



Hansen P4

Maintenance manual

405

Standardized gear units

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1 Customer data sheet

Customer References	
Name	
Project	
Application	

Hansen Industrial Transmissions References	
Manufacturing Number	
Order	
Gear Unit Type	

Technical Specifications	
AGMA Power Rating [kW]	
AGMA Torque Rating [kNm]	
Exact Ratio	
Input Speed(s) constant [RPM]	
Input Speed(s) variable [RPM]	
Output Speed(s) constant [RPM]	
Output Speed(s) variable [RPM]	
Shaft Arrangement	
Motor Power [kW]	
Motor Torque [kNm]	
Service Factor on Motor Power	
Absorbed Power [kW]	
Absorbed Torque [kNm]	
Service Factor on Absorbed Power	
Direction of Rotation (low speed shaft)	
Mass of the gear unit ¹ [kg]	

ATEX Specifications	
ATEX marking Gear unit	
ATEX marking electrical system	
Calculated minimum bearing lifetime [Hrs]	

Paint	
Corrosion category according to ISO12944-2	
Colour	

Lubrication		
Type of gear oil		
Oil viscosity grade [ISO VG]		
Minimum temperature for the oil bath for start-up [°C]		

¹ Estimated value, without gear oil, without drive package components

Lubrication		
Maximum ambient temperature [°C]		
Maximum continuous temperature of the gear oil in the oil bath, during operation [°C]		
Maximum peak temperature of the gear oil in the oil bath, during operation, [°C]		
Grease type		

Storage and protection	
The gearbox is adequately treated for storage and corrosion protection up to ²	
1 year indoors	
2 years outdoors	
5 years indoors	

² The applicable value is marked with X

2 Manual Disclaimer

This Manual and its instructions and information do not purport to cover all details or variations in the gear unit and do not claim to provide for every possible contingency met in connection with handling, installation, operation, or maintenance. Hansen Industrial Transmissions nv does not make any representations, warranties or guarantees, express or implied, as to the accuracy or completeness of the Manual. Users must be aware that updates and amendments will be made from time to time to the Manual. It is the user's responsibility to determine whether there have been any such updates or amendments. Neither Hansen Industrial Transmissions nv nor any of its directors, officers, employees or agents shall be liable in contract, tort or in any other manner whatsoever to any person for any loss, damage, injury, liability, cost or expense of any nature, including without limitation incidental, special, direct or consequential damages arising out of or in connection with the use of the Manual. The user and/or purchaser bears all risks. Should further information be desired or should particular problems arise which are not covered sufficiently for the users' and/or purchaser's purposes, the matter should be referred to in writing to Hansen Industrial Transmissions nv.



Warning: Read and understand all instructions and information prior to any handling including maintenance, installing or starting the gear unit. Failure to follow instructions could lead to damage, serious injury, or death.

- Only qualified and trained personnel should be involved with the storage (including transport), commissioning, operation, installation (including removal), inspection, maintenance and repairs of this gear unit.
- Make sure all your personnel, operators of this gear unit have been professionally and adequately trained for safe working practices.
- Operators must wear adequate personal protective equipment.
- Ensure all international, EU, national and local safety regulations and codes are followed when handling, maintaining, installing (including all related actions) the gear unit.
- Verify the compatibility of the gear unit with the installation it is meant for.

3 About this document

3.1 Function of the document

The document is only applicable for the "Hansen P4" gear unit, from here on in the document referred to as the gear unit.

The document is for approved maintenance engineers and gives the information that is necessary to do maintenance on the gear unit.

3.2 Language

The original instructions of this document are in English. All other language versions are translations of the original instructions.

If there is any doubt, the English version of the document is binding.

3.3 Illustrations

It is not always possible to show the configuration of your gear unit as in the certified drawing. The illustrations in this document show a typical setup. They are for instruction or description only.

3.4 Use of steps, lists and titles in this document

- The steps in procedures have numbers (123) if the sequence is important.
- The lists and steps with bullets (•) are used if the sequence is not important.
- The lists with letters (abc) are used if the sequence is important.
- In titles of sections, the part between brackets () shows to which type of gear unit or component of the gear unit the section applies.

3.5 How to use this document

Procedure

1. Make sure that you know the structure and the contents of the related documents.
2. Read the safety chapter and make sure that you know all the instructions.
3. Do the steps in the procedures fully and in the correct sequence.

3.6 Warnings, cautions and notes used in the document

Type	Description	Icon
Warning	If you do not obey the instruction, this can cause injury.	
Caution	If you do not obey the instruction, this can cause damage to the gear unit, to equipment or to property.	

Type	Description	Icon
Note	A note gives more data.	

3.7

Related documents

Document name	Document code	Target audience
General conditions of sale	-	<ul style="list-style-type: none"> All personnel
Order acknowledgement	OA_	<ul style="list-style-type: none"> Approved installation engineers
Certified drawing		<ul style="list-style-type: none"> Approved installation engineers
Installation manual	IM_	<ul style="list-style-type: none"> Approved installation engineers
Maintenance manual	MM_	<ul style="list-style-type: none"> Approved maintenance engineers
Logbook		<ul style="list-style-type: none"> Approved installation engineers Approved maintenance engineers
Spare parts drawing		<ul style="list-style-type: none"> Approved maintenance engineers
Service manual of the lubrication and cooling system	D_	<ul style="list-style-type: none"> Approved installation engineers Approved maintenance engineers

Document name	Document code	Target audience
Drive package documentation		<ul style="list-style-type: none"> • Approved installation engineers • Approved maintenance engineers

3.8 Storage of this document and the related documents

This document and the related documents are a part of the gear unit.

- Make sure that you keep the document and the related documents in a dry and clean location.
- Make sure that the document and the related documents are available to all personnel.

3.9 Abbreviations

Abbreviation	Description
H.I.T.	Hansen Industrial Transmissions NV
LSS	Low-Speed Shaft
HSS	High-Speed Shaft

3.10 Customer support

Procedure

1. If more information is necessary, speak to H.I.T.
2. Give the manufacturing number and gear unit type to H.I.T. Refer to the type plate.

4 Description

4.1 Intended use

The gear unit is a part of a machine.

Only use the gear unit for the application, ambient conditions, operation conditions and other conditions of use shown in the order acknowledgement.

Resonant vibrations may cause severe overloads on components which may be several times higher than the nominal load. The responsibility for the vibration analysis which includes the total system of driver, gearbox, driven equipment, couplings, mounting conditions and sources of excitation rests with the owner of the installation. H.I.T. is not responsible for system dynamics and related damage.

4.2 Type plate

4.2.1 Type plate

The type plate gives information about the gear unit.

