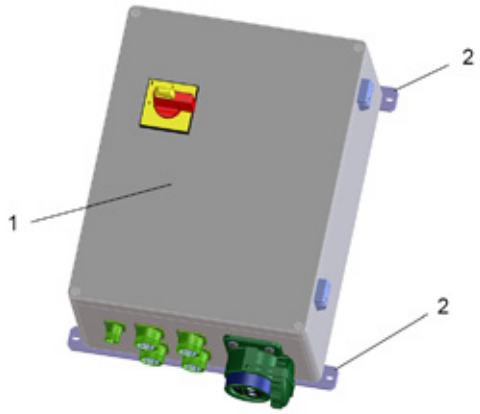


fig. 8-27

- The main control unit housing (1) is mounted to a location provided for it on the container, on two bars (2) using four M6 cylinder screws.

The hole pattern for the fixing screws is 382.5mm x 332.0 mm.

Cabeling

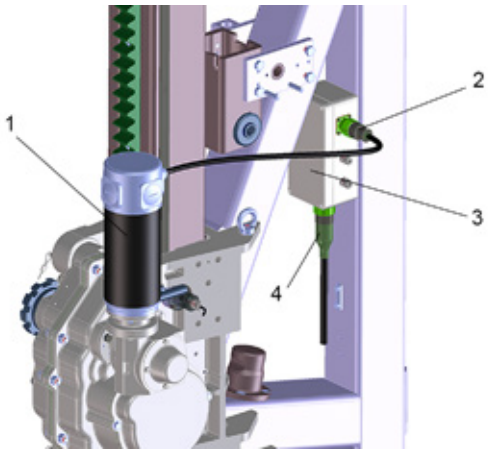


fig. 8-28

- Connect the cable plug (2) of the relevant gear motor (1) to the corresponding dispenser housing (3).
- Connect the cable plug (4) of the relevant connection cable to the corresponding dispenser housing (3).

The connection cables must be provided with a male connector on one end and a female connector on the other end. The ‚female connector' end of the cable must be used to install the connection cable on the dispenser housing.

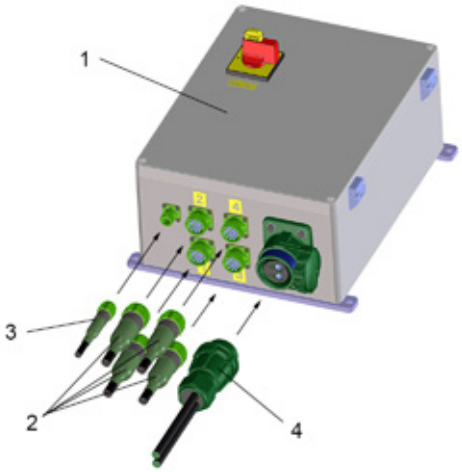


fig. 8-29

- Insert the cable plug (2) of the connection cable into the main control unit (1).

Adhere to the signage on the main control unit housing, in order to guarantee that the individual corner units are aligned correctly.

- Connect the control cable (3) to the main control unit (1).
- Connect the power supply cable (4) to the main control unit (1).

fig. 8-30

- Connect the manual control unit (1) to the main control unit housing via a control cable (2).

The electrical drive is dismantled in the opposite sequence.

Circuit diagram
Circuit diagrams for the electrical drive can be found in chapter 16 „Circuit diagrams“.

9. MOUNTING THE LIFTING, ROLLING AND LOADING SYSTEM

The lifting, rolling and loading system is fitted to the ISO corners of the container being lifted.
When installing the system on the container, the four corner units are each installed on one corner of the container. If the optimal electrical drive is used, ensure that the relevant bars (1, 2, 3, 4) are assigned to the corresponding container corner. An overview diagram is provided in the electrical drive chapter (chapter 8.15).

When installing the individual components, proceed per the sequence described below. The removal of the lifting, rolling and loading system is performed in the opposite sequence.

During operation of the lifting, rolling and loading system, visual contact must be maintained with all four supports at all times; if necessary, assistance must be sought from another person.

In order to avoid danger to man and machine, before lifting the container, make absolutely sure that
- the container is unlocked from the carrier vehicle
- the corner units are properly installed in their operating position
- the lift capacity is not exceeded
- sufficiently firm ground is available

The container is lifted and lowered in all operating modes manually, with the help of the crank and crankcase.

- Container on lorry: Use of assembly crane mandatory
- Container stands on the ground: Use of assembly crane is optional.

9.1 Installation of top receptacle

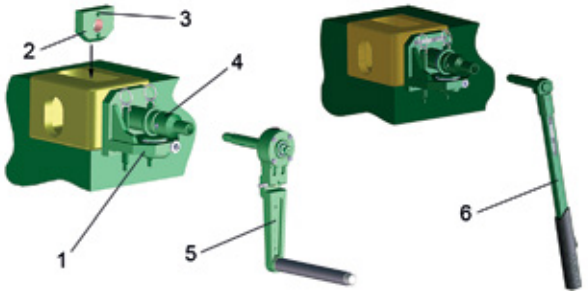


fig. 9-1

Absolutely comply with the location and layout of the 3 spring elements (chapter 8.1).

For mounting the top receptacle, only use an appropriate auxiliary device (e.g. a ladder).

- Insert top receptacle (1) from the front side into the ISO corner.
- Insert clamping plate (2) from the top into the ISO corner and hold it using a positioning drilling (3) in the top receptacle (1).
- Fasten locking bolt (4) into the clamping plate.
- Insert the crank handle (5) into the top receptacle (1) and tighten the connection.
- The required tightening torque of 90 Nm is achieved with the torque wrench.
- Deinstallation is done with the crank handle only.

The torque wrench must be inspected yearly according to the technical guideline 003 « CT 003/AP/MB/DEF/DCMAA/OL.E/MS2 du 23/11/2001 ».

Storage: The top receptacle, as well as the support plates are not lorried on the pivotable corner pillar.

9.2 Pivotable corner pillar installation

The mounting of the corner pillar should preferably be done by 2 persons.

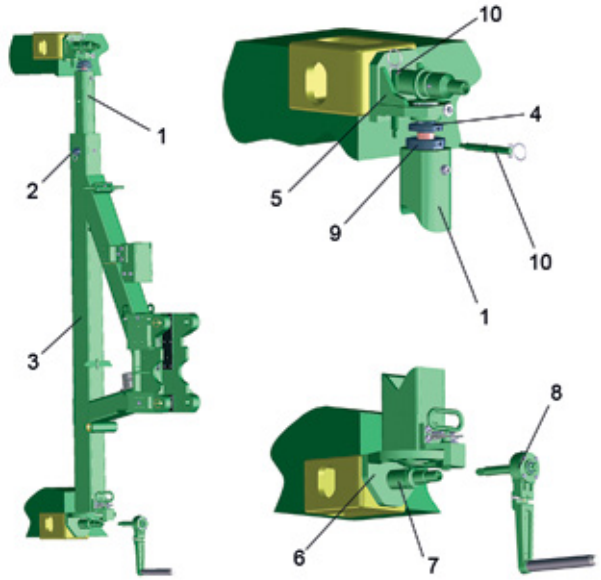


fig. 9-2

- Extend telescopic pipe (1) to the respective cabin height and secure with socket bolt (2).
- Insert pivotable corner pillar (3) with ball coupling (4) into top receptacle (5).
- Insert bottom receptacle (6) from the front side into the ISO corner. Make sure that the ball coupling (4) remains in the joint socket.
- Turn locking bolt by 90° using a cylinder screw (7) and lock bottom receptacle (6) into the ISO corner.
- Insert crank handle (8) into the bottom receptacle (6) and tighten connection. The tightening torque of 90 Nm required is achieved with the torque wrench.
- Remove possibly existing backlash from the system by removing the ball coupling (4).
- Turn lock nut (9) in the direction of the telescopic pipe (1) and clamp it using the adjustment tool (10). The ball coupling (4) is now secured.
- Deinstallation is done in reverse order.

When setting the corner pillar down on the pallet or the ground, make sure, that the „steering rod“ side faces upwards and not the „crank side“. (Protection against damage to the crank)

9.3 Assembly of rack fastener / rack extension

In order to extend the lift (stroke) above 1250 mm, the rack extension must be installed.

Assembly of rack fastener

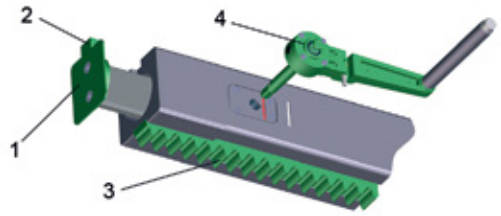


fig. 9-3

- Insert rack fastener (1) with the positioning area (2) form-fitting into the rack (3).
- Insert crank (4) into the rack (3) and lock rack fastener (1) in place. The tightening torque required is approx. 55 Nm. This corresponds to approx. 250 N crank force at an existing crank radius of 225 mm.
- Take crank (4) off again.
- Deinstallation is done in reverse order.

Assembly of rack extension

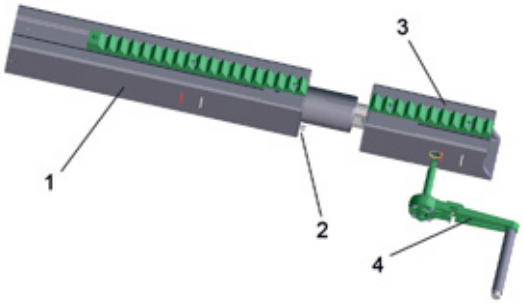


fig. 9-4

(after the rack fastener is deinstalled)

- Insert rack extension (1) with the positioning pin (2) form-fitting into the rack (3).
- Insert crank (4) into the rack (3) and lock rack extensionr (1) in place. The tightening torque required is approx. 55 Nm. This corresponds to approx. 250 N crank force at an existing crank radius of 225 mm.
- Take crank (4) off again.
- Deinstallation is done in reverse order.

9.4 Installation of rack and gear unit

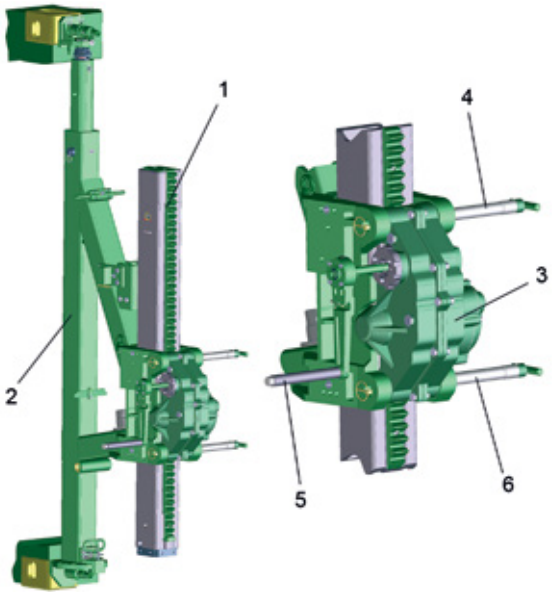


fig. 9-5

- Insert rack (1) into pivotable corner pillar (2). Make sure, that the gearing is located at the side not facing the pivotable corner pillar.
- Attach gear unit (3) to the rack (1). Overlay the upper borehole of the gear unit (3) with the upper borehole of the pivotable corner pillar (2).
- Insert upper socket bolt (4) and secure it.
- Insert crank (5) into the gear unit (3).
- Engage the rack (1) with the box (3) by turning the crank (5). Overlay the lower boreholes of the gear unit (3) with the upper boreholes of the pivotable corner pillar (2).
- Insert lower socket bolt (6) and secure it.
- Raise gear racket (1) by turning the crank (5), until it is flush with the lower side of the pivotable corner pillar (2).
- Take crank (5) off again.
- Deinstallation is done in reverse order.

If using the optional electrical drive, using the crank handle is not possible due to the gear motor that is mounted in its place. Here, the gear rack must be manually corrected upwards or downwards until the gear rack can be meshed to the gear.

9.5 Installation of the wheel unit

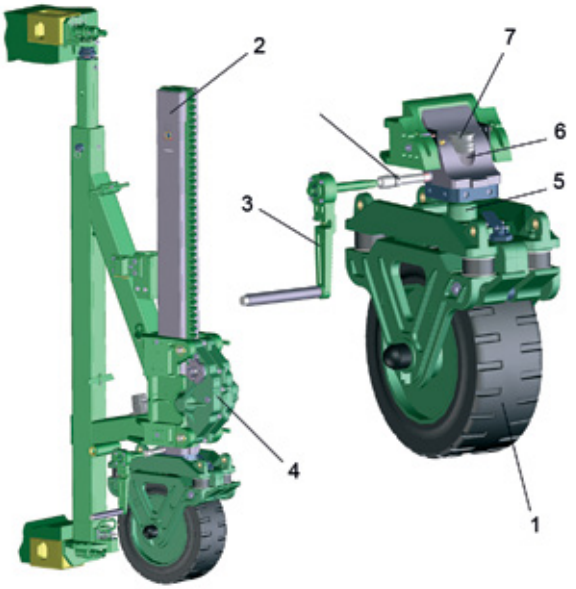


fig. 9-6

- Toll wheel unit (1) under the rack (2).
- Insert crank (3) into the gear unit (4).
- Lower gear track (2) by turning the crank (3). Make sure, that the king pin (5) of the wheel unit (1) and the mounting hole (6) of the rack (2) are aligned.
- Remove crank (3) as soon as the ball bearing (7) or the rack (2) stands up on the king pin (5). In this case, the distance between the rack (2) and the king pin (5) remains unchanged and the crank force increases.
- Attach safety bolt (8) to the crank (3) and screw into the rack (2). The tightening torque required is approx. 55 Nm. This corresponds to approx. 250 N crank force at an existing crank radius of 225 mm.
- The safety bolt (8) must not protrude.
- Remove crank (3) and insert it into the gear unit (4).
- Turn the wheel unit (1) free by rotatinfg the rack (2).
- Take crank (3) off again.
- Deinstallation is done in reverse order.

If using the optional electrical drive, the gear rack can be moved in until switching off at the bottom end switch. The wheel set can be mounted or dismounted in this position. However, if the container is placed on the floor, the bottom end switch must be „overrun“. (Chapter 10.4 Setting mode operating mode: setting option „CU“)

9.6 Installation of crankcase

The crankcase is not applicable in the design with the optional electrical drive.

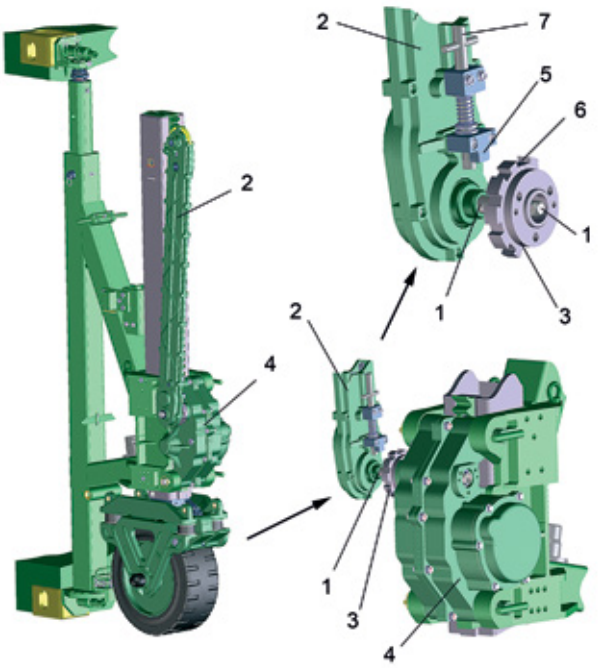


fig. 9-7

- Insert square bolt (1) of the crankcase (2) into the ratchet disc (3) of the gear unit (4). Make sure, that the stop (5) is located directly on top of the assembly opening (6) of the ratchet disc (3).
- Pull the locking bar (7) of crank case (2) against the spring and hold it.
- Press crankcase (2) against gear unit (4), until stop (5) engages behind the ratchet disc (3).
- Swing crankcase (2) into the desired position and lock it into place by releasing the locking bar (7).
- Deinstallation is done in reverse order.

If using the optional electrical drive, assembling and using the crankcase is not required and is not possible due to the gear motor that is mounted in its place.

9.7 Lorry position of not necessary individual components

For all individual components of the lifting, rolling and loading system a lorrying position is defined on the respective pivotable corner pillar. If components are not necessary for a certain mode of operation, then the components are there loss-proof lorried. The same applies during the transport of a cabin with installed lifting, rolling and loading system on a carrier vehicle.

Rack extension / rack fastener

Gear rack fastener and gear rack extension depend on the case of application. They must be exchanged according to the required lifting height.

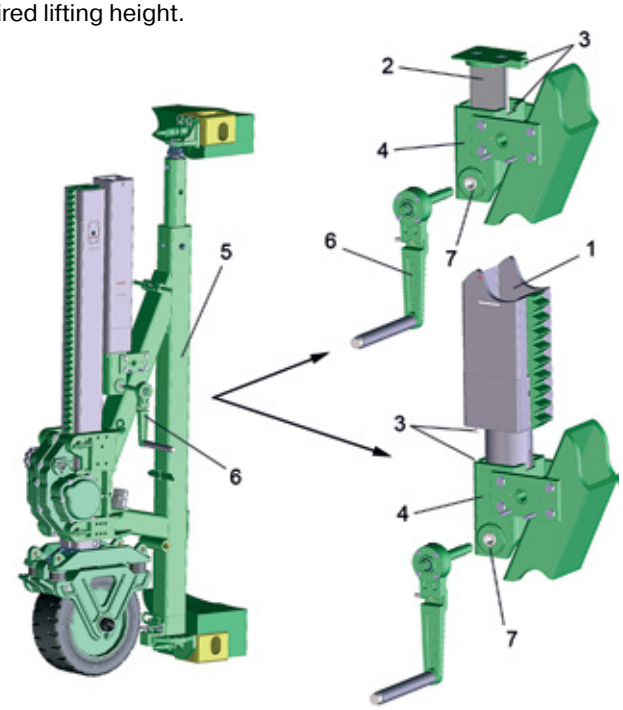


fig. 9-8

- Insert rack extension (1) or rack fastener (2) using the positioning help (3) form-fitting into the lorried mounting (4) on the pivotable corner pillar (5). The rack points into the direction of the container.
- Insert crank (6) into the lorried mounting (4) and secure rack extension (1) or rack fastener (2) in place. The tightening torque required is approx. 55 Nm. This corresponds to approx. 250 N crank force at an existing crank radius of 225 mm
- Tighten lock nut (7) hand-tight in order to secure the anchorage.
- Take crank (6) off again.

Crankcase

The installation of the crankcase in working position is only required for setting up and down mode (chapter 10.1). In all other operating modes it should be lorried on the pivotable corner pillar. Lorrying of the crankcase can be done on both sides of the pivotable corner pillars. In order to avoid collisions with the cabin when the pivotable corner pillar is pivoted into its transport position, the lorrying should always be done on the side directed to the outside.

