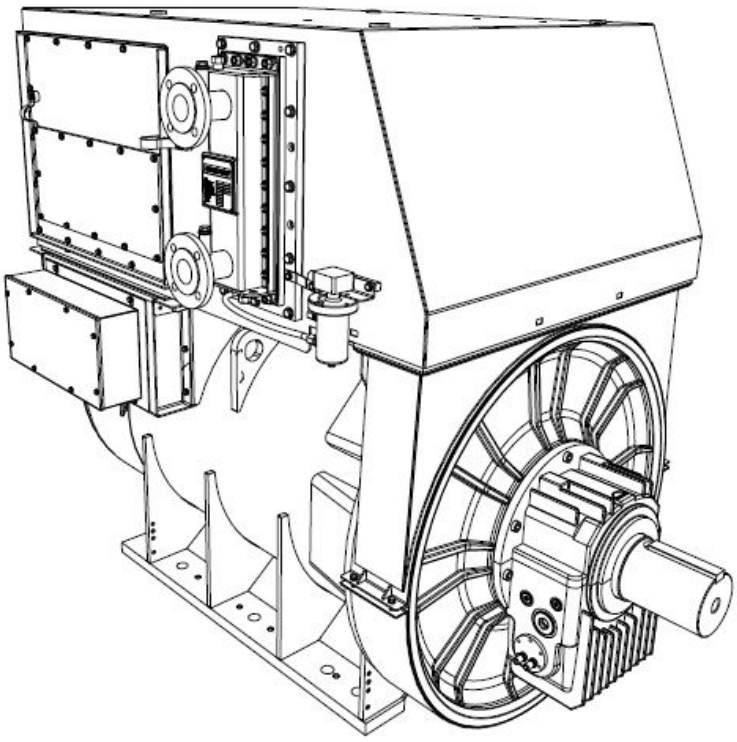
STAMFORD®

Water Cooled and Sleeve Bearing Alternators

ADDENDUM TO OWNER MANUAL



English
Original Instructions

12-2022 A072V518 (Issue 4)

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1 Foreword

1.1 General

This manual forms part of the items supplied and is an important technical guide to the intended use of the alternator. It represents an essential source of information for the user and also for managers for the prevention of injuries and damage to the alternator. The general safety regulations, the specific regulations for the place of use and the precautions described in this document must be followed at all times.

TABLE 1. COMPANY ADDRESSES

Company and European Authorized Representative Addresses	
Cummins Generator Technologies Fountain Court Lynch Wood Peterborough PE2 6FZ United Kingdom	Cummins Generator Technologies Bvd. Decebal 116A Craiova, Dolj 200746 Romania

1.2 Legal

The alternator is the intellectual property of Cummins Generator Technologies LTD (also referred to as 'CGT' or 'the manufacturer' or by the brand names 'STAMFORD®', STAMFORD VITA™ or 'AvK®' within this manual).

1.3 The Manual

This addendum manual contains supplementary guidance and instructions for the installation, servicing and maintenance of optional components that may be fitted and that are not common to all alternator models.

Before operating the alternator, read this addendum manual and the original manual(s) that are supplied with the alternator. Make sure that all personnel who work on the equipment have access to the manual(s) and all additional documentation supplied with it. Misuse and failure to follow the instructions, and the use of non-approved parts, may invalidate the product warranty and lead to potential accidents.

This addendum manual is an essential part of the alternator. Make sure that this addendum manual and the original manual(s) are available to all users throughout the life of the alternator.

The addendum manual and original manual(s) are written for skilled electrical and mechanical technicians and engineers, who have prior knowledge and experience of generating equipment of this type. If in doubt, please seek expert advice or contact your local Cummins Generator Technologies (CGT) subsidiary.

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NOTICE
Information in this manual was correct when published. It may be superseded due to our policy of continuous improvement. Please visit www.stamford-avk.com for latest documentation.

2 Safety Precautions

2.1 Safety Information and Notices used in this Manual

Danger, Warning and Caution panels are used in this manual to describe the sources of hazards, their consequences and how to avoid injury. Notice panels emphasize important or critical instructions.

⚠ DANGER

Danger indicates a hazardous situation which, if not avoided, WILL result in death or serious injury.

⚠ WARNING

Warning indicates a hazardous situation which, if not avoided, COULD result in death or serious injury.

⚠ CAUTION

Caution indicates a hazardous situation which, if not avoided, COULD result in minor or moderate injury.

NOTICE

Notice refers to a method or practice which can result in product damage, or to draw attention to additional information or explanations.

2.2 General Guidance

NOTICE

These safety precautions are for general guidance and supplement your own safety procedures and all locally applicable laws and standards.

NOTICE

Ensure that all personnel are fully aware of location specific rules and procedures in case of accidents, incidents or emergencies.

2.3 Skill Requirements of Personnel

Operation, installation, service and maintenance procedures must only be carried out by experienced and qualified personnel, who are familiar with the procedures and the equipment and who have undertaken suitable training.

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2.4 Risk Assessment

A risk assessment has been performed on this product by CGT, however a separate risk assessment must be performed by the installer/operator/service/maintenance company to establish all site and personnel-related risks. All affected users must be trained on the identified risks. Access to the power plant/generator set during operation must be restricted to persons who have been trained on these risks; refer to Safety Precaution Chapter 2.2 and 2.3.

2.5 Personal Protective Equipment (PPE)

All persons installing, operating, servicing, maintaining or working in or with a power plant or a generator set **must be**; trained in the safe use of, and wear the appropriate personal protective equipment as directed by the installer/operator/service/maintenance company risk assessment; refer to Safety Precaution Chapter 2.4.

Minimum recommended personal protective equipment for installation, operation and service / maintenance or working in or with a power plant or a generator set includes:

Eye protection, face protection, ear protection, head protection, overalls that protect the lower arms and legs, safety shoes or safety boots and gloves.

FIGURE 1. MINIMUM RECOMMENDED PERSONAL PROTECTIVE EQUIPMENT (PPE)

2.6 Tools and Equipment

All personnel that undertake the, installation, operation, service or maintenance of the alternator must be trained in the safe use/operation of the tools/equipment/machinery they use, refer to Safety Precaution Chapter 2.3.

All hand operated tools and power operated tools (either battery or mains powered) and large equipment such as, but not limited to; plant equipment/machinery (such as forklifts), lifting appliances (such as cranes/hoists and jacks) and their accessories (such as chains, straps hooks and shackles) used by personnel to undertake the, installation / operation / service / maintenance of the alternator must be:

- Included within the risk assessment carried out by the installer / operator / service / maintenance company, refer to Safety Precaution Chapter 2.4.
- In a serviceable condition for safe use.
- Suitable for the task and intended use, and if required by the risk assessment; be electrically insulated.

2.7 Safety Information Signs

Safety information signs are provided on the equipment to indicate hazards and emphasize instructions. Become familiar with the signs and the meaning before operating the equipment. To avoid injury, always take the necessary precautions. Sample signs are shown below, these may vary depending on the specification of the alternator.

FIGURE 2. EXAMPLE WARNING SIGNS

2.8 Alternator Safety Precautions

This is an addendum to the original manual(s).

See the **Safety Precautions Chapter** within the **Original Manual(s)** for specific safety information and notices relating to the alternator.

2.9 Danger, Warning and Caution Notices

⚠ DANGER

Rotating Mechanical Parts

Rotating mechanical parts can cause serious injury or death by crushing, severing and trapping.