Sumitomo Drive Technologies		MEMBER OF	
Hansen Industrial Transmissions N.V.			
TYPE	A B		
N°	C		ISO VG K K
P _{NOM} / T _{NOM}	D / E	SF F	MIN startup T L L
Ratio	G	m H	MAX ambient T M M
min ⁻¹	I		OIL VOLUME N
	Z		Grease O Nipples P
Oil	J		Q

- A Manufacturing number
- B Gear unit type
- C Production number
- D Nominal power rating at the HSS
- E Nominal torque rating at the LSS
- F Service factor
- G Exact ratio (R: reduction, M: multiplication)
- H Mass of the gear unit, without gear oil
- I Input speed n1 (output speed n2)
Input speeds n1/n1' (output speeds n2/n2')

Variable input speed n_1 - n_1' (variable output speed n_2 - n_2')

- J Type of gear oil
- K Viscosity of the gear oil
- L Minimum temperature for the oil bath for startup
- M Maximum ambient temperature for which the viscosity of the gear oil is applicable
- N Quantity of gear oil
- O Grease quantity type
- P Number of lubrication points
- Q Grease type
- Z Remarks



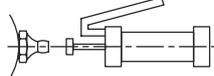
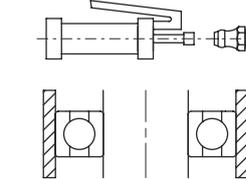
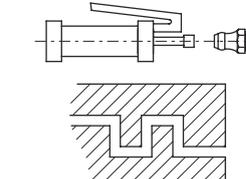
Note: The certified drawing shows more data:

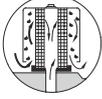
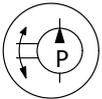
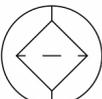
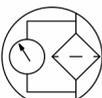
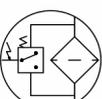
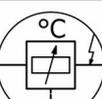
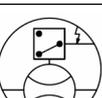
- illustration of the gear unit type
- connection diagrams
- dimensions

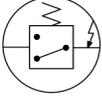
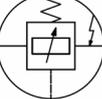
4.3

Signs in the documentation and on the gear unit

Sign	Description
	Risk of hot surface
	Protective clothing is mandatory.
	Hearing protection is mandatory.
	Read and understand the installation and maintenance manual before any handling.
	Dipstick
	Oil drain

Sign	Description
	Magnetic
	Drain valve with hose coupling
	Oil fill plug
	Breather plug
	Anti-humidity
	Condensation drain
	Lubrication point for grease
	Lubrication point for grease at bearing
	Lubrication point for grease at labyrinth seal
	Direction of rotation: clockwise
	Direction of rotation: counterclockwise

Sign	Description
	Breather plug to prevent ingress of moisture
	Level indicator
	Gauge glass
	Overflow
	Inspection opening
	Pump lubrication
	Filter
	Filter with mechanical contamination indicator
	Filter with electrical contamination indicator
	Temperature indicator
	Temperature transmitter
	Level switch
	Flow switch

Sign	Description
	Pressure switch
	Pressure transmitter
	Pressure indicator
	Pressure relief valve
	Built-in backstop
	Heater
	Protection cap for bolt or nut
	Hole for vibration sensor
	Ground connection
	ATEX

4.4 Description of the lubrication of the gear unit

4.4.1 Function of lubrication

Lubrication is necessary for these functions:

- To prevent metal-to-metal contact in gears and bearings
- To decrease friction losses
- To dissipate generated heat from the gears and the bearings
- To prevent corrosion

These parameters have an effect on the type of lubrication system for the gear unit:

- Gear speed
- Mounting position of the gear unit
- Operation conditions

The certified drawing shows the lubrication system that is used for your gear unit.

4.4.2 Splash lubrication

Splash lubrication is the standard for gear units with horizontal LSS of these types:

Number of stages	Speed at the HSS [min ⁻¹]
1	750 to 1800
2	750 to 1800
3	750 to 1800
4	1000 to 1800

In other conditions, the lubrication system can be different. The type plate shows the approved speed of the HSS.

4.4.3 Force-feed lubrication

An oil pump lubricates all turning parts above the level of the oil bath. The oil pump pumps the oil through pressure lines.

There are different types of oil pumps:

- Integrated pump: one of the shafts of the gear unit operates the oil pump.
- Motor pump: a motor operates the oil pump.

The lubrication can be circulation lubrication or pressure lubrication.

Integrated pump

Refer to the certified drawing for the lubrication system for your gear unit. The lubrication system can have these parts:

- A pump
- A filter with bypass
- A flow switch

The pump can operate in two directions of rotation.

Motor pump

A sign on the pump shows the direction of rotation of the motor shaft of the motor pump.

4.5 Breather plug

A breather plug is installed to prevent a too high pressure in the gear unit.

4.6 Cooling system

A cooling system can be necessary to remove heat from the gear unit. Friction and churning of gears and bearings in the gear oil causes the heat.

The certified drawing shows the cooling system that is used for your gear unit, if any.

4.7

Direction of rotation of the shafts

As a standard, the shafts of the gear unit can turn in two directions. If the shafts of the gear unit can only turn in one direction, a sign on the gear unit and the certified drawing shows this.

5 Safety

5.1 Restrictions



Warning: Use of the gear unit in ways other than described in the related documents may result in injury, death, or property and equipment damage. Use the gear unit only as described in the related documents.

H.I.T. cannot be held responsible for injuries or damages resulting from non-standard, unintended use of the gear unit. The gear unit is designed and intended only for the purpose described in the related documents.

Unintended use includes these actions:

- Making changes to the gear unit that have not been recommended in the related documents or using parts that are not replacement parts or accessories from H.I.T.
- Use of materials or equipment that are inappropriate or incompatible with the gear unit.
- Use of gear oils and grease that is not indicated on the type plate or the specifications in this document.
- Allowing unapproved personnel to perform any task on or with the gear unit.

5.2 Approved maintenance engineer

The term approved maintenance engineer is specified here as a person that fully knows the gear unit and its safe operation. Approved maintenance engineers obey all related safety regulations and are approved to safely do maintenance on or with the gear unit.

It is the responsibility of the company that owns the system where the gear unit is part of to make sure that all maintenance engineers obey these requirements.

5.3 General safety instructions



Warning: Obey the specifications that the certified drawing shows. If specifications in this document and the certified drawing for the same item are different, only the specifications in the certified drawing are applicable.

- When you do work on or with the gear unit, obey all legislation and regulations that apply to safety and work requirements, that apply in the country and at the location where you do work on the gear unit.
- Obey the safety instructions of the manufacturer of all chemical materials, including gear oil and grease. Refer to the material data sheets of the chemical material. Make sure that all personnel that installs, does maintenance and servicing on the gear unit, receives these safety instructions.
- Do not open the gear unit near an open flame, spark or hot object. If not this can cause ignition of the fumes of the oil.
- If the gear unit is used as a part of a system that moves persons, obey all regulations and install all necessary safety devices.

5.4 Safety instructions for maintenance

- Obey the European Directives 2006/42/EG and the local safety regulations and install guards and other safety equipment.
- Make sure that the motor that operates the gear unit is de-energized. Make sure that the motor cannot be energized unwantedly during maintenance.
- Make sure that the movement of the gear unit and the motor is blocked.
- If safety devices are removed for maintenance, make sure that they are correctly installed again before you start the gear unit.
- Make sure that there is sufficient lighting on the drive group that the gear unit is a part of.
- Do not disassemble the gear unit.

5.5 Special safety instructions (backstop)



Warning:

- Do not loosen a part of the backstop when there is load on the gear unit. In this condition, the gear unit can turn in the incorrect direction.
- Make sure that a failure of a backstop cannot cause injury or damage to the system.

5.6 Partly completed machine

The gear unit is a partly completed machine. It is a part of a drive group. Refer to the documentation of the drive group and obey all instructions of the drive group.

5.7 Instructions in case of a fire



Warning: After a fire, protective clothing and respiratory equipment are mandatory to handle the gear unit. After a fire, the gear unit can contain dangerous substances that cause injury when you touch or breath them.

- Do not start a gear unit that has burn marks. Speak to H.I.T.
- Hazardous substances of combustion can be generated in a fire involving materials in section [Materials of the gear unit](#) on page 32.

5.8 Warranty

The warranty clause of the general conditions of sale applies to gear units installed and maintained as per instructions contained in this document, including the related documents, and in any additional instruction leaflets supplied with the gear unit insofar as the gear unit operates within the service and rating conditions put forward in the order acknowledgment and on the certified drawing.