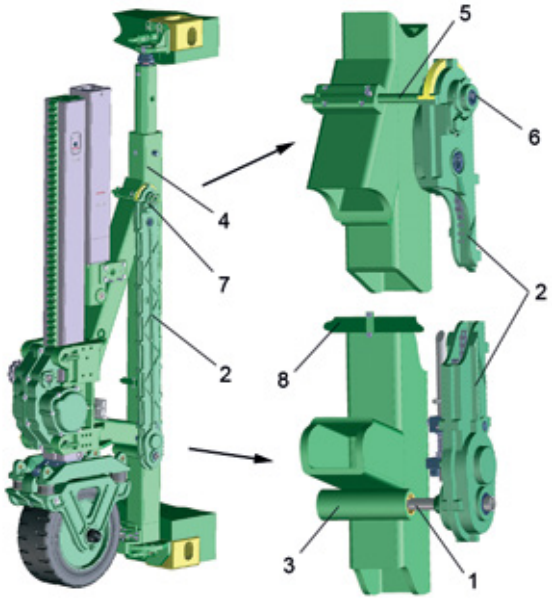


fig. 9-9

- Insert square bolt (1) of crankcase (2) into the lower receptacle socket (3) of the pivotable corner pillar (4).
- Swing crankcase (2) into almost vertical position and push the movable lorry bolt (5) through the crank receptacle (6) of the crankcase (2).
- Secure lorry bolt (5) using clip pins (7).
- Lock lorry position of the crankcase (2) in place using a tie-down strap (8).

Crank

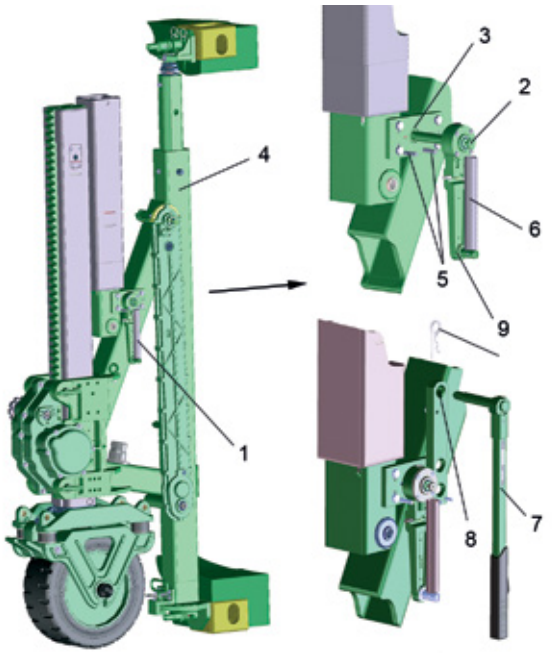


fig. 9-10

- Release ball raster of crank (1) by pressing the safety button (2).
- Insert crank (1) into the receptacle socket (3) of the pivotable corner pillar (4). Position the crank arm centred between the two cylinder pins (5).
- Engage crank (1) by releasing the safety button (2).
- Fold handle (6) lof crank (1) away.

Torque wrench

- Insert torque wrench (7) into borehole (8) and secure with clip connector (9). (see fig. 9-10)

9.8 Remarks regarding system assembly and disassembly

- The installation of the system is identical for all four corners.
- Deinstallation is done in reverse order.
- An assembly hoist is optionally availabe to facilitate installation and deinstallation of the system (chapter 8.12), with which heavy assemblies or already fully pre-assembled corners can be easily handled.

⚠ In case the parked system is left unattended, the cranks must be removed from their storage position and kept inaccessible to unauthorized persons.

10. OPERATING THE LIFTING, ROLLING AND LOADING SYSTEM

⚠ In order to prevent danger to the operator, as well as the lifting, rolling and loading system, prior to lifting the container it must be absolutely ensured, that

- the containter is released at the carrier vehicle.
- the lifting, rolling and loading system is correctly installed in operating position.
- the receptacles are tightly screwed to the ISO corners.
- lifting capacity, permissible rolling speed and max. rolling height are not exceeded.
- sufficiently firm ground is available

10.1 Lowering operation

This operating mode is used to lift and set down the container from or onto a carrier vehicle, as well as to park a container, which has been raised up to operating height and positioned, for an extended period of time. If the wheel units are installed, it is possible to roll the container over short distances.

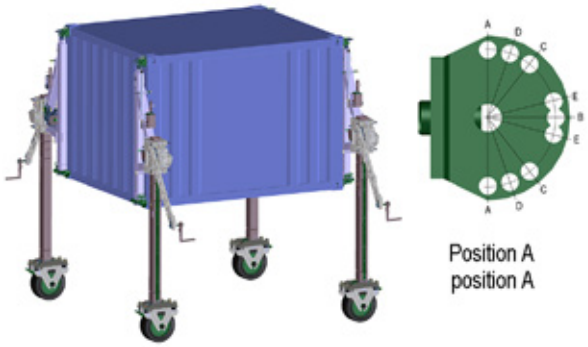


fig. 10-1

⚠ The container must be loaded onto and unloaded from the carrier vehicle on a level, paved surface (e.g. concrete).
If the loading or unloading process is performed on the wheel units, the parking brake must be engaged on all four wheel units. The rotation locks must also be applied on the wheel units.
It is not permitted to leave the container standing on the wheel units for an extended period. If an extended period of standing time is needed, then the wheel units must be replaced for the base plates.

In order to set the container with the lifting, rolling and loading system down on the ground, proceed as follows:

fig. 10-2

- Swing corner units from lorry/loading position into the set-down position and secure them using socket bolts to the ratchet disc. Corner units stand perpendicular to the sidewall of the cabin.
- Turn wheel sets parallel to the sidewall of the cabin and block against rotation.

fig. 10-3

- Release crankcases from the lorry position, mount them to the gear units, swing them into an ergonomic crank height and lock them into place.
- Insert cranks into the fast speed mounting of the crankcases and lower racks to a conventient height for the installation of the rack extensions.
- Install rack extensions and store the rack fasteners in their lorry positions in the corner pillar.

fig. 10-4

- Lower rack further until tires have contact with the ground.
- Apply hand brakes of the front wheel sets and release the rear ones.

fig. 10-5

- Insert cranks into the working speed mount of the crankcases and lift cabin until the carrier vehicle is clear. Ensure uniform lifting speed, in order to avoid overloading of individual supports. Do not exceed the maximum lifting height.
(–> Pos. 8 and Pos. 10, fig. 8.4)

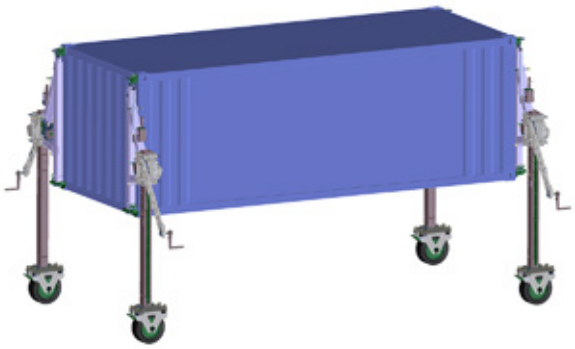


fig. 10-6

- Drive carrier vehicle away from under the lifted cabin.

Positioning help required!

- Align container in horizontal position.
- Move container into desired position or set it down on the ground by uniform cranking. The second run-off protecton on the crankcases must be released during cranking.
- Switch rack extensions and rack fasteners back again.

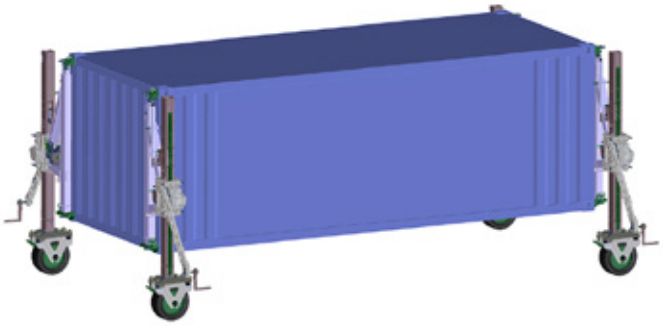


fig. 10-7

- If the container is set down on the ground, swing corner units into lorry position and secure them if necessary.

In order to set the container with the lifting, rolling and loading system back onto the carrier vehicle, the above described procedure must be followed in reverse order.

10.2 Rolling operation

In order to drive the container with the lifting, rolling and loading system with a speed of up to 6 km/h (fig. 10-8), proceed as follows:

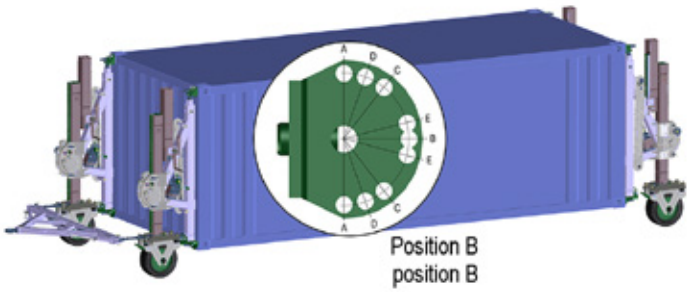


fig. 10-8

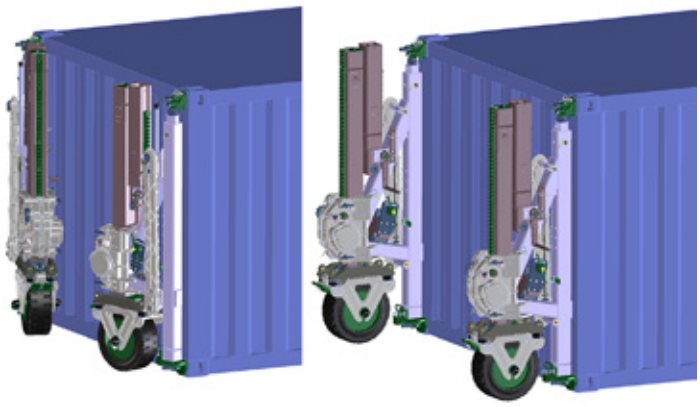


fig. 10-9

Only pivot into the desired operating position on a level, paved surface (e.g. concrete).

- Swing corner units from lorry/loading or set-down position into the rolling position and secure them using socket bolts to the ratchet disc. Corner units stand perpendicular to the front- or backside of the container. The track width is approx. 2500 mm.
- Turn wheel sets into rolling direction. Observe specified direction of rotation of the wheels. (Chapter 8.5)
- Block rear wheel sets against rotation. (Chapter 8.5 Locking 7)

fig. 10-10

- Swing crankcases into an ergonomic crank height and lock them in place.
- Insert cranks into the working speed receptacle of the crankcases and lift cabine up to rolling height. Normally the rolling height is 300 mm.
- Lock the crankcases in place in their lorry position on the pivotable corner pillar.
- Release hand brakes of the wheel sets.

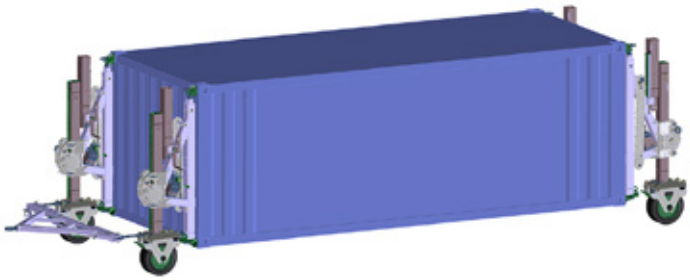


fig. 10-11

The lifting, rolling and loading system is ready to roll and can be moved with a speed of up to 6 km/h. A pulling rod is required to enable rolling operation and to establish a connection between the cabin or the lifting, rolling and loading system and a towing vehicle. The pulling rods are available as option (Chapter 8.13).

The maximum rolling speed of 6 km/h must **not** be exceeded and for uneven ground **must** be adjusted to the obstacles dimensions (max. 1.5 km/h).

Wheel units, which are not steered, **must** be blocked against twisting in rolling operation mode.

If the wheel units are steered manually while rolling, this means utilizing steering rods (--> Chapter 8.11), then crossing of obstacles is **not** permitted.

10.3 ‚Sloped ramp' loading mode

This operating mode is used for loading and unloading a transport aircraft via the sloped ramp.

During loading of the container into the transport aircraft, the respective applicable loading regulations must be observed. Aircraft-specific parameter, such as permissible ground pressure, required safety distances, etc. must be observed.

The relevant loading specifications for the aircraft type must be adhered to due to the bearing load of the solid rubber tyres.

There are two possibilities to load the container via the sloped ramp. This methods are described in the following captures:
- rolling in over the sloped ramp via all four wheel sets (10.3.1)
- rolling in over the sloped ramp via the two wheel sets in the front (10.3.2)

10.3.1 Rolling in via all four wheel sets

Rolling in via all four wheel sets over the sloped ramp is possible by broad gauge or narrow gauge. This depends on if the roller tracks of the loading ramp and the floor of the aircraft are mounted or not.

Following pivot positions are used:
Position B: Rolling in via broad gauge / without roller tracks
Position C: Rolling in via narrow gauge / between the roller tracks

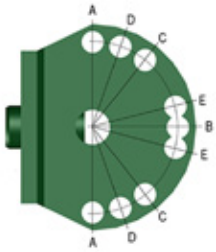


Bild 10-12

Prerequisites for the transport aircraft
- The transport aircraft must be lowered to the lowest loading position and supported. The height of the bend in the ramp must be approx. 760 mm.
- The ramp must be set down on the ground.
- Four run-up wedges of approx. 1200 mm in length must be present.
- The roller tracks must have been removed from the loading ramp and the floor of the aircraft.
- The aircraft's own on-board rope winch is used to pull in or roll out the container. To half the rolling-in speed, a deflection roller is used.

Loading the transport aircraft

The container is rolled up to just in front of the end of the ramp and aligned with the axis of the aircraft. The tow bar is located on the side of the container facing the aircraft. The brakes and the rotation lock are applied on the wheel units.

In the following the rolling in is pictured without roler tracks.

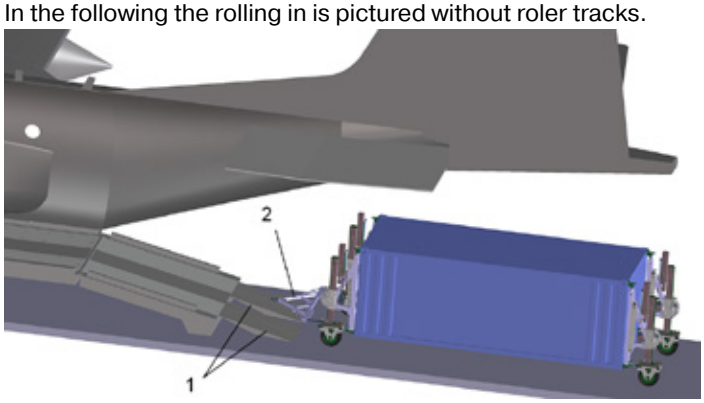


fig. 10-13

- Align the run-up wedges (1) to the wheelbase of the wheel units. They must line up with the reinforced rolling track on the floor of the aircraft.
- Secure the pulling-in rope of the on-board winch to the tow bar (2) via the deflection roller.
- Release the rotation locks on all wheel units (10).

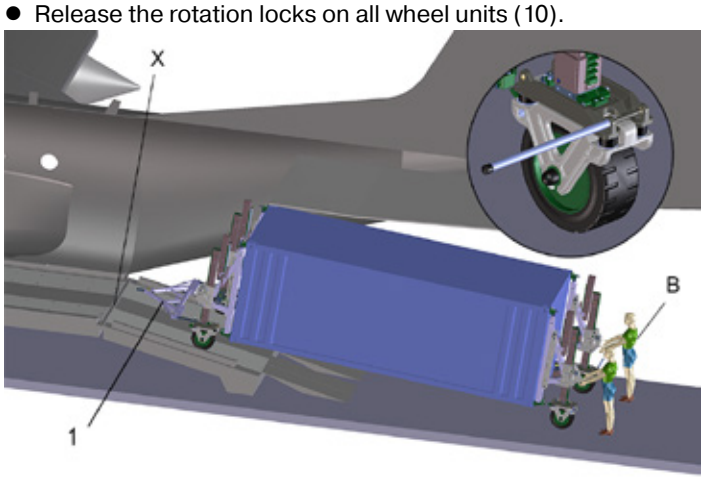


fig. 10-14

- Lift or lower the front of the container with the installed tow bar (1) using the crank, until there is a clearance of approx. 50 mm between the container and the ground.
- Pull the container over the run-up wedges with the on-board winch and stop.

⚠ The pulling-in rope must not rub against the bend in the ramp (x) during the whole loading process.

⚠ During the rolling-in process, steering is only possible at the back of the container. Steering is performed by two operators (B) using the steering rods on the rear left and right wheel units.

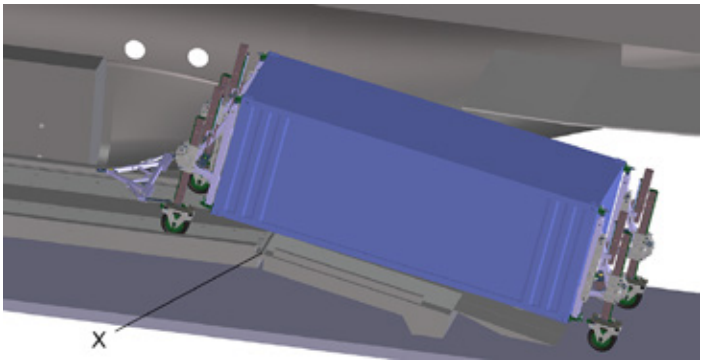


fig. 10-15

- Roll the container over the loading ramp into the aircraft using the on-board rope winch. Where necessary, pause to correct the height of the container with the crank.
- Adjust the steering once the bend in the ramp (x) is reached.
- Perform a height correction (lift) on the front and back corner units on the container.

⚠ The bottom of the container must not rest on the bend in the ramp (x) during the whole loading process.

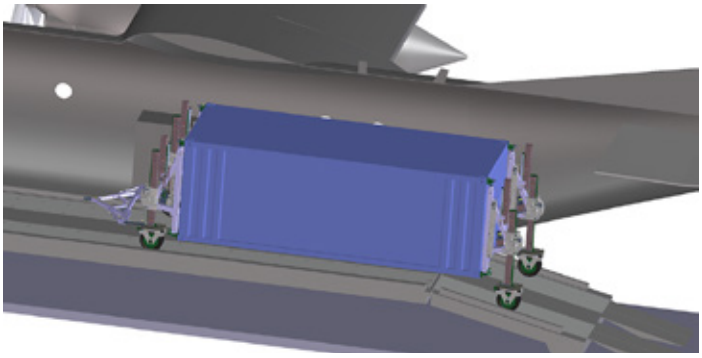


fig. 10-16

- Continue to pull in the container with the on-board rope winch, while making continuous height corrections. At this point, lower the container at the front corner units and, if necessary, lift it higher at the rear.

⚠ Where possible, the container must be rolled into the aircraft in a horizontal position. Avoid collision between the container or lifting, rolling and loading system and the transport aircraft at all costs. Clearance from the ground, roof and side walls must be monitored throughout the whole loading process.

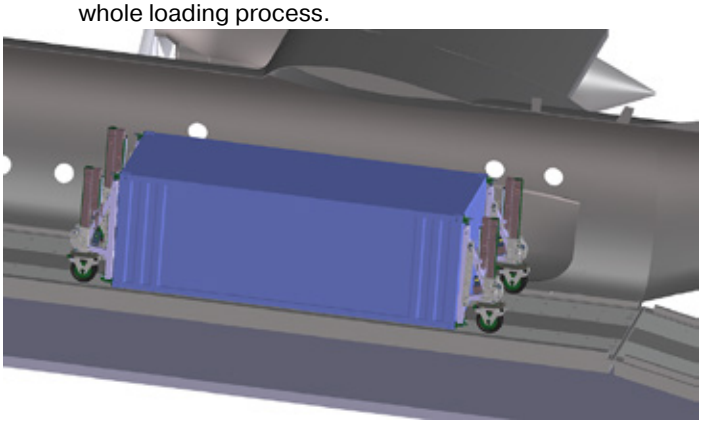


fig. 10-17

- Align the container horizontally, roll to the intended loading spot in the aircraft and set down on the floor of the aircraft. The precise location is dependent on the centre of gravity of the container and the load inside, and is should be selected based on applicable loading regulations.