To prevent injury and before removing safety covers for testing on or near rotating mechanical parts:

- ***Assess risk and test on or near uncovered rotating mechanical parts only if absolutely necessary.***
- ***Only trained, competent persons may test on or near uncovered rotating mechanical parts.***
- ***Do not test on or near uncovered rotating mechanical parts alone; another competent person must be present, trained to isolate energy sources and take action in an emergency.***
- ***Place warnings and prevent access by unauthorized persons.***
- ***Take suitable precautions to prevent contact with uncovered rotating mechanical parts including personal protective equipment and barriers.***

⚠ DANGER

Falling Mechanical Parts

Falling mechanical parts can cause serious injury or death by impact, crushing, severing or trapping. To prevent injury and before lifting:

- ***Check the capacity, condition and attachment of lifting equipment (crane, hoists and jacks, including attachments to anchor, fix or support the equipment).***
- ***Check the capacity, condition and attachment of accessories for lifting (hooks, slings, shackles and eye bolts for attaching loads to lifting equipment).***
- ***Check the capacity, condition and attachment of lifting fixtures on the load.***
- ***Check the mass, integrity and stability (e.g. unbalanced or shifting center of gravity) of the load.***
- ***Fit drive end and non-drive end transit fittings to single bearing alternators to keep the main rotor in the frame.***
- ***Keep the alternator horizontal when lifting.***
- ***Do not use the lifting points fitted to the alternator for lifting a complete generator set.***
- ***Do not use the lifting points fitted to the cooler for lifting the alternator or a complete generator set.***
- ***Do not remove the lifting label attached to one of the lifting points.***

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⚠ WARNING

Moving Mechanical Parts

Moving mechanical parts during generator set coupling can cause serious injury by crushing, severing or trapping. To prevent injury:

- ***Personnel must keep their limbs and body parts away from mating surfaces when coupling the alternator to a prime mover.***
- ***Personnel must keep their limbs and body parts away from mating surfaces when installing large components, such as coolers on to the alternator/generator set.***

⚠ WARNING

Exposure to Ejected Debris and Particles

Ejected debris and particles can cause serious injury or death by impact, severing or puncturing. Exposure to mechanically driven release of debris and particles exists in all directions (horizontally and vertically) in the areas surrounding the alternator air outlet(s), air inlets(s) and the open shaft end (also commonly known as the Drive End (DE)).

To prevent injury; observe the below points while the alternator is operating:

- ***Keep away from the air inlet(s) and air outlet(s) when the alternator is running.***
- ***Do not put operator controls near the air inlet(s) and air outlet(s).***
- ***Do not cause overheating by running the alternator outside rating plate parameters.***
- ***Do not overload the alternator.***
- ***Do not run an alternator with excessive vibration.***
- ***Do not synchronize parallel alternators outside the specified parameters.***

⚠ WARNING

Exposure to Particles and Fumes from an Alternator.

Particles and fumes can be released in all directions (horizontally and vertically) from where any ventilation opening is fitted. To avoid injury:

- ***Avoid the areas around all ventilation openings, air intake(s) and air outlet(s) when the alternator is operating.***

⚠ WARNING

Exposure to Particles and Fumes from Alternator Terminal Boxes.

Particles and fumes can be released in all directions (horizontally and vertically) from where any ventilation opening is fitted. To avoid injury:

- ***Depending on the machine design, the pressure release flap can be located at different positions, orientations, and directions, according to alternator configuration.***
- ***It is important to identify the position(s) of the pressure release flap(s) and avoid them during alternator operation.***

⚠ WARNING

Hot Surfaces and Fire

Contact with hot surfaces can cause serious injury and death by burns. A risk of fire exists where hot surfaces are contacted by combustible items. To prevent injury/fire:

- ***Avoid contact with hot surfaces.***
- ***Always wear the appropriate personal protection equipment, refer to; Safety Precaution Chapter 2.5.***
- ***Ensure that no combustible materials (such as packaging) or flammable substances come in to contact with or are stored in close proximity to the anti-condensation heater (if fitted).***
- ***Ensure that no combustible material(s) or flammable substances come in to contact with or are stored in close proximity to the alternator or prime mover, including its cooling, ventilation and exhaust system(s) where applicable.***

⚠ CAUTION

Hazardous Substances

Contact with hazardous substances such as; oils, grease, lubricants, fuel, adhesive, battery acid or cleaning agents and solvent or corrosive substances can cause minor or moderate injury by contact/inhalation. To prevent injury:

- ***Always read and comply with the information provided by the product manufacturer, use, handle and store substances accordingly.***
- ***Always wear appropriate personal protection equipment, as per product manufacturer information and Safety Precaution Chapter 2.5.***

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3 Introduction

3.1 Introduction Information

This is an addendum to the original manual(s).

NOTICE
Refer and comply with the Original Operator and Service Manual(s) for the Alternator before installing, servicing or operating the alternator, and before installing the water cooler on to the alternator.

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4 Transportation, Storage and Corrosion Protection

4.1 General

⚠ DANGER

Falling Mechanical Parts

Falling mechanical parts can cause serious injury or death by impact, crushing, severing or trapping. To prevent injury and before lifting:

- ***Check the capacity, condition and attachment of lifting equipment (crane, hoists and jacks, including attachments to anchor, fix or support the equipment).***
- ***Check the capacity, condition and attachment of accessories for lifting (hooks, slings, shackles and eye bolts for attaching loads to lifting equipment).***
- ***Check the capacity, condition and attachment of lifting fixtures on the load.***
- ***Check the mass, integrity and stability (e.g. unbalanced or shifting center of gravity) of the load.***
- ***Fit drive end and non-drive end transit fittings to single bearing alternators to keep the main rotor in the frame.***
- ***Keep the alternator horizontal when lifting.***
- ***Do not use the lifting points fitted to the alternator for lifting a complete generator set.***
- ***Do not use the lifting points fitted to the cooler for lifting the alternator or a complete generator set.***
- ***Do not remove the lifting label attached to one of the lifting points.***

The alternator is supplied on a transport frame with a transport lock.

The following protective measures are taken in the factory before the delivery of the alternator. If the alternator is moved subsequently, the same protective measures are to be taken:

1. Protect machined surfaces

   e.g. the seat for the drive coupling, are protected against corrosion using an anti-corrosion coating.

4.2 General Information for Sleeve Bearings

The sleeve bearings are drained after the alternator test run; they are therefore delivered wet with oil. All oil inlets and oil outlets as well as oil pipes are sealed. This method provides adequate protection against corrosion. Sleeve bearings must be filled with oil during commissioning before operating the alternator. The sleeve bearings must always be transported wet with oil but not filled with oil.

4.3 General Information for Air-Water Coolers

Air-water coolers are drained and the inlets and outlets on the cooler are sealed using protective caps.

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4.4 Protect Against Corrosion

4.4.1 Sleeve Bearings

NOTICE
If the transport lock is re-tightened to a higher torque, the bearing will be damaged. In case of questions please contact the manufacturer.

Refer to the manuals from the sleeve bearing supplier. This will be given as a hard copy with the alternator. In the event the manual is misplaced, please contact the service team at https://www.stamford-avk.com/service who can provide you with the manual.

To protect the sleeve bearings against corrosion take the following measures:

- Fittings on the sleeve bearings are sealed in the factory and sealing lacquer applied.
    1. If the sleeve bearing has already been filled with oil (e.g. after test run on the unit), drain this oil.
    2. Spray Tectyl 511 or equivalent with a compressed air tool through the filler opening into the bearing. Repeat this corrosion protection treatment every six months for two years. For this purpose it is recommended to open the packaging at the bearings.
    3. Check the compatibility of synthetic oil with bearing materials, corrosion protection materials and oil filling.
    4. Remove the sight glass for the oil ring, remove the oil and open the oil drain (see Figures 2&3).
    5. Spray corrosion protection agent into the openings using compressed air.
    6. The parts of the bearing must be fully covered with lubricant to prevent corrosion during the storage period.
    7. Seal the sight glasses and the oil drain.
    8. Repeat the procedure on the second bearing.
    9. After protection against corrosion, carefully re-seal the packaging to prevent corrosion due to external effects.

Alternators with sleeve bearings are fitted with a transport lock to protect the bearing against damage during transport and storage.

Check the transport lock for bolt tightness regularly.

4.5 Air-Water Cooler

Check the effectiveness of the corrosion protection measures annually. Or more frequently in particularly unfavorable ambient conditions. Renew the corrosion protection measures as necessary.

1. Drain the existing cooling water.
2. Clean the cooling water pipes and flush using clean, clear water.
3. Dry the cooler with warm, pre-dried air.

4.6 Customer Connection Openings

Clean the cooler and pipes and blow through warm, dry air to dry them. Seal the openings through which cables are not yet connected to terminal boxes or flanges that are not yet connected to pipes.

4.7 Remove Corrosion Protection

NOTICE
Do not remove the anti-corrosion coatings using emery paper.

Before operating a corrosion-protected alternator, remove the measures taken and logged for storage and establish the state required to perform commissioning

- Remove any drying agent that may have been placed in the alternator.
- Remove the anti-corrosion coatings using cleaner´s solvent or a similar oil-based solvent.
- Ensure that all necessary fluids (e.g. oil, grease, water) are added in the correct amount to the alternator before it is taken into operation.