Non compliance with these instructions, injudicious choice of lubricant or a lack of maintenance will render warranty agreement invalid.

This warranty clause applies to all parts of the gear unit with the exception of those parts which are subject to wear.

6 Maintenance

6.1 General maintenance instructions

6.1.1 Limits

Each maintenance interval also contains the maintenance task of the interval(s) before. For example, the maintenance after 1 week also contains the maintenance after 1 day.

Procedure

1. Read also the maintenance tasks in the drive package documentation. Refer to section [Related documents](#) on page 10
2. If the maintenance task shows more than one limit, obey the limit that comes first.

6.1.2 Not approved work

Do not do other maintenance than in the instructions in this document, change or do repairs on the gear unit without the written approval of H.I.T. If not, H.I.T. is not liable.

Procedure

1. Only do the maintenance tasks that are in the related documents. Refer to section [Related documents](#) on page 10.
2. If you cannot obey the instructions or if you think that there is an instruction not available, speak to H.I.T.

6.1.3 Instructions (water cooling)

Procedure

1. Drain the cooling water if the gear unit does not operate and the ambient temperature is below the freezing point.

6.2 Maintenance schedule (all gear units)

Task	Limit	Instruction
Change the oil.	800 hours of operation after the initial startup ³	Section Change the oil on page 23
Do a check for oil leaks.	1 month	Section Do a check for oil leaks on page 24
Clean the gear unit.	3 months	Section Clean the gear unit on page 27
Do a check for unwanted noise and vibrations.	6 months	Section Do a check for unexpected noise and vibrations on page 24
Do a check on the gear oil level.	6 months	Section Measure the gear oil level on page 29
Do a check on the gear oil quality.	4000 hours of operation or 6 months	Section Do a check on the quality of the gear oil on page 24

³ Not before 100 hours of operation after the initial startup

Task	Limit	Instruction
Do a check on the breather plug.	6 months	Section <i>Do a check on the breather plug</i> on page 25
Do a check on the fixation of the gear unit.	1 year	Section <i>Do a check on the fixation of the gear unit</i> on page 25
Do a check on the position of the gear unit.	1 year	Section <i>Do a check on the position of the gear unit</i> on page 26
Do a check for corrosion.	1 year ⁴	Section <i>Do a check for corrosion of internal parts of the gear unit</i> on page 31
Replace the oil filter cartridge.	800 hours of operation or if the contamination indicator tells you to ⁵	Section <i>Replace the oil filter cartridge (if applicable)</i> on page 27
Change the oil.	8000 hours of operation or 18 months	Section <i>Change the oil</i> on page 23

6.3 Special maintenance (belt drives)

Task	Limit	Instruction
Do a check on the V-belt drive.	1 month	Section <i>Do a check on the V-belt drive</i> on page 31

6.4 Special maintenance (grease lubrication points)

Task	Limit	Instruction
Add grease to the grease lubrication points.	800 hours of operation after the initial startup ⁶	Section <i>Add grease to the lubrication points for grease</i> on page 30

6.5 Special maintenance (lubrication points for bearings)

Task	Limit	Instruction
Add grease for bearings.	800 hours of operation or 1 year	Section <i>Add grease to the lubrication points for grease</i> on page 30

⁴ Also do the task when you start to operate the gear unit again after a period of standstill of more than 2 weeks.

⁵ Not all oil filters have a contamination indicator. If the oil filter has a contamination indicator, only obey the signal of the indicator, not the time limit.

⁶ Not before 100 hours of operation after the initial startup

6.6 Special maintenance (lubrication points for labyrinth seals)

Task	Limit	Instruction
Add grease for labyrinth seals.	3000 hours of operation or 1 year	Section <i>Add grease to the lubrication points for grease</i> on page 30

6.7 Special maintenance (backstop)

Task	Limit	Instruction
Do a check on the backstop.	1 year	Section <i>Do a check on the backstop</i> on page 28

6.8 Change the oil



Warning:

- Do not touch the gear unit or the gear oil. They are hot. Use protective clothing.
- If the gear unit has a heater, de-energize the heater. If not, the heater can increase the temperature of the gear unit or the gear oil.



Note:

- If you need to change the oil to a higher viscosity grade, do this before the ambient temperature increases.
- These steps make it easier to remove all gear oil:

Change the oil when the gear unit is hot.

Remove the dipstick.

Use a portable pump to drain a large volume of gear oil.

If a small quantity of oil stays below the bearings, remove it with the additional drain plugs. For the location of these drain plugs, refer to the certified drawing.

Procedure

1. Add grease to all lubrication points for grease. Refer to [Add grease to the lubrication points for grease](#) on page 30.
2. Make sure that the gear unit operates for minimum one hour.
3. Stop the gear unit.
4. Remove all the gear oil from the gear unit. Refer to section [Drain gear oil](#) on page 30.
5. Flush the lubrication and the cooling system with the new or filtered gear oil. Make sure that the gear unit, the lubrication system and the cooling system only contain new or filtered oil. For instructions, refer to the service manual of the lubrication and cooling system.
6. If the gear unit has a heater, clean it.
7. Fill the gear unit with gear oil. Use new gear oil or filtered gear oil.
 - For the specification of the new gear oil, refer to section [Lubricants](#) on page 41.
 - For the filtered gear oil, filter the gear oil minimum 10 times. Do not use the filter of the lubrication system. For the filter specifications, refer to section [Gear oil filter specifications](#) on page 41.
 - For instructions on how to fill the gear unit with gear oil, refer to section [Fill the gear unit with gear oil](#) on page 29.
8. If an oil filter is installed, replace the oil filter cartridge. Refer to section [Replace the oil filter cartridge \(if applicable\)](#) on page 27.

6.9 Do a check for oil leaks



Warning: Do not disassemble an "OIL-LOCK™" or the "OIL-GUARD™" system on the HSS. If you see leaks at this location, speak to H.I.T.

Procedure

1. Examine the surface of the gear unit and the adjacent parts.
2. If you see leakage: find and remove the cause of the leakage.
3. Clean all parts that have gear oil or grease on the surface.

6.10 Do a check for unexpected noise and vibrations

Procedure

1. While the gear unit operates, listen for unexpected noise and vibrations.
2. If you hear unexpected noise and vibrations, speak to the approved installation engineer.

6.11 Do a check on the quality of the gear oil



Warning: Do not touch the gear unit or the gear oil. They are hot. Use protective clothing.



Note: For the test parameters and the specifications of the test container, refer to the supplier of your gear oil.

Procedure

1. Drain 2 liters of gear oil. Refer to section *Drain gear oil* on page 30.
2. At the oil drain, get an oil sample. Use a clean test container.
3. Make sure that a test is done on the sample. Obey the instructions and specifications of the gear oil supplier.
4. Obey the instructions that you read on the test report.

6.12 Do a check on the breather plug

Procedure

1. Do a check for blockage of the breather plug.
2. If you see a blockage, remove the blockage.

6.13 Do a check on the fixation of the gear unit

6.13.1 Do a check on the fixation of the gear unit (solid shafts)

Procedure

1. Measure the torque of the bolts at the bolt holes of the gear unit.
2. Compare the torque with the specification in section *Bolt specifications (gear units with solid shafts)* on page 34.
3. Measure the torque of all other bolts for fixation of the gear unit such those that connect to a motor, a brake and a chassis. For the location and specification of these bolts, refer to the certified drawing.
4. If the torque is not correct, tighten the bolts.