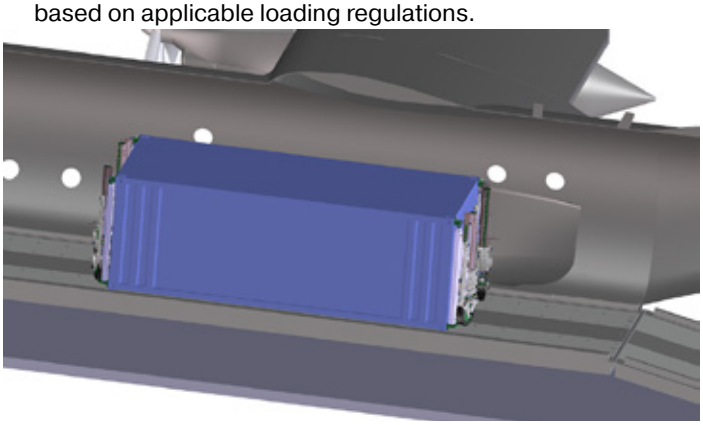


fig. 10-18

- If necessary, turn the corners in the loading position.
- In transport position, the wheel set of each corner unit must be in contact with the cargo area of the carrier vehicle. Thus the stored system is slightly pre-tensioned, which largely avoids damaging vibrations.
- Lash the container in position for transport.

⚠ No lashing may be attached to components of the lifting, rolling and loading system.

Loading the container into the aircraft in „narrow-gauge“ mode

For this application case „Loading the container into an aircraft“, rolling operation with a narrow track width of approx. 1700 mm is also possible. For this, roll the container with standard track width up to the aircraft ramp and set it down. Next, pivot and secure the corner units into the respective position. They are at an angle of approx. 50° to the front or back wall of the container. The rotation of the wheel sets cannot be blocked in this case. While rolling the container into the aircraft, all wheels must be steered using the pulling rod or manually.

This track width accords to the rolling treadways of C130 Hercules and C160 Transall. The roller tracks can remain on the floor of the aircraft.

⚠ Handle with care while pivoting the support!
Crushing hazard!

10.3.2 Rolling in via the two wheel sets in the front

Only the two wheel sets in the front will be rolled in over the sloped ramp. As soon as they are on the floor of the aircraft, the container will aligned horizontally and the ramp will be lifted. The container will be rolled in by mean of the roller tracks from the aircraft.

Front side with steering rod: position C: rolling in with narrow gauge/ between the roller tracks

Back side: position B: broad gauge

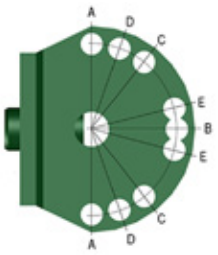


fig. 10-19

Prerequisites for the transport aircraft

- The transport aircraft must be lowered to the lowest loading position and supported. The height of the bend in the ramp must be approx. 760 mm.
- The ramp must be set down on the ground.
- Four run-up wedges of approx. 1200 mm in length must be present.
- The roller tracks must have been mounted on the loading ramp and the floor of the aircraft.
- The aircraft‘s own on-board rope winch is used to pull in or roll out the container. To half the rolling-in speed, a deflection roller is used.

Loading the transport aircraft

The container is rolled up to just in front of the end of the ramp and aligned with the axis of the aircraft. The tow bar is located on the side of the container facing the aircraft. The brakes and the rotation lock are applied on the wheel units.

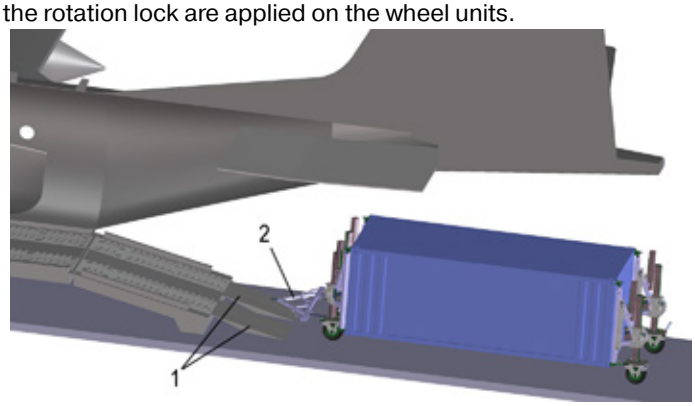


fig. 10-20

- Align the run-up wedges (1) to the wheelbase of the wheel units. They must line up with the reinforced rolling track on the floor of the aircraft.
- Secure the pulling-in rope of the on-board winch to the tow bar (2) via the deflection roller.
- Release the rotation locks on the wheel units (10) on the behind side.

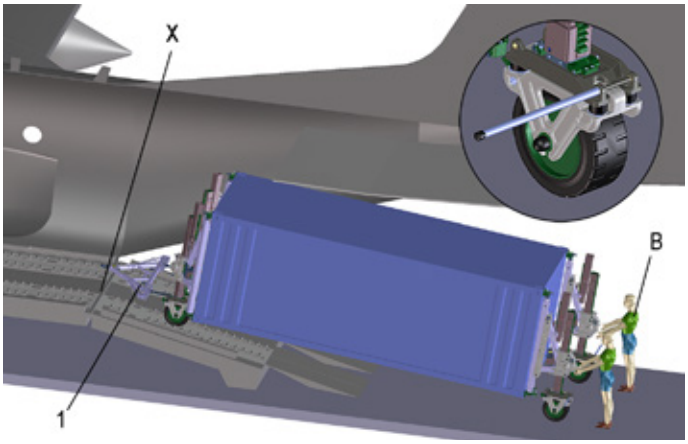


fig. 10-21

- Lift or lower the front of the container with the installed tow bar (1) using the crank, until there is a clearance of approx. 50 mm between the container and the ground.
- Pull the container over the run-up wedges with the on-board winch and stop.

⚠ The pulling-in rope must not rub against the bend in the ramp (x) during the whole loading process.

During the rolling-in process, steering is only possible at the back of the container. Steering is performed by two operators (B) using the steering rods on the rear left and right wheel units.

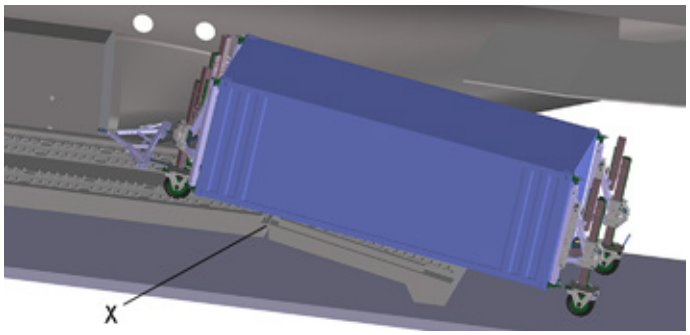


fig. 10-22

- Roll the container over the loading ramp into the aircraft using the on-board rope winch. Where necessary, pause to correct the height of the container with the crank.
- Adjust the steering once the bend in the ramp (x) is reached.
- Perform a height correction (lift) on the front and back corner units on the container.

The bottom of the container must not rest on the bend in the ramp (x) during the whole loading process.

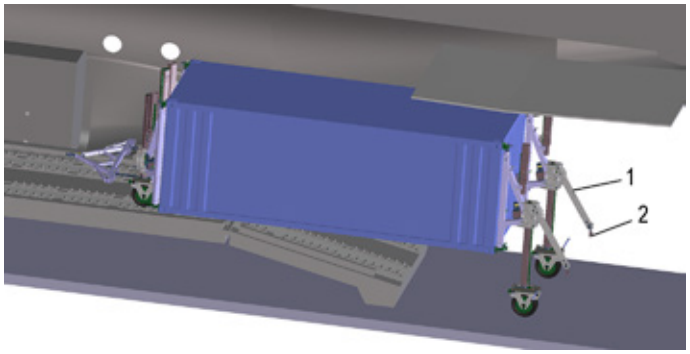


fig. 10-23

- Displace the front side of the container on the roller tracks
- Lift up the container at its back side until it is parallel to the roller tracks inside the aircraft by means of the crankcase (1) and the crank (2).

Avoid collision between the container or lifting, rolling and loading system and the transport aircraft at all costs. Clearance from the ground, roof and side walls must be monitored throughout the whole loading process.

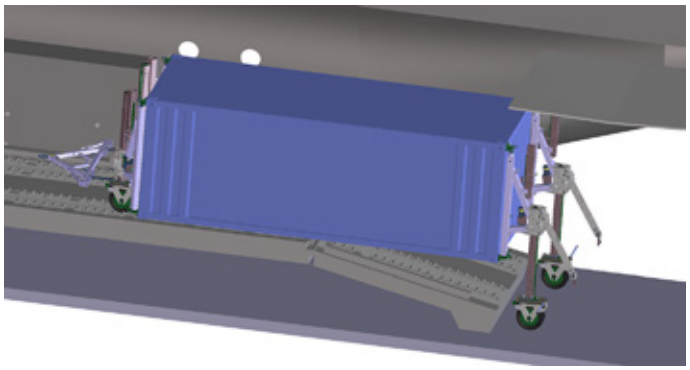


fig. 10-24

- Move the container into the aircraft until the wheel sets on the back side are near by the sloped ramp.

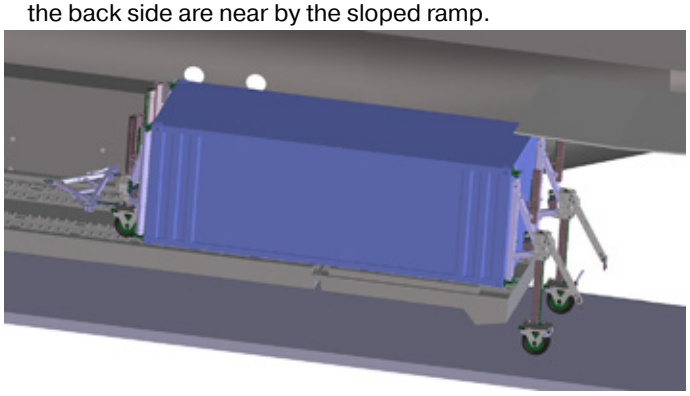


fig. 10-25

- Lift the ramp of the aircraft until it is in extension to the floor of the aircraft.
- Displace the container onto the roller tracks.
- Lift the wheel sets at the front side.
- Retract the rack and pinion on the back side and bring the corner units in stowed position.

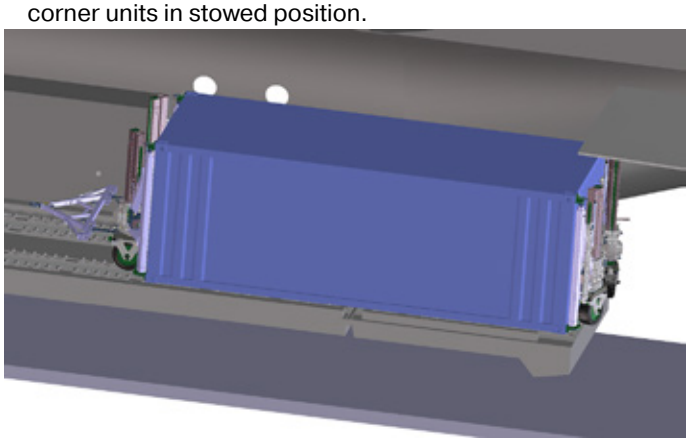


fig. 10-26

- Roll to the intended loading spot in the aircraft and set down on the floor of the aircraft. The precise location is dependent on the centre of gravity of the container and the load inside, and is should be selected based on applicable loading regulations.

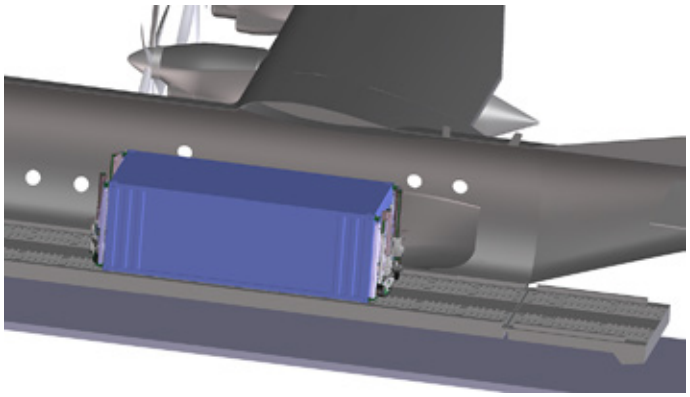


fig. 10-27

- In transport position, the wheel set of each corner unit must be in contact with the cargo area of the carrier vehicle. Thus the stored system is slightly pre-tensioned, which largely avoids damaging vibrations.
- Lash the container in position for transport.

No lashing may be attached to components of the lifting, rolling and loading system.

10.4 Operating with electrical drive unit

If the electrical drive is mounted completely (chapter 8.15) and the main control switch is set on ‚On', the lifting, rolling and loading system can be operated using the manual control unit.

⚠ Since one person cannot have all four corner units in sight continuously, a second person is essential for the entire lifting or lowering process in all operating modes described below. The two people (operator and second person) must remain in visual contact at all times and must be in a position to communicate verbally.

Description of control unit

The mobile manual control unit enables easy and manageable operation of the system. All functions are activated by means of joysticks.

fig. 10-19

The impact-resistant aluminium control unit is connected to the levelling control system by means of a control cable (1). The shoulder belt (2) is designed to enable fatigue-free operation. Signs (3) provide an overview of the control modes and functions for the following controls:

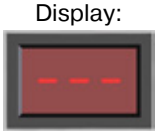
– *On switch (4)*
  Pressing the ‚ON' switch causes the system to be switched on. The on switch illuminates green if the control cable to the levelling control system is correctly plugged, the „EMERGENCY-STOP" switch is unlocked and the levelling control system is in switch position ‚1'.
– *Off switch / EMERGENCY-STOP (5)*
  Pressing the ‚EMERGENCY-STOP' switch causes the system to be switched off. The button locks down when it is pressed and the on switch illumination goes off. It is only possible to switch on the system again after releasing the lock. In order to do so, turn the mushroom knob in the direction of the arrow.
– *Status display (6)*
  A three-digit digital display provides information about the selected mode, switch status of the proximity switches and basic adjustment of the levelling control system.
– *Joystick for primary control (7)*
  The left-hand joystick serves to control the main functions of the lifting equipment. Moving the joystick in the horizontal direction (right-left) enables selection of the various modes and configuration of the basic settings. Movement in vertical direction (forward and back) serves to start the lifting or lowering movement within the selected mode.
– *Joystick for secondary control (8)*
  The right-hand joystick serves to change the parameters of the selected basic settings and enables selection of the supports in lifting / lowering mode, insofar as this is allowed by the selected mode. Diagonal movement selects individual supports and horizontal / vertical movement moves pairs of supports for the drive. When the joystick is in the central position, all four supports are controlled simultaneously.

Modes - standard operation

The control system is operated in various modes which can be selected for standard operation after the control system is switched on by means of the control unit. The following modes can be selected by means of horizontal movement of the left-hand joystick:

– *Standby*
  Once the system is switched on with the ‚ON' button, the levelling control system activates within 20 s. The process is indicated in the status display. Once the process is complete, the status display indicates standby.

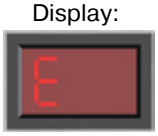
Display:



System standby

– *Mode: ‚E'*
  Moving the supports in and out individually, in pairs or all together.
  This operating mode serves to move the supports in and out individually, in pairs or all four together.
  The following display on the screen shows that operating mode ‚E' is selected.

Display:



Mode ‚E'

The first field of the status display signalises the mode.
Moving the right-hand joystick enables selection of the supports to be moved. In the centre position, all of the supports are moved simultaneously, otherwise the selected supports are moved.
The supports are moved in and out by moving the left joystick vertically upwards or downwards.
After reaching the end switch, the drive switches the corresponding corner unit off. Further movement of the respective support only in opposite direction. The other supports can be moved further. When moving the gear rack out, the status display shows the status of the relevant top end switch; when moving the gear rack in, the status display shows the status of the relevant bottom end switch.

Display:

Mode ‚E'
Supports 1, 2 and 3 - end switch not reached
Support 4 - end switch reached

Hazardous operation! Due to the lack of monitoring offered by this mode and the possibility to control the supports individually, there is a risk of causing the container to topple!

A warning signal sounds and the status display flashes as a warning when the supports are retracted in this mode due to the risk involved. Once all of the supports reach their limit positions - ‚supports retracted', these warnings are cancelled.

– *Mode: 'HA'*
Manual mode
This mode serves to lift or lower the container
The following display on the screen shows that operating mode „HA" is selected.

Display:

Mode 'HA'

Only use this operating mode if all four supports have approximately the same load (see operating mode „E").

Since one person cannot have all four corner units in sight continuously, a second person is essential for the entire lifting or lowering process. The two people (operator and second person) must remain in visual contact at all times and must be in a position to communicate verbally.

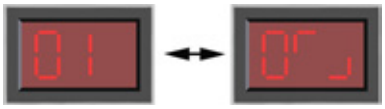
The left-hand joystick serves to enable the container to be lifted or lowered. The right-hand joystick then enables the position of the container to be varied by means of selecting the individual support (pairs). The main difference when compared to operating mode „E" is that the lifting or lowering process switches off when it reaches one single end position.
If only one support is selected, the two neighbouring supports also move but at a slower speed.
If a pair of supports is selected, only these two supports move.

Ensure that all wheel sets have approximately the same load. This can be seen by how flat the tyres of the relevant wheel units become.

Hazardous operation!
The max. permissible inclination for the container is 2°. Slightly increased angles of inclination are possible at low heights or reduced loads. The operator of the lifting equipment is responsible for determining and utilising these values.

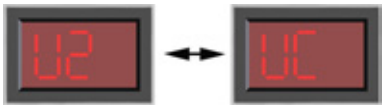
– *Mode: 'SA'*
Status query
This mode serves to query the status of the system. The status display screen first shows the information ID code and after a short time it changes over to the respective value. Moving the left-hand joystick vertically enables the following information to be selected:

'O1' limit position up - 'supports extended'



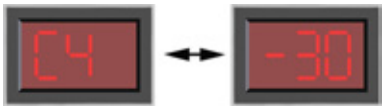
The first field of the value display signalises the mode. The following fields represent the supports 1 to 4 corresponding to the selection options of the right-hand joystick. Example: Supports 2 and 3 are fully extended.

'U2' limit position down - 'supports retracted'



Display analogue to limit position up - 'supports extended'. Example: Supports 2 and 4 are fully retracted.

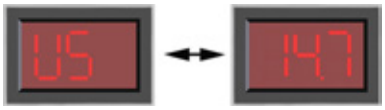
'C4' temperature



Temperature display for the electronic components in the switching cabinet. Example: -30°C

In the event of temperatures under - 32°C, you must wait for the heating period to elapse before starting up the system. In order to do so, remove the electrical drives from the support legs and allow them to operate briefly without a load. Due to their dissipated power, the electronic components will increase the temperature in the switching cabinet. At temperatures under - 40°C, the temperature flashes on the display and operation is blocked.

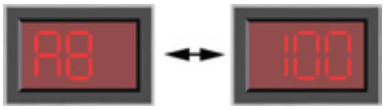
'U5' control voltage



Displays the current control voltage. Example: 14.7 V.

An error message is displayed if the control voltage is under 12V.

'A8' Motor efficiency



Displays the current specified maximum value in % with which the motors are operated (>> chapter 'Setting-up mode'). Example: 100 %.