4.7.1 Sleeve Bearings

The removal of the protection against corrosion in the sleeve bearings and further steps are described in the operating instructions for the sleeve bearings.

After extended storage, check the bearings for corrosion damage.

1. Clean the bearing housing from the exterior. Dust and dirt will hinder the dissipation of heat from the bearing.
2. Remove any drying agent that may have been placed in the bearing housing.
3. Re-tighten the joint screws and the flange screws as follows.

For torque settings; refer to the technical documentation from the sleeve bearing manufacturer or contact the manufacturer with the machine number.

1. Check that the sight glass is correctly seated.
2. Check the sight glass for the oil ring on the top of the bearing. This should be tightened hand-tight (12-16 Nm)
3. Tighten all plugs to the required tightening torque.

4.7.2 Cooler

Follow the operation and maintenance instructions supplied by the cooler manufacturer.

This will be given as a hard copy with the alternator. In the event the manual is misplaced, please contact the service team at https://www.stamford-avk.com/service who can provide you with a digital copy of the original manual.

4.7.3 Air-Water Cooler

Fill and operate the water circuit according to the operating and maintenance instructions from the cooler manufacturer. You will find these instructions in the cooler manual supplied by the manufacturer.

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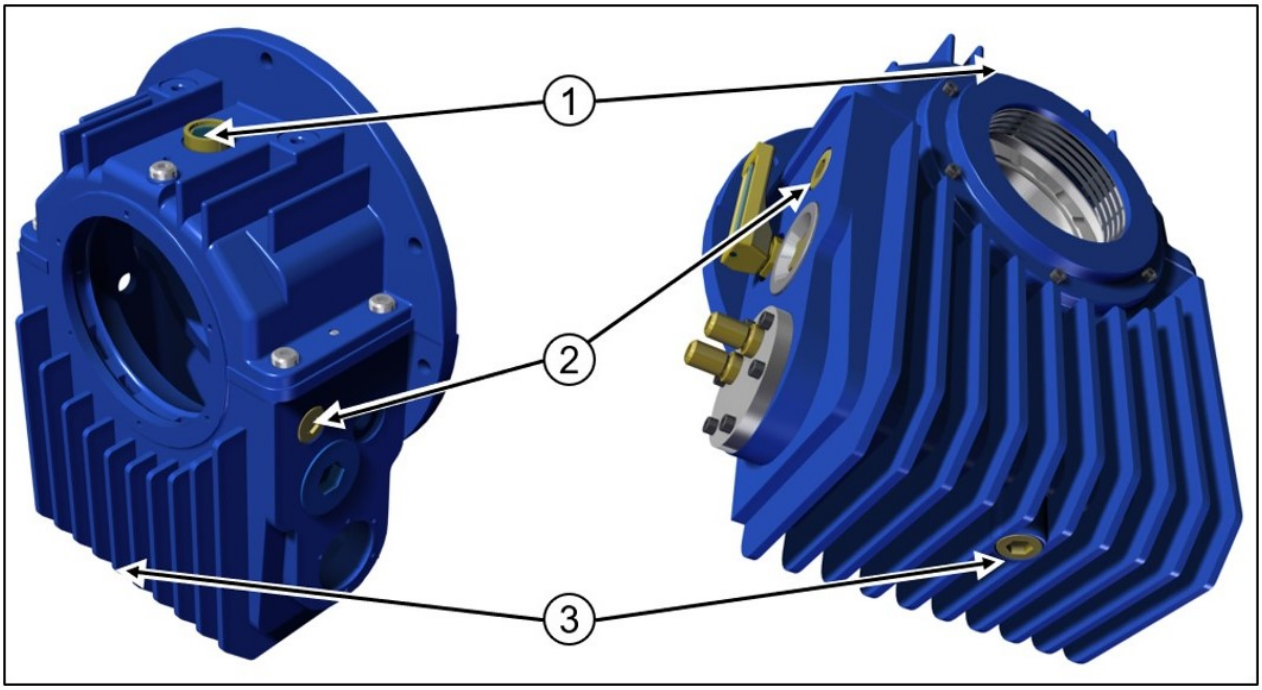
4.8 Oil Drain Points

TABLE 2. DRIVE END (DE) AND NON DRIVE END (NDE) OIL DRAIN POINTS



No	Description
1	Oil Ring Sight Glass
2	Oil Sight Glass
3	Oil Drain

5 Installation and Alignment

5.1 Alternators with Sleeve Bearings

The drive end bearing is always fixed. Fill the sleeve bearings with oil. For this purpose, refer to the sleeve bearing manual for the viscosity of the oil. If this is not stated in the manual, please contact the sleeve bearing manufacturer or the Cummins Generator Technologies service team https://www.stamford-avk.com/service.

5.2 Alternators with Water Coolers

NOTICE

Before installing the water cooler on to the alternator:

- **Read and comply with the safety chapters within the alternator manual(s) and within this addendum manual.**
- **For additional information, refer to; the parts diagram and the parts list/torque setting table in the Appendix.**

⚠ DANGER

Falling Mechanical Parts

Falling mechanical parts can cause serious injury or death by impact, crushing, severing or trapping. To prevent injury and before lifting:

- ***Check the capacity, condition and attachment of lifting equipment (crane, hoists and jacks, including attachments to anchor, fix or support the equipment).***
- ***Check the capacity, condition and attachment of accessories for lifting (hooks, slings, shackles and eye bolts for attaching loads to lifting equipment).***
- ***Check the capacity, condition and attachment of lifting fixtures on the load.***
- ***Check the mass, integrity and stability (e.g. unbalanced or shifting center of gravity) of the load.***
- ***Fit drive end and non-drive end transit fittings to single bearing alternators to keep the main rotor in the frame.***
- ***Keep the alternator horizontal when lifting.***
- ***Do not use the lifting points fitted to the alternator for lifting a complete generator set.***
- ***Do not use the lifting points fitted to the cooler for lifting the alternator or a complete generator set.***
- ***Do not remove the lifting label attached to one of the lifting points.***

⚠ WARNING

Moving Mechanical Parts

Moving mechanical parts during generator set coupling can cause serious injury by crushing, severing or trapping. To prevent injury:

- ***Personnel must keep their limbs and body parts away from mating surfaces when coupling the alternator to a prime mover.***
- ***Personnel must keep their limbs and body parts away from mating surfaces when installing large components, such as coolers on to the alternator/generator set.***

-

The tools and equipment needed to install the water cooler are:

1. Crane / hoist and suitable lifting accessories such as; support stand, shackles, slings or lifting chains etc.
2. 13mm & 17mm sockets and spanners.
3. Torque wrench (50Nm).
4. Protective equipment; as per risk assessment, refer to; Safety Precaution Chapter 2.4 and 2.5.

Installing the Water Cooler on to the Alternator.

1. **Install the anti-vibration mounts on to the water cooler:**
    - Lift the water cooler using a suitable crane.
    - Add 1 x 6mm thick flat washer to the top each of 8 x anti-vibration mounts (see the image below).

FIGURE 3. FLAT WASHER FITTED TO TOP OF ANTI-VIBRATION MOUNT

- Screw the anti-vibration mount, complete with 6mm washer, in to the threaded holes in the underside of the water cooler (see the image below). The washers must be fitted between the anti-vibration mounts and the water cooler.
- Do not work under an unsupported load, support the cooler with a suitable stand if access to the underside is required.

FIGURE 4. 8 X ANTI-VIBRATION MOUNTS INCLUDING 6MM WASHERS FITTED TO UNDERSIDE OF WATER COOLER.

2. **Install the gaskets on to the water cooler:**
    - Remove the film from the self-adhesive strip on each of the gaskets.
    - Fit the self-adhesive gaskets in to the corresponding channels on the underside of the water cooler (see the images below). Each water cooler requires 1 x large gasket and 1 x small gasket.

- Do not work under an unsupported load, support the cooler with a suitable stand if access to the underside is required.