6.13.2 Do a check on the fixation of the gear unit (hollow shafts)

Procedure

1. Do a visual check on the paint or the torque seal on the nut and the torque nut of the torque reaction point.
2. If you see broken paint or a broken torque seal, install the torque arm correctly again. Refer to section *Prestress specifications for the torque arm (hollow shaft)* on page 40.
3. Measure the torque of all other bolts for fixation of the gear unit such as those that connect to a motor, a brake and a chassis. For the location and specification of these bolts, refer to the certified drawing.
4. If the torque is not correct, tighten the bolts and apply new torque seal.

6.13.3 Do a check on the fixation of the gear unit (shrink disk, other than 2-part)

Procedure

1. Measure the torque of the bolts of the shrink disk.
2. Compare the torque with the specification in the drive package documentation.
3. If the torque is not correct, tighten the bolts. For the correct torque, refer to the drive package documentation.

6.13.4 Do a check on the fixation of the gear unit (2-part shrink disk)

Procedure

1. Measure the torque of the bolts of the shrink disk.
2. Compare the torque with the specification in section *Torque specifications* on page 39.
3. If the torque is not correct, tighten the bolts. Start with one bolt and continue counterclockwise until the last bolt.

6.14 Do a check on the position of the gear unit

6.14.1 General instructions

Procedure

1. Do a check on the position of the gear unit.
2. Compare the inclination with the specifications. Refer to the certified drawing.
3. If the position is not correct, speak to the approved installation engineer to adjust the position of the gear unit.
4. Do a check if the gear unit aligns with the motor that operates the gear unit and the machine that is operated by the gear unit. Refer to the documentation of the motor and the machine.

6.14.2 Measure the position of the LSS and the HSS (single stage)

Procedure

1. Measure the misalignment of the coupling.
2. Compare the misalignment with the specifications. Refer to section *Misalignment of the HSS (couplings)* on page 33.
3. If the misalignment is not satisfactory, speak to the approved installation engineer to align the LSS and the HSS.

6.14.3 Measure the position of the LSS (multi stage)

Procedure

1. Measure the misalignment of the coupling.
2. Compare the misalignment with the specifications. Refer to the specification of the couplings.
3. Calculate the result of the angular and the radial misalignment. Refer to section [Misalignment of the LSS](#) on page 33.
4. Compare the result with the specifications. Refer to section [Misalignment of the LSS](#) on page 33.
5. If the result is not satisfactory, speak to the approved installation engineer to align the LSS.

6.14.4 Measure the position of the HSS (multi-stage)

Procedure

1. Measure the misalignment of the coupling.
2. Compare the misalignment with the specifications. Refer to section [Misalignment of the HSS \(couplings\)](#) on page 33.
3. If the misalignment is not satisfactory, speak to the approved installation engineer to align the HSS.

6.15 Replace the oil filter cartridge (if applicable)

Procedure

1. If you must add grease to the bearings or to the labyrinth seals in the same maintenance sequence: do the instructions in the sequence below.
 - a) Add grease.
 - b) Make sure that the gear unit operates for minimum one hour.
 - c) Replace the oil filter cartridge.
2. In other conditions: replace the oil filter cartridge.

6.16 Clean the gear unit



Caution: If you use a high-pressure cleaner, do not point it directly to the breather plugs or seals.

Procedure

1. Remove all contamination from the gear unit.
2. Make sure that you can see all the signs on the gear unit.
3. Make sure that air can flow around the gear unit.

6.17 Do a check on the backstop



Warning:

- Do not loosen a part of the backstop when there is load on the gear unit. In this condition, the gear unit can turn in the incorrect direction.
- Make sure that a failure of a backstop cannot cause injury or damage to the system.



Caution: Do not turn the gear unit in the incorrect direction. This condition causes damage to the backstop.

Procedure

1. Make sure that the backstop operates correctly.

6.18 Install the torque arm

Install the torque arm

Procedure

1. Attach the gear unit to a torque reaction point. Use a torque arm. Refer to the certified drawing for the location of the torque arm on the gear unit.

Prestress the disk springs of the torque arm

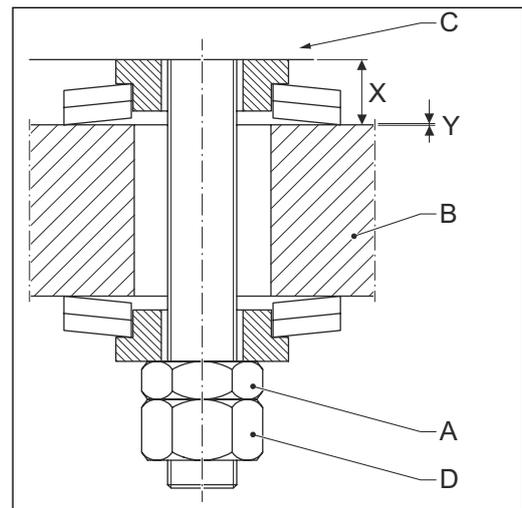
This is necessary to make sure that the connection between the torque arm and the torque reaction point stays flexible and resilient.

Procedure

1. Turn the nut (A) to decrease the distance (X) with a distance (Y). (X) is the distance between the torque reaction point (B) and the gear unit (C).
 - This step prestresses the disk springs.
 - For the specification of (Y), refer to section *Prestress specifications for the torque arm (hollow shaft)* on page 40.



Note: (Y) is the difference between the distance without load and the distance when the disk springs are prestressed.



2. Turn the nut (D) tightly against the nut (A).
3. Apply torque seal to the nuts. Refer to section *Torque seal specification* on page 32.

6.19 Fill the gear unit with gear oil

6.19.1 Select the gear oil

**Caution:**

- Only use the gear oil that agrees with the type plate and with section *Lubricants* on page 41. Do not use another type of gear oil.
- Only use the markings on the dipstick to measure the gear oil level.
- Make sure that all items that can cause draining of the gear oil by accident are secured

**Note:**

- H.I.T. is not responsible or liable if the supplier of oil changes the composition of the gear oil.
- It can be necessary to rinse the gear unit. Speak to the supplier of the gear oil.

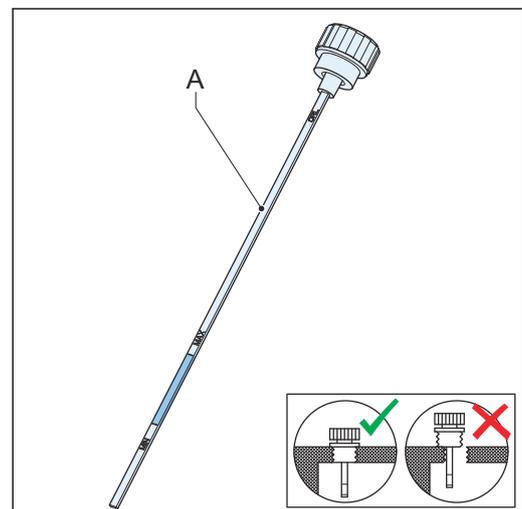
Procedure

1. For the correct type and viscosity of gear oil, refer to the type plate.
2. With the type and viscosity, select the gear oil from the tables in section *Lubricants* on page 41.
3. If the gear unit contains gear oil for storage, drain it.

6.19.2 Measure the gear oil level

Procedure

1. Remove the dipstick (A). Refer to the sign on the gear unit.
2. Clean the dipstick.
3. Lower the dipstick fully.
4. Remove the dipstick.
5. Read the gear oil level on the dipstick.
6. If the gear oil level is below the minimum level indicated on the dipstick, add gear oil.
7. If the gear oil level is above the maximum level indicated on the dipstick, drain gear oil.



