

General operating and maintenance manual

TRAKr

Air suspension systems and axles
with disc brakes
Valid for axle versions BIR/SIR/ZIR



Dear customer,

This operating manual helps you to familiarise yourself with the products from SAF-HOLLAND with instructions for their proper use. The operating manual contains important instructions on how to operate the product safely, properly and economically. Adherence to it helps prevent hazards, faults reduce down-time and increase the reliability and service life of the product. Read the operating manual through carefully and follow the instructions accurately. It must be ensured that all personnel with responsibility for performing tasks on the vehicle are able to consult the operating manual at all times.

The operating manual must be kept in the glove compartment in the driver's cabin of the towing vehicle at all times.

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1. Axle data

1.1 Identifying the axle

Please have the exact type designation of the product ready when ordering spare parts.

The 11-digit number (serial No.) can be found on the type plate.

SAF-HOLLAND GMBH D-63856 BESSENBACH · GERMANY			  
Version	BIR9-22K01	ID1 – SBK2243 – 11S	
Serial No.	11 12 117 0009	ID2 – SBK2243 – 11S 01	
Ident No.	147 96 62 7 48 20	ID3 – 10791	
Stat. 9000 kg Vmax. 105 km/h		ID4 – 36110303	
Made in Germany E		SN 11121170009	

Fig. 1: Type plate

1.2 Position of the type plate

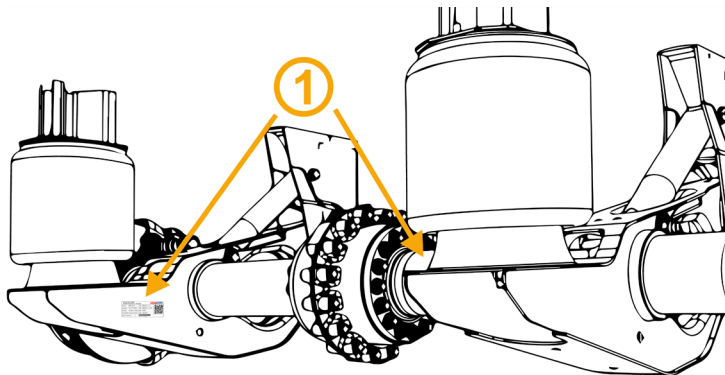


Fig. 2: Position of the type plate, air suspension system type TRAKr

Two type plates each on the rear inside of the trailing arms.

1.3 Identification in case of missing type plate

The axle's serial No. is embossed on the axle journal, on the right-hand side, viewed in the direction of travel.

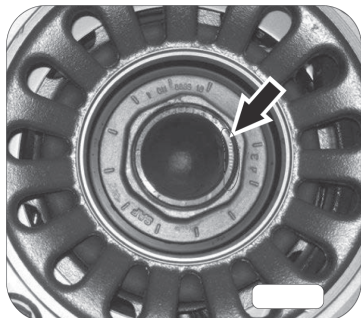


Fig. 3: Right-hand axle stub end: Serial No.

2. Ordering spare parts

When ordering original spare parts from SAF-HOLLAND, make sure that you pay attention to the assembly groups of the respective product.

Non original parts have a negative effect on the function of the product, have a shorter lifetime and cause risks and hazards, which SAF-HOLLAND cannot evaluate. They also increase the maintenance requirement.

For technical information on SAF-HOLLAND products and the purchase of parts, a comprehensive service network of SAF-HOLLAND partner companies are on hand to help you (see the back page or visit us online at www.safholland.com).

For further instructions on identifying spare parts refer to our homepage www.safholland.com in the „Aftermarket“ section.

Updates are published on the internet at www.safholland.com as necessary.

3. General information

3.1 Liability

In principle, the „General Terms and Conditions of Delivery and Business“ apply from SAF-HOLLAND.

SAF-HOLLAND does not recognise any liability claims for personal injury or material damage which are caused by one or more of the following causes:

- Improper use of the product, see „4.2 Proper use“ on page 9.
- Failure to adhere to the operating manual and the safety instructions contained in it.,
- Arbitrary constructional changes to the product,
- Insufficient maintenance of parts which are subject to wear, see „5. Maintenance“ on page 14,
- Improper maintenance work and maintenance work that is not performed as scheduled, see „5.3 Maintenance schedule“ on page 17.
- The use of any spare parts other than original SAF-HOLLAND parts, see „2. Ordering spare parts“ on page 7,
- the use of damaged parts,
- disasters due to external influences or force majeure.

3.2 Warranty and general terms and conditions of business

For information on our current warranties and general terms and conditions, refer to the „Service“ section of our homepage at www.safholland.com.

3.3 Environmental protection

All components and consumables used for maintenance and care must be disposed of in an environmentally friendly manner. Recyclable components must be cleaned of oil and lubricants and recycled. When doing so, you must adhere to the disposal instructions for the respective consumables and the valid national and regional regulations.

4. Safety

4.1 Target group

The operating manual for the product is restricted exclusively to use of the product by the user and personnel authorised and instructed by the user.

The user must ensure that the personnel authorised by him receive regular instruction on the content of the operating manual and in particular the safety instructions it contains.

4.2 Proper use

The product has been constructed using state-of-the-art technology and in accordance with the recognised rules of technical safety. However, its use may result in hazards for the operator or third parts or damage to the device or other objects of material value. The product must only be used as a fixed axle.

Proper use also includes:

- Adherence to the operating manual and implementation of the working steps stipulated in the operating manual.
- Adherence to the performance limits of the product., see „Fig. 1: Type plate“ on page 6,
- Adherence to all maintenance and care instructions and additional inspections.
- The use of the listed consumables, see „5.12 Supplies and tools“ on page 35 and their disposal in an environmentally friendly manner, see „3.3 Environmental protection“ on page 8.

Operationally safe function can only be guaranteed if all the instructions, adjustments and performance limits for the product are adhered to.

4.3 Safety instructions and symbols used in the operating manual

The following symbols are used to denote particularly important information and sections of the text. Make sure that they are always read and adhered to before working with the product.



Danger!

This safety instruction with the signal word warns of a possible safety risk or serious and fatal injuries.



Attention!

This safety instruction with the signal word warns of a possible damage to the product.



Note:

Marking for special user tips and other particularly useful and important information for efficient work and economical use.



Dangerous electrical voltage!

Major accident hazard which could result in death or serious injury.

Dangerous electrical voltages can occur during installation, operation and maintenance of the product. Assembly and repair work may only be carried out by qualified personnel trained in accordance with national laws and regulations.

**Danger!**

Risk of serious traffic accidents which may lead to serious or fatal injuries.

Operation

- You must make sure that the brakes do not overheat, e.g. due to continuous use. Overheating on brakes can lead to a dangerous reduction of the braking power. On disc brakes overheating can cause damage to the surrounding components - in particular the wheel bearing. This can be seriously detrimental to safety, e.g. can cause the wheel bearings to fail.
- In case of overheating the parking brake must not be applied until the brake has cooled down. The brake discs may otherwise become damaged as a result of different levels of tension arising during the cooling process.

**Danger!**

Dangerous electrical voltage: Major accident hazard which could result in death or serious injury.

The vehicle manufacturer is responsible for creating and providing a rescue data sheet in accordance with ISO17840-2.

**Danger!**

Danger of major accidents leading to serious or fatal injuries.

The electrical lines (signal, power and high voltage) must be checked before each ride and replaced immediately if damaged.



Danger!

- When loading and unloading the provided support devices must be used in order to prevent damage to the axle.
- Adhere to the trailer manufacturer's recommendations for OFF ROAD use of the installed axles and suspensions. The SAF-HOLLAND definition OFF ROAD refers to driving on nontarmacked/concreted stretches, e.g. gravel roads, countryside and forest roads, on construction sites and in gravel pits. The operation of axles and suspensions from SAF-HOLLAND in OFF ROAD use which are not conceived for this purpose can cause damage and thus compromise traffic safety.

Care

- The wheel contact surfaces between the wheel disc, wheel hub and the wheel nut contact surface at the wheel disc must not be additionally painted. The contact surfaces must be clean, smooth and free from grease. Failure to observe this may result in the wheel coming loose. Any additional instructions of the wheel manufacturer must also be observed.

Further safety instructions

- You must only use the wheel rims and tyre sizes specified by the trailer manufacturer. The tyres must always have the stipulated tire pressure.



Danger!

Danger of major accidents leading to serious or fatal injuries.

The gearbox may only be operated with the correct amount of gearbox oil (0.45 l).

**Danger!**

Danger of major accidents leading to serious or fatal injuries.

The screw-in thread for the load hook on the gearbox is not suitable for lifting the entire axle.

**Danger!**

Danger of major accidents leading to serious or fatal injuries.

- In the event of axle shaft or gearbox damage, the axle must be tied up or the axle shafts must be dismantled on both sides. It must be ensured that the openings in the wheel hubs are closed again after the axle shafts have been dismantled (masking, etc.). When dismantling the axle shafts, no oil can escape from the gearbox because the gearbox is completely sealed.
- When tied up, the vehicle may only be transferred to the nearest workshop.
- With the axle tied up, pay attention to the maximum axle load of the other axles.

en

4.4 Marking used for sections of text

- Marking for instructions, for actions and information in safety instructions
- 1., 2., 3., ... Marking used for working steps

4.5 General safety instructions

It is imperative to adhere to the following safety instructions for your axles and suspensions from SAF-HOLLAND in order to comply with operational safety and traffic safety:

5. Maintenance

5.1 General maintenance instructions



Danger!