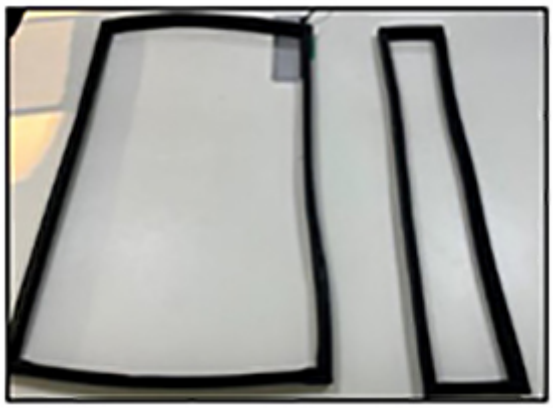


FIGURE 5. GASKET SET

FIGURE 6. FITTED GASKET

3. **Mounting the water cooler on to the alternator:**
   - Using the crane/hoist, position the water cooler over the alternator, align the anti-vibration mount studs with the holes on the water cooler support plate fitted to the alternator.
   - Lower the water cooler in to position.

-

FIGURE 7. WATER COOLER LOWERED IN TO POSITION

Secure the water cooler to the alternator using: 8 x spring washers, 8 x flat washers and 8 x M10 nuts.

- Torque the M10 nuts to 50Nm.

4. **Fit the ground wire between the water cooler and the alternator:**

   Use the M8 bolt in the lower left corner of the rear panel of the water cooler to secure the ground wire between the water cooler and the alternator (Torque 28Nm).

FIGURE 8. GROUND WIRE

The water cooler installation on to the alternator is now complete.

Connect the water cooler to the cooling system and check for leaks and correct operation.

6 Mechanical and Electrical Connections

6.1 General

Do not drill additional holes and threads. The alternator will be damaged.

Mechanical and electrical connections are made after installation and alignment. Mechanical connections can include the connection of air ducts, water pipes and/or an oil supply system.

Electrical connections include the connection of line cables and additional cables, ground cables and optionally external fan motors.

6.2 Mechanical Connections

6.2.1 Connect a Cooler to the Alternator

Alternators that are equipped with a heat exchanger for their cooling have a cooling air seal on the heat exchanger.

If the heat exchanger or parts of the cooling system are supplied separately, they must be installed on site as follows:

1. Lift the cooler or the individual parts only by the lifting eyes using suitable lifting equipment.
2. Make sure all connection components are free of dust and dirt.
3. Refer to the outline drawing in the Appendix for the correct installation positions.
4. Lift the cooler parts at the point provided and fasten them using the hardware provided.
5. Make sure all seals are fitted correctly.

6.2.2 Connect an External Fan Motor (if Fitted)

The external fan motor is generally an asynchronous three-phase motor. The terminal box for the fan motor is on the motor housing. The rating plate on the external fan motor indicates the voltage and frequency to be used. The direction of rotation of the fan is marked with an arrow.

NOTICE
Check the direction of rotation of the external fan motor (fan) visually before you start the alternator. If the fan motor runs in the wrong direction, its phase sequence must be changed.

6.2.3 Connect Cooling Water to Heat Exchanger

6.2.3.1 Air-Water Cooler

Alternators that are equipped with an air-water heat exchanger have connection flanges. Connect the flanges and seal the joints using suitable seals. Refer to the outline drawing in the Appendix for the size of the connection flanges.

- Ensure that the water circuit has no leaks, before starting the alternator.

6.2.3.2 Connect Cooling Water to Sleeve Bearings

Make the connections, make sure they are secure and there are no leaks in the system. The size of the connection is Flange EN 1092 – 1 PN16, DN50. After the alternator has run for a time, it is necessary to check the cooling system. Make sure the coolant can circulate freely.

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6.2.4 Oil Supply for the Sleeve Bearings

Alternators with external lubrication are equipped with oil pipe flanges and optionally pressure limiters and flow indicators.

1. Install all the necessary oil lines and connect the oil supply.
2. Install the oil supply in the vicinity of the alternator so that the pipes to each bearing are of similar length.
3. Test the oil supply before the pipes are connected to the bearings using flushing oil.
4. Check the oil filter and clean or replace if necessary. A replacement filter is not included in the items supplied
5. Install the oil inlet pipes and connect them to the bearings.
6. Install the oil outlet pipes underneath the bearings with a minimum angle of 15°, which corresponds to a fall of 250 - 300 mm/m (3-3,5 inch/foot).

The oil level in the bearings will increase if the fall on the pipes is inadequate; the oil flows too slowly back to the oil tank from the bearings. This will result in malfunctions in the oil flow or even oil leaks. Fill the oil supply with clean oil of the correct type and the correct viscosity. Always use oil of the correct viscosity, stated on the outline drawing. If the type of oil is not clear from the outline drawing, refer to the oil types in the lubricant list from the sleeve bearing manufacturer. If not clear on the type of oil to use, please contact the bearing manufacturer directly or the service team https://www.stamford-avk.com/service.

1. Switch on the oil supply and check the oil circuit for any leaks before starting the alternator.
2. The normal oil level is reached between one third and half of the oil sight glass. Check the oil level only at standstill and at ambient temperature.

NOTICE
The bearings are supplied without lubricant. If the alternator is operated without lubricant, immediate bearing damage will result. **Do not drill additional holes and threads. The alternator will be damaged.**

6.2.5 Hydrostatic System (if Fitted)

Make sure that the hydrostatic system is running and functional before starting or coasting down the alternator.

On the connection of the pipe to the hydrostatic connection for the bearing it must be ensured that the connection on the bearing is not rotated. This connection must be locked using a suitable tool during the installation of the pipe.

Sleeve bearings with hydrostatic lifting are used in critical cases To prevent damage due to metal contact on the bearing surfaces, hydrostatic systems ensure low bearing wear where the alternator starts at low speeds, or with frequent starts/stops, high starting load or very long coast-down times. For these application conditions, the use of hydrostatic systems is strongly recommended by the manufacturer.

The maximum load bearing capacity of the system is defined by the maximum pump pressure. The hydrostatic pump pressure is normally limited to 200 bar. Due to small lubrication gap at the shaft surface in case of metal-on-metal contact, the pump pressure is highest at the start of lifting. Lifting is associated with a noticeable pressure surge. As the lubrication gap increases in size after lifting the shaft, the pressure drops as a function of the bearing geometry and the volume of lubricant. The static pump pressure for supporting the shaft should be around 100 bar.

Refer to the order-specific documentation for the minimum speed for operating a alternator without a hydrostatic system.

7 Commissioning and Starting

7.1 Bearings

7.1.1 Alternators with Sleeve Bearings

Make sure that no rotating parts rub on fixed parts. For self-lubricating bearings, check the oil level in the oil sight glass at standstill and at ambient temperature. It must be in the area from one third to half of the oil sight glass (see **Figure 9 on page 27**).

Continuously check the temperature and oil level in the bearings at the start. This is particularly important with self-lubricating bearings. If the temperature of the bearing suddenly increases, the alternator must be stopped immediately and the cause of the temperature increase corrected, before the alternator is started again. If no logical reason is found using the measuring equipment, open the bearings and check their state.

During the warranty period the manufacturer is always to be informed before measures are taken.

For self-lubricating bearings, check the rotation of the oil lubrication ring through the inspection window on the top of the bearing. If the oil lubrication ring is not rotating, stop the alternator immediately to avoid bearing damage.

In case of alternators with external lubrication, the oil supply is provided by external units. See documentation on the oil supply.

The use of higher supply pressures and increased flow rates will not provide any advantage and may result in leaks. The viscosity of the oil, the flow rates and the maximum oil inlet temperature are stated on the outline drawing.

The lubrication system must be designed so that the pressure in the bearing corresponds to atmospheric pressure (external pressure). Air pressure that enters the bearing via inlet or outlet pipes will result in oil leaks.

7.2 Heat Exchanger

- Before starting, make sure the connections are secure and there are no leaks in the system.

After the alternator has run for a time it is necessary to check the cooling system.

- Make sure the coolant and, if necessary, the air can circulate without hindrance.

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8 Operation

8.1 General

⚠ WARNING

Hot Surfaces and Fire

Contact with hot surfaces can cause serious injury and death by burns. A risk of fire exists where hot surfaces are contacted by combustible items. To prevent injury/fire:

- ***Avoid contact with hot surfaces.***
- ***Always wear the appropriate personal protection equipment, refer to; Safety Precaution Chapter 2.5.***
- ***Ensure that no combustible materials (such as packaging) or flammable substances come in to contact with or are stored in close proximity to the anti-condensation heater (if fitted).***
- ***Ensure that no combustible material(s) or flammable substances come in to contact with or are stored in close proximity to the alternator or prime mover, including its cooling, ventilation and exhaust system(s) where applicable.***

Before starting the alternator, ensure the following:

1. Check the sleeve bearings for the correct oil and oil level according to the technical data and the outline drawing
2. All cooling systems are operating
3. Check the alternator and all attachments for leaks, soiling or damage
4. Check that there is no servicing work in progress
5. The operators and the system are ready for the machine start.