Operating modes - extended operation
Additional operating modes are integrated into the levelling control unit for special operational circumstances such as maintenance, checking, loading, etc. To access the extended selection menu, the right joystick must point outwards (toward supports 2+4) when the end switch is actuated. The following operating modes are selected by moving the left joystick horizontally:

– *Setting option: 'CU'*
Assembling and dismantling the wheel unit when the container is on the floor

This option is only required if the container is placed on the floor. The container only needs to be placed on an 80 mm high pallet in order to use the normal operating modes ‚E' or ‚HA' to change the wheel unit.

Due to the hazardous operation, a warning signal sounds when moving the supports in and a warning light flashes on the status display.

The following display on the screen shows that operating mode ‚CU' is selected.

Display:

Mode 'CU'

In order to assemble or dismantle the wheel unit or the support plate, the gear rack must be moved in until it is flush with the lower edge of the gear. This is not possible in all other operating modes because the lifting movement is switched off due to the bottom end switch. In the setting option ‚CU', the bottom end switch is deactivated and the gear rack can continue to be moved in, in order to enable the wheel unit or the support plate to be assembled, dismantled or changed.
If the wheel unit and the support plate are connected to the gear rack properly (chapter 9.5), the gear rack is again in a position in which the bottom end switch can be re-activated without the control unit displaying a fault indication (see the fault indications point).
In order to re-activate the end switch and to enable setting mode so that standard operation can be resumed, the control unit must be switched off and then switched back on.

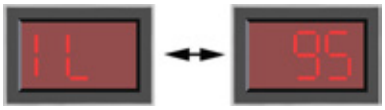
Hazardous operation! Since the bottom end switch is missing for operational reasons, if a wheel unit is mounted and locked, there is a danger that the wheel unit may press against the bottom of the corner pillar and damage this irreparably.

Modes - setting-up mode

Various basic settings must be configured in order to commission the system or after significant modifications to the system or its power supply. In order to do so, the levelling control system has an integrated additional selection menu available. This menu can be activated by pressing the on switch with both joysticks pointing inwards. The following configuration options can be selected by means of horizontal movement of the left-hand joystick:

– *Configuration option: 'IL'*
Maximum motor efficiency
Changing this option enables a proportional configuration of the maximum motor efficiency to be configured. Among other things, this is required if the power supply required for ensuring trouble-free operation of the system cannot be made available. The configurable range is between 53 % and 100 %. The configured value can be changed by means of vertically moving the left-hand joystick. The output of the motors will be restricted if the value is lowered. As a result of this, the lift speed and the overall power consumption of the system will be reduced.

Display:



Configuration option 'IL'
Max. motor efficiency at 95 %

In order to exit setting-up mode and to return to standard mode or extended mode, switch the levelling control system off and back on again.

Error messages

Malfunctions which occur during operation will automatically cause the lifting or lowering process to be interrupted and an error message to appear on the display.

Display:

Error message (display: FEH)

Once the error message has been acknowledged by means of vertically moving the left-hand joystick, the status display switches over to the malfunction causing condition (see following list).
A further vertical movement of the left-hand joystick changes the level control system back to the previous mode, ready for fault rectification or resuming operation, depending on the malfunction which has occurred.
If this procedure does not work, then the fault must be acknowledged by means of switching the level control system off and back on again. If this still fails resolve the issue, please contact the manufacturer's service department for support.

Error messages are subdivided into two categories:

– *Desired fault indications resulting from safety queries*

Display	Fault	Remedy
	*Limit position up* The displayed support no. 2 is extended to its maximum lifting height. It is impermissible to lift the container any further!	Initiate the lowering process by means of a suitable mode.
	*Limit position down* The displayed support no. 2 is fully retracted. It is impermissible to lower the container any further!	Initiate the lifting process by means of a suitable mode or retract the other supports.
	*Temperature* The temperature of the electronic components is outside of the permissible range (in this case -33 °C).	Wait for the heating phase for the electronic components to complete.

Display	Fault	Remedy
	*Supply voltage faulty* The voltage has dropped impermissibly during operation and as a result the transformed control voltage is too low (in this case 16,8 V).	Increase the power supply voltage or lower the overall power consumption of the system (–> Setting-up mode).
	*Faultyconnection* The connection between the level control system and the switchgear for a specific support (in this case no. 2) is faulty.	Check the connection between the level control system and the supports, as well as the connection between the supports and the proximity switches.

– *Undesired fault indications*
Resulting from software or hardware problems

Display	Fault	Remedy
	Fault in one of the joysticks	If the error message appears after acknowledging the fault by means of switching the level control off and on again, please contact the manufacturer's service department.
	Bus connection fault in the direction of the control unit	
	Bus connection fault from the direction of the control unit	
	Bus connection fault in level control system	
	Memory fault in level control system	
	Processor crash triggered by monitor switching	

11. INSPECTION

The equipment must be inspected in accordance with the conditions of use and the operating conditions latest **after 50 lifting procedures at least once per year** by an authorised person per TRBS 1203 (Technical expert) (testing per **BetrSichV**, §10, sect.2 represents implementation of **EC Directives** 89/391/EEC and 2009/104/EC and the annual occupational safety inspection per **DGUV-V 54**, §23, sect. 2 and DGUV-G 309-007, and DGUV-V 3, §5, sect. 2).

These inspections must be documented:
– Before commissioning.
– After significant alterations before recommissioning.
– Latest after 50 lifting procedures.
– At least once per year.
– In the event of unusual occurrences arising that could have detrimental effects on the safety of the winch (extraordinary tests, e.g. after a long period of inactivity, accidents, natural events).
– After repair works that could have an influence on the safety of the winch.

Technical experts are persons, who have sufficient knowledge based on their specialist training and experience, in the areas of winches, lift and pull systems and the relevant official occupational health and safety rules, accident prevention regulations, guidelines and generally accepted engineering rules (e.g. EN standards), to evaluate the operational safety of winches, and lift and pull systems.

Technical experts are to be nominated by the operator of the equipment. Performance of the annual occupational safety inspection as well as the training required to obtain the aforementioned knowledge and skills can be provided by haacon hebetechnik.

In **every 5th inspection**, at the latest however, **after 5 years**, a verification of the suspension and the components relevant for security must occur. On this occasion all load-bearing brake and friction pads of the lifting device must be exchanged. This examination can occur on site, also in the tilled state of the lifting device.

In **every 10th inspection**, at the latest however, **after 10 years**, a major overhaul of the device must occur. In this process, the device will be disassembled and the condition of all components has to be examined. Operational worn components will be substituted, wear parts (bearings, sealings...) and components relevant for safety have to be exchanged in every case. We recommend to charge haacon hebetechnik gmbh with the conduction of this major overhaul.
This inspection may be carried out only by people who are authorised by the manufacturer haacon hebetechnik gmbh and who are trained in dealing with this device and its components.

12. CONSUMABLES

The functional principle of the lifting, rolling and loading system is based on a construction, which mostly goes without consumables. Only the guide plates mounted to the beam and gearbox must be visually inspection every now and then and replaced after excessive wear. Missing wear grooves indicate excessive wear. Furthermore is it possible, that due to climatic conditions the rubber-metal elements integrated in the wheel set become brittle over time. In order to ensure safety and maintenance of the lifting, rolling and loading system under normal operating conditions within the first 3 operating years, haacon hebetechnik gmbh recommends to stock the following list of consumables in the specified quantities.

Consumable in assembly Pivotable corner pillar	Quantity / Set [Pieces]	Order No.
Guide plate	8	100627
Guide plate	4	104739
Guide plate	8	129420
Guide plate	8	129421

Consumable in assembly gear unit	Quantity / Set [Pieces]	Order No.
Guide plate	16	104735
Guide plate	8	104736

Consumable in assembly-Wheel unit	Quantity / Set [Pieces]	Order No.
Buffer	8	126171
Buffer	8	126172
Spring element	4	129379

13. MAINTENANCE RECOMMENDATION

The operator determines the intervals themselves based on frequency of use, operating conditions, and a risk assessment.
The following list of maintenance and inspection intervals are minimum requirements.
The system must be cleaned regularly (do not use a pressure washer!).

Lubricant recommendation:

Lubricant	A	Gleitlack Gleitmo 920 / 805 (Fa. Gleitmo, München) stock number: 9150-12-363-5496
Lubricating grease	B	GREASE TCL 435 (Fa. Esso) / HermGearfit TCL 00/000 - Fa. Herm stock number: 9150-0-035-0068
grease	C	lubricating grease (NATO code G-421)
lubricating oil	D	lubricating oil (NATO code S-761)

Before every use:
– visual and functional tests
– Brake function under load

Only perform inspection, maintenance and repair work on an unloaded hoist. Only allow work on brakes and locks to be performed by qualified specialist personnel.

Maintenance intervals:

A = yearly	A2 = every 2 years
A4 = every 4 years	A5 = every 5 years
S = semi-annually	
T = 3-monthly	

Care and maintenance required for the individual components are listed below.
– rating NTI 1 = optional
– rating NTI 2 = mandatory

Material maintenance echelon

The several levels are classificated as follows:
– level 1: maintenance
executed by operator
– level 2: squad maintenance
executed by maintenance squad
– level 3: between overhaul
executed by depot maintenance or industry
– level 4: major overhaul
executed by depot maintenance or industry

component	part	inter-val	maintenance task	libricant	rating	per-sons	term [h]	level
Corner pillar pivotable fig 8-3 / fig 11-1	guide plates (14)	T	Cleaning; Visual inspection of the wear grooves / replace plate when grooves are worn down to the ground of the grooves		NTI 1 NTI 2	2	0,25/2	2
	bar ball coupling (9) and lock nut (10)	A	Clean boreholes and apply lubri-cant Clean boreholes and apply lubri-cant	A - 0,1 kg	NTI 1 NTI 1	2	0,5	1
	Socket bolt (8) Telescopic pipe (7)	A	Clean bolts and boreholes and apply lubricant	A - 0,1 kg	NTI 1	1	0,5	1
	Socket bolt (11) -position locking	A	Clean bolts and boreholes and apply lubricant	A - 0,1 kg	NTI 1	1	0,5	1
	Bottom receptacle (1)	A	Clean parts prior to each use, at least once a year		NTI 1	1	0,25	1

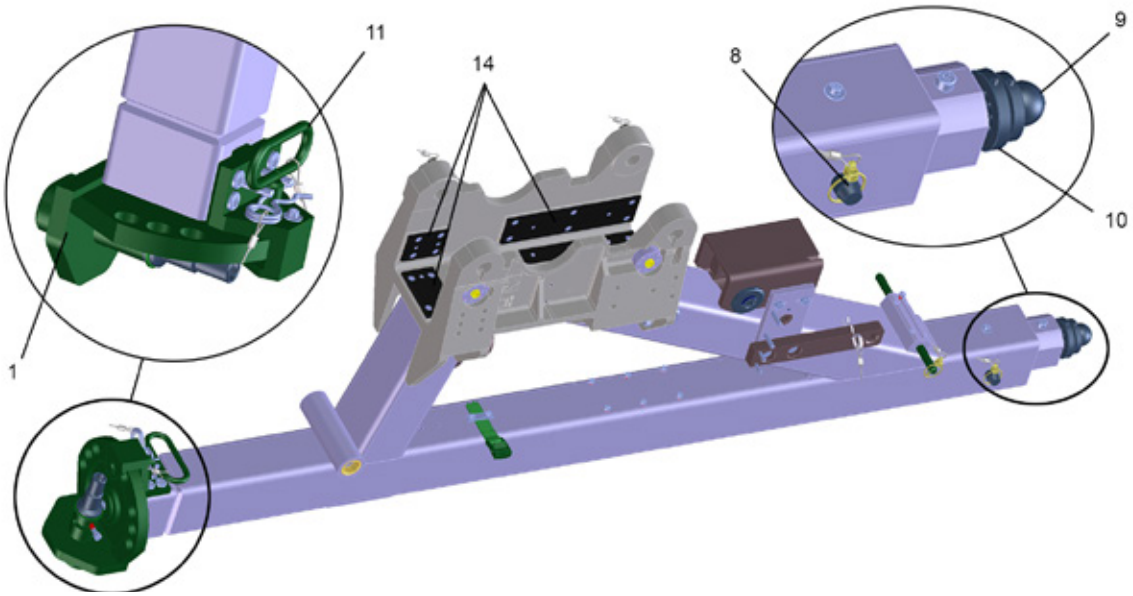


fig 11-1

component	part	inter-val	maintenance task	libricant	rating	per-sons	term [h]	level
Gear rack extension fig 8-4 / 11-2	Gearing (3)	A	Clean and apply lubricant		NTI 1	1/1	0,25/ 0,5	1
	Bearing surfaces (1)	A	Cleaning		NTI 1	1	0,25	1
	Locking bracket (11)	A	Cleaning prior to each use, at least once a year		NTI 1	1	0,25	1

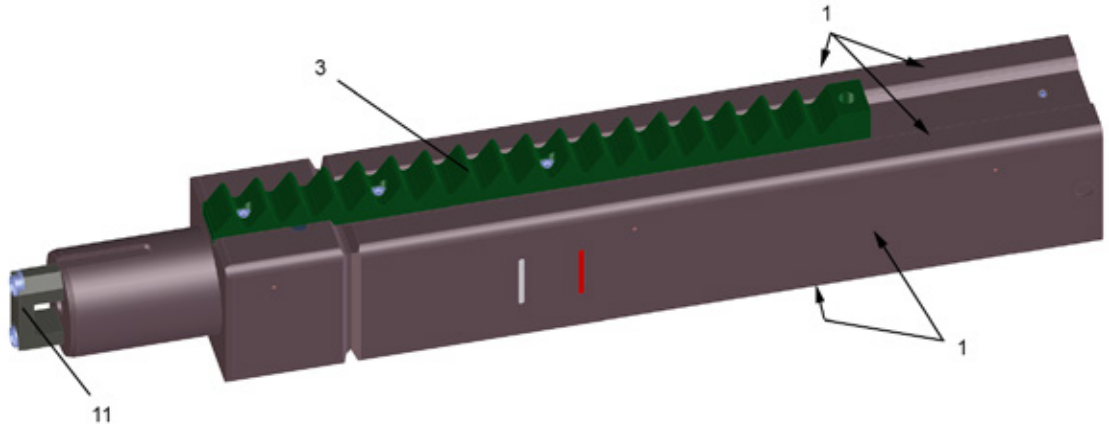


fig 11-2

component	part	inter-val	maintenance task	libricant	rating	per-sons	term [h]	level
Gear rack fig 8-4 / 11-3	Gearing (3)	S	Clean and apply lubricant	A 0,2 kg	NTI 1	1/2	0,25/1	1
	Bearing surfaces (1)	S	Cleaning		NTI 1	1	0,5	1
	Bearing (2)	A	Grease (with grease)	C - 0,1 kg	NTI 1	1	0,25	2
	Locking (4)	A	Clean screw thread (129359) and grease Remove bearing for that (129365)	C - 0,1 kg	NTI 2	1	0,25/1	2

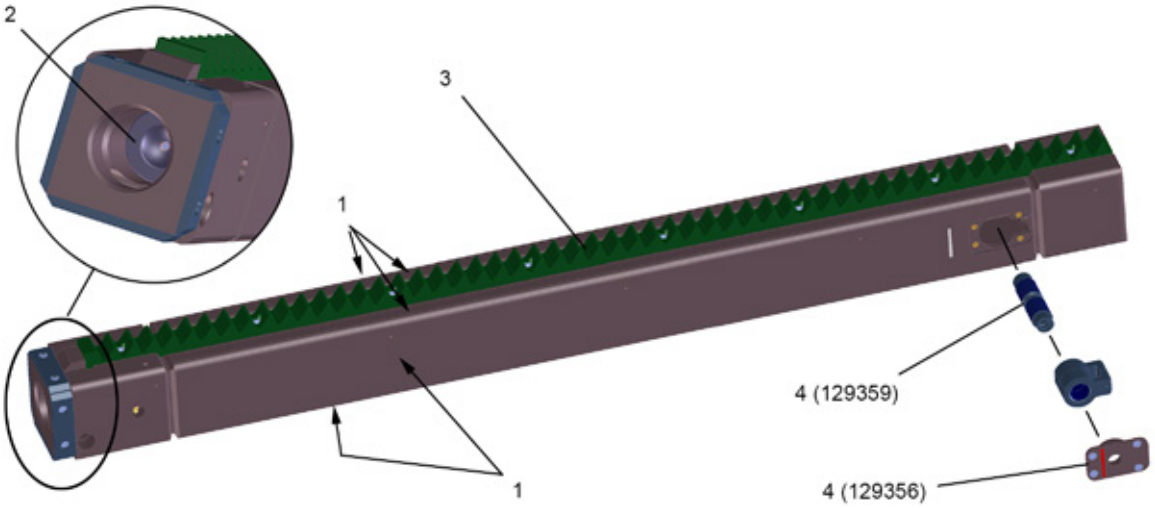


fig 11-3

component	part	inter-val	maintenance task	libricant	rating	per-sons	term [h]	level
Gear box fig 8-5 / 11-4	Rack drive (3)	S	Clean and apply lubricant	A - 0,1 kg	NTI 1	2/2	0,5/1	1
	guide plates (1)	A	Cleaning; Visual inspection of the wear grooves / replace plate when grooves are worn down to the ground of the grooves		NTI 1 NTI 2	2/2	0,25/1	2
	Bolt hole (2)	A	Clean bolts and boreholes and apply lubricant	A - 0,1 kg	NTI 1	2	0,5	1
	Housing	A4	Replace the oil, when the gear box is disassembled (approx. 1 litre)	B - 1 l	NTI 2	1	6	2

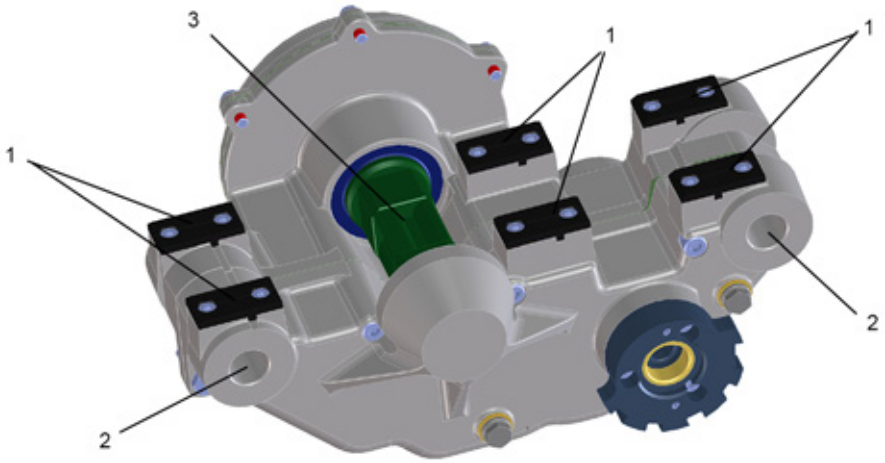


fig 11-4

component	part	inter-val	maintenance task	libricant	rating	per-sons	term [h]	level
Wheel set fig 8-6 / 11-5	King pin, (1)	A	Clean and apply lubricant	A - 0,1 kg	NTI 1	2/2	0,5	1
	Brake (2)	T	Clean and check functionality		NTI 1	2	0,5	1
	Rotation blocking (7)	T	Clean		NTI 1	1	0,25	1
	Spring elements (5)	T	Visual inspection, replace if necessary		NTI 1	1/2	0,25/4	1
	Tires (3)	T	Visual inspection of the thread		NTI 1	1	0,25	1
	Silentbloc (5)	A	Check after disassembly of the wheel saddle, replace if necessary		NTI 2	2	0,5/2	3
	Brake lever spring (4)	A	Check after disassembly of the wheel saddle, replace if necessary		NTI 2	2	0,5/2	3
	Raised disk (6)	A	Check after disassembly of the wheel saddle, replace if necessary		NTI 2	2	0,5/2	3
	Damping disc (8)	A	Check after disassembly of the wheel saddle, replace if necessary		NTI 2	2	0,5/2	3