Risk of serious traffic accidents which may lead to serious or fatal injuries.

- Maintenance work must always be carried out by authorized specialist workshops and by appropriately trained personnel.



Dangerous electrical voltage!

Major accident hazard which could result in death or serious injury.

Dangerous electrical voltages can occur during installation, operation and maintenance of the product. Assembly and repair work may only be carried out by qualified personnel trained in accordance with national laws and regulations.

Updates will be published on the internet at www.safholland.com if necessary.

Important: After every wheel change, it is essential to retighten the wheel nuts to the prescribed tightening torque after 50 km and after 150 km.

- Check the thickness of the disc brake pads regularly, e.g. when checking tire pressure. Observe minimum wear limits.
- Carry out regular general visual inspections on the brakes, tires and all chassis parts and check for attachment, wear, leaks, corrosion and damage.
- We recommend using SAF-HOLLAND original spare parts.

- When the minimum wear limit is reached, we recommend carrying out a safety check.



Danger!

- The wheel nuts must be tightened to the prescribed tightening torque for the first time after 50 km and after 150 km.
- At the latest 5,000 km after the trailer/semi-trailer has been put into operation, the brake systems of the towing vehicle and the trailer/semi-trailer must be coordinated by means of a trailer brake adjustment in order to ensure safe and even braking behavior and even brake pad wear. Truck-trailer brake harmonisation should be carried out by specialist and knowledgeable specialist brake workshops . For vehicles with EBS, an adaptation test must be carried out.
- All defective components must be replaced immediately.
- The general safety check must be carried out in accordance with the legal requirements.
- The daily check of the vehicle for road safety before starting the journey is one of the driver's duties. To maintain operational and road safety, SAF-HOLLAND axles and assemblies require continuous care, inspection and maintenance in order to identify natural wear and tear and defects . SAF-HOLLAND recommends the in chapter „5. Maintenance“ on page 14 to carry out the checks and maintenance work described. In the case of repairs, the SAF-HOLLAND repair instructions and information must always be observed.

5.2 Before each journey



Danger!

Risk of serious traffic accidents which may lead to serious or fatal injuries.

- The maximum permitted axle load must not be exceeded and the loaded goods must be positioned with an even distribution.
- For vehicles with an air suspension system, you must ensure that the airbags are fully inflated with air. An incomplete supply of air can cause damage to the axles, chassis, frame and attachment and compromise traffic safety.

1. Carry out general visual inspections on the tyres and all parts of the chassis to make sure they are firmly fastened and check for wear, leaks, corrosion and damage.
2. Carry out general visual checks on the brakes to make sure they are firmly fastened and to check for wear, leaks, corrosion and damage.
3. Remove any abrasive dirt before starting the journey in order to prevent damage to the traffic behind.
4. Visual inspection of the cooling system and hose for damage and leaks. Damaged components must be replaced and repaired.
5. Visual inspection of the gearbox for leaks. A leaky gearbox must be repaired or changed.



Danger!

Risk of serious traffic accidents which may lead to serious or fatal injuries.

The electrical lines (signal, power and high voltage) must be checked before each journey and replaced immediately if the cable sheath is damaged and the cable braid underneath is visible.

5.3 Maintenance schedule



Danger!

Risk of serious traffic accidents which may lead to serious or fatal injuries.

- Maintenance work must always be carried out by authorized specialist workshops and by appropriately trained personnel.
- For vehicles with extreme operating conditions, e.g. OFF ROAD or multi-shift operation, the maintenance intervals should be reduced from 12 months / 120,000 km to 6 months / 60,000 km.
- Observe the maintenance instructions on the following pages.
- If necessary, observe deviating manufacturer information.

5.4 Maintenance schedule air cooled version



Note:

The E-Machine is used to identify a TRAKr version.



Fig. 4: E-Machine air cooled version



Fig. 5: E-Machine liquid cooled version

	Initially after 1 month or 10.000 km *	Every 3 month or all 30.000 km *	Every 6 month or all 60.000 km *	Every 12 month or all 120.000 km *	Every 24 month or all 240.000 km *
Check the wheel bearing unit for play, noise and leakage of grease according to the service of the hub unit.	-	-	X	-	-
Check ride height and adjust if necessary	-	-	-	X	-
For aluminum and stainless steel hangers, check the screw connections, spring bearings and shock absorbers with the prescribed test torque, see „5.10.2 SAF INTRA Aluminum / stainless steel hanger bracket“ on page 30.	X	-	X	-	-
With MODUL units, the U-bracket screw connections must be checked with the appropriate test torques, see „5.10.3 SAF Modul“ on page 31.	-	-	-	X	-

	Initially after 1 month or 10.000 km *	Every 3 month or all 30.000 km *	Every 6 month or all 60.000 km *	Every 12 month or all 120.000 km *	Every 24 month or all 240.000 km *
Check the screw connection of the air bags with the prescribed test torque, see „5.10.1 SAF INTRA steel hanger bracket“ on page 29.	-	-	-	X	-
Check the condition of the outer bellows of the brake calliper for cracks and damage, check the adjuster function and the correct position of the adjuster cover cap.	-	-	-	X	
Checking the wear dimensions on the brake pad, see „5.8.2 Wear limits on the brake pad“ on page 26 and disc, see „5.8.1 Wear limits on the brake disc“ on page 26.	-	-	X	-	-
Check the brake caliper guide system for free movement.	-	-	-	X	-
Check brake disc for cracks, see „5.9 Cracking on the brake disc“ on page 27.	-	-	X	-	-

	Initially after 1 month or 10.000 km *	Every 3 month or all 30.000 km *	Every 6 month or all 60.000 km *	Every 12 month or all 120.000 km *	Every 24 month or all 240.000 km *
Visual inspection of the gearing on the axle shaft. Then re-grease and reinstall. See „5.12 Supplies and tools“ on page 35 as well as „6. De- / Mounting axle shaft“ on page 42.	-	-	-	X	-
Gearbox oil change, see „5.12 Supplies and tools“ on page 35. **	-	-	-	-	X
Greasing of the spline shaft of the E-Machine. See „5.12 Supplies and tools“ on page 35 as well as „7.2 Grease E-Machine spline shaft“ on page 46.	-	-	-	X	-
Visual inspection of the fan on the E-Machine.	-	X	-	-	-
Visual inspection of the inlets of the air ducts.	-	X	-	-	-
Check the brake disc for corrosion, for the first time after 3 years, then every 12 months.					
General security check in accordance with legal requirements.					

*) Depending on what comes first

**) To drain the gearbox oil, the air suspension must be set to the driving height.

5.5 Maintenance schedule liquid cooled version



Note:

The liquid cooled maintenance schedule applies in addition to the air cooled maintenance schedule, see „5.4 Maintenance schedule air cooled version“ on page 17.



Note:

The E-Machine is used to identify a TRAKr version.

	Initially after 1 month or 10.000 km *	Every 6 month or all 60.000 km *	Every 12 month or all 120.000 km *	Every 24 month or all 240.000 km *
Check whether dirt or dust has accumulated on the radiator or fan that affects the air supply or heat dissipation.	X	-	X	-
Visually inspect the coolant fittings and hoses for damage or leaks.	-	X	-	-
Maintain the cooling system by replacing all of the coolant. See „10. Cooling system maintenance“ on page 51.	-	-	-	X
Clean the radiator with a pressure washer. See „10. Cooling system maintenance“ on page 51.	-	X		

*) Depending on what comes first

5.6 Identification of the brake type

The brake is identified by referring to „Fig. 1: Type plate“ on page 6 field „Version“ on the axle's type plate. The combination of numbers and letters after the hyphen indicate the type of brake:

xxx-19S = SAF disc brake type SBS 1918 H0 + H01

xxx-22S = SAF disc brake type SBS 2220 H0 + H01

xxx-22S01 = SAF disc brake type SBS 2220 K0

xxx-22S03 = SAF disc brake type SBS 2219K1

xxx-22K = KNORR disc brake type SK7/SN7

xxx-19K = KNORR disc brake type SN6

5.7 Inspecting pad wear



Danger!

Risk of serious traffic accidents which may lead to serious or fatal injuries.

It must be ensured that the lining thickness is sufficient until the next lining change. Otherwise, the brake pads must be replaced before the wear limit is reached.

5.7.1 SAF disc brake SBS 2220 / 1918 H0, H01

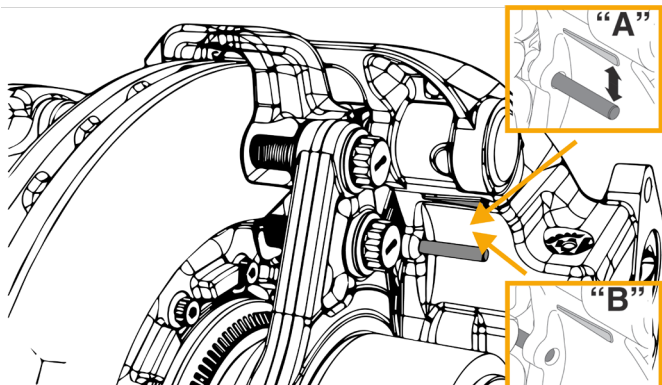


Fig. 6: SAF disc brake type SBS 2220

At the position of the Visual Wear Indicator (VWI), the total wear of the brake disc and both brake pads can be checked with the wheels attached.