In case of deviations from the normal operating state, e.g. raised temperatures, noise or vibration, shut down the alternator and find the cause. If in doubt, contact the manufacturer.

8.2 Heat Exchangers

Make sure the connections are secure and there are no leaks in the system. Make sure the coolant and, if necessary, the air can circulate freely. (See **Section 9.5.1 on page 30**).

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9 Service and Maintenance

9.1 Lubrication System and Sleeve Bearings

TABLE 3. LUBRICATION SYSTEM AND SLEEVE BEARINGS

	Servicing Work		Type					Servicing Intervals				
System	X = required * = if necessary O = see rating plate/documentation	Alternator in Operation	Visual Inspection	Test and Measure	Clean	Repair or Replace	During Commissioning	Every 8,000 hours or 1 year	Every 20,000 hours or 3 years	Every 25,000 hours or 3 years	50,000 hours or 6 years	100,000 hours
Lubrication System and Sleeve Bearings	Bearing assembly - Fastening, general condition, soiling		X	X	*		X	X				
	Oil - Oil level		X			*	O					
	Bearing shells -General condition, wear		X		*						X	
	Loose lubrication ring - Condition, abraded material		X		*						X	
	Loose lubrication ring - Function		X			X	X					
	Gaskets and seals - Freedom from leak		X	X		*	X	X				
	Bearing insulation - Condition, insulation resistance		X			*					X	
	Operation - Freedom from leaks, operation		X	X		*	X	X				
	Oil - Change interval					X	O					
	Oil - Type, quality, quantity, flow rate, pressure		X	X		*		X				
	Oil lubrication - Function, amount of oil		X				X	X				
	Flow rate regulator - Function		X	X			X	X				
	Oil tank - Cleanliness, freedom from leaks		X		*		X	X				
	Additional units - Operation		X	X	*		X	X				
	Oil cooler / oil heating - Oil temperature		X	X	*		X	X				

-

9.2 Cooling System

TABLE 4. COOLING SYSTEM

	SERVICING WORK		TYPE					Servicing Intervals				
System	X = required * = if necessary O = see rating plate/documentation	Alternator in operation	Visual inspection	Test and Measure	Clean	Repair or Replace	During Commissioning	Every 8,000 hours or 1 year	Every 20,000 hours or 3 years	Every 25,000 hours or 3 years	50,000 hours or 6 years	100,000 hours
Air-water cooling	Heat exchangers -Freedom from leaks, operation, pressure		X				X	X				
	Cooler condensate drain - Function, cleanliness		X		*		X	X				
	Pipes - Cleanliness, corrosion, freedom from leaks		X		X					X		
	Ducts - Cleanliness, operation		X		X					X		
	Cooler housing - Freedom from leaks, condition		X		*		X	X				
	Gaskets and seals -Freedom from leaks, condition, cracks		X			*		X				
	Metal ribs - General condition		X		*					X		
	Vibration dampers - Condition and function		X			*	X	X				
	Check for leaks		X	X	X	*	X	X				

9.3 Servicing the Bearings and the Lubrication System

This section addresses the most important servicing work on the bearings and on the lubrication system.

9.3.1 Sleeve Bearings

In case of normal operating conditions, sleeve bearings only require little servicing.

To ensure reliable operation, the temperature is to be monitored and the oil level as well as the freedom of the bearing from leaks is to be checked.

9.3.2 Oil Tank

The oil tank must be designed so that no pressure from the tank can enter the oil return line to the bearing. The oil tank can be either a separate tank or comprise an external oil circuit. In both cases the tank must be arranged clearly below the bearing so that oil can flow to the tank from the bearings.

9.3.3 Pressure in the Oil Tank

The atmospheric pressure in the oil tank is to be checked. The pressure must not be higher than the pressure outside the bearing. In case of overpressure, the vent on the oil tank is to be checked or fitted if necessary.

9.3.4 Oil Lines

The oil return line is used to return the oil from the sleeve bearing to the oil tank with the lowest possible resistance. This is achieved by using a pipe with an adequately large diameter so that the flow of oil in the return line does not exceed 0.15 m/s (6 inch/s) based in the pipe cross-section.

- Install the oil outlet lines underneath the bearings with a minimum angle of 15°, which corresponds to a fall of 250 - 300 mm/m (3 – 3½ inch/foot).
- The line must be assembled so that the fall stated above is present on all parts of the line.
- Make sure that the line has an adequate diameter, is not clogged and that the entire oil return line has an adequate downward gradient.

9.3.5 Oil Flow

The inlet oil flow is calculated for each bearing. The oil flow must be adjusted appropriately during commissioning.

The alternator settings are defined on the outline drawing.

9.3.6 Oil Level

The oil level for a self-lubricating sleeve bearing must be regularly checked when the alternator is at standstill and at ambient temperature. It must be in the area from one third to half of the oil sight glass.

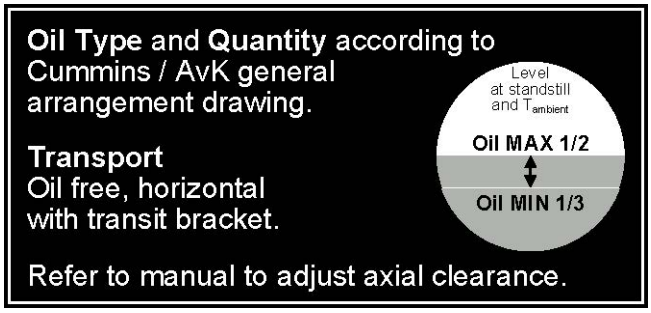

FIGURE 9. OIL LEVEL

Overfilled oil must be drained by opening the oil drain. For externally lubricated sleeve bearings the oil sight glass may be replaced with an oil outlet flange.

9.3.7 Bearing Temperature

NOTICE
Temperature indicated by RTD sensors is typically higher than shown on the analogue thermometer because the spring-loaded PT100/PT1000 sensors are in firm contact with the thermal well, whereas the thermometer fits inside a protective tube and not in direct contact.

The bearing temperatures are measured using a resistive temperature sensor PT100/PT1000. A temperature increase in the bearing beyond the alarm limit can be caused by either increased losses or by a reduced cooling capacity. This often indicates a alternator problem or a problem in the lubrication system and must be clarified.

Temperature variations may have various causes. If the temperature increase is followed by an increased vibration level, the problem may also be related to the alignment of the alternator, or damage to the bearing shells; in this case the bearing must be dismantled and checked.

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9.3.8 Lubrication of Sleeve Bearings

The alternators are equipped with sleeve bearings that feature a very long service life, provided the lubrication functions continuously, the type of oil and quality of the oil correspond to the recommendations from the manufacturer and the instructions on oil changes are followed.

9.3.9 Lubricating Oil Temperature

The correct lubricating oil temperature is of significant importance for maintaining the bearing at the correct operating temperature and to ensure there is adequate lubrication. For alternators that are operated with oil supply systems, the incorrect function of the oil cooler or the oil heater and an incorrect oil flow can cause temperature problems. If temperature problems occur, check whether the quality and quantity of oil are correct for all bearings.

NOTICE
On starting the alternator pay attention to the ambient temperature. The temperature of the oil must not be below a minimum limit. State the minimum temperatures during order clarification. See standard IEC 60034. Consult Cummins Service department if your installation is below the minimum temperature. Starting at excessively low temperatures can result in serious bearing damage.

9.3.10 Recommended Check Values for Lubricating Oil

The lubricating oil is to be checked in relation to the following aspects:

- Use a test bottle to undertake a visual inspection of the oil for color, turbidity and deposits. The oil must be clear. The turbidity must not be caused by water. Check the odor of the oil. A strongly acidic or burnt odor is not acceptable.
- The water content must not exceed 0.05%
- The original viscosity must be maintained within a tolerance of ±10%.
- The oil must not contain any visible soiling. Its purity must correspond to ISO 4406 class 21/18/15 or SAE 4059 class 9
- The amount of metal soiling must be less than 50 PPM. An increase in this value is indicative of bearing damage.
- The increase in the acid number (AN) must not exceed 1 mg KOH per gram of oil. Please note that the AN value is not the BN value (base number).