6.19.3 Add gear oil (all gear units)

Only do the procedure if it is necessary to add gear oil.



Caution: Before you use a different type of gear oil that is in the gear unit, speak to the supplier of the gear oil. Not all gear oils are compatible with each other. The supplier of the gear oil gives instructions. Obey these instructions.

Procedure

1. Open the gear unit at the oil fill plug. Refer to the sign on the gear unit.
2. Add gear oil.
3. If the gear unit has a motor pump, make sure that the pump goes on for minimum 3 minutes.
4. Measure the level of gear oil.

6.19.4 Drain gear oil

Only do the procedure if it is necessary to drain gear oil.

Procedure

1. Put a container below the oil drain. Refer to the sign on the gear unit.
2. Open the gear unit at the oil drain. Gear oil comes out of the opening at the oil drain.
3. If the gear unit has a magnetic plug, clean it.
4. Install a new copper ring on the drain plug.
5. Close the oil drain. For the correct torque, refer to [Torque values for oil drain screw](#) on page 38.
6. Discard the gear oil in the container. Obey the local regulations to prevent environmental pollution.
7. Measure the oil level.
8. If you removed components of the gear unit during maintenance, install them again. Do a check for oil leaks.

6.20 Add grease to the lubrication points for grease

6.20.1 General procedure

Procedure

1. Select the grease type.
2. If necessary, add grease.

6.20.2 Select the grease type



Caution: Only use the grease type that agrees with the type plate and with section [Lubricants](#) on page 41. Do not use another grease type.



Note: If the supplier of grease changes the composition of the grease, H.I.T. is not responsible or liable.

Procedure

1. For the correct grease type, refer to the type plate.
2. Use this data to select the grease from the tables in section [Lubricants](#) on page 41.

6.20.3 Add grease



Caution: Before you use a different type of grease that is in the gear unit, speak to the supplier of the grease. Not all greases are compatible with each other. The supplier of the grease gives instructions. Obey these instructions.



Note:

- The grease nipples agree with the standard DIN 71412 or optional DIN 3404.
- For the grease quantity, refer to chapter *Technical data* on page 32.

Procedure

1. Add grease to the grease nipples. Refer to the signs on the gear unit. Use a grease gun.

6.21 Do a check for corrosion of internal parts of the gear unit

Procedure

1. Open the inspection cover. For the location of the inspection cover, refer to the certified drawing.
2. Do a check for corrosion of internal parts of the gear unit.
3. If there is a sign of corrosion of internal parts of the gear unit, do these steps:
 - a) Make a report.
 - b) Give the report to H.I.T.

6.22 Do a check on the V-belt drive

Procedure

1. Do a check on the belt tension.
2. If the tension is not correct, adjust the tension.
3. Do a visual check for damage.
4. If you see damage, replace the V-belt drive immediately. Speak to the approved installation engineer.

7 Technical data

7.1 Dimensions and mass

Refer to the certified drawing.

7.2 Materials of the gear unit

- Gear oil
- Grease
- FKM (a type of fluoroelastomer)
- Copper
- Aluminium
- Polycarbonate (solid)
- Polypropylene (with embedded glass fibre or with carbon)
- Polyamide (solid)
- Polyphenol sulfide (solid)
- For information on the paint and other materials, refer to the drive package documentation.

7.3 Torque seal specification

Parameter	Specification
Torque seal	Loctite 7417 torque Marque or similar

7.4 Paint specification

Parameter	Specification
Primer	Two-component, polyamide-cured epoxy pre-fabrication primer (20µm)
Finish	Two-component, high build, polyamine adduct-cured epoxy coating (200µm)
Total average minimum dry film thickness	220µm

7.5 Corrosion protection by H.I.T.

Parameter	Specification
Inner parts	Rust preventive mineral oil
Breather plug	Present but not sealed
Shaft extensions	Rust preventive grease
Hollow shafts	Anti-oxidising waxy varnish
Unpainted machined surfaces	Anti-oxidising waxy varnish

7.6 Position of the gear unit

Parameter	Specification
Inclination	Maximum 5 mm per 1 m (5/32 inch per 3 feet or 5 mrad or 17 arc minutes)
Accuracy of the vertical position from the fourth connection point [mm] ([inch])	0.1 (0.004)

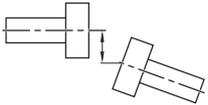
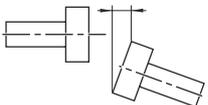
7.7 Ambient conditions for storage

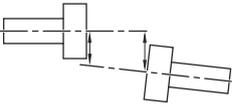
Parameter	Specification
Temperature [°C]	Above dew point temperature
Relative humidity, non-condensing [%]	Maximum 60 (indoors)
General protection	Against corrosion and contamination
Vibration	Not allowed

7.8 Misalignment of the LSS

Parameter	Specification
$\frac{dr}{\Delta r} + \frac{d\alpha}{\Delta\alpha}$ <p>Misalignment equation, where</p> <ul style="list-style-type: none"> • dr = measured radial misalignment [mm] • Δr = maximum permitted radial misalignment [mm] • $d\alpha$ = measured angular misalignment [mm] • $\Delta\alpha$ = maximum permitted angular misalignment [mm] 	Smaller than or equal to 1

7.9 Misalignment of the HSS (couplings)

Type of coupling	Speed of the HSS [1/min]	Maximum permitted misalignment [mm] ([mils])
Short flexible coupling, radial misalignment 	750	0.19 (7.5)
	900	0.15 (6.0)
	1000	0.12 (4.8)
	1200	0.10 (4.0)
	1500	0.09 (3.5)
	1800	0.08 (3.0)
Angular misalignment for coupling diameter 100 mm (10 inch) 	750	0.13 (13.0)
	900	0.10 (10.0)
	10000	0.096 (9.6)
	1200	0.08 (8.0)
	1500	0.07 (7.0)
	1800	0.05 (5.0)

Type of coupling	Speed of the HSS [1/min]	Maximum permitted misalignment [mm] ([mils])
Radial misalignment for the spacer shaft and membrane (disk) coupling, spacer length 100 mm (1 inch) 	750	0.25 (2.5)
	900	0.20 (2.0)
	1000	0.18 (1.8)
	1200	0.15 (1.5)
	1500	0.12 (1.2)
	1800	0.10 (1.0)

7.10 Bolt specifications (gear units with solid shafts)

7.10.1 Bolt specifications (single-stage, horizontal LSS)

Table for bolts according to DIN 267 bolt quality grade 8.8

Gear unit type	Gear unit size	Bolt dimension [ISO]	Torque [Nm]
QHP.1	C	M20	335
	D	M24	675
	E	M24	675
	F	M30	1350
	G	M30	1350
QHP.1T	G	M36	2350
	H	M36	2350
	J	M36	2350
	K	M36	2350

Table for bolts according to SAE bolt quality grade 5

Gear unit type	Gear unit size	Bolt dimension [UNC]	Torque [lbf.in]
QHP.1	C	3/4"	2950
	D	7/8"	4850
	E	1"	6000
	F	1 1/8"	10300
	G	1 1/4"	12000
QHP.1T	G	1 1/2"	21000
	H	1 1/2"	21000
	J	1 1/2"	21000
	K	1 1/2"	21000