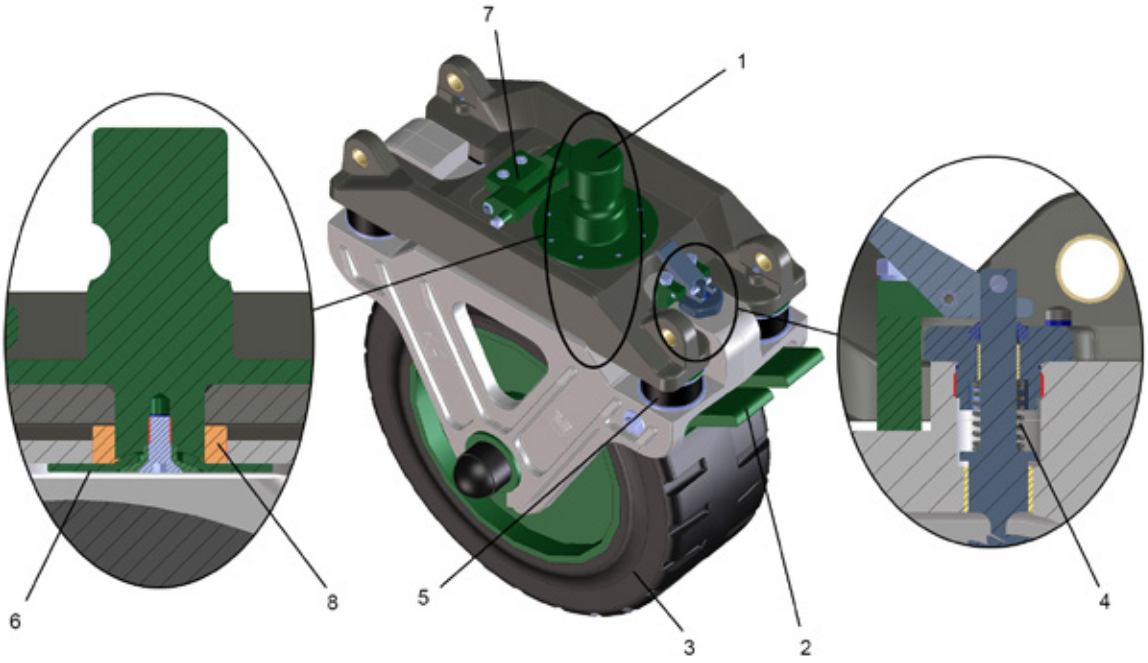


fig 11-5

component	part	inter-val	maintenance task	libricant	rating	per-sons	term [h]	level
Locking bolt fig 8-8 / 11-6	-	A	Clean and apply lubricant	A - 0,1 kg	NTI 1	1	1	1

component	part	inter-val	maintenance task	libricant	rating	per-sons	term [h]	level
Crank handle fig 8-9 / 11-6	Output square-end	S	Clean and apply lubricant	A - 0,1 kg	NTI 1	1/1	0,25	1

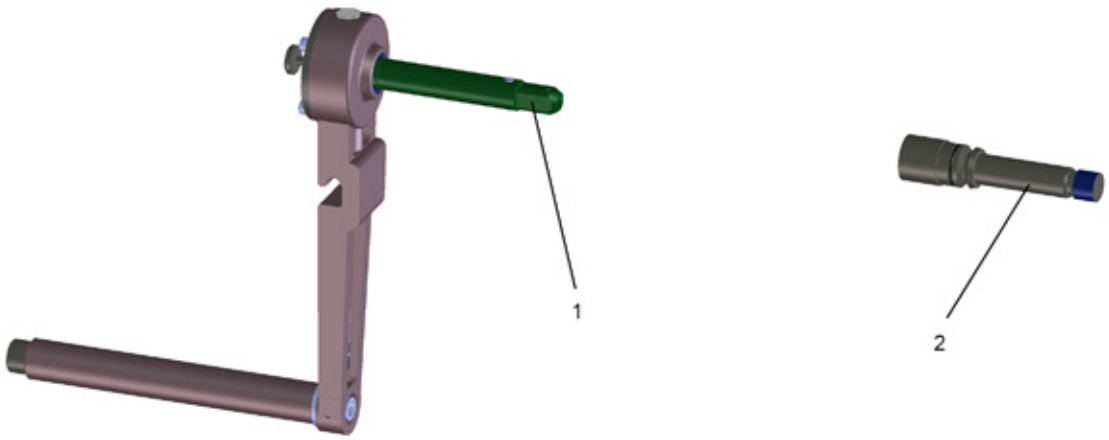


fig 11-6 (left: crank handle / right: locking bolt)

component	part	inter-val	maintenance task	libricant	rating	per-sons	term [h]	level
Crankcase fig 8-7 - 11-7	Drive shafts Crank holder (4/5)	A	Clean and apply lubricant	A - 0,1 kg	NTI 1	1/1	0,25	1
	Output square-end (1)	A	Clean and apply lubricant	A - 0,1 kg	NTI 1	1	0,25	1
	Run-off protection (2)	S	Clean		NTI 1	1/1	0,25	1
	Chain (3) and drive shaft	A5	Open screw plug and grease with lubricating oil	D - 0,1 l	NTI 2	1	0,25	2

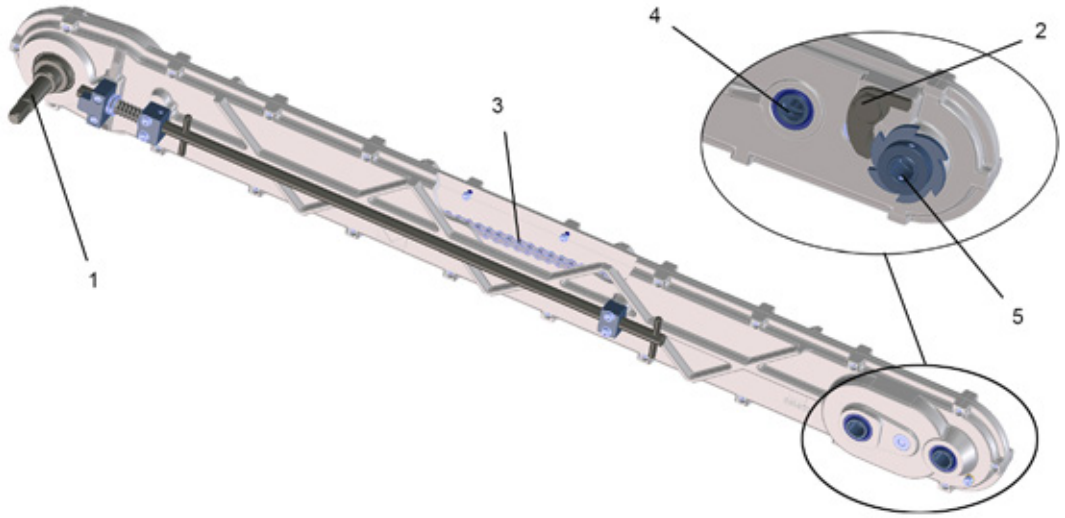


fig 11-7

component	part	inter-val	maintenance task	libricant	rating	per-sons	term [h]	level
Support plate fig 8-10 / 11-8	King pin (1)	A	Clean and apply lubricant	A - 0,1 kg	NTI 1	1/1	0,25	11
	Ball joint (2)	A	Clean and apply lubricant	A - 0,1 kg	NTI 1	1/1	0,25	

component	part	inter-val	maintenance task	libricant	rating	per-sons	term [h]	level
Adapter: fig 8-11 / 11-8	ISO corner locking device (3) Grease fitting	A A	Clean Grease	C - 0,1 kg	NTI 1 NTI 2	1	0,5	2
	Axial bearing (4)	A	Grease (with grease)	C - 0,1 kg	NTI 1	1	0,25	2

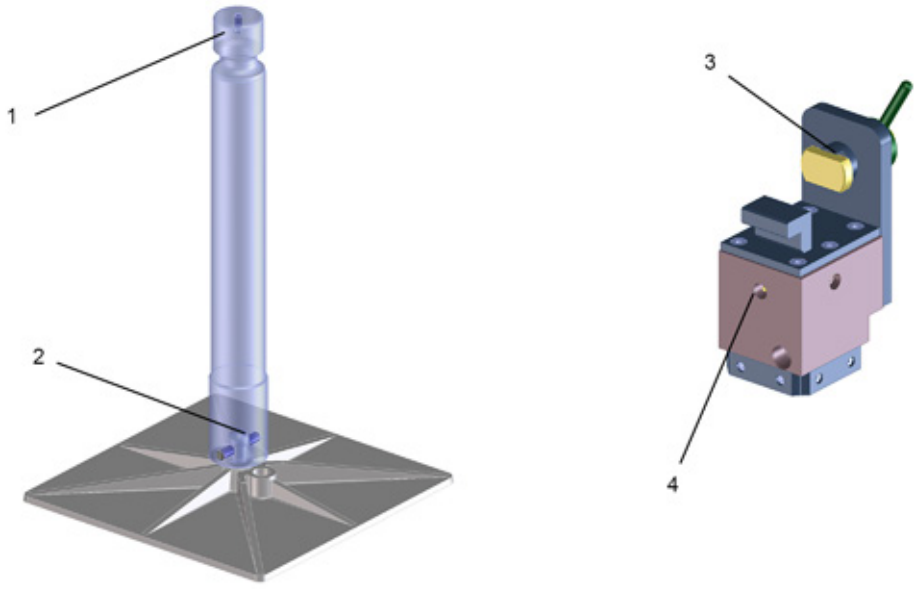


fig 11-8 (left: support plate / right: adapter)

component	part	inter-val	maintenance task	libricant	rating	per-sons	term [h]	level
Top receptacle fig 8-1 / 11-9		A	Clean parts prior to each use, at least once a year		NTI 1	1	0,25	1

component	part	inter-val	maintenance task	libricant	rating	per-sons	term [h]	level
Fastener fig 8.4 / 11-9		A	Cleaning prior to each use, at least once a year		NTI 1	1	0,5	1

fig 11-9 (left: top receptacle, right: fastener)

component	part	inter-val	maintenance task	libricant	rating	per-sons	term [h]	level
Steering rod fig 8-13 / 11-10		A	Clean and apply lubricant	A - 0,2 kg	NTI 1	1	0,5	1

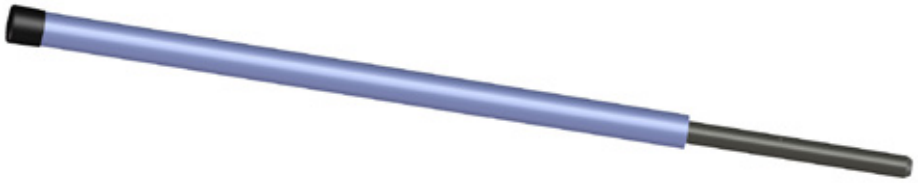


fig 11-10

component	part	inter-val	maintenance task	libricant	rating	per-sons	term [h]	level
Drawbar fig 8-16 / 11-11	-	A2	Clean and apply lubricant	A - 0,1 kg	NTI 1	1/1	0,25	1

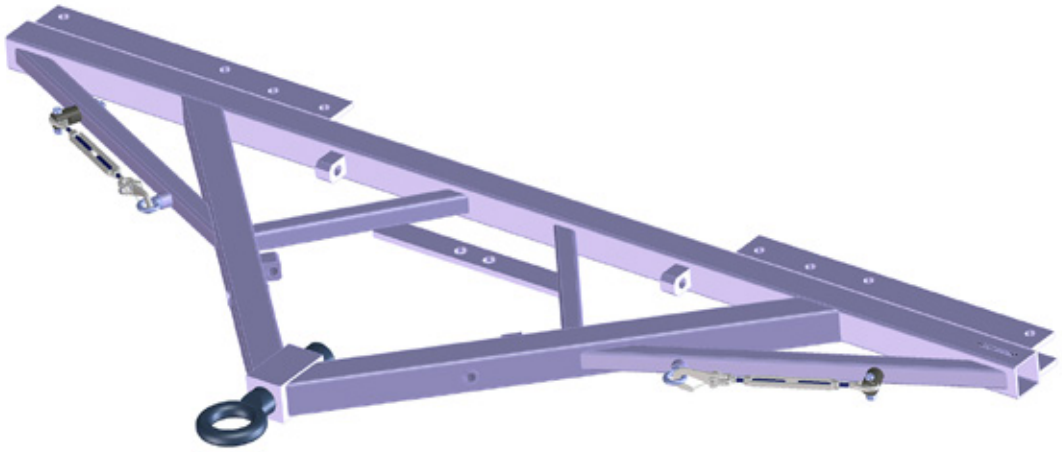


fig 11-11

component	part	inter-val	maintenance task	libricant	rating	per-sons	term [h]	level
Torque wrench		A	Check torque (90 Nm)		NT2	1	0,5	2

without illustration

component	part	inter-val	maintenance task	libricant	rating	per-sons	term [h]	level
Assembly hoist fig 8-15 / 11-12	Socket bolt,(8)	A	Clean		NTI 1	1	0,25	1
	Lower locking device (9)	A	Clean and apply lubricant	A - 0,1 kg	NTI 1	1	0,5	1
	Wire rope (4)	A	check according to country-specific regulations: in France NOR : SOCT 0410464A in the UK: 89/391 $137 EU-contract- HSE		NTI 2	1	0,75	3
	Rope winch (3)	A A5	For heavy dury grease every two years, replace consumables For normal dury every five years	C - 0,1 kg	NTI 2	1	1,5	2
	Swivel pin (5)	A2	Clean and grease after disassembly	A - 0,1 kg	NTI 2	1	0,25	1

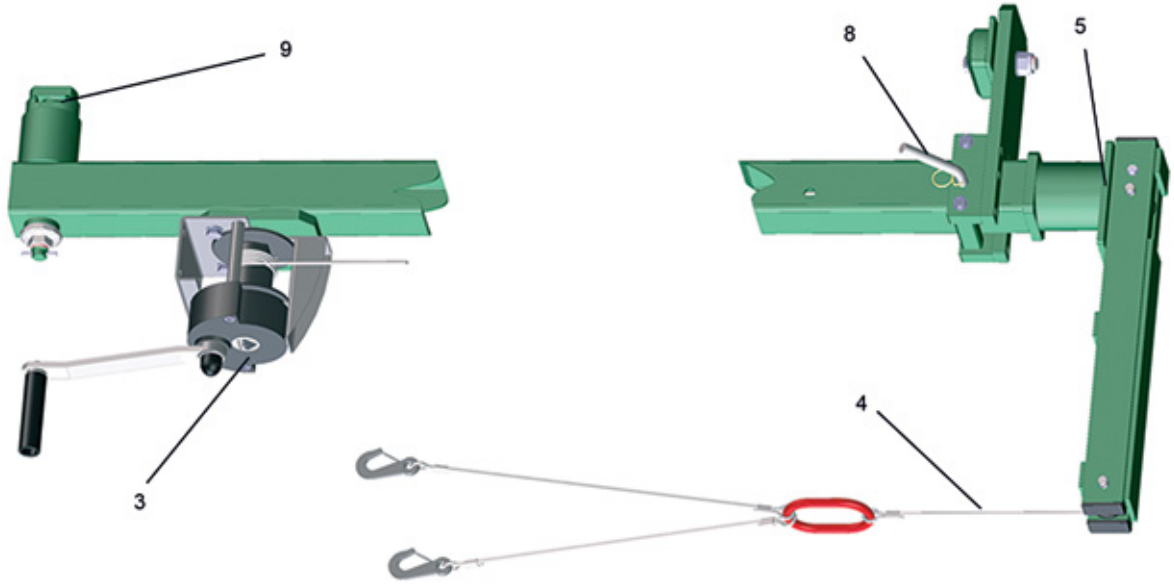


fig 11-12

component	part	inter-val	maintenance task	libricant	rating	per-sons	term [h]	level
Air loading plate fig 8-17		A5	Clean bolts and boreholes and apply lubricant	A - 0,5 kg		1	0,75	1

without illustration

14. TEMPORARY NON-USE AND LONG-TERM STORAGE

If the system will not be used temporarily, over a period of up to 6 months, care and maintenance tasks must be performed at the usual intervals.

If the system will not be used in the long term, for a period of up to 5 years, care and maintenance tasks must be performed at the usual intervals.

Before commissioning the system again, a function check must be performed.

The cranks must be removed and kept inaccessible to unauthorized persons.

15. DISASSEMBLY / DISPOSAL

In order to avoid damage to the system or life-threatening injuries during decommissioning, all of the safety instructions must be observed. The system and the substances within it must be disposed of in accordance with the valid national regulations.

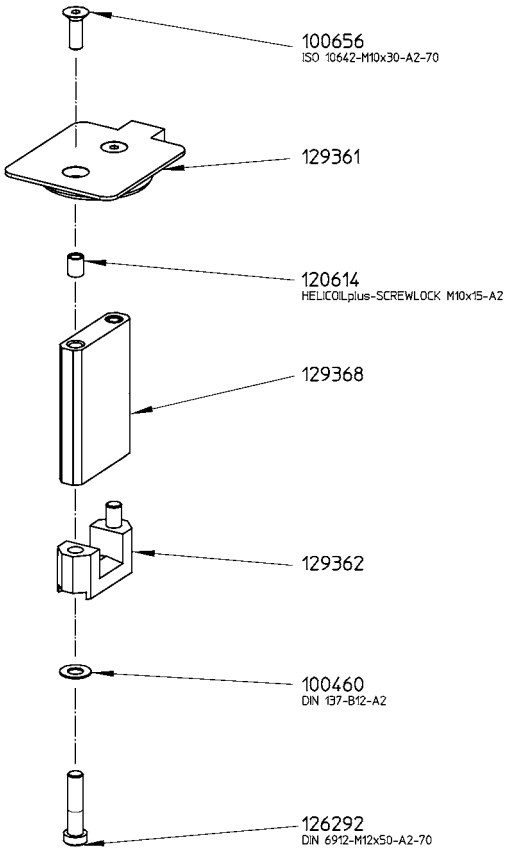
16. SPARE PARTS

Only use genuine spares and consumables - these parts are especially designed for the lifting, rolling and loading system. Third-party parts do not guarantee design and manufacturing according to stress and safety related requirements.