If in doubt, an oil sample can be sent to the laboratory to determine the viscosity, the acid number, the tendency to foaming etc.

9.3.11 Lubricant Check

During the first year of operation it is recommended to take samples of the lubricating oil after around 1,000, 2,000 and 4,000 operating hours. Send the samples to the oil supplier for analysis. The optimal oil change interval can be determined based on the results.

After the first oil change, the oil can be analyzed in approximately middle and at the end of the oil change interval.

9.3.12 Oil Quality

See outline drawing.

For Lubricant type, please refer to the bearing manufacturer manual or contact the service team https://www.stamford-avk.com/service.

NOTICE

Check for the correct oil quality using the bearing identification plate and the outline drawing. Incorrect or soiled oil will result in serious bearing damage.

9.3.13 Oil Change Schedule for Mineral Oils and Synthetic Oil

⚠ CAUTION

Hazardous Substances

Contact with hazardous substances such as; oils, grease, lubricants, fuel, adhesive, battery acid or cleaning agents and solvent or corrosive substances can cause minor or moderate injury by contact/inhalation. To prevent injury:

- ***Always read and comply with the information provided by the product manufacturer, use, handle and store substances accordingly.***
- ***Always wear appropriate personal protection equipment, as per product manufacturer information and Safety Precaution Chapter 2.5.***

Perform the oil change interval for self-lubricating bearings after 8,000 operating hours, for externally lubricated bearings after 20,000 h.

For frequent starts, slow turning, high oil temperatures or excessively high contamination due to external effects, shorter intervals are required.

NOTICE

For slow turning and for frequent starts and stops, it is highly recommended to use a hydro static device.

9.4 Alternators with Bearing Insulation

The insulation resistance test on the bearings is performed in the factory. The insulation is neccessary to avoid bearing currents which result in bearing damages. The insulation at one of the bearings interrupts the path of the current. Both ends of the shaft must not be insulated from the housing without further measures. The standard is that the NDE bearing is insulated.

9.4.1 Bearing Insulation on Sleeve Bearings

For alternators with the bearing insulated at the non-drive end, the bearing at the drive end is not insulated.

1. To test the resistance in the non-drive end bearing, remove the bearing shells or the drive end bearing plate and lift the rotor. This ensures that electrical contact between the rotor and another part, e.g. the stator or bearing housing, is not possible. Make sure that the circuit cannot be closed by the lifting equipment.
2. Remove any shaft grounding brushes, rotor grounding brushes and coupling (if they are made of conductive material) for the insulation test.
3. Measure the insulation resistance between the shaft and ground using 500 V DC as a maximum. The minimum insulation resistance is 10 kΩ.

9.5 Servicing the Alternator Cooling

Check the alternator cooling regularly to ensure trouble-free operation.

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9.5.1 Servicing Instructions for Alternators with Heat Exchangers

Over time soiling on the cooling surface and the pipes will reduce the cooling performance. Clean the heat exchanger at regular intervals according to local conditions. Check the heat exchanger frequently during the initial operating period.

Clean the heat exchanger using compressed air or clean it using a soft round brass brush. Do not used steel brushes in or on aluminum pipes, a these pipes may be damaged.

9.5.1.1 Air-Water Heat Exchanger

If the temperature sensors indicate a normal operating temperature and the leak detectors are not indicating any leak, visual inspection of the alternator at a servicing interval is sufficient.

For information on servicing the heat exchanger, please see manual from the manufacturer. For any queries, please contact the service team https://www.stamford-avk.com/service.

10 Fault Finding

Before starting any fault finding procedure, examine all wiring for broken or loose connections. If in doubt, refer to the wiring diagram supplied with the alternator.

The following list is to aid in troubleshooting and is not exhaustive. If after completing the appropriate action the problem still persists refer to the Fault Finding manual or consult Cummins Generator Technologies Customer Service Department. For details of your nearest outlet or to refer to the Fault Finding Manual visit **www.stamford-avk.com**.

10.1 Lubrication System and Sleeve Bearings

TABLE 5. LUBRICATION SYSTEM FAULT FINDING

SYMPTOM	POSSIBLE CAUSE	MEASURE
High bearing temperature, oil leaks, bearing noise of vibration, visible degradation of the quality of the oil	Axial load excessive/coupling and installation defects	Check coupling, installation and alignment, check adjustment indicator
High bearing temperature, bearing noise or vibration, visible degradation of the quality of the oil	Inadequate lubrication/oil level low	Check bearing for leaks, top-up oil
	Bearing shells damaged/contamination of the oil	Change oil, check condition of bearing, replace bearing shells if necessary
High bearing temperature, oil leaks, oil in the machine, visible degradation of the quality of the oil	Unsuitable oil quality	Follow manufacturer's oil specification
Oil leaks, oil in the machine	Too much oil and damaged seals	Clean bearings and alternator, replace seals and fill with correct amount of oil
High bearing temperature, oil leaks, bearing noise of vibration	Machine displacement	Re-align machine and replace seals if necessary
Bearing noise or vibration, visible degradation of the quality of the oil	Foreign body in the bearing	Remove foriegn body and clean the bearing. Check condition of the seals, and replace if necessary
Oil leaks, oil in the machine	Pressure differences in and on the bearing/pressure equalization malfunction	Correct cause of the pressure difference

-

SYMPTOM	POSSIBLE CAUSE	MEASURE
High bearing temperature, bearing noise or vibration	Degradation of the quality of the oil/incorrect oil change interval/incorrect oil	Clean bearings and change oil
	Bearings fitted incorrectly	Check installation and adjustment of the bearing
	Bearing shells damaged/bearing currents	Repair bearing insulation, replace bearing shells
	Bearing shells damaged/failure of the bearing	Replace faulty bearing parts
	Bearing shells damaged/normal wear	Replace bearing shells
	Bearing shells damages/increased wear due to number of starts and stops	Replace bearing shells, possibly retrofit hydrostatics
High bearing temperature	Instrument fault/temperature sensor faulty	Check bearing temperature monitoring system
	Function of the oil lubrication or loose lubrication ring degraded	Correct cause
Oil leaks	Bearing seals damaged or worn	Replace bearing seals
	External under pressure or overpressure/rotating equipment in the vicinity	Check pressures, change position of the rotating equipment, fit additional seal if necessary
Oil in the machine	Machine seal damaged	Replace machine seal
Formation of bubbles in the oil	Incorrect oil, contamination of the oil	Follow manufacturer's oil specification, change oil

10.2 Air-Water Cooling System

TABLE 6. COOLING SYSTEM FAULT FINDING

Symptom	Possible Cause	Measure
High Winding Temperature, High Cooling Air Temperature, Water Leak Alarm	Drop in the performance of the secondary cooling system/leak in the cooler	Replace cooler
	Instrumentation or measuring system defect	Check measurements, sensors and wiring
High Winding Temperature, High Cooling Air Temperature	Drop in the performance of the main cooling system/fan damaged	Check fan, cooling circuit
	Incorrect direction of fan rotation	Replace fan
	Drop in the performance of the main cooling system/interior of the machine soiled	Correct cause of the soiling, clean alternator parts and air gaps
	Drop in the performance of the secondary cooling system/coolant pipes blocked	Open cooler and clean pipes
	Drop in the performance of the secondary cooling system/coolant pump faulty	Check pump and repair
	Drop in the performance of the secondary cooling system/incorrect flow rate adjustment	Check coolant flow and adjust correctly
	Drop in the performance of the secondary cooling system/air in the cooler	Bleed cooler
	Drop in the performance of the secondary cooling system/emergency ventilation flap open	Securely close emergency ventilation flap
	Cooling water inlet temperature too high	Adjust cooling water temperature correctly
High Winding Temperature	Overload/control system settings	Check control system, remove overload
	Line asymmetry	Ensure compliance with the line symmetry requirements
	Excessively frequent starts	Leave machine to cool down before the start
	Winding damage	Check windings
	Reactive load outside the specifications	Correct cause

-

10.3 Fault Finding Sleeve Bearings

10.3.1 Oil Leaks on Sleeve Bearings

Owing to the design of the sleeve bearings it is extremely difficult to prevent oil leaks. Minor leaks can occur.