7.10.2 Bolt specifications (multi-stage, horizontal LSS)

Table for bolts according to DIN 267 bolt quality grade 8.8

Gear unit type	Gear unit size	Bolt dimension [ISO]	Torque [Nm]
QH...	A	M16	180
	B	M20	335
	C	M24	675
	D	M24	675
	E	M30	1350
	F	M30	1350
	G	M36	2350
	H	M36	2350
	J	M36	2350
	K	M36	2350
	L	M42	3800
	M	M42	3800
	N	M48	5700
	P	M48	5700
	Q	M48	5700
	R	M56	9150
	S	M56	9150
T	M56	9150	

Table for bolts according to SAE bolt quality grade 5

Gear unit type	Gear unit size	Bolt dimension [UNC]	Torque [lbf.in]
QH...	A	5/8"	1550
	B	3/4"	2950
	C	7/8"	4850
	D	1"	6000
	E	1 1/4"	12000
	F	1 1/4"	12000
	G	1 1/2"	21000
	H	1 1/2"	21000
	J	1 1/2"	21000
	K	1 1/2"	21000
	L	1 3/4"	33650
	M	1 3/4"	33650
	N	2"	50750
	P	2"	50750
	Q	2"	50750
	R	2 1/4"	81050
	S	2 1/4"	81050
T	2 1/4"	81050	

7.10.3 Bolt specifications (multi-stage, vertical LSS)

Table for bolts according to DIN 267 bolt quality grade 8.8

Gear unit type	Gear unit size	Bolt dimension [ISO]	Torque [Nm]
QV...	A	M16	180
	B	M20	335
	C	M24	675
	D	M30	1350
	E	M30	1350
	F	M36	2350
	G, 2-stage	M36	2350
	G, 3-stage and 4-stage	M42	3800
	H	M42	3800
	J	M42	3800
	K	M42	3800
	L	M48	5700
	M	M48	5700
	N	M48	5700
	P	M48	5700
	Q	M48	5700
	R	M56	9150
	S	M56	9150
T	M56	9150	

Table for bolts according to SAE bolt quality grade 5

Gear unit type	Gear unit size	Bolt dimension [UNC]	Torque [lbf.in]
QV	A	5/8"	1550
	B	3/4"	2950
	C	1"	6000
	D	1 1/8"	10300
	E	1 1/4"	12000
	F	1 1/2"	21000
	G, 2-stage	1 1/2"	21000
	G, 3-stage and 4-stage	1 3/4"	33650
	H	1 3/4"	33650
	J	1 3/4"	33650
	K	1 3/4"	33650
	L	2"	50750
	M	2"	50750
	N	2"	50750
	P	2"	50750
	Q	2"	50750
	R	2 1/4"	81050
S	2 1/4"	81050	
T	2 1/4"	81050	

7.11 Torque values for oil drain screw

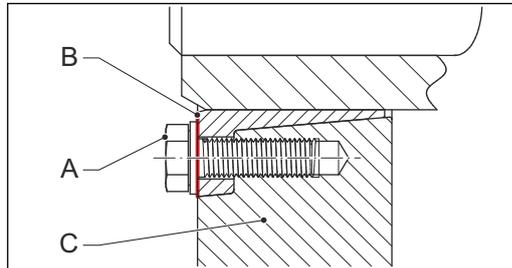
Dimension of the drain screw	Torque
G 1/2 "	56,5 Nm
G 3/4 "	73,4 Nm
≥ G 1 "	79 Nm

7.12 Shrink disk specifications (2-part shrink disk)

7.12.1 Lubrication

Parameter	Specification
Lubricant	Molykote D321R or similar (friction coefficient: 0.04)

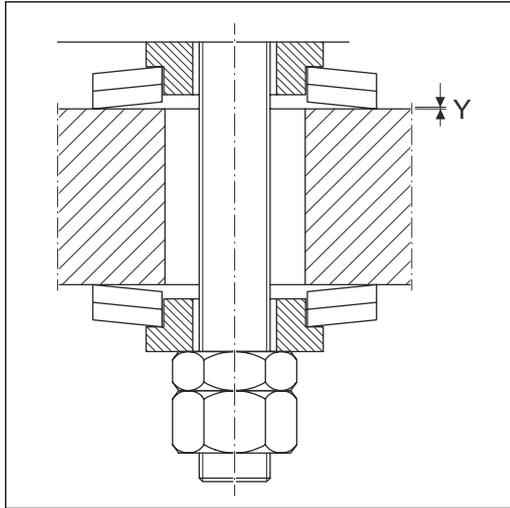
7.12.2 Torque specifications



Gear unit size	H.I.T. part number of the shrink disk	Torque of the bolts (A), for the 2-part shrink disk [Nm] ⁷
A	901-SDA2D110001	120
B	901-SDA2D125001	120
C	901-SDA2D140001	190
D	901-SDA2D165001	290
E	901-SDA2D185001	290
F	901-SDA2D220001	570
G	901-SDA2D240001	570
H	901-SDA2D260001	570
J	901-SDA2D280001	570
K	901-SDA2D320001	990
L	901-SDA2D340001	990
M	901-SDA2D360001	990
N	901-SDA2D390001	1480
P	901-SDA2D420001	1480
Q	901-SDA2D440001	1480
R	901-SDA2D480001	1980
S	901-SDA2D500001	1980
T	901-SDA2D530001	1980

⁷ Torque values only valid for 'Sumitomo Drive Technologies' branded shrink disc. For other brands, obey the mounting instructions and torque values of the manufacturer.

7.13 Prestress specifications for the torque arm (hollow shaft)



Note: (Y) is the difference between distance without load and the distance when the disk springs are prestressed.

Gear unit type	Y	
	[mm]	[inch]
QH.A2	0.7	0.028
QH.B2	0.7	0.028
QH.C2	0.9	0.035
QH.D2	0.9	0.035
QH.E2	1.0	0.039
QH.F2	1.0	0.039
QH.G2	1.0	0.039
QH.H2	1.0	0.039
QH.C3	0.7	0.028
QH.D3	0.9	0.035
QH.D4	0.9	0.035
QH.E3	0.9	0.035
QH.E4	0.9	0.035
QH.F3	1.0	0.039
QH.F4	1.0	0.039
QH.G3	1.0	0.039
QH.G4	1.0	0.039
QH.H3	1.0	0.039
QH.H4	1.0	0.039
QH.J3	1.4	0.055
QH.J4	1.4	0.055

Gear unit type	Y	
	[mm]	[inch]
QH.K3	1.4	0.055
QH.K4	1.4	0.055
QH.L3	1.4	0.055
QH.L4	1.4	0.055
QH.M3	1.4	0.055
QH.M4	1.4	0.055

7.14 Lubricants

7.14.1 General specifications for lubricants

Parameter	Specification
Initial gear oil cleanliness	-/15/12 (or better) according to ISO 4406
Gear oil: maximum allowable water content (Karl Fischer) [%]	0,05
NLGI-Grade of grease	3 2 or 3, for labyrinth seals and lower bearing of the LSS
Nominal temperature of the gear oil in the oil bath, during operation [°C] ([°F])	60 - 80 (140 - 180)
Maximum volume concentration of corrosion inhibitor in the gear oil [%]	2
Working temperature range for corrosion inhibitor [°C] ([°F]) ⁸	15 - 70 (60 - 158)

General specifications for gear oil per viscosity grade

Viscosity grade	AGMA	SUS/100°F
ISO VG150	4	690
ISO VG220	5	1100
ISO VG320	6	1600
ISO VG460	7	2300

7.14.2 Gear oil filter specifications

Parameter	Specification
Filter mesh [µm]	10
Beta ratio of the filter	200 or more

⁸ Make sure to store the gearbox in this temperature range for at least 5 days after each fill of corrosion inhibitor. Afterwards the conditions for storage apply. Refer to *Ambient conditions for storage* on page 33

7.14.3 Additional gear oil specifications (heater)

Parameter	Specification
Minimum gear oil temperature for startup	Refer to the type plate
Gear oil temperature at which the heater must stop [°C] ([°F])	15 (60), unless the certified drawing shows another specification. Then, refer to the certified drawing.