Condition „A“ shows the position of the VWI with new brake pad thickness.



Danger!

Risk of serious traffic accidents which may lead to serious or fatal injuries.

When the wear limits are reached, the brake pads and brake discs must be replaced immediately by an authorized specialist workshop and appropriately trained personnel.

If condition „B“ is reached, the thickness of the brake pads and the brake disc must be checked with the wheels removed.

5.7.2 SAF disc brake SBS 2220 K0 / SBS 2219 K1 and Knorr disc brake SK7 / SN7 / ST6

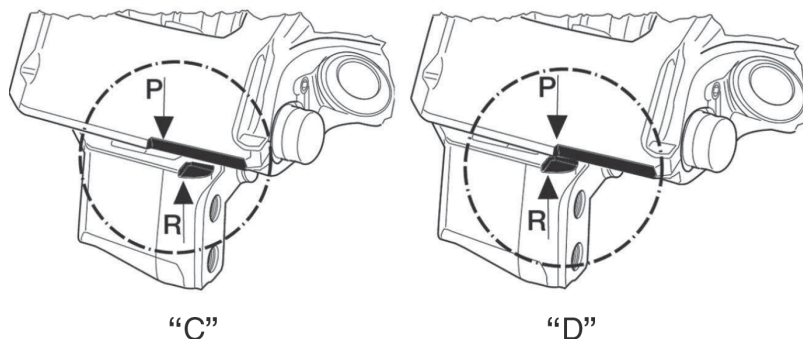


Fig. 7: KNORR disc brake type SK7

The thickness of the brake pads can be checked when the wheels are mounted by checking the position of the brake calliper marking -P- in relation to the fixed brake carrier marking -R-.

Condition „C“ shows the average brake pad thickness.



Danger!

Risk of serious traffic accidents which may lead to serious or fatal injuries.

When the wear limits are reached, the brake pads and brake discs must be replaced immediately by an authorized specialist workshop and appropriately trained personnel.

If condition „D“ is reached, the thickness of the brake pads and the brake disc must be checked with the wheels removed.

5.7.3 Knorr disc brake SN6

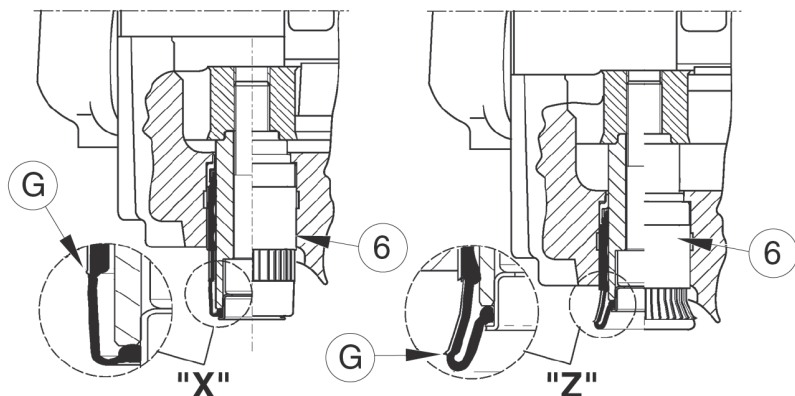


Fig. 8: KNORR disc brake type SN6

The total wear of the brake disc and both brake pads with the wheels installed can be checked at the position of the wear mark -G- (transition from the grooved area to the smooth area).

The condition „X“ shows the new condition of the wear mark -G- on the rubber seal -6-.



Danger!

Risk of serious traffic accidents which may lead to serious or fatal injuries.

When the wear limits are reached, the brake pads and brake discs must be replaced immediately by an authorized specialist workshop and appropriately trained personnel.

If condition „Z“ is reached, the thickness of the brake pads and the brake disc must be checked with the wheels removed.

5.8 Checking the wear on the disc brake

5.8.1 Wear limits on the brake disc

∅ (mm)	„A“ new (mm)	„B“ wear limit reached (mm)
430	45	37
377	45	37

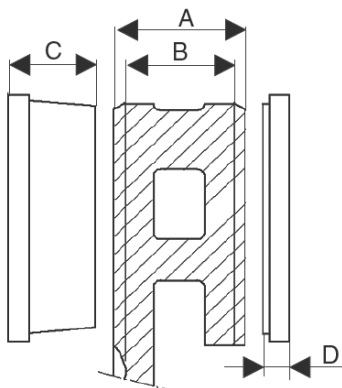


Fig. 9: Wear limit

5.8.2 Wear limits on the brake pad

„C“ new (mm)	„D“ wear limit reached (mm)
WABCO	
32mm	2 mm
KNORR	
30mm	2mm

5.9 Cracking on the brake disc

Check the braking surface of the brake disc carefully for cracking.



Danger!

Risk of serious traffic accidents which may lead to serious or fatal injuries.

In the case of continuous cracking -D1-, brake disc resurfacing is not permitted.

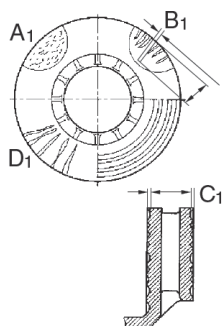


Fig. 10: Cracking on the brake disc

In case of cracking on the brake disc the disc can be resurfaced by a workshop as necessary.

For reasons of safety the minimum dimension for resurfacing the brake discs is set at 39 - 40 mm.

Item	Type of cracking	Ok	Not Ok
-A1-	Network-type cracking	X	
-B1-	Cracks of up to max. 1.5 mm (width and depth) which run to the centre of the hub	X	

Item	Type of cracking	Ok	Not Ok
-C1-	Unevenness of the disc surface	X	
-D1-	Full-length cracking/cracking allthe way through		X



Danger!

Risk of serious traffic accidents which may lead to serious or fatal injuries.

Check the brake disc vents for corrosion. If there is significant corrosion in 3-4 layers, the brake discs must be replaced before the degree of wear has been reached. For the first time after 3 years / 360 thousand km then every 6 months / 60 thousand km.

5.10 Inspection torque



Danger!

Risk of accidents due to loose screw connections.

- Threads must not be oiled or greased.
- Do not loosen screws.
- Check the inspection torque with a pre-set torque wrench. If the stipulated inspection torque is not achieved, an authorised specialist workshop with appropriately qualified staff must be visited.
- Test torques do not represent tightening torques. Tightening torques can therefore deviate and the respective installation instructions / test regulations must be taken into account.

5.10.1 SAF INTRA steel hanger bracket

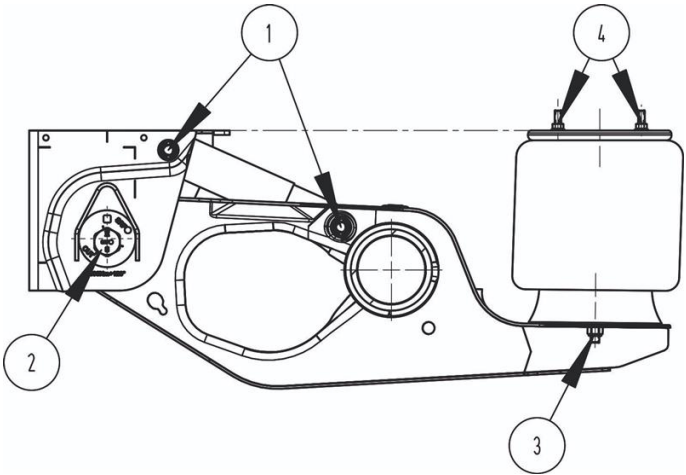


Fig. 11: Torques SAF INTRA steel hanger bracket

Item	Screw connection	Inspection torque in Nm	Tightening torque in Nm	WAF
-1-	M20x1.5	600	600	30
-2-	M30	1200	400 + 120°	46
-3-	M16	80	180 steel piston 80 plastic piston	24
-4-	M12	40	40	17

5.10.2 SAF INTRA Aluminum / stainless steel hanger bracket

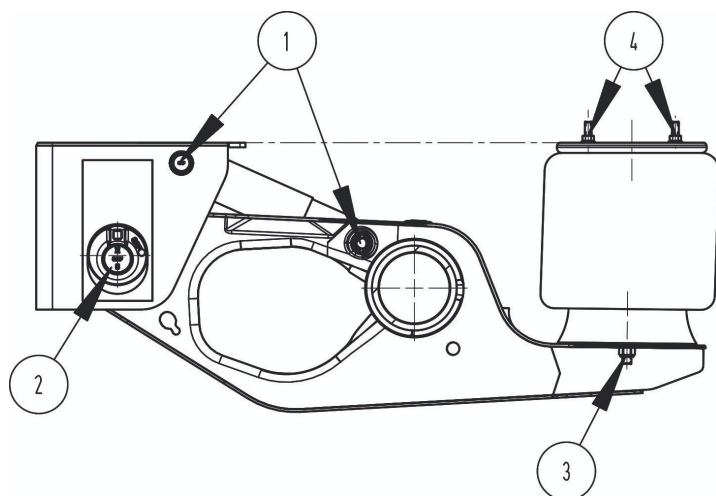


Fig. 12: Torques SAF INTRA Aluminium / stainless steel hanger bracket

Item	Screw connection	Inspection torque in Nm	Tightening torque in Nm	WAF
-1-	M20x1.5	400	400	30
-2-	M30	1200	400 + 120°	46
-3-	M16	80	180 steel piston 80 plastic piston	24
-4-	M12	40	40	17



Danger!