However, oil leaks can also occur for reasons that are not related to the design of the bearings, e.g.

- Incorrect oil viscosity
- Overpressure in the bearing
- Low pressure outside the bearing
- Heavy vibration on the bearing
- Incorrect servicing, repair
- Oil foaming
- Over filling of the bearing with oil

In case of excessive leaks, check the following aspects:

1. Make sure the oil used complies with the specifications.
2. Tighten the bearing house halves and the labyrinth seal cover to the related torque. (See sleeve bearing documentation from the manufacturer). This aspect is particularly important after extended alternator standstill.
3. Measure the vibration at the leaking bearing in three directions at full load. If the vibration level is too high, the bearing housing may be open wide enough to allow the oil to flow away between the halves of the housing.
4. Eliminate any causes of low pressure in the vicinity of the bearing. For example a shaft or coupling cover may be designed so that it causes a low air pressure in the vicinity of the bearing
5. Make sure there is no overpressure inside the bearing. Overpressure can enter the bearing via the oil outlet line from the lubrication unit. Provide vents on the bearing housing to relieve the overpressure from the bearing. Also check the vent at the oil supply unit.
6. In case of an external lubrication system, check whether the fall on the oil outlet pipes is adequate.

If it is not possible to correct the leak problem by means of one of the above points, contact the manufacturer.

10.3.2 Oil

For the bearings to function correctly, the oil must meet certain criteria, including viscosity and cleanliness. Only use the oil stipulated by the manufacturer with the correct viscosity. Incorrect viscosity will result in bearing failures and can seriously damage the bearings and the shaft.

10.3.3 Sealant

To prevent oil escaping from the bearing through the joints, apply a sealant along the joint. Use Loctite 5926 for this purpose. On the use of biodegradable oils, request information on the compatibility of the oil with the sealant from the sealant manufacturer. Only Hylomar Advanced Formulation HV/Hylomar can be used for floating labyrinth seals. Refer to the documentation from the sleeve bearing manufacturer.

10.3.4 Checking the Bearings

If you suspect that the bearing housing itself is leaking, do the following steps:

1. 1. Re-tighten the bolts of the bearing housing
    - This aspect is particularly important during commissioning or after extended standstill, as the parts may have loosened.
    - If the halves of the bearing housing are not firmly screwed together, the oil may flush the sealant out of the joint.
2. Open the bearing housing
    - You can open the bearing housing and apply new sealant to the joint.

      Make sure that the seals are not damaged when opening the bearing and that no dirt or foreign bodies enter the bearing. De-grease the joint then apply a very thin layer of sealant. See documentation from the sleeve bearing manufacturer. Make sure that no sealant enters the interior of the bearing when assembling the halves of the bearing housing. Sealant that enters the interior of the bearing can degrade the function of the bearing or labyrinth seals. Make sure that the labyrinth seals are sealed according to the manufacturer of the sleeve bearing.

10.3.5 Check on the Oil Tank and the Oil Lines

If you suspect that the leak is caused by the design of the oil tank or the oil lines do the following steps:

Pressure in the oil tank

Check the atmospheric pressure in the oil tank. The pressure must not be higher than the pressure outside the bearing. In case of overpressure, check the vent on the oil tank or fit one, if necessary.

Oil lines

Make sure that the line has an adequate diameter, is not clogged and that the entire oil return line has an adequate downward gradient.

10.3.6 Vibration and Oil

All alternators are subjected to vibration and are designed to withstand this vibration to suit their purpose. However, heavy vibration outside the design specification can result in problems with the function of components other than bearings.

Heavy vibration can affect the oil film between the shaft and the bearing shells and more likely results in bearing failures than oil leaks. Under heavy vibration, parts of the bearing housing may move so far apart that the oil enters the joint between the upper and lower half of the bearing housing. The vibration will also cause the parts of the bearing housing to move in relation to each other. The pumping effect that pumps oil into and out of the joint can flush out the sealant, causing bearing leaks.

10.3.7 Hydrostatic System

Possible causes of malfunction:

- The pump motor is faulty or its function is degraded
- The pump pressure is inadequate
- The oil filter is soiled
- The oil flow sensor is not signaling any oil flow, for example in case of intake line fracture

10.3.8 Air Pressure in the Bearing

The bearing housing is not a hermetically sealed unit; overpressure in the bearing housing allows air to escape via the labyrinth seals. As it escapes, the air carries oil vapor with it, and the bearing leaks.

-

Overpressure in the bearing is normally caused by other components, not by the bearing itself. The most frequent reason for overpressure in the bearing is cavitation in the inlet line or a buildup in the oil outlet line.

10.3.8.1 Check the Air Pressure in the Bearing

Check the air pressure inside and outside the bearing.

The best place to measure the pressure in the bearing is at the oil filter or at the inspection glass for the loose lubrication ring on the top of the bearing.

10.3.9 Air Pressure Outside the Bearing

Similar to overpressure in the bearing, a low pressure outside the bearing will result in the extraction of air containing oil from the inside of the bearing, causing the bearing to lose oil.

Low pressure near the bearing housing is caused by rotating parts that move the air in their vicinity so that there is an area of low pressure at the shaft outlet on the bearing.

10.3.9.1 Check on the Air Pressure Outside the Bearing

⚠ DANGER

Rotating Mechanical Parts

Rotating mechanical parts can cause serious injury or death by crushing, severing and trapping.

To prevent injury and before removing safety covers for testing on or near rotating mechanical parts:

- ***Assess risk and test on or near uncovered rotating mechanical parts only if absolutely necessary.***
- ***Only trained, competent persons may test on or near uncovered rotating mechanical parts.***
- ***Do not test on or near uncovered rotating mechanical parts alone; another competent person must be present, trained to isolate energy sources and take action in an emergency.***
- ***Place warnings and prevent access by unauthorized persons.***
- ***Take suitable precautions to prevent contact with uncovered rotating mechanical parts including personal protective equipment and barriers.***

⚠ WARNING

Exposure to Ejected Debris and Particles

Ejected debris and particles can cause serious injury or death by impact, severing or puncturing. Exposure to mechanically driven release of debris and particles exists in all directions (horizontally and vertically) in the areas surrounding the alternator air outlet(s), air inlets(s) and the open shaft end (also commonly known as the Drive End (DE)).

To prevent injury; observe the below points while the alternator is operating:

- ***Keep away from the air inlet(s) and air outlet(s) when the alternator is running.***
- ***Do not put operator controls near the air inlet(s) and air outlet(s).***
- ***Do not cause overheating by running the alternator outside rating plate parameters.***
- ***Do not overload the alternator.***
- ***Do not run an alternator with excessive vibration.***
- ***Do not synchronize parallel alternators outside the specified parameters.***

⚠ WARNING

Exposure to Particles and Fumes from an Alternator.

Particles and fumes can be released in all directions (horizontally and vertically) from where any ventilation opening is fitted. To avoid injury:

- ***Avoid the areas around all ventilation openings, air intake(s) and air outlet(s) when the alternator is operating.***

⚠ WARNING

Exposure to Particles and Fumes from Alternator Terminal Boxes.

Particles and fumes can be released in all directions (horizontally and vertically) from where any ventilation opening is fitted. To avoid injury:

- ***Depending on the machine design, the pressure release flap can be located at different positions, orientations, and directions, according to alternator configuration.***
- ***It is important to identify the position(s) of the pressure release flap(s) and avoid them during alternator operation.***

1. Attach measuring instruments/lines with the alternator at standstill.
2. Only measure with the alternator in operation.
3. Never try to correct low pressure in the bearing by installing a vent, as this would further amplify the leak. Check the air pressure in the vicinity of the shaft outlet on the bearing. This aspect is particularly important if the bearing is mounted on the prime mover using a flange of a coupling, or if the shaft is mounted inside a cover or another construction that together with the shaft can cause a centrifugal air flow.
4. If a very low pressure is found or suspected, the air pressure is to be measured in the vicinity of point where the shaft leaves the bearing housing.
5. To be certain that the low pressure outside the bearing may be the cause of the leak, the pressure must also be measured outside the bearing (Pos. 1 and 3 on the DE and Pos. 5, 7 and 9 on the NDE, in the bearing (Pos. 2 on the DE and Pos. 6 on the NDE) and in the area between the bearing plate and the alternator seal (Pos. 4 DE and Pos. 8 NDE). During the measurement (Pos. 4 DE and Pos. 8 NDE) the pipe is to be inserted as deep as possible and the ducts must be temporarily sealed, see Figure: Checking the air pressure inside and outside the sleeve bearing.
6. To analyze the situation, compare the positions 1-4 on the DE with each other and the positions 5-9 NDE with each other. The measurements outside the bearing must be measured free of malfunctions or turbulence in the vicinity of the alternator. The following situations can occur:
7. If all pressures are equal, the leak is not caused by pressure differences.
8. If the pressure in the bearing is higher than the exterior pressure, there is an overpressure in the bearing.
9. If the pressure outside the bearing is lower than the pressure at other points, there is low pressure near the bearing.
10. If all pressures are different, there may be both overpressure in the bearing and low pressure outside the bearing.