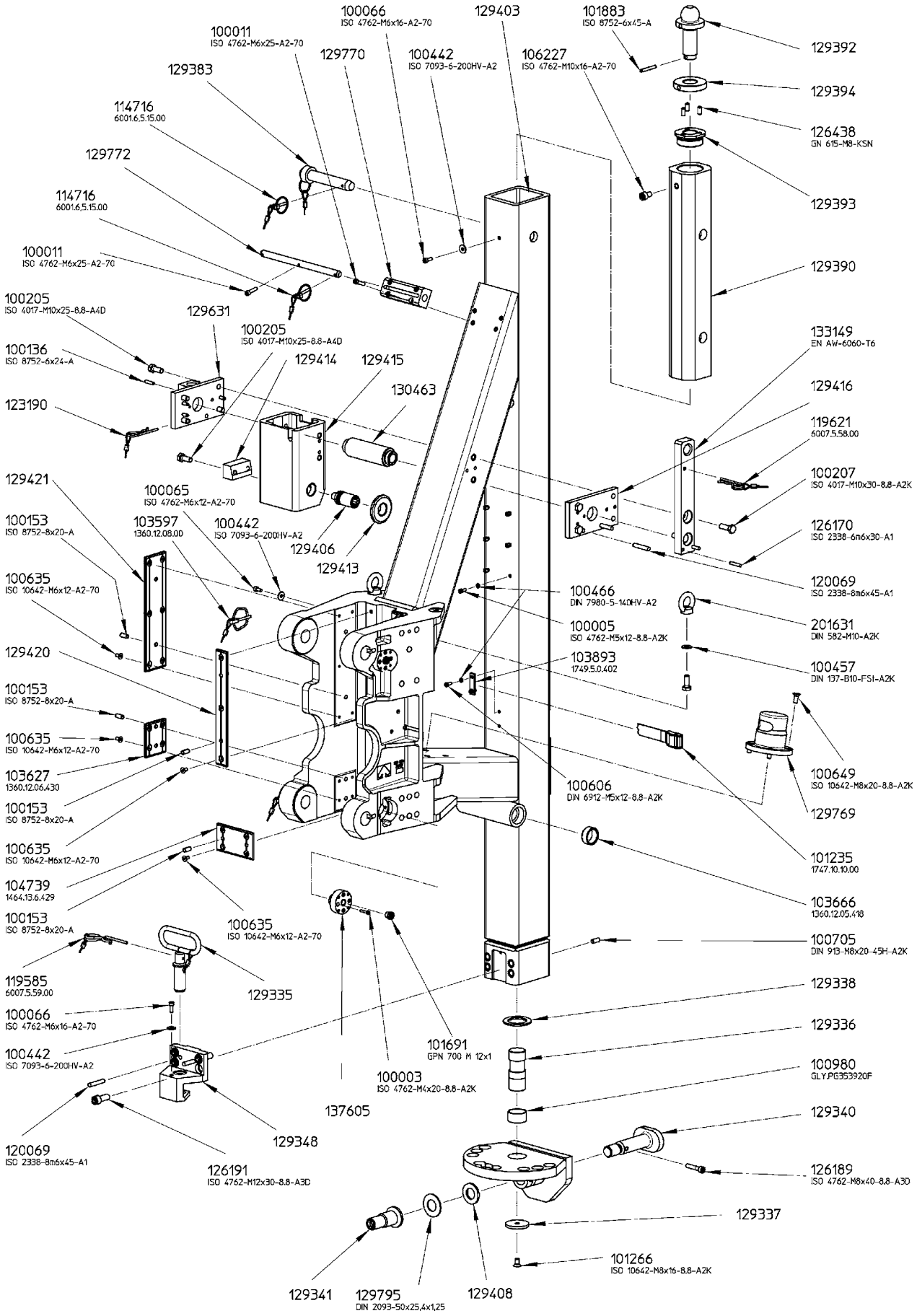
Please quote the following to order spare parts:

Type: – See model plate
Serial No.: – See model plate
Part No.: – See spare parts drawing

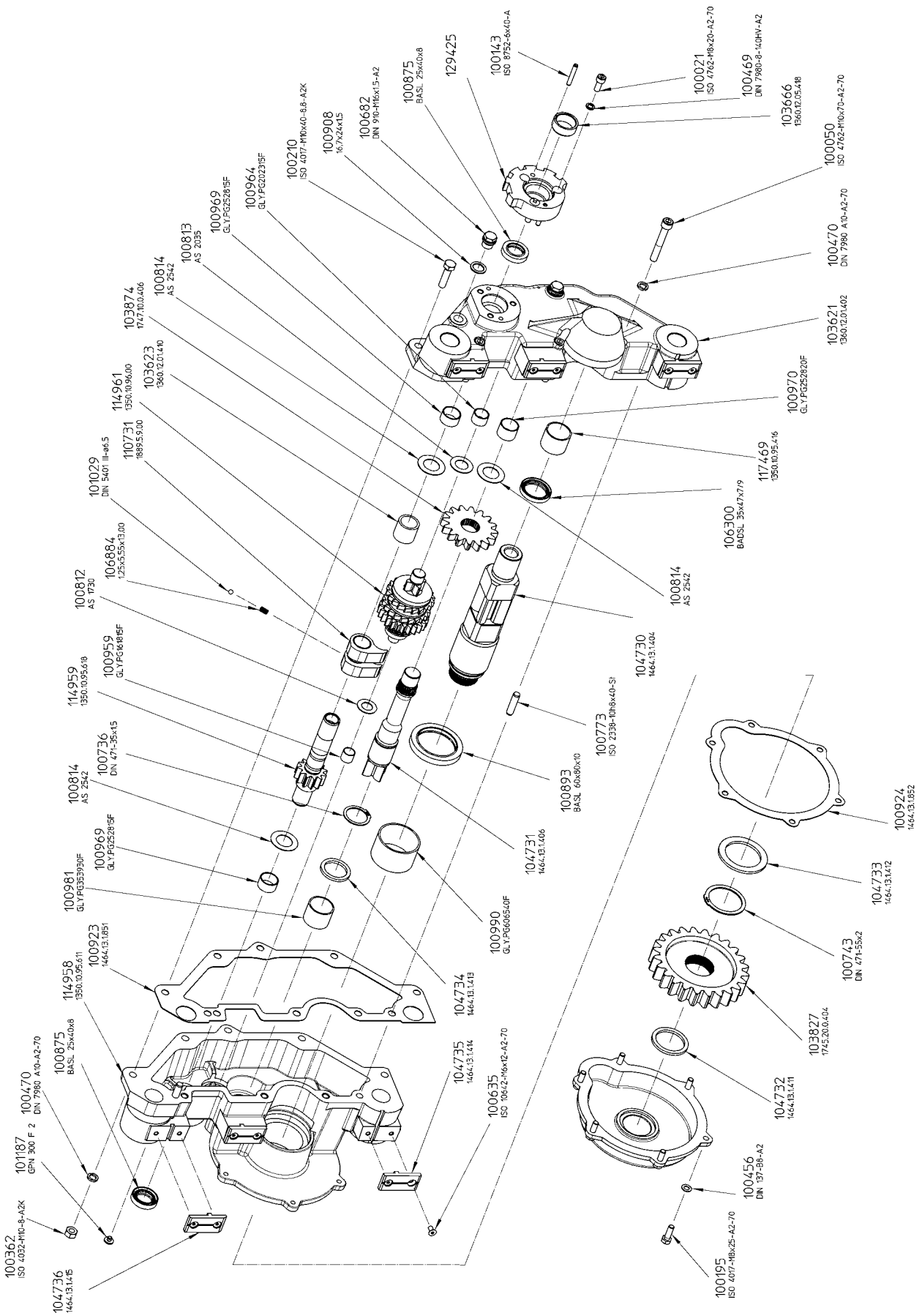
Fastener (129377)



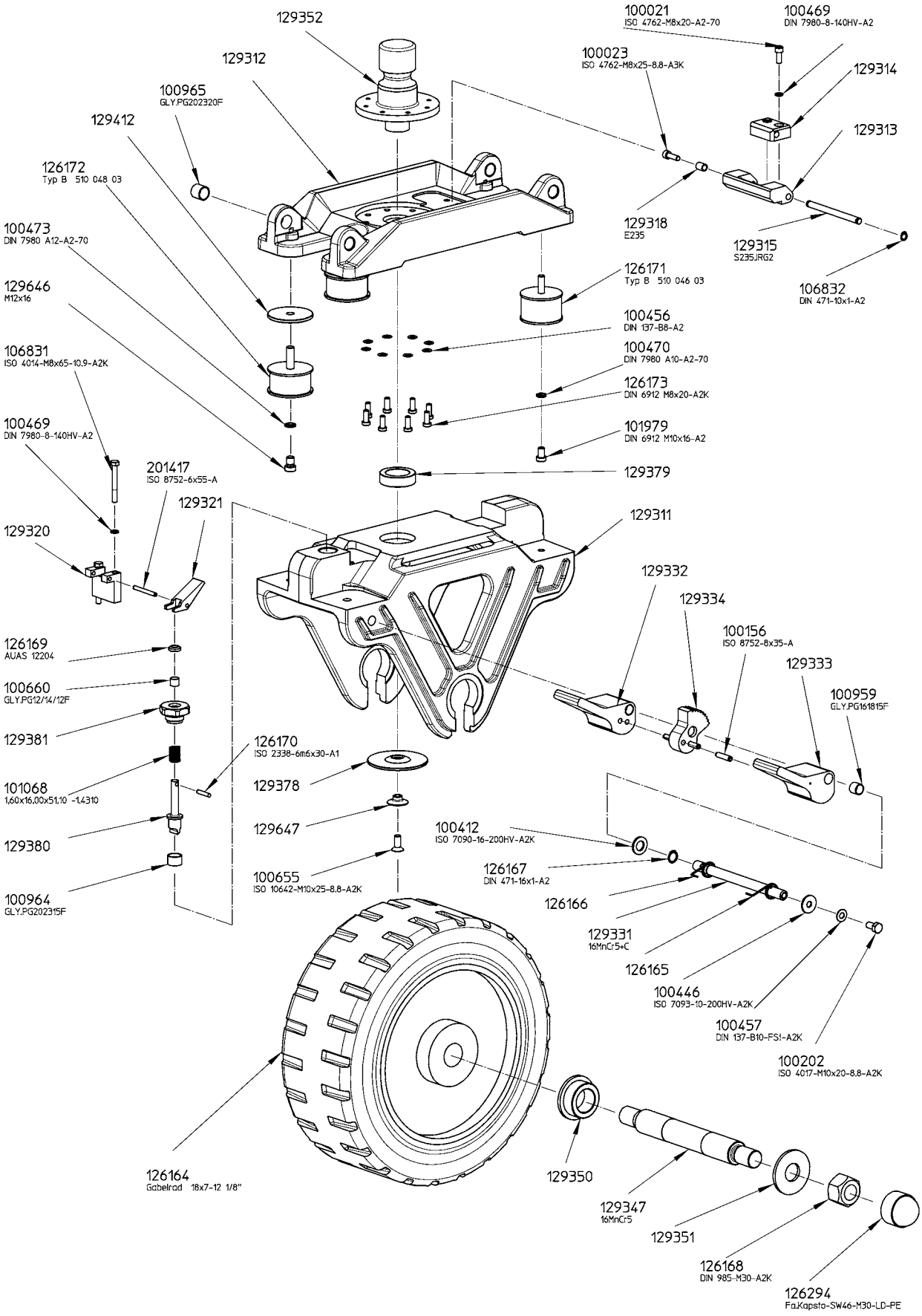
Corner pillar - pivotable - (129418)



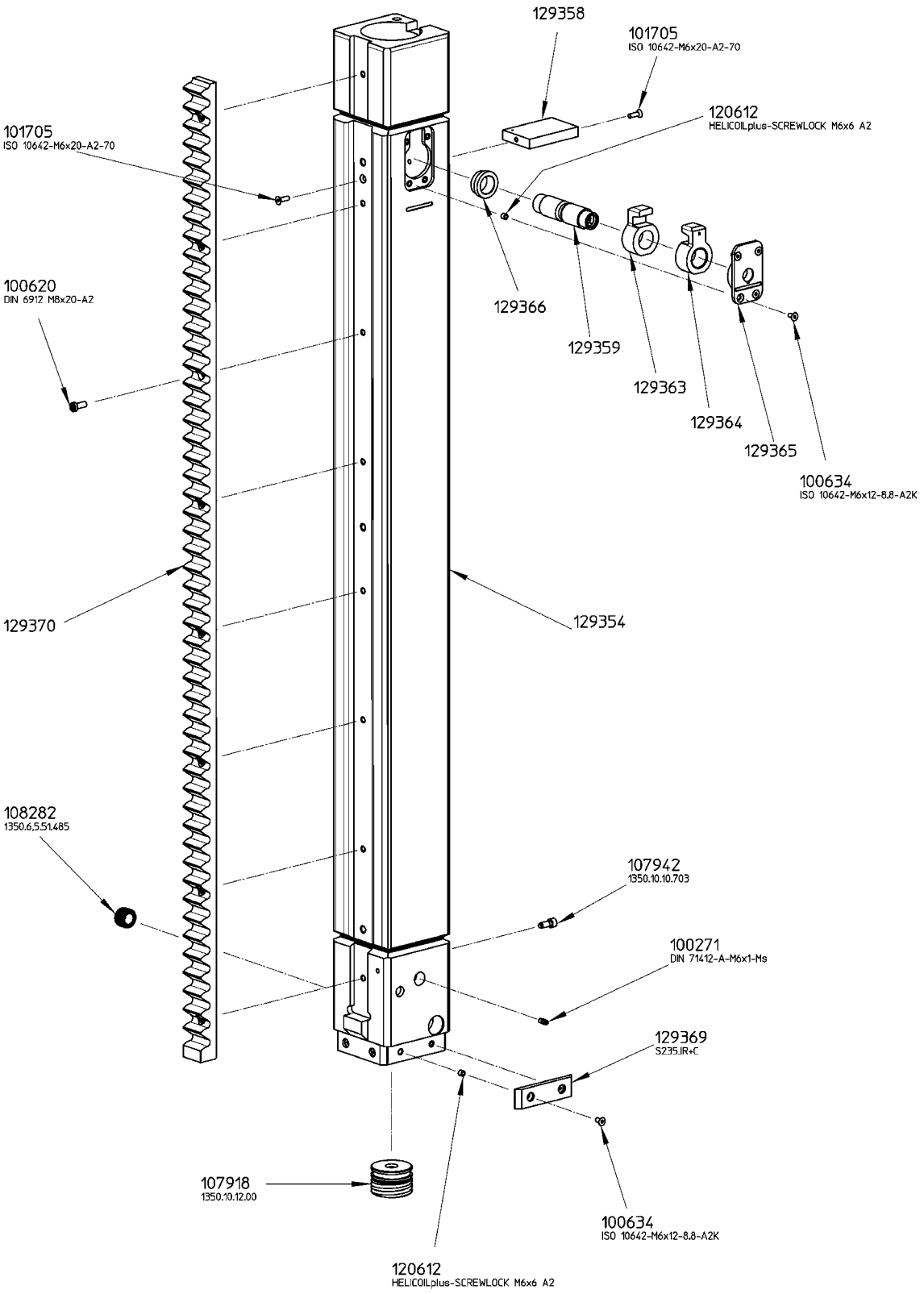
Gear unit (129426)



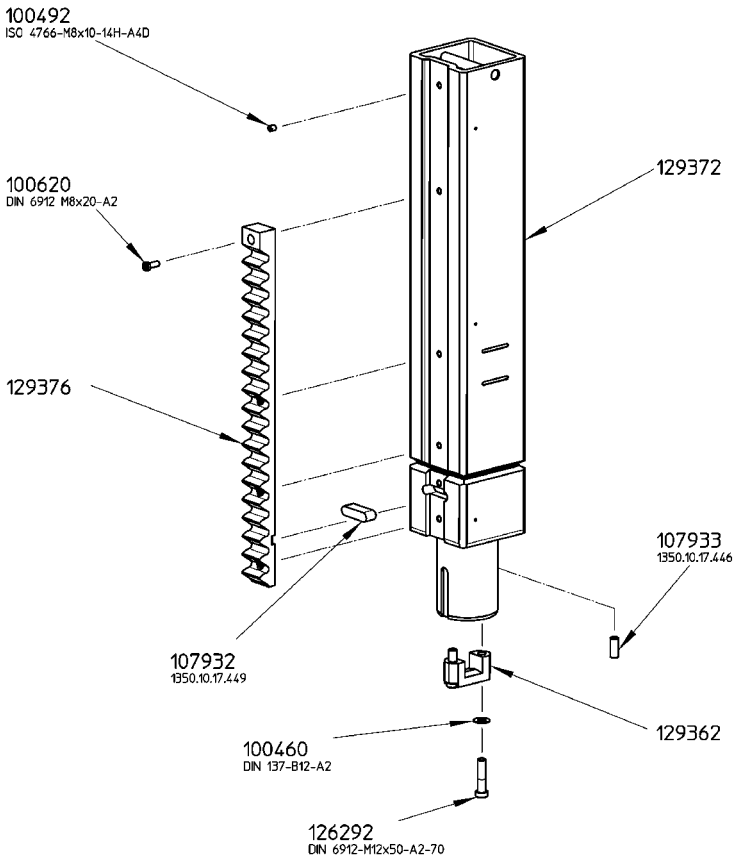
Wheel unit (129405)



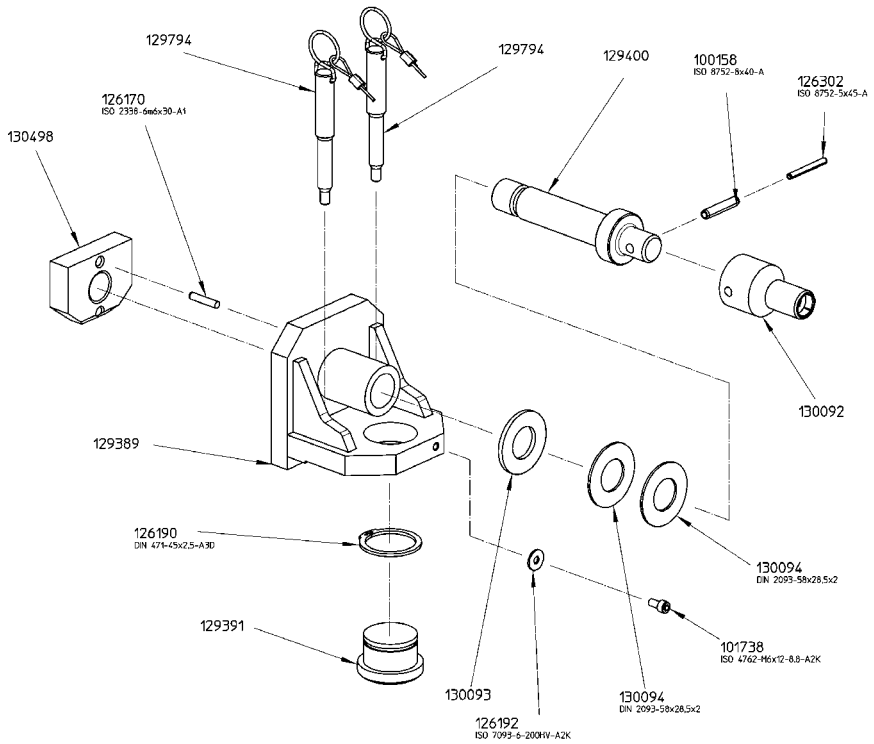
Rack (129353)


129358
101705
ISO 10642-M6x20-A2-70
120612
HELICOILplus-SCREWLOCK M6x6 A2
101705
ISO 10642-M6x20-A2-70
100620
DIN 6912 M8x20-A2
129366
129359
129363
129364
129365
100634
ISO 10642-M6x12-8.8-A2K
129370
129354
108282
1350.6,5.51.485
107942
1350.10.10.703
100271
DIN 71412-A-M6x1-Ms
129369
S235JR+C
107918
1350.10.12.00
100634
ISO 10642-M6x12-8.8-A2K
120612
HELICOILplus-SCREWLOCK M6x6 A2