Check the tightening torques of Pos -1- and Pos -2- every 60.000 km or 6 months

5.10.3 SAF Modul

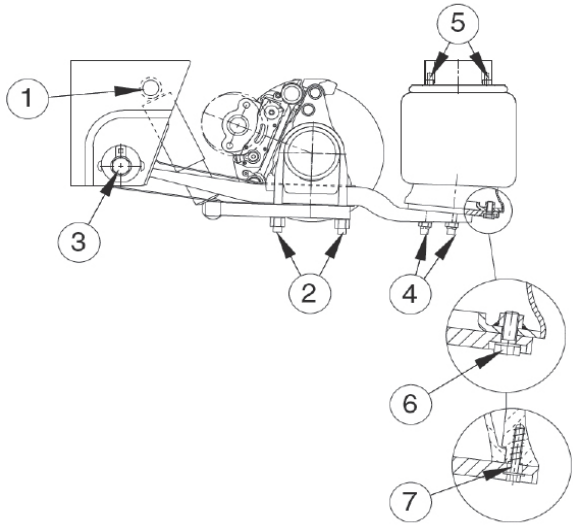


Fig. 13: Torques SAF Modul

Item	Screw connection	Tightening torque in Nm	WAF
1	M24x2	400	36
2	M22x1.5	580	32
3	M30	1200	46
4	M20	180	30
5	M12	40	19
6	M12	80 steel piston	19
7	K100x40	20 plastic piston	10

5.10.4 Tightening instruction

1. The trailing arm bearings have to be installed in accordance with the maintenance and repair instructions.
2. Bring the vehicle to the correct ride height.
3. Position the eccentric under the screw head.
4. Pre-tighten the nuts M30/SW46 to 400 Nm.
5. Tighten the nut an additional 120° (2 corners) while holding the bolt head.
6. Carry out a visual inspection. Correct the tightening angle if necessary.
7. After tightening is complete, mark the positions of the washer, nut and bolt on the hanger bracket.

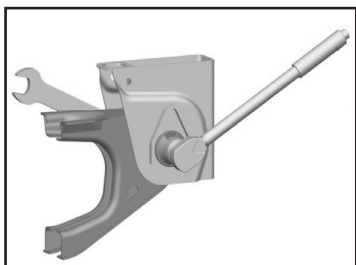


Attention!

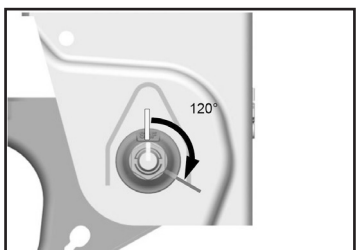
- Do not oil or grease the thread.
- The screw connections of the steel hanger bracket are maintenance-free.
- The layer thickness of the paint on the screw contact surfaces between the shock absorber and the hanger bracket and between the trailing arm and the hanger bracket must not be greater than 45 µm.

For premium coated axles:

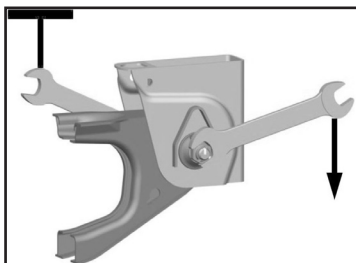
- The layer thickness of the paint on the screw contact surfaces between the shock absorber and the hanger bracket and between the trailing arm and the hanger bracket must not be greater than 120 µm. (Not valid for galvanized or zinc coated axles). With greater layer thicknesses, the screw connections are no longer maintenance-free.
- The pivot bolt must be replaced after removal.



1. Pre-tightening 400 Nm



2. Marking for angular tightening to 120° (two edges)



3. Angular tightening 120° (two edges)



4. Mark for later visual inspection

5.11 Installation of the ground strap



Attention!

Final tightening torque for ground strap: 9 ± 1 Nm

Resistance E-Machine - chassis: $< 0.1 \Omega$ at 0.2 A



Attention!

When installing the ground strap, the compression and rebound travel of the axle must be taken into account.

5.11.1 Mounting with ground strap

The ground strap has to be mounted on the frame of the semi-trailer.

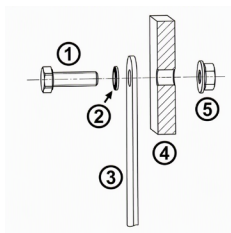


Fig. 14: Mounting trailer chassis

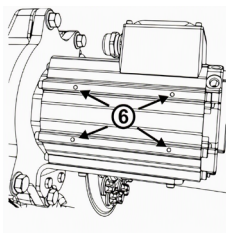


Fig. 15: Mounting with blind hole

Pos	Meaning
1	Hex bolt
2	Lock washer type VS
3	Ground strap
4	Frame of the semi-trailer
5	Hex nut
6	Trapped hole

5.12 Supplies and tools

For the axles:

BIR9-19 / BIR9-22 / BIR10-22 / SIR9-19 / ZIR9-19 / ZIR10-19

Tools	
Mounting tools:	Part no:
Axle Nut Wrench WAF 85	04 434 3828 00
Nut for the half axle - gear box screws: WAF Torx E28	commercial available
Hub unit puller	03 434 3822 03
Universal disc brake tool kit	03 434 3328 02
Wrench for external hexagonal screws, 1/2", E18	04 434 3897 00
Wrench for double hexagon screws, 1/2", WAF15	04 434 3862 00
Double hexagon socket WAF 24 mit 3/4" connection	04 434 3859 00
Socket wrench WAF17 Socket wrench WAF18	Commercially available

TRAKr Supplies

Description:	Part no:
HUB ASSY. BIR 9/10 -TK335/10	03 307 3087 50
MOUNTING KIT HUB CAP TRAKr/e	03 434 5001 00
MOUNTING KIT AXLE TUBE TRAKr	03 434 5002 00
MOUNTING KIT ADAPTER PARTS EM640023-SPL ZSB	03 434 5003 00
MOUNTING KIT E-MACHINE EM640023- SPL ZSB	03 434 5004 00
GEAR OIL KIT TRAKr	03 434 5005 00
GEAR UNIT KIT GU051401-10 TRAKr	03 434 5006 00
KIT E-MASCHINE EM640023-SPL ZSB	03 434 5007 00
SPLINE SHAFT KIT EM640023-SPL	03 434 5008 00
AXLE SHAFT KIT D.40 track -1054-	03 434 5009 01
AXLE SHAFT KIT D.40 track -1079-	03 434 5010 01
KIT E-MACHINE EM640023-SPL TRAKr	03 434 5011 00
COOLING SYSTEM FOR EM640023-SPL	03 422 5090 01
RENOLIT PASTE AZ0-1 -5g BEUTEL	05 387 0015 03

5.13 Maintenance instructions

For axles:

BIR9-19 / BIR9-22 / BIR10-22 / SIR9-19 / ZIR9-19 / ZIR10-22

Maintenance-free hub unit. Regular check according to Service Hub Unit. see „5.3 Maintenance schedule“ on page 17. For that first remove the axle shafts. „6. De- / Mounting axle shaft“ on page 42

Observe the following when repairing the brakes:

Check the brake caliper and seals for damage, wear and tear and correct function.

High-pressure cleaners or liquid cleaners are not permitted on the brake disc and hub unit.

5.13.1 Tighten axle nut

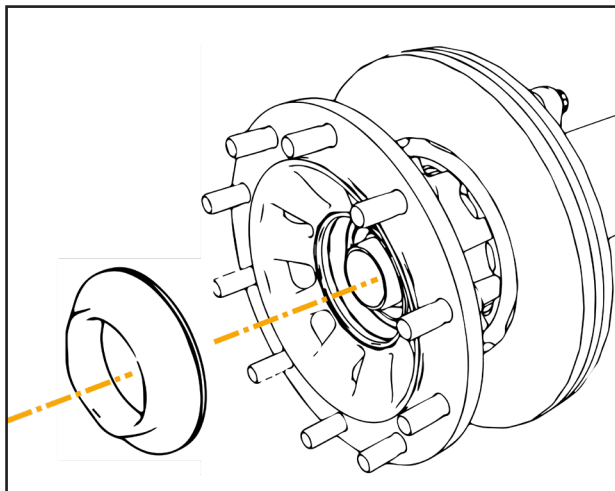


Fig. 16: Tighten axle nut

In the direction of travel on the left - left-hand thread.

In the direction of travel on the right - right-hand thread.

Initial tightening: 150 Nm, turning the wheel head 5 turns evenly.

Final tightening: Tighten 1 graduation (30°) or 900 Nm.