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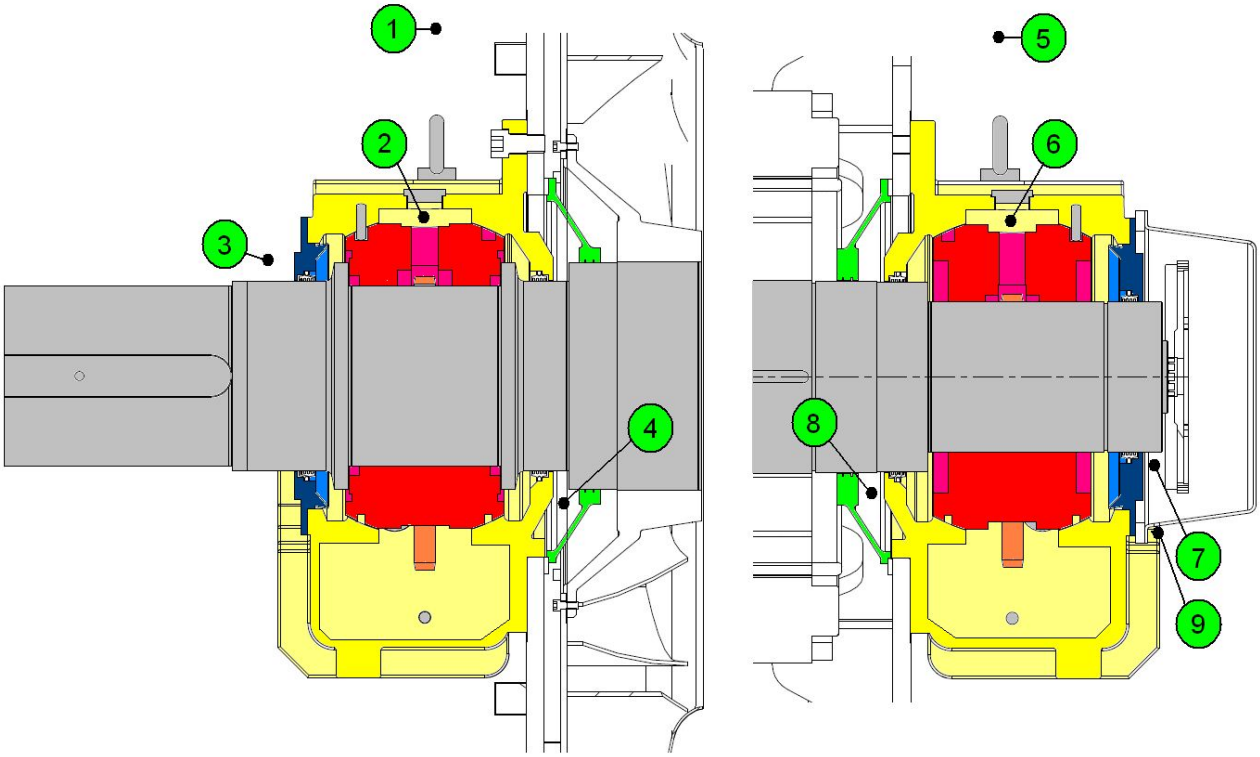

FIGURE 10. CHECKING THE AIR PRESSURE INSIDE AND OUTSIDE THE SLEEVE BEARING (1 - SLEEVE BEARING COVER)

11 Appendix

11.1 Water Cooler Diagram and Parts List

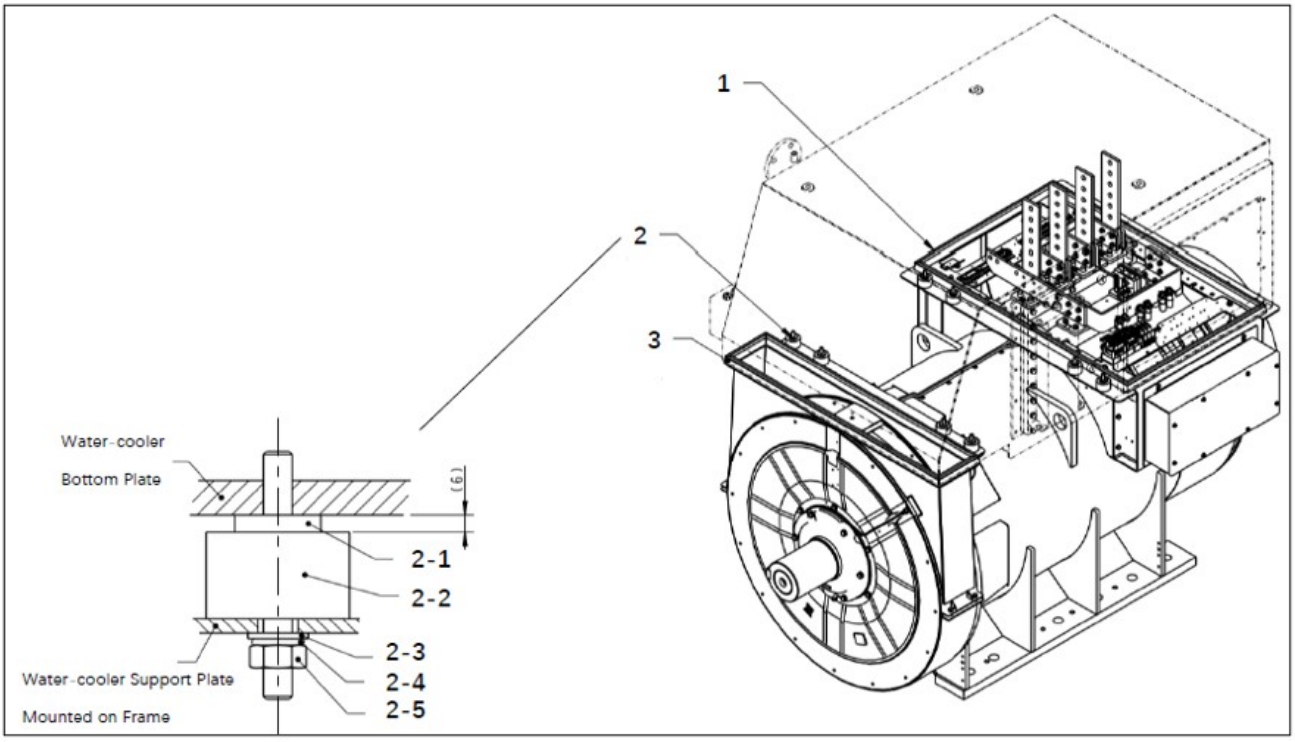

FIGURE 11. WATER COOLER PARTS DIAGRAM

TABLE 7. PARTS LIST AND TORQUE SETTING

Reference	Part ID Number	Component	Quantity	Torque (Nm)
1	A066C518	Gasket Seal - NDE	1	-
2-1	A073E205	6mm Thick Flat Washer	8	50Nm
2-2	A065X995	AVM	8	50Nm
2-3	029-61109	M10 Flat Washer	8	50Nm
2-4	028-31409	M10 Spring Washer	8	50 Nm
2-5	027-41109	M10 Lock Nut	8	50 Nm
3	A066C517	Gasket Seal - DE	1	-

11.2 References

For additional information refer to:

1. The original manual(s) that were supplied with the Alternator.
2. The appendices in the original manual(s) that were supplied with the Alternator.
3. The technical drawings and schematics that were supplied with the Alternator.

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4. If the Alternator is fitted with RENK™ bearings; please contact RENK™ directly for information & support relating to RENK™ components: https://www.renk-group.com/.

If you need any other information or support, please contact the STAMFORD® customer support team.

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