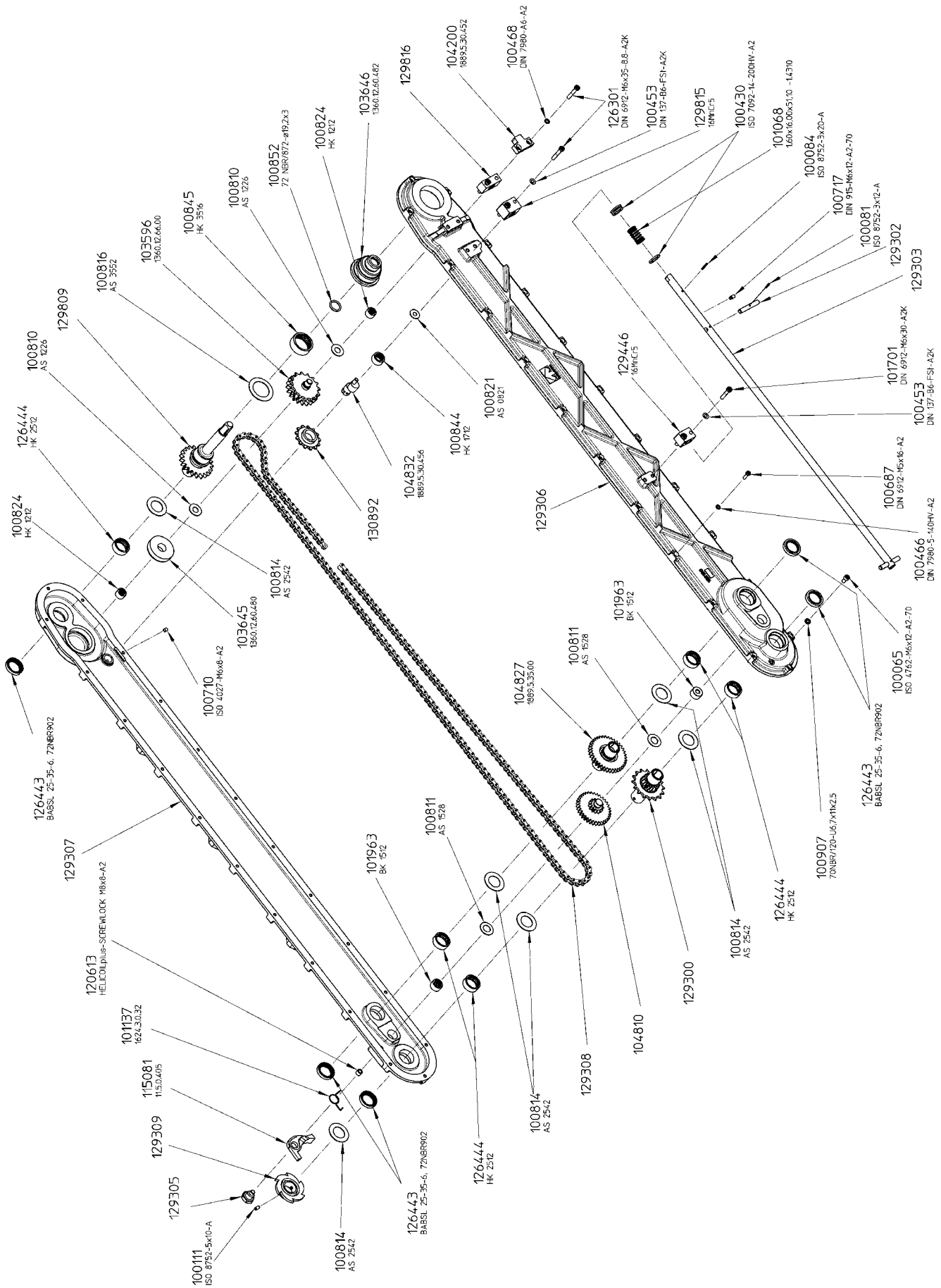
Rack extension (129371)



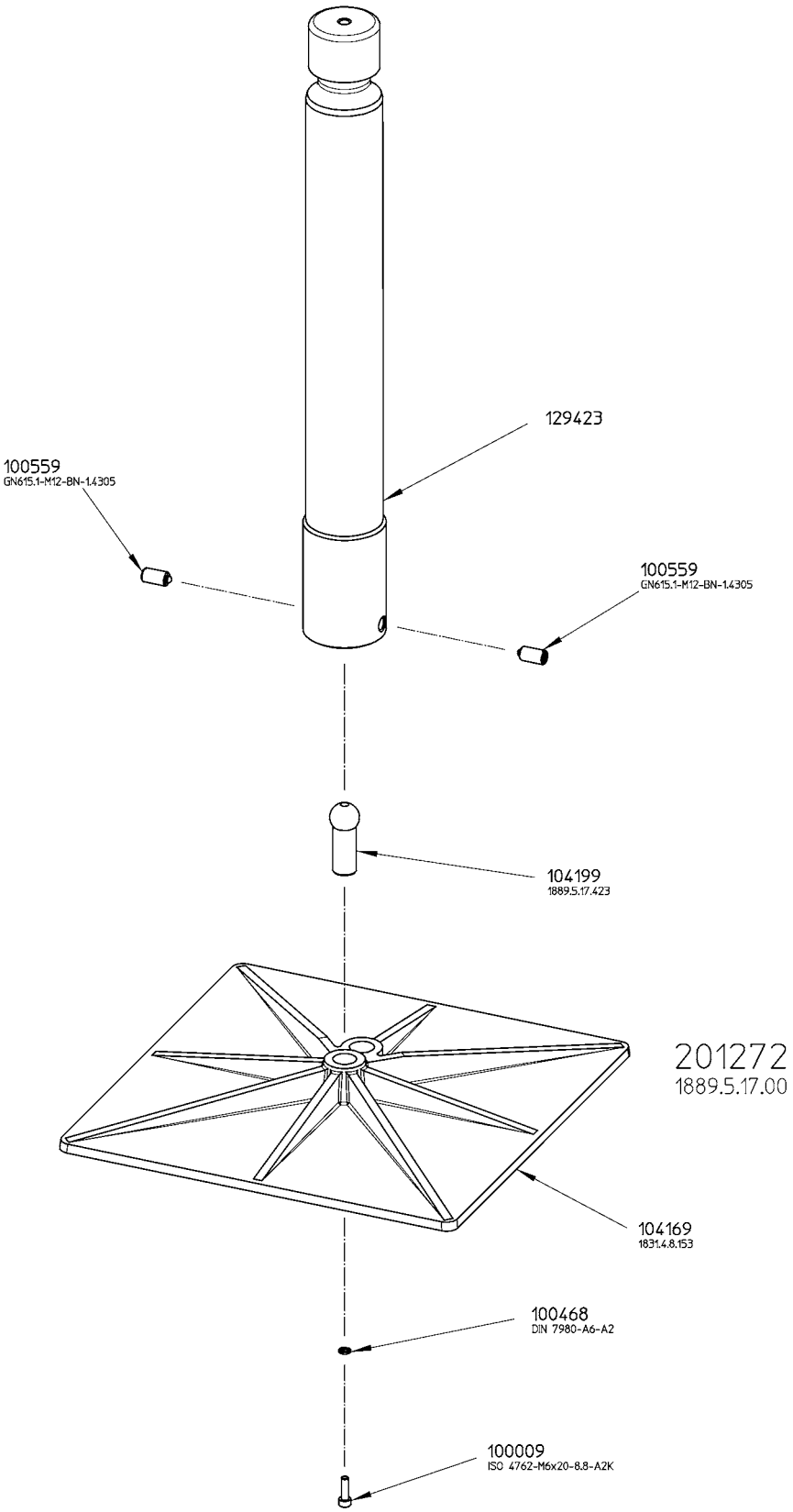
Top receptacle (129401)



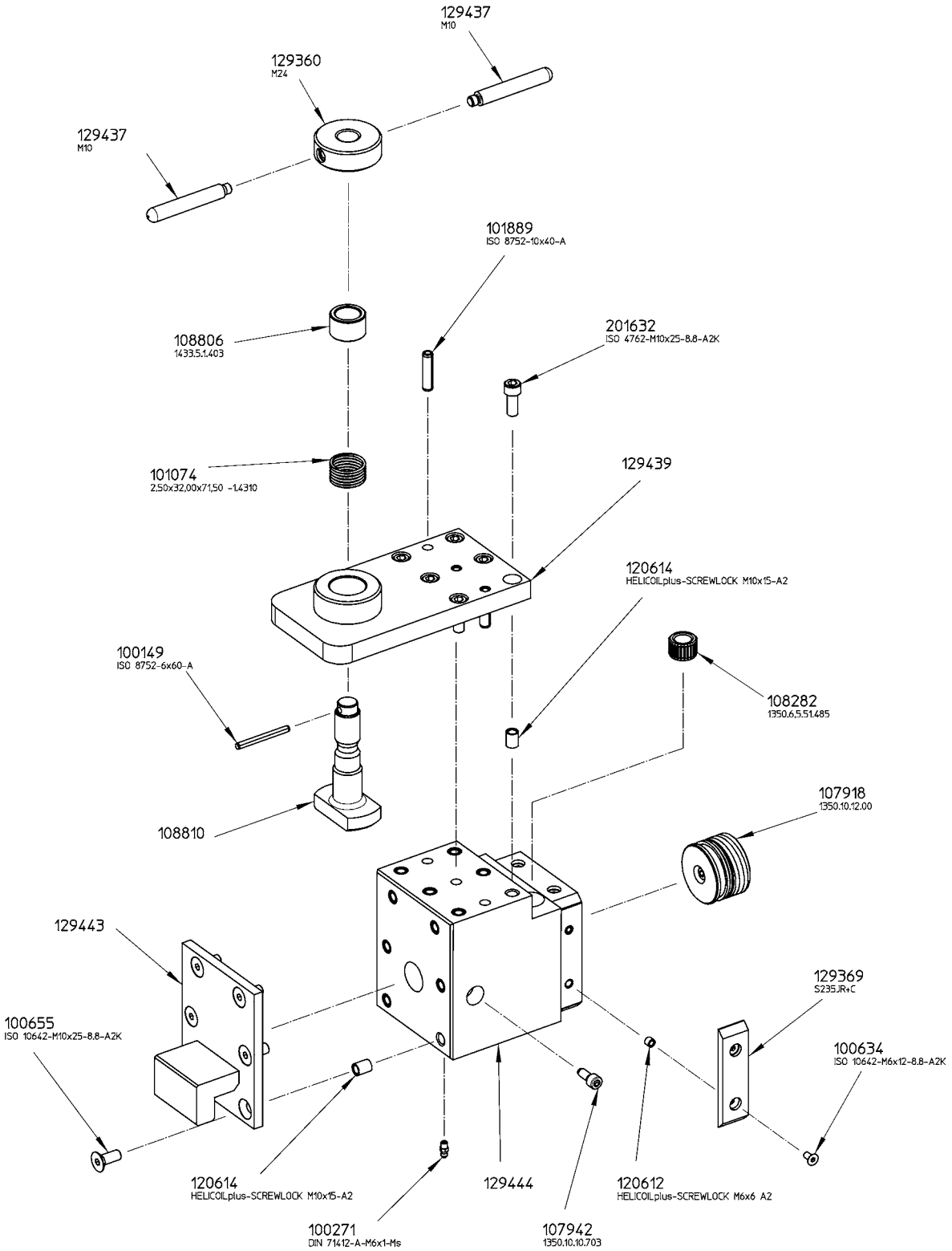
Crankcase (129304)



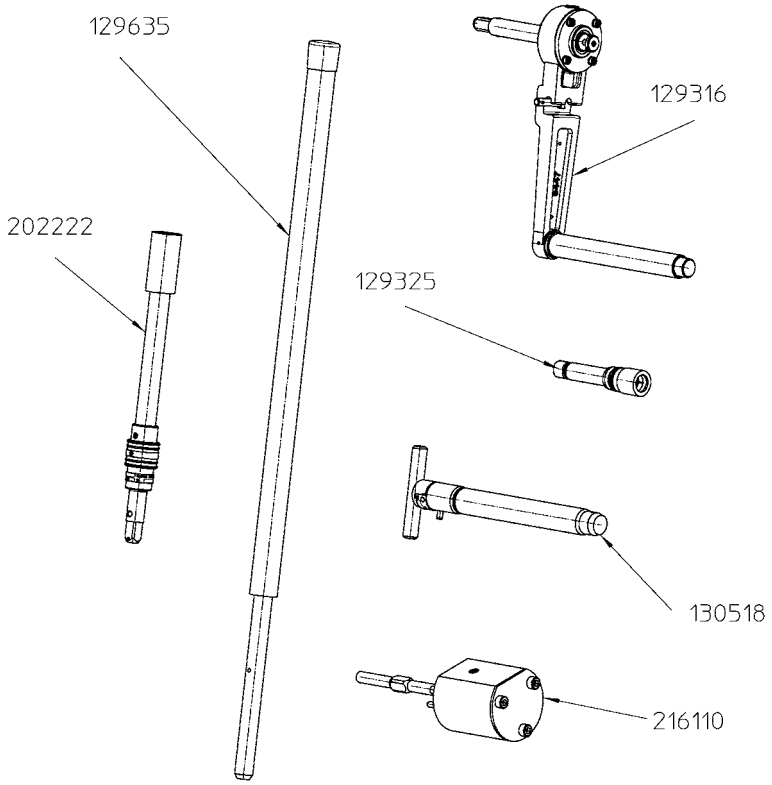
Base plate (129424)



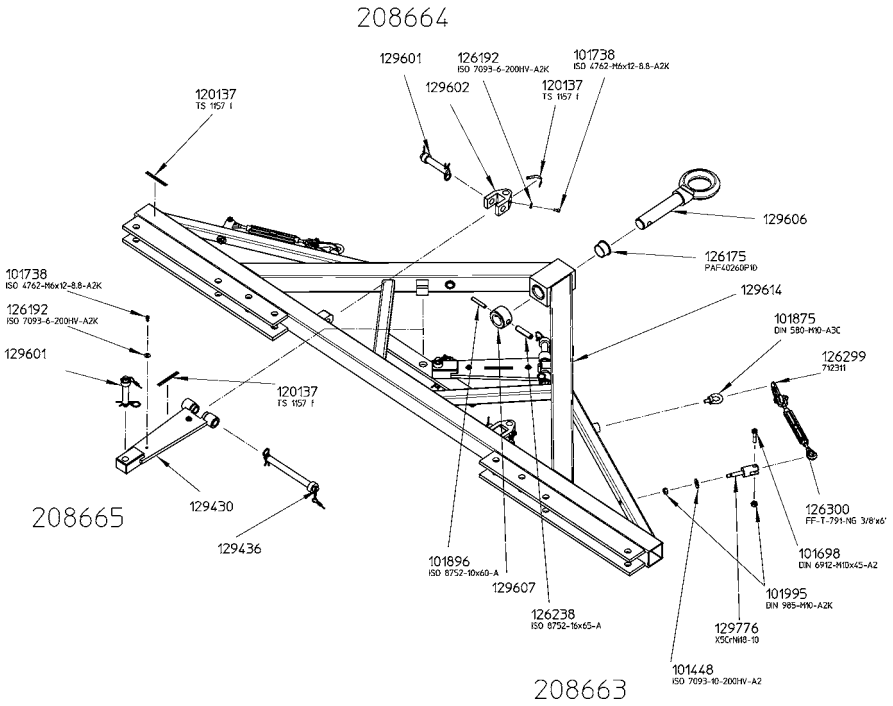
Adapter (129445)



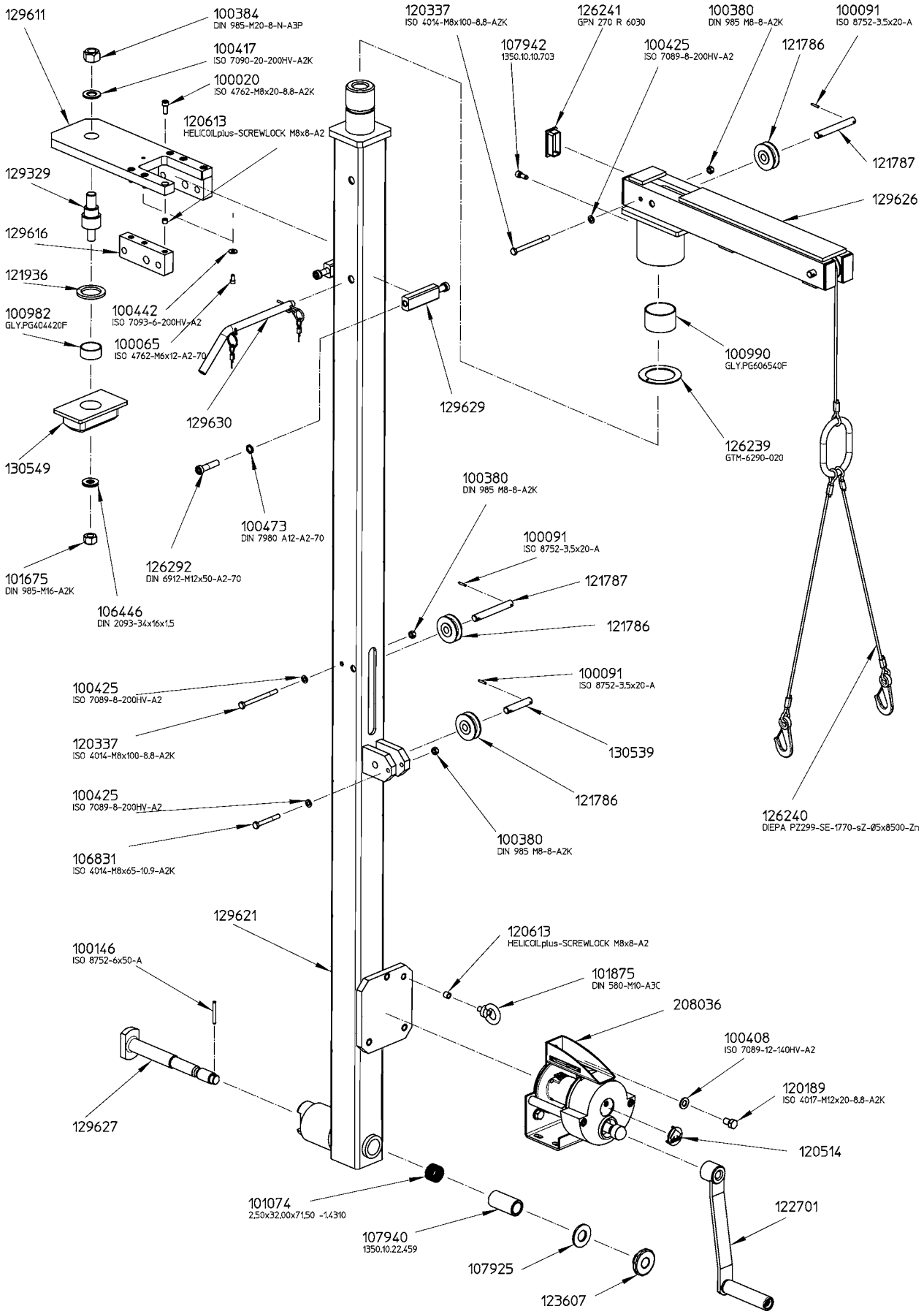
Crank (129316), steering rod (129635), bolt (129325), bolt (130518), lowering safety device (216110)