Identification of the axle nut with left-hand thread: Groove on the outer edge.

Hub unit: permissible axial play from 0 - 0.20 mm.



Danger!

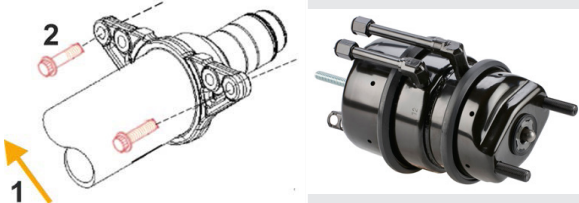
If this regulation is not observed, there is a risk of accidents!

- Do not use an impact wrench.
- Do not oil or grease thread.

5.13.2 Tightening procedures for screw connections

axle type	BIR	SIR / ZIR
Screwing method	Torque / Rotation angle	Torque / Rotation angle
Thread type	M12x1.5	M14x1,5
Screw type	Double hex	Double hex
Head size	E18	WAF 15
Torque / Angle	40 Nm + 90°	50 Nm + 120°
Target torque	130 Nm	180 Nm
Illustration		
Procedure	• Pre-tighten to 40 Nm • Final tightening: 90°	• Pre-tighten to 50 Nm • Final tightening: 120°
Caution	Use screws only once! No oil, grease, dirt or other residues in the threaded area!	

Axle type	SI / ZI	SIR/BIR/ZIR
Screwing method	Torque / Rotation angle	Torque / Rotation angle
Thread type	M14x1,5	M75x1,5
Screw type	Double hex	Hex Nut
Head size	WAF 15	WAF 85
Torque / Angle	50 Nm + 120°	150 Nm + 30°
Target torque	180 Nm	900 Nm
Illustration		
Procedure	• Pre-tighten to 50 Nm • Final tightening: 120°	• Initial tightening: Tighten the wheel hub to 150 Nm, while turning it evenly by 5 turns. • Final tightening: tighten by one notch (30°). • Final tightening: 900Nm • Notice! Left-hand threaded axle nuts: feature a milled groove on the outer flange.
Caution	Use screws only once! No oil, grease, dirt or other residues in the threaded area!	No oil, grease, dirt or other residues in the threaded area! Do not use an impact wrench!

Axle type	SIR/BIR/ZIR	SIR/BIR/ZIR
Screwing method	Torque / Rotation angle	Torque
Thread type	M18x1,5	M16x1,5
Screw type	Double hex	Hex Nut
Head size	WAF 24	WAF 24
Torque / Angle	120 Nm + 60°	-
Target torque	450 Nm	210 Nm
Illustration		
Procedure	Pre-tighten to 120 Nm Final tightening: 60° from inside to outside	
Caution	Note the position of the fitting screws! • Use screws only once! • Ensure there is no oil, grease, dirt or other residue in the threaded area! • Do not use an impact wrench!	• Tighten evenly in two stages, alternating between them! • Use nuts only once! • Ensure there is no oil, grease, dirt or other residue in the threaded area! • Remove the exhausting plug from the bottom if installed!
Index	1: direction of travel 2: fitting screw	

**Attention!**

If this regulation is not observed, there is a risk of accidents!
All screws must be replaced before reassembly.

**Attention!**

Do not use an impact wrench. Neither for loosening or for tightening.



6. De- / Mounting axle shaft

6.1 Overview

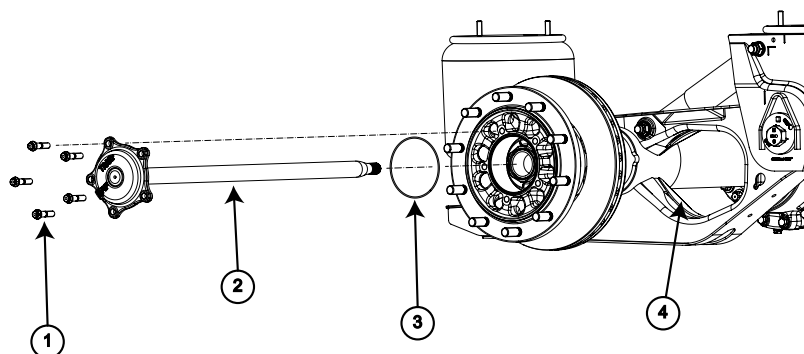


Fig. 17: De- / Mounting axle shaft

Pos	Description
1	Double hexagon screw WAF15, M14x1.5x65
2	Axle shaft
3	O-ring
4	Axle



Note:

After assembling the axle shafts, the correct function of the differential should be checked.

To do this, turn a wheel head by hand with the electric motor mounted and the axle raised. Observe whether the opposite wheel head rotates in the opposite direction. If this is the case, the differential and the connection to the axle shafts are working as intended.

6.2 Tightening torque

Pos	Description	Screw	Torque
1	Double hexagon screw	5 x M14x1.5x65, WAF15	Pre tightening 50 Nm Final tightening 120°, crosswise

6.3 Greasing of the axle shaft gearing

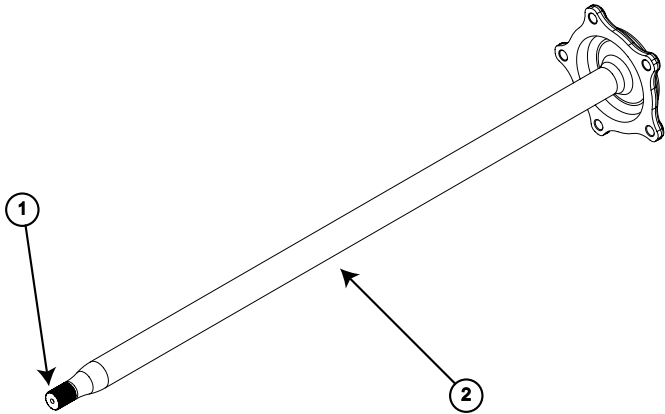


Fig. 18: Greasing axle shaft

Pos	Description
1	Axle shaft gearing
2	Axle shaft

Apply grease to the axle shaft gearing. Observe the maintenance interval specified in section „5.4 Maintenance schedule air cooled version“ on page 17. Only use the specified grease listed in section „5.12 Supplies and tools“ on page 35, part number 05 387 0015 03 „RENOLIT PASTE AZ0-1 -5g BEUTEL“ on page 36.

7. De- /Mount E-Machine



Dangerous electrical voltage!

Major accident hazard which could result in death or serious injury.

Dangerous electrical voltages can occur during installation, operation and maintenance of the product. Assembly and repair work may only be carried out by qualified personnel trained in accordance with national laws and regulations.

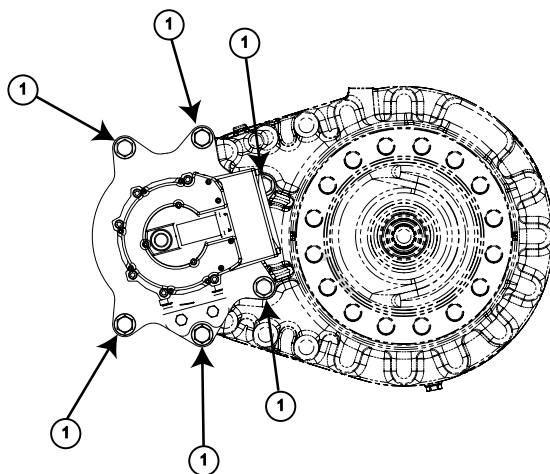


Fig. 19: E-Machine mounting

Position	Description	Screw	Torque
1	Hexagon flange bolt	M12 x 1,5 x 30 WAF18	Pre tightening 50 Nm Final tightening 60° or 135 Nm

1. Switch off the system and ensure that the high-voltage system is de-energized.
2. Verify absence of voltage according to applicable safety procedures.
3. Disconnect all electrical connections from the E-Machine.
4. Support the weight of the E-Machine using suitable lifting

- equipment.
5. Loosen and remove all hexagon flange bolts „Fig. 19: E-Machine mounting“ on page 44.
 6. Carefully remove the E-Machine from its mounting position.
Store the removed components in a safe and clean area.

7.1 Fitting E-Machine sealings

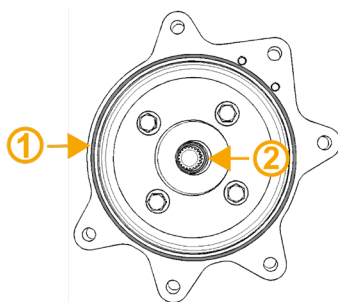


Fig. 20: Mounting sealings

Pos	Description
1	Outer sealing
2	spline shaft O-ring



Note:

The O-ring of the spline shaft sits on gearbox side

7.2 Grease E-Machine spline shaft

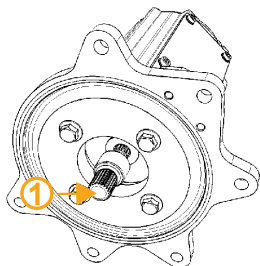


Fig. 21: Parker EM640023-SPL

Pos	Description
1	E-Machine spine shaft

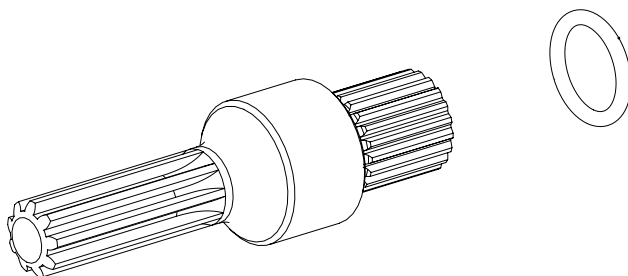


Fig. 22: spline shaft

Apply grease to the spline shaft. Observe the maintenance interval specified in section „5.4 Maintenance schedule air cooled version“ on page 17. Only use the specified grease listed in section „5.12 Supplies and tools“ on page 35, part number 05 387 0015 03 „RENOLIT PASTE AZO-1 -5g BEUTEL“ on page 36.