7.14.4 Mineral gear oil and related grease

Table 1: Mineral gear oil

Supplier	ISO VG150	ISO VG220	ISO VG320	ISO VG460
ADDINOL	Eco Gear 150 M	Eco Gear 220 M	Eco Gear 320 M	Eco Gear 460 M
BP-CASTROL	Alpha SP 150	Alpha SP 220	Alpha SP 320	Alpha SP 460
FUCHS	Renolin CLP 150	Renolin CLP 220	Renolin CLP 320	Renolin CLP 460
KLÜBER	Klüberoil GEM 1-150 N	Klüberoil GEM 1-220 N	Klüberoil GEM 1-320 N	Klüberoil GEM 1-460 N
LUBRICATION ENGINEERS INC.		Duolec Vari-Purpose Gear Lubricant 1605	Duolec Vari-Purpose Gear Lubricant 1606	Duolec Vari-Purpose Gear Lubricant 1607
EXXON MOBIL	Mobilgear XMP 150	Mobilgear XMP 220	Mobilgear XMP 320	Mobilgear XMP 460
	Mobilgear 600 XP 150	Mobilgear 600 XP 220	Mobilgear 600 XP 320	Mobilgear 600 XP 460
REPSOL		Super Tauro FND 220	Super Tauro FND 320	
SHELL	Omala F 150	Omala F 220	Omala F 320	Omala F 460
SHELL	Omala S2 GX 150	Omala S2 GX 220	Omala S2 GX 320	Omala S2 GX 460
SINOPEC		SINOPEC AP Gear Oil 220	SINOPEC AP Gear Oil 320	SINOPEC AP Gear Oil 460
STATOIL	LoadWay EP 150	LoadWay EP 220	LoadWay EP 320	LoadWay EP 460
TOTAL		Carter XEP 220	Carter XEP 320	Carter XEP 460
		Carter EP 220	Carter EP 320	Carter EP 460

Table 2: Related grease

Supplier	Related grease, NLGI grade 2	Related grease, NLGI grade 3
BP-CASTROL	Spheerol EPL-2	Spheerol EPL-3
FUCHS EUROPE SCHMIER-STOFFE	Renolit FEP 2	Renolit FEP 3
KLÜBER	Centoplex 2EP	-
(EXXON)MOBIL	-	Mobilux EP 3

Supplier	Related grease, NLGI grade 2	Related grease, NLGI grade 3
SHELL	Gadus S2 V220 2	Gadus S2 V220 3
STATOIL	Uniway Li 62	-
TOTAL	-	Multis EP 3
ADDINOL	Multi-grade grease LM 2 EP	Multi-grade grease LM 3 EP

7.14.5 Synthetic gear oil and related grease

The synthetic oil must be of the poly-alpha-olefin type (SHF-type, Synthetic Hydrocarbon Fluid).

Table 3: Gear oil

Supplier	ISO VG150	ISO VG220	ISO VG320	ISO VG460
ADDINOL	Eco Gear 150 S	Eco Gear 220 S	Eco Gear 320 S	Eco Gear 460 S
	Eco Gear 150 W	Eco Gear 220 W	Eco Gear 320 W	Eco Gear 460 W
ANDEROL		ANDEROL 5220 Plus	ANDEROL 5320 Plus	ANDEROL 5460 Plus
	ANDEROL 5150 XEP	ANDEROL 5220 XEP	ANDEROL 5320 XEP	ANDEROL 5460 XEP
BEL-RAY	Synthetic Gear Oil 150	Synthetic Gear Oil 220	Synthetic Gear Oil 320	Synthetic Gear Oil 460
BP	Enersyn EP-XF 150	Enersyn EP-XF 220	Enersyn EP-XF 320	Enersyn EP-XF 460
CASTROL	Alphasyn EP 150	Alphasyn EP 220	Alphasyn EP 320	Alphasyn EP 460
ENGEN		Gengear SPL A-220	Gengear SPL A-320	Gengear SPL A-460
EXXON MOBIL	Mobilgear SHC XMP 150	Mobilgear SHC XMP 220	Mobilgear SHC XMP 320	Mobilgear SHC XMP 460
	Mobil SHC Gear Series 150	Mobil SHC Gear Series 220	Mobil SHC Gear Series 320	Mobil SHC Gear Series 460
		Mobil SHC 630	Mobil SHC 632	Mobil SHC 634
FUCHS	Renolin Unisyn CLP 150	Renolin Unisyn CLP 220	Renolin Unisyn CLP 320	Renolin Unisyn CLP 460
INDIAN OIL COMPANY LIMITED	SERVOSYN-MESH GOLD 150	SERVOSYN-MESH GOLD 220	SERVOSYN-MESH GOLD 320	SERVOSYN-MESH GOLD 460
KLÜBER	Klübersynth GEM 4-150 N	Klübersynth GEM 4-220 N	Klübersynth GEM 4-320 N	Klübersynth GEM 4-460 N
LUBRICATION ENGINEERS INC.		Duolec Syn Gear Lubricant 9822	Duolec Syn Gear Lubricant 9832	Duolec Syn Gear Lubricant 9846

Supplier	ISO VG150	ISO VG220	ISO VG320	ISO VG460
PETRO-CANADA		ENDURATEX Synthetic EP 220	ENDURATEX Synthetic EP 320	ENDURATEX Synthetic EP 460
Q8 Oils	Q8 Galilei 150	Q8 Galilei 220	Q8 Galilei 320	Q8 Galilei 460
REPSOL		SUPER TAURO SINTETICO 220	SUPER TAURO SINTETICO 320	SUPER TAURO SINTETICO 460
SHELL	Omala S4 GX 150	Omala S4 GX 220	Omala S4 GX 320	Omala S4 GX 460
SHELL	Omala S4 GXV 150	Omala S4 GXV 220	Omala S4 GXV 320	Omala S4 GXV 460
SINOPEC	SINOPEC AP-S Gear Oil 150	SINOPEC AP-S Gear Oil 220	SINOPEC AP-S Gear Oil 320	SINOPEC AP-S Gear Oil 460
TOTAL		Carter SH 220	Carter SH 320	Carter SH 460

Table 4: Related grease



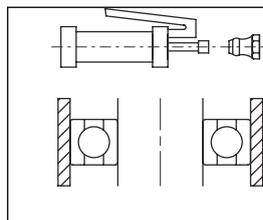
Note: For all synthetic gear oils, you can only use the grease type in the table below.

Supplier	Related grease, NLGI grade 2	Related grease, NLGI grade 3
FAG	-	Arcanol VIB3

7.15 Grease quantity at lubrication points for bearings

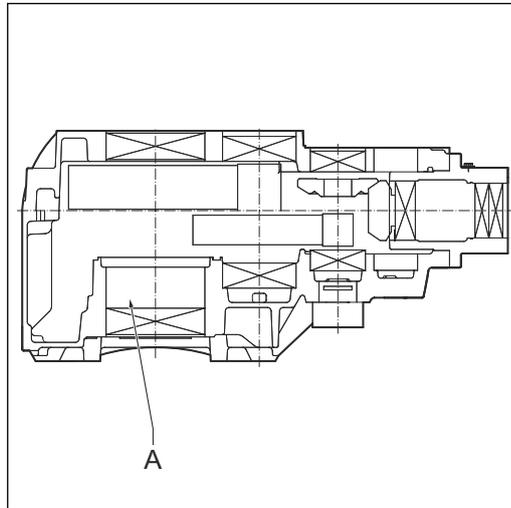
7.15.1 Grease quantity type

For the grease quantity type: refer to the type plate.