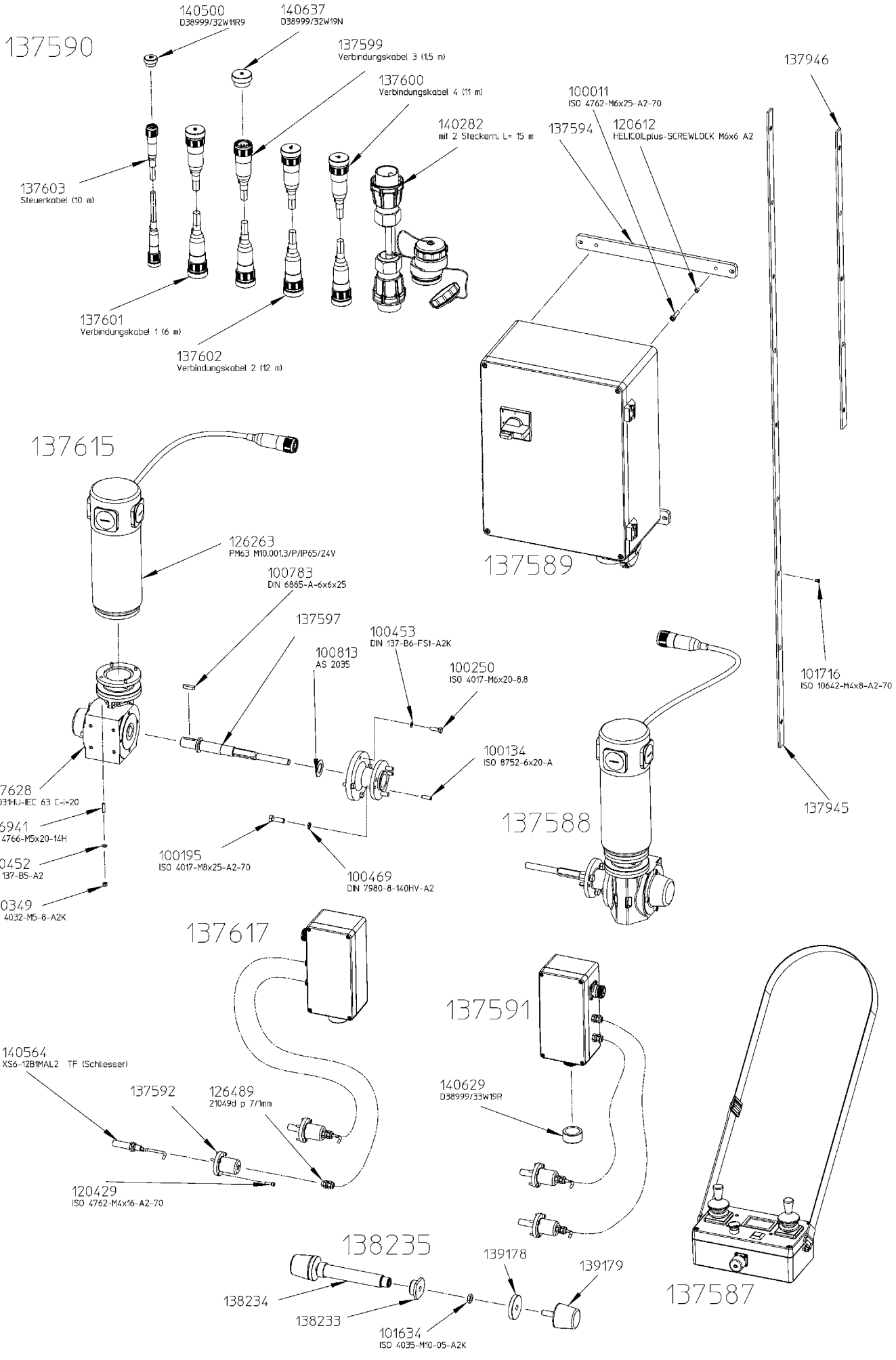
Tow bar (209733)



Mounting winch (209735)



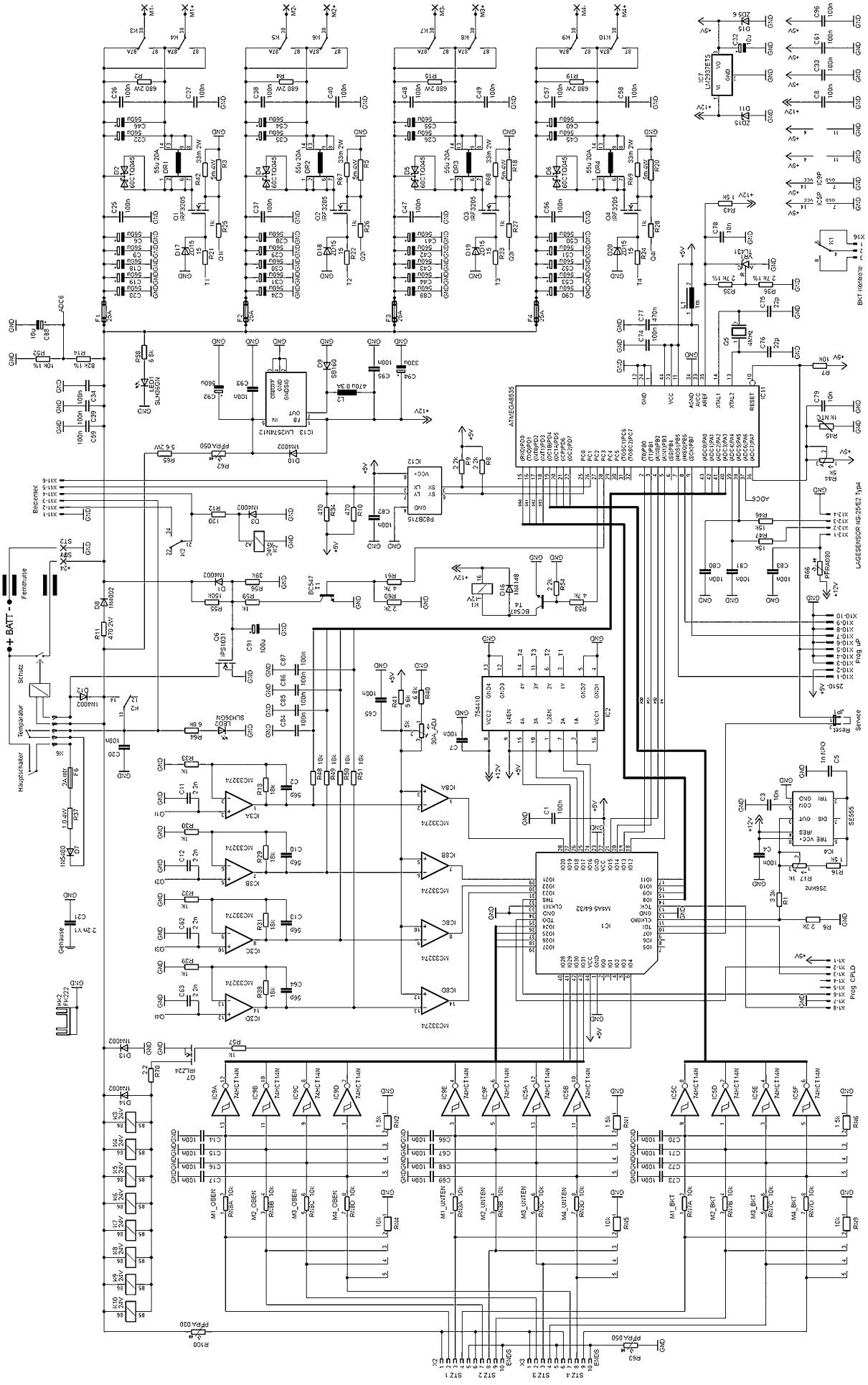
Electrical drive unit (215916)


137590
140500
D38999/32W11R9
140637
D38999/32W19N
137599
Verbindungskabel 3 (1,5 m)
137600
Verbindungskabel 4 (11 m)
140282
mit 2 Steckern, L= 15 m
137603
Steuerkabel (10 m)
137601
Verbindungskabel 1 (6 m)
137602
Verbindungskabel 2 (12 m)
137946
100011
ISO 4762-M6x25-A2-70
137594
120612
HELICOILplus-SCREWLOCK M6x6 A2
137589
137615
126263
PM63 M10.001.3/P/IP65/24V
100783
DIN 6885-A-6x6x25
137597
100453
DIN 137-B6-FSt-A2K
100813
AS 2035
100250
ISO 4017-M6x20-8.8
100134
ISO 8752-6x20-A
137628
SM031HU-IEC 63 C-i-20
106941
ISO 4766-M5x20-14H
100452
DIN 137-B5-A2
100349
ISO 4032-M5-8-A2K
100195
ISO 4017-M8x25-A2-70
100469
DIN 7980-8-140HV-A2
101716
ISO 10642-M4x8-A2-70
137945
137588
137617
140564
XS6-12B1MAL2 TF (Schliesser)
137592
126489
21049d p 7/1mm
120429
ISO 4762-M4x16-A2-70
137591
140629
D38999/33W19R
138235
138234
138233
139178
139179
101634
ISO 4035-M10-05-A2K
137587

17. CIRCUIT DIAGRAMS

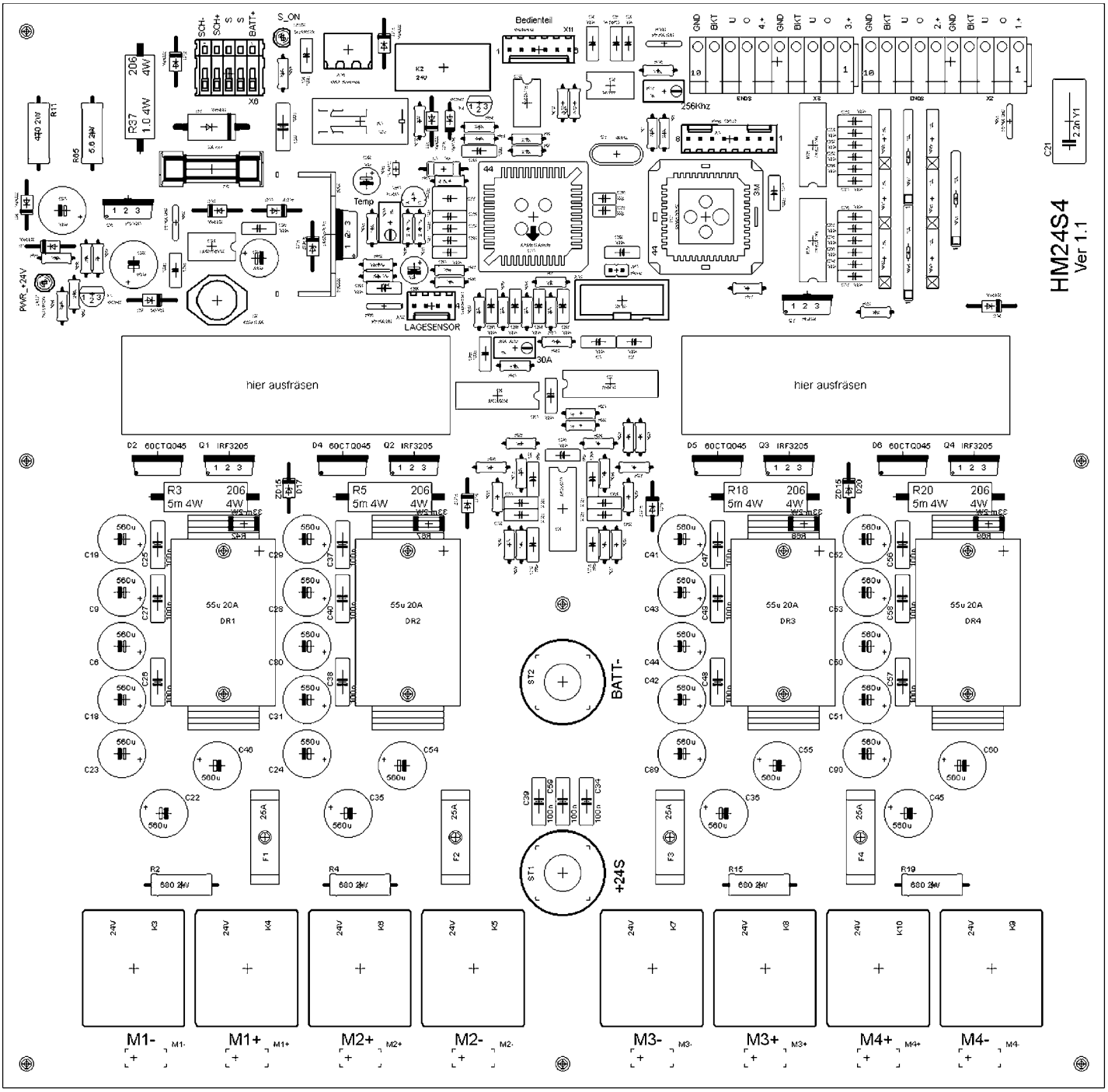
24 V-version – HM24S2

Circuit diagram



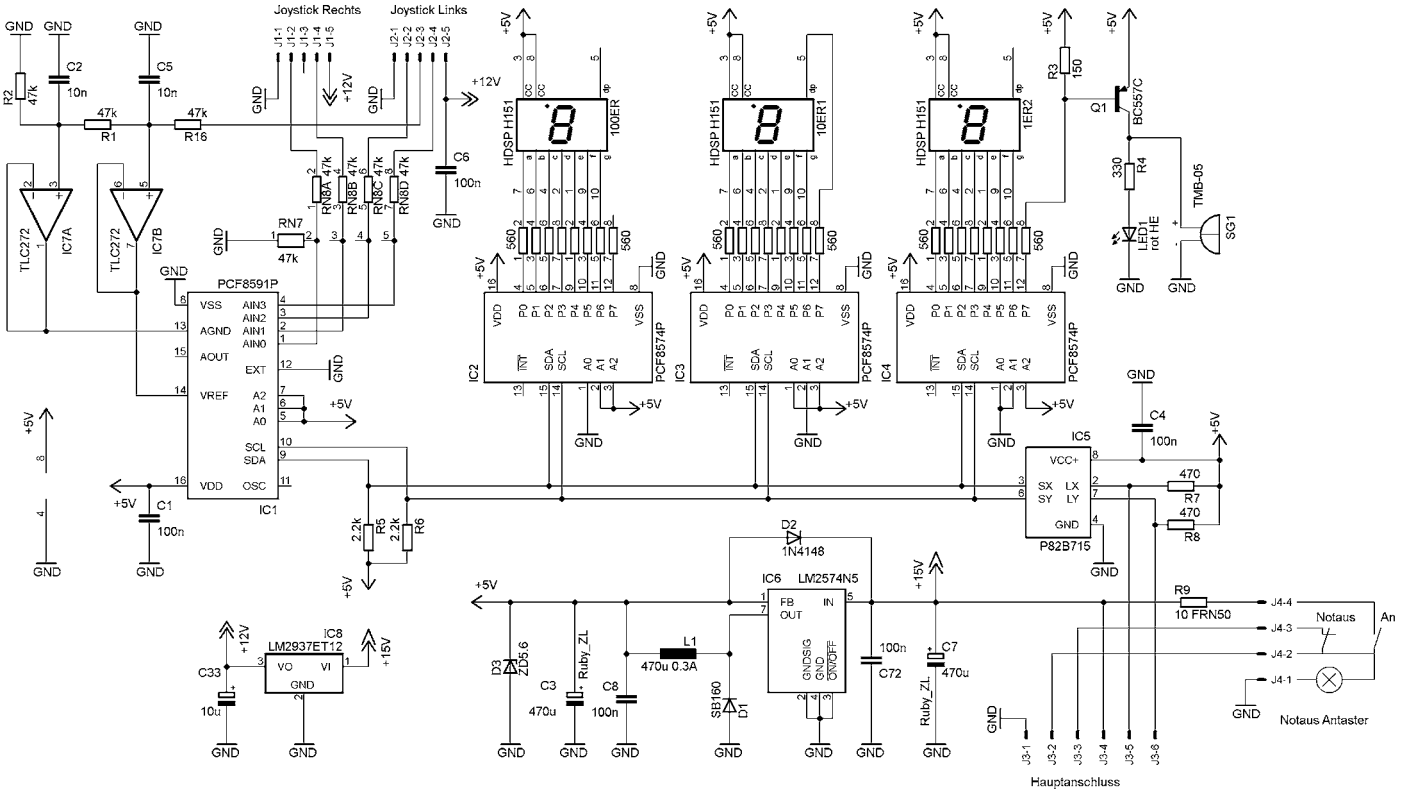
24 V-version – HM24S2

Boardplan

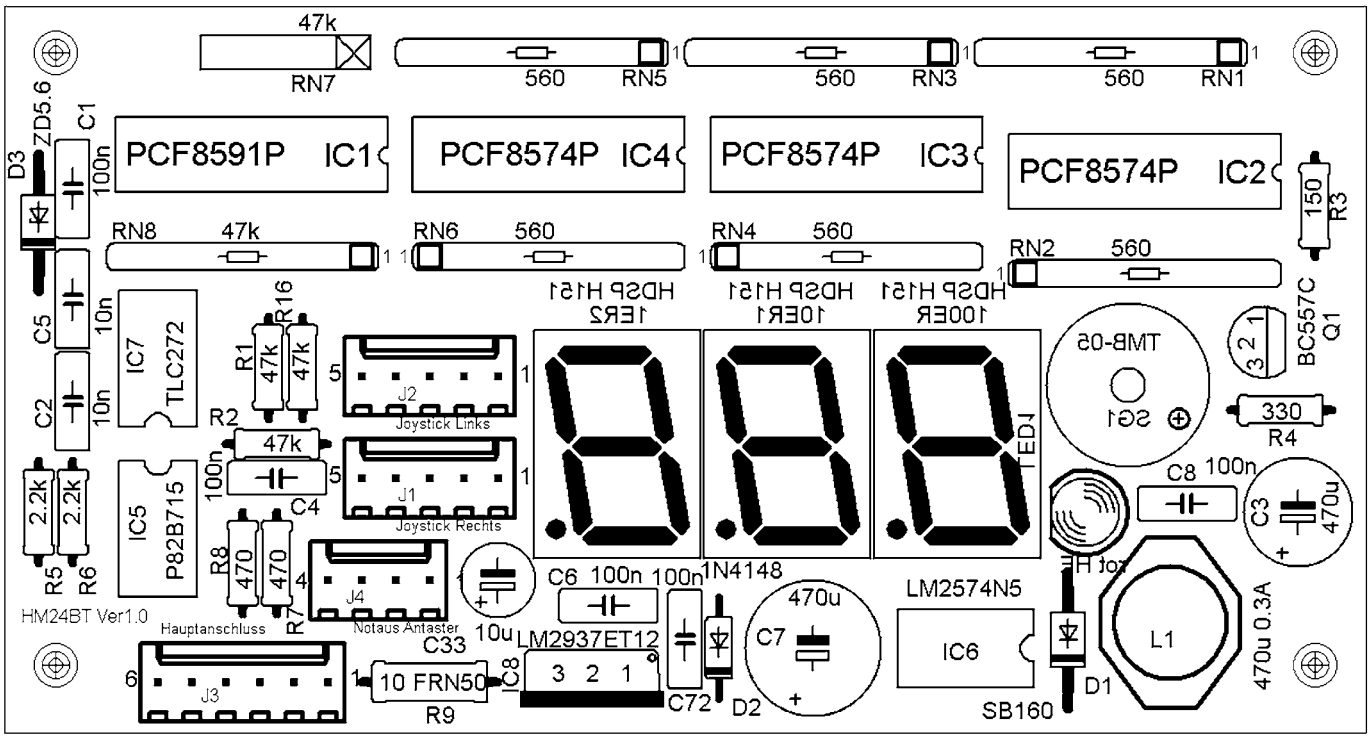


Operating device

Circuit diagram



Conductor plate



Manufacturer and customer service address

haacon-hebetechnik gmbh
Josef-Haamann-Strasse 6
D-97896 Freudenberg/Main
Phone +49 (0)9375 84-0
Fax +49 (0)9375 8466
www.haacon.com

When placing spare parts orders, please provide the following information:

Type 1350.FR - 231459
Year of constrution:
Serial no.
Order no. from spare parts list
Quantity required