8. Change gearbox

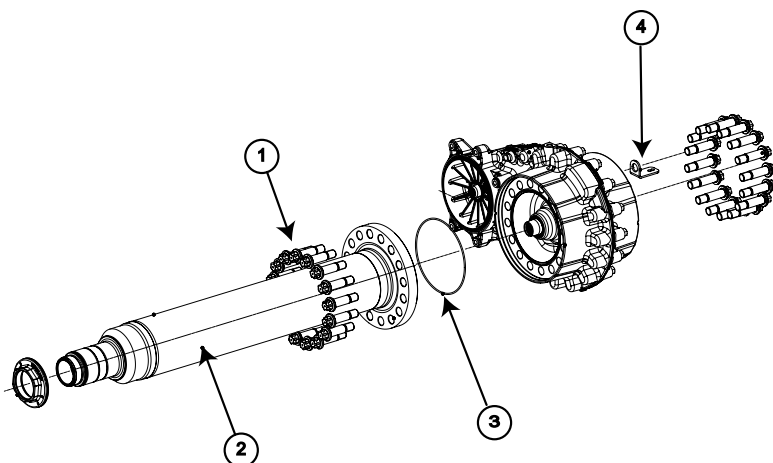


Fig. 23: Gearbox change

Pos	Description	Screw	Torque
1	Axletube screws - gearbox	16x M20x1,5x80	Pre tightening: 50 Nm Final tightening: 550 Nm +/- 50 Nm
2	Axle tube	-	-
3	O ring	-	-
4	Retaining plate for ride height valve	-	-



Danger!

Danger of major accidents leading to serious or fatal injuries.
The screw-in thread for the load hook on the gearbox is not suitable for lifting the entire axle.

- HV System must be deactivated.
- Secure vehicle against rolling.
- Support the vehicle frame.
- Vent/deflate air suspension bellows.
- Remove the generator from the gearbox and secure it to the vehicle; if necessary, remove the generator completely. Chapter „7. De- /Mount E-Machine“ on page 44.
- Disassemble axle shafts, Chapter „6. De- / Mounting axle shaft“ on page 42.
- Drain gearbox oil. Dispose the oil properly.
- Mark the position of the gearbox oil drain plug on the half-shaft flange.
- Mark the mounting position of the bracket for the level control valve on the half-shaft flange.
- Secure axle halves against tipping using suitable tools.
- Support the gearbox with a suitable lifting device.
- Remove the screws/bolts of the axle halves at the flange. „Fig. 23: Gearbox change“ on page 47,
- Carefully remove the bottom screw last.
- Carefully push the axle halves apart at the control arm end using a suitable tool so that the axle halves flange clears the guide on the gearbox.
- Now lower the gearbox downwards.

Installation:

- Inspect axle halves, clean the flange.
- Inspect the gearbox mount for the flange on both sides and insert the O-rings on gearbox side.
- Insert the new gearbox from below into the gap until the flanges of the axle halves are on the same level with the guide on the gearbox.
- Now carefully pull the two axle halves back together at the rear control arm using suitable aids so that the flanges are fully seated in the guide on the gearbox.
- Align the gearbox carefully on the mark for the oil drain plug.
- Position and pre-tighten the axle halves to the gearbox using two old screws (opposing each other).

- Fasten the flanges with new screws. Fix the bracket for the level control valve at the marked position.
- Remove the two old screws and replace them with new screws as well.
- Tighten the bolted connection of the half-shaft and gearbox at the flange to the specified torque.
- Fill the air suspension with and set the axle to ride height.
- Refill gearbox oil. Chapter „11. Gearbox oil change“ on page 56.
- Install axle shafts, Chapter „6. De- / Mounting axle shaft“ on page 42.
- Grease the intermediate shaft.
- Flange the generator to the transmission and fasten with the correct torque. Chapter „7. De- /Mount E-Machine“ on page 44.

9. E-Machine short circuit check

Process for determining a generator short circuit without opening the engine terminal board cover. The system must be electrically isolated before the plug is removed from the system!

1. Open the system-side connector leading to the generator. To do this, open the Harting connector using the lever.
2. Measure the resistance between the pins 1 → 2, 2 → 3, 3 → 1
 - a.) Expected values using a multimeter: 0.3 to 0.4 ohms
 - b.) Expected values using a milliohm meter: 230 mOhm to 380 mOhm

Information: Values below this value indicate a phase short of the generator. Values above this value indicate a defective winding.

-> Then replace the generator

3. Check the protective equipotential bonding between the generator housing and the chassis:
 - a.) Expected value: <1 ohm at 0.2 A

Information: Values above this value indicate that the connection between the generator and the chassis is not guaranteed, which

means that monitoring using an insulation monitor is not possible.

-> Check the ground strap between the generator and the vehicle.

- Bare surfaces.
- Not corroded.

4. Measure the insulation resistance between the chassis and the generator phases:

a.) Expected value with a multimeter: >10 MOhm.

b.) Expected value with a insulation tester at 1000 V: >10 GOhm.

Information: Values below this indicate a short circuit in the housing / a phase is electrically connected to the housing.

Causes: excessive load, moisture/dampness in the generator.

-> Then replace the generator.

10. Cooling system maintenance

10.1 Maintenance intervals

Pos	Maintenance	Remark	Interval
1	Visually inspect the coolant fittings and hoses for damage or leaks. If necessary, take effective corrective action by replacing or repairing the defective parts.	Original SAF-HOLLAND spare parts should be used to replace the hoses. To connect the cooler, hoses with an inner diameter of 19 mm must be used. There is no specific inlet/outlet of the generator cooling connections. The course of the coolant lines can thus be freely selected and adjusted. The cooler should not be placed vertically below the generator or coolant lines to ensure proper coolant flow.	6 Mon.
2	Check whether there is dirt or dust on the radiator or accumulated on the fan. It affects the air supply or heat dissipation.	With a maximum pressure of up to 3 bar.	Initial after 1 Month
3	Replace the coolant. To do this, the entire cooling system must be emptied.		2 Years

Pos	Maintenance	Remark	Interval
4	Clean the radiator and the cooling system with a pressure washer.	With a maximum pressure of up to 3 bar. From a minimum distance of 1.5 m.	6 Month



Danger!

Cleaning using a high-pressure device may only be used if the distance between the lance and the radiator cooling system is $\geq 1.5\text{m}$. The high-pressure cleaner may not be used for distances $< 1.5\text{m}$; instead, a standard hose extension with a maximum pressure of 3 bar may be used. Failure to do so will result in damage to the cooling fans.

10.2 Spare parts cooling system

Pos	Description	Material number
1	Cooling system EM640023	04 422 5090 01
2	Cable set cooling system EM640023	04 424 2055 00
3	Vent valve 20x26mm	04 425 0172 00
4	Coolant hose 2x 2,5m 20x26mm	04 309 3039 00
5	Threaded nozzle coolant connection EM640023	04 424 0332 00
6	Hose clamp coolant hose EM640023	04 194 5002 00



Note:

Current part numbers for the respective spare parts identification can be found on the homepage.

10.3 Drain coolant



Note:

The maintenance of the cooling system only applies to the liquid cooled version.



Danger!

The coolant can be hot and must be cool before servicing.

1. Loosen the hose clamp on - pos 1-. Not shown.
2. Detach cooling hose -pos 1-. Not shown.
3. Collect coolant in a container and dispose of properly.

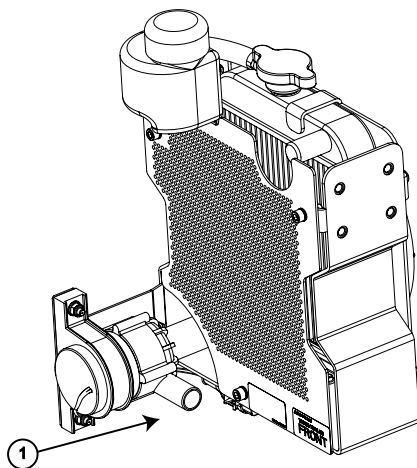


Fig. 24: Drain Coolant



Note:

Collect coolant in a container and dispose of properly.