The grease quantities only apply to the lubrication points that are indicated on the gear unit with the sign for lubrication point for grease at bearings.

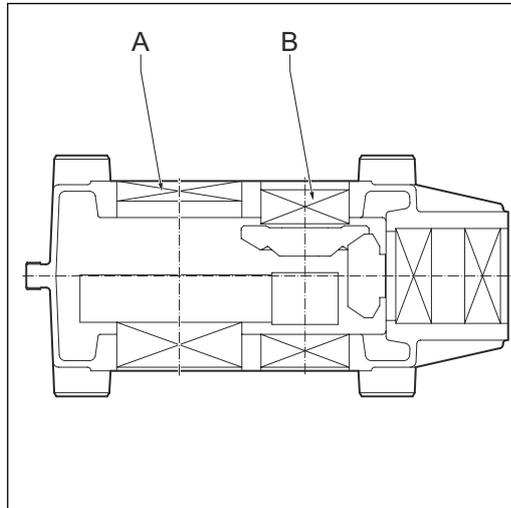
7.15.2 Grease quantity types Q1, Q2, Q3, Q6, Q7 and Q8



A Lubrication point

Gear unit size	Grease quantity type					
	Q1 [g]	Q2 [g]	Q3 [g]	Q6 [g]	Q7 [g]	Q8 [g]
C	50	60	50	100		
D	60	80	60	130	100	120
E	90	110	90	180	130	170
F	120	150	120	240	180	220
G	170	200	170		220	320
H	180	230	180		280	400
J	220	280	220		320	410
K	260	320	260		320	500
L	320	400	320		410	590
M	340	410	340		370	700
N	380	380	290			
P	470	470	350			
Q	490	490	360			
R	500	500	380			
S	600	600	440			
T	620	620	470			

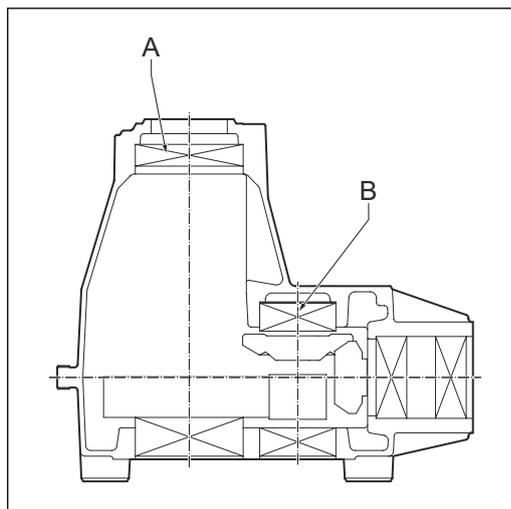
7.15.3 Grease quantity type Q4



- A Lubrication point
- B Lubrication point

Gear unit size	Lubrication point	
	A [g]	B [g]
Z	10	20
A	20	20
B	30	30

7.15.4 Grease quantity type Q5

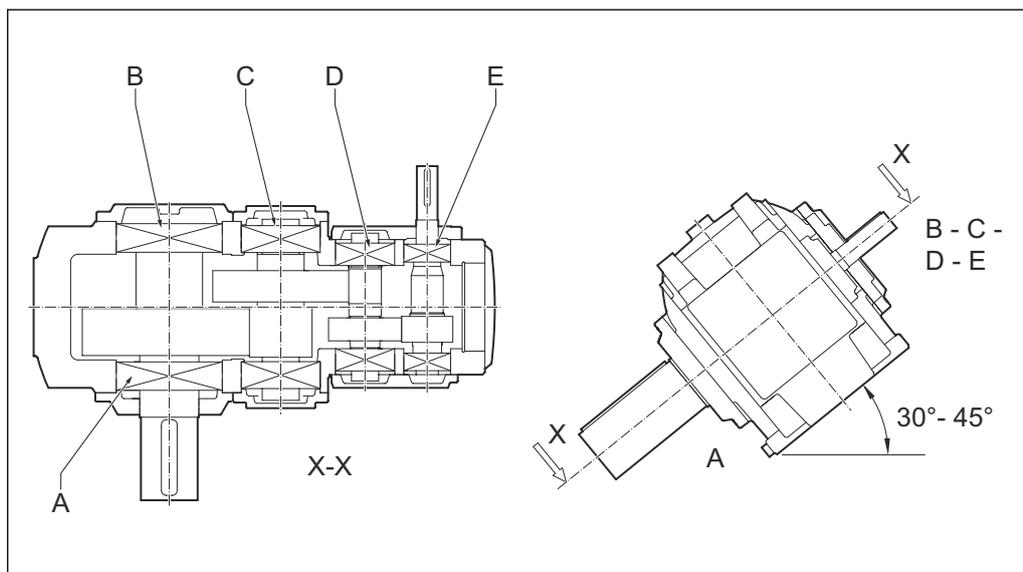


- A Lubrication point
- B Lubrication point

Gear unit size	Lubrication point	
	A [g]	B [g]
Z	10	20

Gear unit size	Lubrication point	
	A [g]	B [g]
A	20	20
B	30	30

7.15.5 Grease quantity type Q9

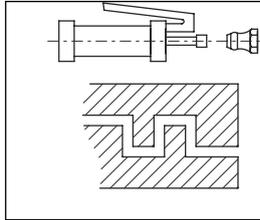


- A Lubrication point at the lower side
- B Lubrication point at the upper side
- C Lubrication point at the upper side
- D Lubrication point at the upper side
- E Lubrication point at the upper side

Gear unit size	Lubrication point				
	A [g]	B [g]	C [g]	D [g]	E [g]
C		50	30	20	10
D		60	40	30	20
E		90	50	40	20
F		120	80	50	30
H	180				
J	220				
K	260				
L	320				
M	340				
N	290				
P	350				
Q	360				

7.16 Grease quantity for lubrication points at labyrinth seals (LSS)

7.16.1 Grease quantity type



The grease quantities only apply to the lubrication points that are indicated on the gear unit with the sign for lubrication point for grease at labyrinth seals.

7.16.2 Grease quantity (single-stage)

Gear unit type	Grease quantity [g]
QHRC1Z-..N	75
QHRD1Z-..N	75
QHRF1Z-..N	45
QHPC1	10
QHPD1	10
QHPE1	15
QHPP1	25
QHPPG1	35
QVPZ1	10
QVPB1	10

7.16.3 Grease quantity (multi-stage)

Gear unit type		Grease quantity [g]
Gear unit size	LSS type	
QVRZ2		50
QVRZ2L		30
QVRA2		70
QVRA2L		40
QVRB2		50
QVRB2L		55
A	Solid	15
	Hollow	10
B	Solid	22
	Hollow	16
C	Solid	25
	Hollow	25
D	Solid	35
	Hollow	25

7.17.3 Grease quantity (multi-stage)

Gear unit type	Grease quantity [g]
Z	10
A to H	10
J to T	20

7.18 Cooling water specifications

Parameter	Specification		
	[MPa]	[bar]	[psi]
Maximum water pressure on the cooling coils	0.8	8	116
Quality	Fresh water or salt water		

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