10.4 Filling the cooling system

Step	Description
1	Loose the cap from the radiator.
2	Fill 1l of coolant in measuring jug.
3	Switch cooling system on by System unit or external other 24V source.
4	Verify that fan and pump is running.
5	Fill in coolant until reaches the top edge of cap fill access.
6a	Check every two minutes for possibility of refill. Refill until reaches the top edge of cap fill access.
6b	Supportive action: move/shake tubes.
6c	Supportive action: use purge valve to de-air tubes.
7	Repeat step 6a to 6c as long as air bubbles are rising to the top surface inside of the cap filling access.
8	Filling porcess is finalized when no further air is rising to the surface inside of the filling cap. Ensure that coolant amount is filled in accordance with graph.
9	Open access cap of expansion tank.
10	Fill coolant until 3/4 of tank is filled.
11	Close access cap of expansion tank
12	The liquid cooling system is ready for operation.
13	Ensure fan operation consideration correct rotation direction (see „Fig. 25: Radiator fan rotation direction“ on page 55).
14	Ensure pump working by 24V by touch (Correct polarity causes vibration which indicates pump working).

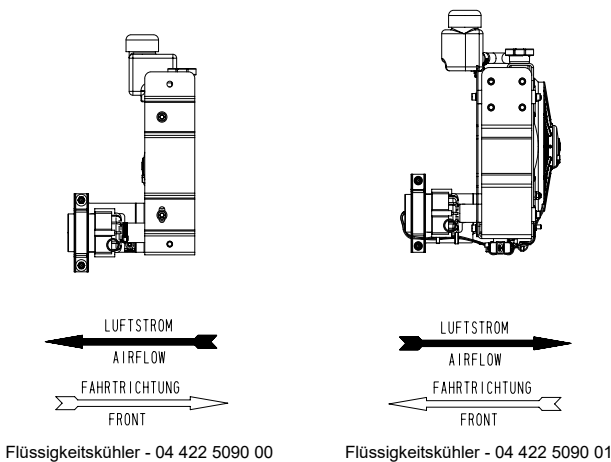


Fig. 25: Radiator fan rotation direction

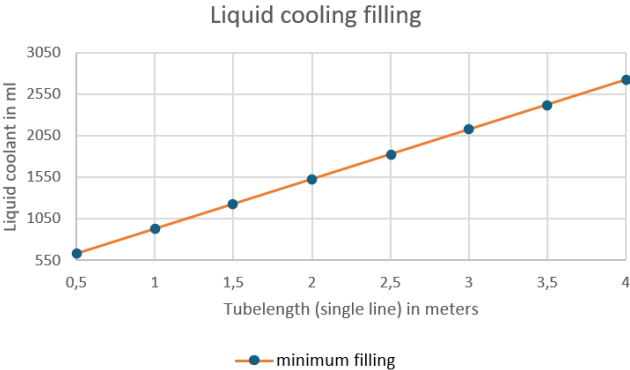


Fig. 26: Liquid cooling filling



Note:

Depending on the simple hose length selected, filling can take longer, up to half a day for full length.

11. Gearbox oil change

Dismount the drain plug to drain the oil

Dismount the Gearbox breather

Check the amount of oil that came out of the gearbox (max. 0.45 l)

Check the metallic particle on the drain plug (see picture)

Insert the new drain plug with new sealing and the correct torque moment

Fill in the new amount of oil through the gearbox breather

Install the breather with the correct torque.



Fig. 27: Check metal flakes at drain plug



Danger!

Before operation the gearbox unit GU051401-10 must be filled with the supplied gearbox oil SAF SynLube SAE 70W-90 (0.45 l, article no: 03 387 1004 00).



Attention!

We recommend to use only original SAF operating supplies.

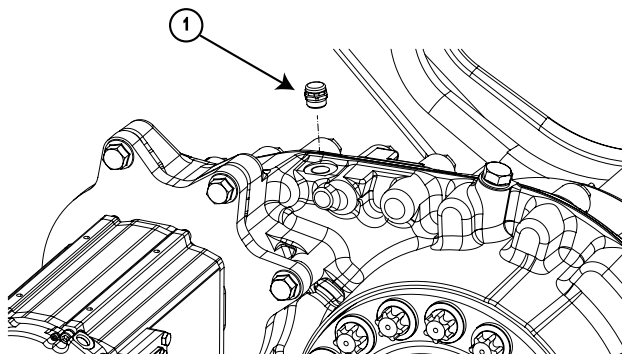


Fig. 28: Initial gear oil filling

Pos	Description
1	Pressure compensation element - oil fill opening.

11.1 Pressure compensation element



Attention!

- The proper function of the pressure compensation element is crucial for the proper function of the gearbox. The gearbox will be damaged if the pressure compensation element is replaced by an ordinary screw.
- Overpainting the pressure compensation element is not allowed. A coat of paint prevents the operation of the pressure compensation element and will result in a defect gearbox.
- The tightening torque of the pressure compensation element is 5 Nm +2/ Nm.
- The article number of the pressure compensation element is 04 337 0077 00.

12. Axle alignment

In order to compensate for production tolerances, an axle alignment and, if necessary, a correction should be carried out.

The maximum permissible deviations (tolerances) of the alignment values are specified by the tyre manufacturer.

The maximum possible wheelbase correction per axle is ± 6 mm.

12.1 Conventional adjustment

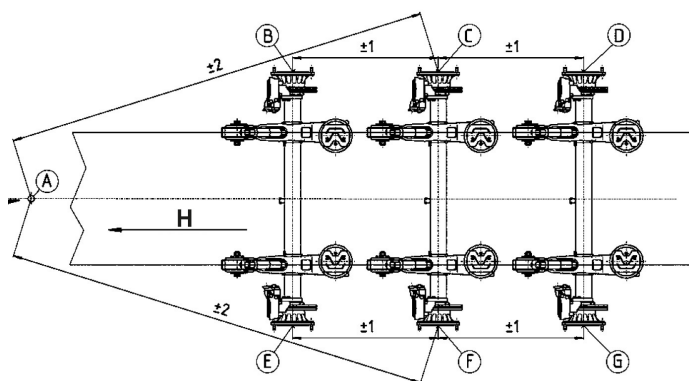


Fig. 29: Adjust axle alignment

Determine the lengths of the diagonals A - C and A - F for the middle axle (reference axle) by comparison measurements, observing the tolerances.

Check the wheelbases B - C and E - F for the front axle and C - D and F - G for the rear axle and correct, if necessary, observing the tolerances.

A: Kingpin

H: Driving direction

12.2 Optical adjustment

Observe the operating and setting instructions of the measuring system manufacturer.

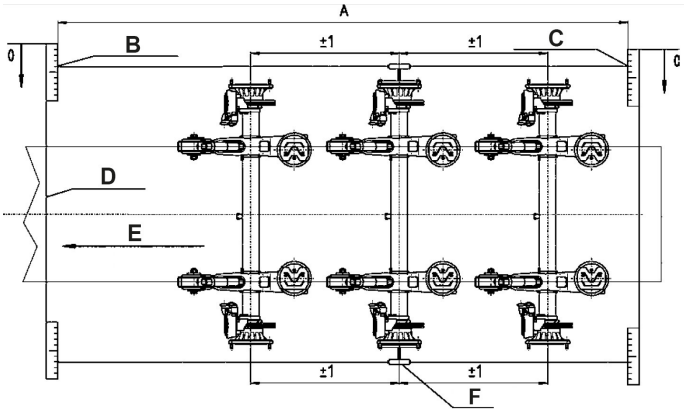


Fig. 30: Adjust axle alignment optically

Legend:

Cypher	Meaning
A	Measuring distance
B	Measurement A1
C	Measurement B1
D	Measuring ruler
E	Driving direction
F	Laser with holder

Calculation of the toe-in and toe-out values:

$$S = A1 - B1 \text{ (mm)} / A \text{ (m)}$$

„/“ means divided by

S = positive value = Toe-in

S = negative value = Toe-out



Attention!

- In order to avoid tyre wear, we recommend that an axle alignment is performed at regular intervals.
- We recommend the use of an optical measuring system for carrying out the axle alignment.
- For alignment, only the centres of the middle of the wheel cap or the middle of the axle stub end are of interest as reference points.



Attention!

Possible causes of deviations in the axle alignment are:

- Loose U-bolts
- Wear of the spring guide bearing
- Deformation of the axle assembly components due to improper use.

12.3 Jacking point

Raise the vehicle with the jack. See „Fig. 31: Jacking point“ on page 60.

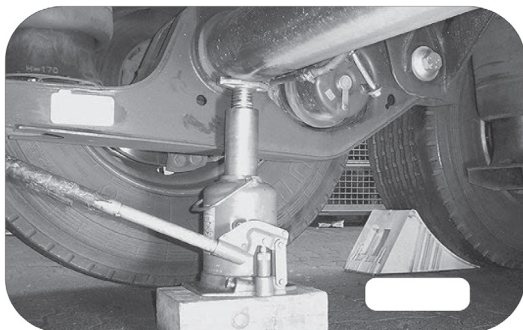


Fig. 31: Jacking point



Attention!

Damage to the axle.

The jack is only to be positioned as in „Fig. 31: Jacking point“ on page 60

13. Inclination of the semi-trailer

On single axles a minimum suspension travel of 60 mm must be observed.

On multiple axle trailers a minimum suspension travel of 70 mm must be observed.

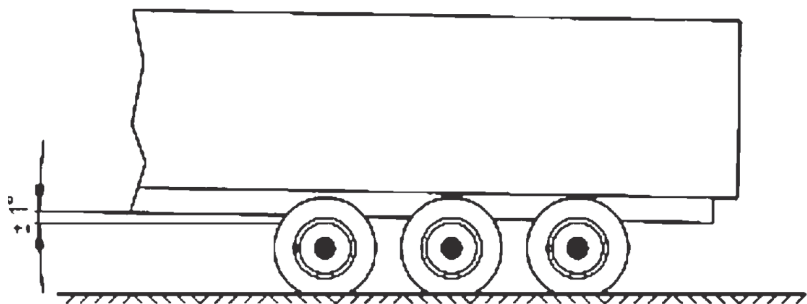


Fig. 32: Inclination of the semi-trailer



Attention!

Risk of damage to the vehicle!

The maximum inclination of the semi-trailer must not exceed 1 degree or 20 mm per meter.

14. TRAKr Torques

14.1 Parker EM640023-SPL

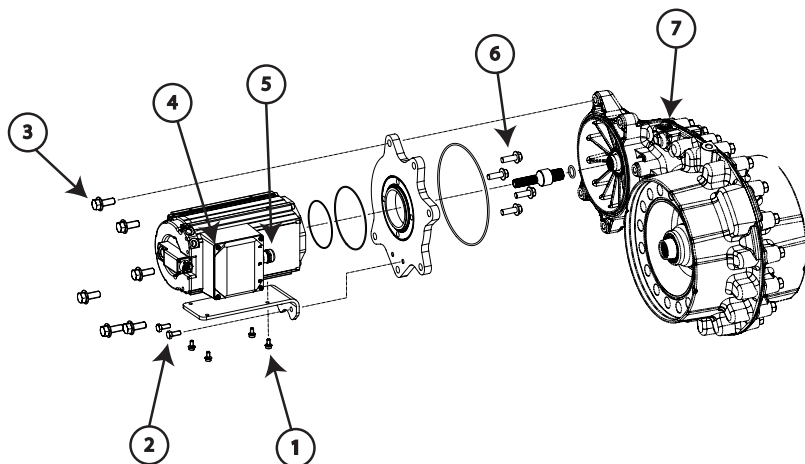


Fig. 33: Torques 1

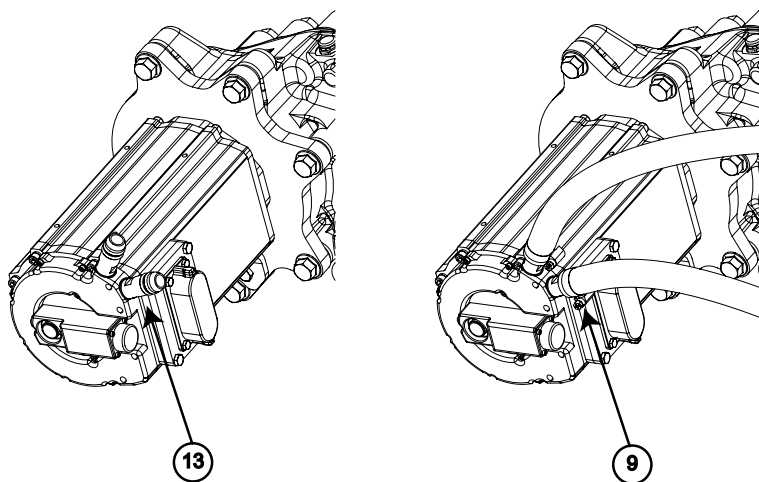


Fig. 34: Torque 2

14.2 Gearbox

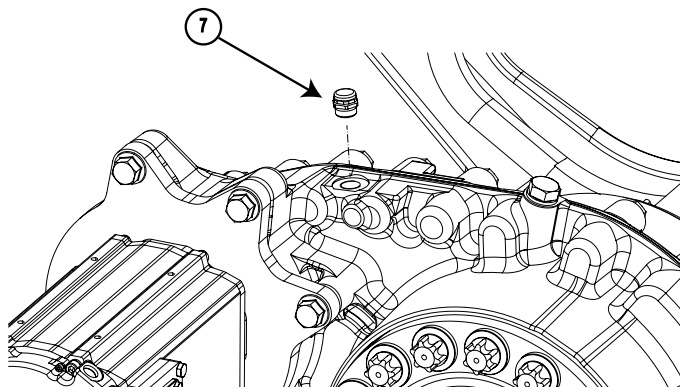


Fig. 35: Torque 3

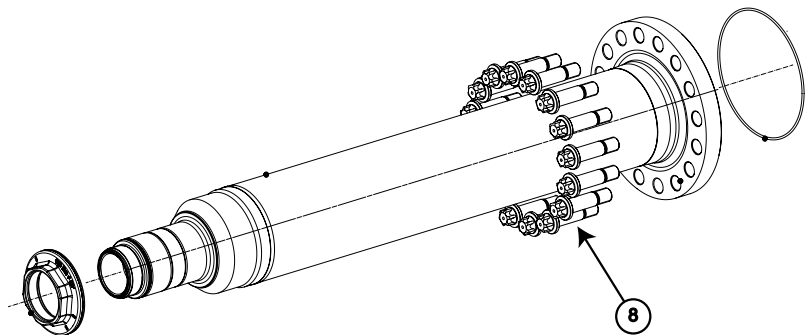


Fig. 36: Torque 4

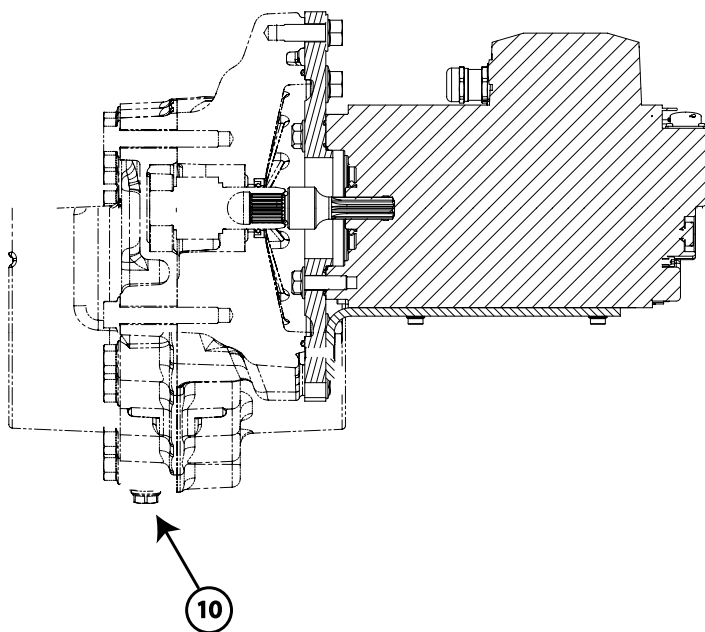


Fig. 37: Torque 5

14.3 AEM

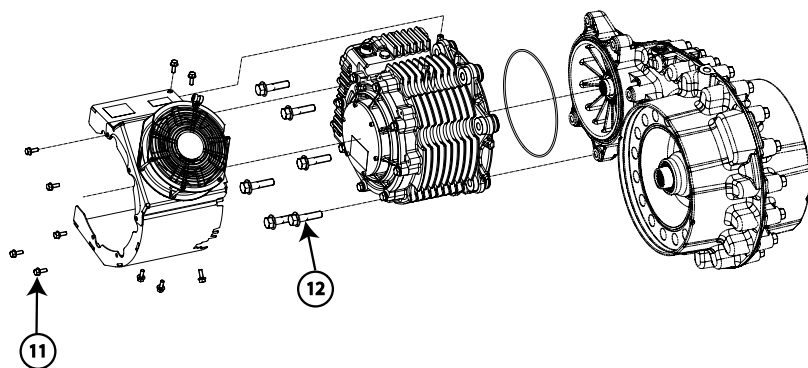


Fig. 38: Torque 6

Pos	Description	Screw	Torque
1	Mounting bracket screws	4x M6 x 12	10 Nm +-1 Nm
2	Mounting bracket screws – adapter flange	2x M8 x 20	24 Nm +-2 Nm
3	Adapter flange screws – gearbox	6x M12 x 1,5 x 20	Pre tightening 50 Nm Final tightening 60° or 135 Nm +- 10 Nm
4	HV system cover	4x M4	8 Nm
5	HV cable interface	1 x M18 x 1,5	12 Nm
6	Adapter flange screws – generator	4x M10 x1,5 x 30	49 Nm +-3 Nm
7	Gearbox breather AF18 oil inlet	1x M16 x 1,5	5 Nm +2 Nm
8	Axle tube screws – gearbox	16x M20 x1,5x80	Pre tightening 50 Nm Final tightening 550 Nm +- 50 Nm
9	Connection piece for hose	Hose clamp	16 to max. 20 Nm
10	Gearbox drain plug	1x M16 x 1,5	5 Nm +2 Nm
11	Screw for Fan and Cowl assembly	10 x M6 x 16	7 Nm +- 0,5 Nm
12	Generator Screw	6x M12 x 1,5 x 50	Pre tightening 50 Nm Final tightening 60° or 135 Nm + 10 Nm crosswise
13	Threaded coolant port	7/16" - 20	20 Nm

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